THE ROLE OF SOCIO-ECONOMIC AND CULTURAL FACTORS ON INFANT AND CHILD SEX MORTALITY DIFFERENTIAL IN KENYA

BY

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DECLARATION

This Thesis is my original work and to the best of my knowledge has not been presented in any university for an M.A. degree.

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DEDICATION

This Thesis is dedicated to my entire family, and especially to my mother W/ro Amelework G/Ab.

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ABSTRACT

This study was aimed at investigating the role of socio-economic and cultural factors and isolate the potential determinants of sex mortality differential during the childhood period at the national level in Kenya. The major objective was to explore the variation of mortality by sex under different categories of selected socio-economic and cultural variables from the 1993 Kenya Demographic and Health survey data (KDHS 1993), and then asses and isolate the potential determinants of the sex differences in mortality.

The socio-economic and cultural variables investigated include: level of education of mothers'; place of residence of mothers'; marital status of mothers'; current type of employment of mothers'; region of residence of mothers'; the religious affiliation of mothers' and the ethnic origin of mothers'. Each variable was splitted into different categories.

The Trussell variant of the original Brass method was used to determine infant and child mortality levels whereas multivariable regression method was employed to isolate the potential determinants of mortality at the childhood period by sex.

In general the factors investigated were found to contain large variation in infant and child sex differences in mortality rates. Excess female child mortality rates were observed among children of mothers: with no education; residing in urban areas; who are working away from home; who are widowed or divorced; residing in Nyanza and Central provinces; with Catholic religious

affiliation; and, from Nilotic ethnic origin. Among the categories Nyanza province recorded the highest excess female child deaths whereas Eastern province recorded the highest male child deaths. Although the direction of childhood mortality change among the various socio-economic groups was found to be the same for males and females, the magnitudes of the change were found to vary by sex.

In the multivariate analysis the proportion of variance of the dependent variable explained by the selected socio-economic and cultural variables was found to be relatively small; and this was attributed to, the non linearity of some relationships, the high random variation that might exist while using a mortality indicator as dependent variable and the non inclusion of some important variables related to individual child risk of death. However, the F-test values of the analysis confirmed that the model was statistically significant. Education and ethnicity variables were found to explain most of the observed variation. In all, level of maternal education, type of employment of mothers', marital status of mothers' and the ethnic origin of mothers' were found to be important determinants of the proportion of children dead of both the sexes. In addition urban place of residence was found to be a potential determinant of the proportion of male children dead compared to rural place of residence. Primary and secondary and above level of maternal education and other Bantus ethnic origin of mothers' were found to have reduction effect on child mortality. Children of mothers working away, working at home, widowed and

divorced have relatively higher mortality rates when compared with the selected background reference categories for both the sexes. Urban place of residence, in the case of male children was found to have a reduction effect on child mortality.

In view of the results of the demographic and statistical analysis this study recommended that policy makers and planners have to integrate gender issues in development planning so as to facilitate equal opportunities for both the sexes at any level of socio-economic strata and in any cultural set-up. It also recommended deep and comprehensive studies to be conducted in this area.

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LIST OF ABBREVIATIONS

CBS = Central Bureau of statistics

CD = Children dead

CEB = Children everborn

CMRm = Male child mortality rate

CMRf = Female child mortality rate

DD = Daughters dead

DEB = Daughters everborn

FP = Female population

GNP = Gross national product

IMRm = Male infant mortality rate

IMRf = Female infant mortality rate

KDHS = Kenya Demographic and health survey

NCPD = National Council of Population and Development

OLS = Ordinary least square

PCI = Per capital income

SEB = Sons everborn

SMD = Sex mortality differential

SPSS = Statistical package for social sciences

SMR = Sex mortality ratio

UN = United Nations

UON = University of Nairobi

CHAPTER ONE

GENERAL INTRODUCTION

1.1 INTRODUCTION

The study of differential mortality is one of the important focuses of demographic research. The study of differential mortality in addition to providing descriptive information on the pattern of mortality, is the foundation for policy intervention designed to improve the probability of individual survival.

Several studies showed that there is a general mortality decline in Sub-Saharan countries, but the principle of equal opportunity for both the sexes is not implemented in the realm of life (Gebyon and Locoh, 1989). Even if equality in right and opportunities for both sexes is the primary objective of developed countries,in most of developing countries the discriminatory attitude towards the female sex is still highly prevalent (ibid).

Studies have shown that developing countries have not only excess maternal mortality but also considerable variation in infant and child sex mortality differential favouring one sex due to the differences in attitudes of parents towards their children based on their socio-economic and cultural backgrounds (Chai 1983, Das Gupta 1987, Bourne and George 1991, Legrand and Mbacke' 1992).

On the whole, girls are believed to be innately more resistant to health risks than boys because of their biological nature, and so other things being equal the risk of dying is higher for males as compared to females. Excess female infant and child mortality or

the discrepancy from what is "normally" expected, where it exists according to Legrand and Mbacke'(1992), is likely to be caused by: females particular vulnerability to a specific health risk; discrimination within families in the provision of health care or nutrition; and socio-economic and cultural variables which underly the family's desire and ability to treat their sons and daughters differently.

Ethically, every infant and child life which can be saved must be saved without discrimination or favouring either sex. In any culture or socio-economic set-up the right of an infant or a child to the longest possible life must not be questioned based on its sex.

In Kenya differences in the chances of survival of infants and children from different socio-economic and cultural backgrounds are still considerable (Jada 1992, Mamo 1995, Karen et al. 1993). With customs and traditions sanctioned by some religious doctrines which dictate gender inequality, the mentioned differences in the chances of survival are gender biased favouring the male sex. Level of education of mothers', work status of mothers', place of residence, ethnicity, and religion are some of the socio-economic and cultural factors which are expected to bring variation in infant and child sex mortality differential (Legrande and Mbacke', 1992).

Being sensitive indicators of the health situation and the level of socio-economic development in a society infant and child mortality are considered as the prime measure of welfare and development. Information on the mortality situation of a country

like Kenya based on individual sex is then very essential for planning and research. From such an information formulation of proper policies, population forecasting, educational and health planning, evaluation of success and failure of different services are possible.

Thus, this study focuses on bringing out and providing information on the roles of socio-economic and cultural factors on infant and child sex mortality differential in Kenya. Such information can help policy makers on what steps to take in the implementation and encouraging equal opportunity and treatment to both the sexes at any level of socio-economic strata and in any cultural set-up.

1.2 BACKGROUND TO THE STUDY AREA

1.2.1 Geography

Kenya is one of the countries of Sub-Saharan Africa covering an area of 582000 square kilometres, and lying astride the equator on the eastern sea board of Africa. It lies between Ethiopia to the north, Sudan to the north west, Tanzania to the south, Uganda to the west and Somalia to the east. The Indian ocean coastline stretches to a distance of 400 kilometres. The country is entirely within the equatorial zone almost bisected by the equator, lying 3° north and 5° north latitude and between 34° and 41° east longitude. The rift valley cut across the country running from north to south and whose depth is between 610 and 914 metres below the rest of the landscape (UON,1989).

Altitude plays the major role in patterns of human settlement, climate and agricultural activities, in which there are two distinct regions, the highland and the lowland Kenya. The physical environment is of savannah, tropical, equatorial and tectonic types. From the available land only 20% is arable while the remaining is arid and semi arid.

1.2.2. History, culture and administrative set-up

Kenya is one of the countries which were under the British colonial rule. The country became an independent nation on December 12,1963.

There are 43 ethnic groups in Kenya's ethnic mosaic, of which there are a dozen major tribes and tribal clusters (KDHS,1993). Most of the tribes belong to the Bantu, Nilotic and Kushitic language groups constituting about 63% of the total population (Ayiemba,1990). Bantu speaking tribes constitute the larger number followed by Nilotic. The Kikuyus, Luhya, Majikenda, Kamba, Meru, Embu and Kisii (Bantus); Luo and Kalenjin (Nilotic); are considered to be the major ethno-linguistic groups in the country (KDHS,1993).

Christianity and Islam are the two major religions in the country. The country is divided into eight administrative areas. Each administrative area (province) is further sub-divided into districts, divisions, locations and sub-locations. Nairobi being a primate city has a special provincial status (Ewbank et al., 1986).

1.2.3 Economy

After independence Kenya experienced a tremendous growth in its economy. Tea, coffee, dairy products and meat are the major agricultural products. There is also extensive industrial set-ups in Nairobi and in other large towns. The variety of flora and fauna which are to be found in national parks are the main tourists assets which generate a lot of income (UON, 1989). The GNP PCI at mid 1996 was 260 US dollars (UN, 1996).

1.2.4 Demographic information

Ewbank et al.(1986), consider Kenya as a unique country in Sub-Saharan Africa in its rich diversity of demographic and epidemiological data.

Kenya's population was estimated to be 28.2 million at mid 1996 with a natural increase of 2.7%(UN,1996). In 1948 the country had a total population of 5.4 million with an estimated annual growth rate of 2.3% and a doubling time of below 30 years. Then in 1962 the population grew to 8.6 million with an annual growth rate of 3.0% and a doubling time of 23 years. In 1969, the population numbered to 10.9 million with an annual growth rate of 3.3%. The population reached 15.3 million in 1979 with an annual growth rate of 3.9, and risen to 21.4 million in 1989.

The country is the first Sub-Saharan African country to adopt a national family planning programme in 1967 with the aim of reducing the annual growth rate to 2.8% by the year 2000, as well as reduction of maternal, perinatal, infants and child mortality,

morbidity and malnutrition. Kenya is characterised by the decline both in mortality and fertility. The total fertility rate was 7.6 in 1969 as compared to the total fertility rate of 5.4 at present. The infant mortality rate declined from 184/1000 in 1948 to 62/1000 at present. The expectation of life at birth has been increased due to the reduction in infant and child mortality which is attributed to the rising family incomes, advances in public health care, increase in literacy and the provision of other services. In the country there are differentials in both mortality and fertility in different parts, Central province having a declined mortality and fertility rate with a tendency towards smaller families, while in Nyanza province both fertility and mortality rates are considerably high.

Out of the four types of human migration the rural to urban and the rural to rural types of migration are the most dominant ones in the country.

1.3 THE PROBLEM

Kenya, a nation which is characterised by extreme regional imbalances in socio-economic development, diverse cultural set-ups, high rate of rural to urban migration and a considerable prevalence of gender inequality, experiences variation in infant and child sex mortality differential in line with the different socio-economic strata and cultural groups due to the different levels of discriminatory attitudes towards the female sex.

Different studies showed the existence of differential

mortality in Kenya (Kibet 1981, Kichamu 1986, Ondimu 1986, Jada 1992). The 41 districts covered by the 1993 KDHS out of the then 48 districts in Kenya have different socio-economic and cultural set-ups between them and within the districts themselves. These make Kenya a country of heterogeneous society with considerable imbalances in socio-economic and socio-cultural developments, paving the way for the existence and variation of sex differences in infant and child mortality.

The unwritten traditional code entails preference to the male offsprings, as sons are considered to carry the family name and as old age security. Even if in Kenya it is argued that the girls are much more than boys who continue to care for their parents in the old age, there is a continuing preference for male over female children even among some educated individuals (Kahihu,1996). The prevailing high income differences ranging from few with the highest income to the majority below subsistence income, the employment status ranging from high income employees to the unemployed, the great difference in urban and rural residential areas in terms of social and economic developments and in provision of basic facilities, the level of education which ranges from the highly educated to those with no education, the diversities in marital status, religion, type of marriage and ethnicity with the prevailing cultural norm in the society facilitate gender biased treatment of children leading to the existence and variation of infant and child sex mortality differential.

Here access to good job depends upon the broader socio-

cultural and economic settings. The discrimination practices that emanate from the cultural norms led to large gaps in wages that women and men could earn. Customs also give men priority in most decision affecting the household and family, even in some cultures, mother in-laws and other family members have a greater say than the potential mother in the treatment of children. Even the constitutional provision on equality in Kenya doesn't apply specifically to the inheritance of property (UN,1996). The resulting outcome and status of women in the society force families to favour sons discriminating against daughters. Changes to weaver discriminatory practices against female children which are deeply embedded in the prevailing culture, often with the sanction of religious and customary laws are slowed due to, unequal enrolment and attendance of girls at all levels of education, dropping out of formal education as a result of early marriage, pregnancy or economic need, and the majority those working outside home involving in menial jobs in exchange of meagre livelihood.

Mothers or women in general have a far reaching influence on the health, survival probabilities and equal treatment of their children regardless of sex. Their little representation at all levels of planning, managing and executing population, health and development programmes for reasons of equality and success has led to the variation in infant and child sex mortality differential at different levels of socio-economic strata and different cultural set-ups.In view of the above arguments, the differential levels of maternal education, place of residence,current type of employment,

current marital status, region, religion and ethnicity among other socio-economic and cultural factors combine together to bring about differential treatment of each sex leading to regional sex variation in infant and child mortality in Kenya.

This study thus, based on the problem tries to examine the existence and variation of survival probabilities of the sexes at the childhood periods in relation to the various socio-economic and cultural factors. It gives suggestions the extent to which policy makers focus in implementing and taking adequate measures to minimize the problem and reduce the general level of mortality in Kenya effectively.

1.4 STUDY JUSTIFICATION

Various researchers have studied variations in infant and child mortality in general and indicated that these variations are attributed to socio-economic level of each region, socio-cultural and ethnic backgrounds, and environmental factors which generally dictate the health and survival of infants and children in kenya.

Considerable research also has been done on the existence and determinants of sex differentials in mortality in less developing countries. According to Legrand and Mbacke'(1992), much of this work has focused on the Indian sub-continent, where excess female child mortality is linked to discrimination within the families in provision of nutrition and health care. The underlying causes of this discrimination have been argued to be the relatively greater economic value of sons to their families of birth in the medium and

long terms, low levels of female autonomy and prevailing cultural and religious attitudes that place more value on sons. They further noted that this subject has received little attention in Sub-Saharan Africa, where the relative mortality risk faced by female children appears to be both high by European standards and low by Indian and Bangladesh standards.

Kenya being one of Sub-Saharan African countries, extensive studies on the relationship between socio-economic and cultural factors with the existence and variation of infant and child sex mortality differential have not been done.

Anker Richard and James C. Knowels (1977), in their study of mortality differential in Kenya at macro and micro levels pointed out that in Kenya sex ratio at birth varies so greatly across population sub-groups as to affect overall mortality differentials. So, they recommended that in the analysis of mortality differential among households or births mortality rate by sex to be considered.

The UN (1992), in its analysis of child mortality since the 1960 found out that, throughout the age span, death rates in Sub-Saharan Africa appears to correspond to the standard pattern in which male rates exceed female rates if the variations with socio-economic and cultural factors are not considered. However, for most of the countries, there are also some age groups in which female death rates are greater, generally during the childhood and the ages of child bearing. With respect to childhood years, the Kenyan data used show an overall higher female than male mortality for all ages under ten years. Gbenyon and Locoh (1989) by using data from

the 1977-1978 world fertility survey in Kenya also showed the existence of excess female mortality in the post-neonatal period.

In most of the cases during infancy the death occurring during the post-neonatal period are taken as best indices of the overall development of a society group, because during the earlier neonatal period most of the deaths which occur are related to the birth process itself (endogenous factors); so, the variation in sex mortality is not significant in most of the cases. But, in most of the cases of post-neonatal and later periods the variation becomes significant in a heterogenous society , because the deaths during these periods are associated with environmental causes (exogenous); factors related to the environment in which the infant or child lives. Therefore, here the role of socio-economic and cultural factors becomes highly significant.

Insignificant variation in infant and child sex mortality differential with socio-economic and cultural factors from what is "normally" expected, i.e., excess male mortality during the childhood period, can be an indicator of the uniform attitude of parents in the society towards their children, and the variation can be taken as an indicator of the impact of gender inequality in the different socio-economic and cultural groupings. Even the absence of a difference in infant and child mortality differential by sex at any socio-economic and cultural group indicates the unfavourable treatment of females, in that excess male mortality is biologically accepted norm to the age five.

The study of the existence and variation of survival

probabilities of the different sexes with regard to survival through the first year and up to age five in relation to the various socio-economic and cultural factors will suggest the extent to which policy makers focus in implementing and taking adequate measure to minimize the problem and reduce the general level of mortality effectively.

Most studies done in Kenya on mortality have focused on differentials like education, marital status, residence, ethnicity, income etc., but the role of these socio-economic and cultural factors on the variation of infant and child sex mortality differential is not adequately done. Thus, this study tries to examine the role of some socio-economic and cultural factors on the existence and variation of infant and child sex mortality differential in Kenya. It provides suggestions for sound policy options in effort to improve the treatment of both sexes towards equal opportunity so in effect reduce the mortality level of the general population.

1.5 GENERAL OBJECTIVE OF THE STUDY

The main objective of this study is to asses the existence and variation of infant and child sex mortality differential in relation with different socio-economic and cultural factors.

The goal is to investigate whether or not there exists variation in infant and child sex mortality differential with different socio-economic strata and cultural background taking Kenya as a focus of study.

1.6 SPECIFIC OBJECTIVES OF THE STUDY

1. To determine levels and variations of the rate of death among the two sexes during childhood period of different socio-economic strata and cultural backgrounds by analyzing infant and child mortality by sex with a set of socio-economic and cultural variables.

2. To determine the effects of mother's education, mothers' current type of employment, place of residence, current marital status, religion and ethnicity on the variation of the rate of death among the sexes during the childhood period.

1.7 SCOPE AND LIMITATION

The study does not examine the effects of all demographic, socio-economic and socio-cultural determinants like biological causes of death, the sex composition of older siblings and others which can have adverse effect on the variation of infant and child sex mortality differential. It limits itself to certain socio-economic and cultural factors because of the time span, availability of sufficient and reliable data and literature, and the limited access to resources.

The inaccessibility of enough literature on the variation of infant and child sex mortality differential related to the Kenyan situation makes the study to rely more on studies made on other African and especially Asian countries, making adequate and reliable comparisons with previous studies on Kenya very limited.

Due to lack of access to reliable information, determination of the mechanism through which the different socio-economic and cultural factors operate to influence infant and child sex mortality differential couldn't be adequately possible.Even if effort is made to identify the mechanisms of sex mortality differential which are hypothesised to operate through discrimination in health care or nutrition or total neglect, deep analysis couldn't be possible because of the aforementioned reasons.

Thus, the above mentioned limitations encountered in this study couldn't allow for a more comprehensive study on the issue of the role of socio-economic and cultural factors on infant and child sex mortality differential. Therefore, this study is open and subject to further studies.

CHAPTER TWO

LITERATURE REVIEW AND STUDY DESIGN

2.1 LITERATURE REVIEW

2.1.1 General

It is generally observed that there prevails female longevity almost without exception throughout the animal kingdom (Rutherford, 1975). Among human beings males' generally greater susceptibility to infectious disease mortality is attributed to genetic factors, in which females have higher levels of the major classes of immunoglobulin. It appears that the X chromosomes carries one or more gene(s) that influence the production of immunoglobulin, the pair of chromosomes in females' cells favour high production of immunoglobulin than the single X chromosomes of the males' cells (UN, 1988). Waldron (1985), argued that the sex differential in life expectancy at birth on average increases by about the fifth of a year in favour of females for each one year improvement in life expectancy at birth.

Arnold and Zahoxiang (1986), argued that parental preference for sons over daughters is a common phenomenon in many parts of the world. They further mentioned that son preference has been well documented in a large number of countries, but the degree varies from one country to another depending on such factors as; level of economic development, social norms, cultural and religious practices, marriage and family systems, degree of urbanization, and the nature of social security system. The preference of sons particularly observed to be more pronounced in developing

countries, in rural areas, among more traditional couples, and among couples of lower socio-economic status (ibid.).

In many less developed countries particularly in rural areas sons are seen more productive workers than daughters, as providers of old age security for their parents, and as carriers of the family name (Asia-Pacfic,2:1987).

Abbas Bhuiya and Kim Streatfield (1991), pointed out that in the developed world better survival chances of females are almost universally higher than those of males, but in societies in which females are disadvantaged relative to males a higher mortality of females can be observed. They further indicated that during the neonatal period when biological factors largely determine survival, mortality of girls is lower than that of boys in most of the cases, and the transition from a higher mortality of males to a higher females occurs at the age of around six months, when breast milk alone ceases to be adequate for children's nutritional requirements.

Legrand and Mbacke'(1992), in their study in the Sahel attributed the existence of relative excess female mortality to girls vulnerability to a specific health risk, discrimination within families in provision of health care or nutrition and socio-economic and cultural variables which underlie the family's desire and ability to treat their sons and daughters differently. And they further mentioned that the ultimate socio-economic and cultural factors to be; income and earning potential, mothers' education, the sex composition of older siblings, urban rural residence,

cultural norms and religious doctrines.

Ware (1986), on studying the United nations 30 collection of life tables observed that the early childhood period (1-4 years) to be the period at which females are most likely to suffer and preference for sons to have greater impact.

2.1.2 North American and European studies

Robert D. Rutherford (1975) in his study of the changing sex mortality differential indicated that in the rapidly declined mortality in the western world women are on the whole who have benefited more than men. He strengthened his argument by taking USA as an example at which male and female expectation of life at birth rose from 48.5 and 52.5 years in 1910 to 66.9 and 73.9 years in 1965, increase of 38.0 and 48.1 percent respectively. Since the genetic code varies too slowly for biological differences between the sexes to have contributed significantly, he concluded environmental factors to be the main responsible factors.

Ware (1986), based on historical evidences argued the pre-existence of excess female mortality with the undervaluing of girls in what are now developed countries. In USA based on the studies by Hammel, Johansen, and Grusher, she pointed out that the sex ratio in childhood were varied with a relative excess of male in agricultural and frontier areas, and the reverse in urban and industrial areas. The major factor for this variation indicated to be the differential child care based on the sex specific economic value of children to the household in agricultural versus urban

settings.

Ware further argued that in England and Wales in rural areas where there was virtually no employment available to the daughters of landless agricultural labourers there existed excess mortality of young girls. She found similar pattern for Ireland.

Ruth Petrovic (1981), in his study of the types of sex specific mortality rates in the former Yugoslavia concluded that in different part of the country in the period 1953-1981, there have existed four types of relations, four types of sex specific over mortality. During the year 1950-1960 in the Socialist Autonomous Province of Kosovo, male mortality was more than female mortality only after fifty years of age unlike other provinces, and the particular characteristic of mortality in the province was that higher rate of mortality of female children not only found between five and fourteen years, but also in the early childhood and even in the year of birth. This female over mortality was not also the characteristics of the entire population, but only of the Albanian nationality. Bosnia Hercegovina, Macedonia, Cerbia up to 1960 had longer expectation of life at birth of women, but had over mortality of women in certain ages often in the early childhood, but the population of Slovania, croatia, and Socialist Autonomous Region Of Vojovodina had over mortality of men from birth to the advanced old age during the period 1953-1981.

2.1.3 Asian and Arabian studies

South Asia is known as being a major area of the world where the normally higher number of females than males in the total

population is reversed (Monica Das Gupta,1987).

Das Gupta further indicated that among the Indian states Punjab historically has had the most imbalanced sex ratios, and this is commonly attributed to discrimination against female, particularly female children, relative to males, in the allocation of food and health care within the household. According to her findings the major causes of this phenomenon are:

- Female children may be neglected because their parents are poor and, faced with difficult choices in allocating resources among their children, they give priority to children of the preferred sex, but discrimination against female children is not motivated primarily by economic hardship, but rather cultural factors. When there is scarcity of resources where preference exists it heighten discrimination against females.
- The neglect of female children is related to participation of female labour in agriculture and their exclusion from holding immovable property, particularly land.
- The most important determinant of Punjab parents attitude towards girls is the fact that married women can do almost nothing to their natal kin and the evidence suggest that Punjabs have preference for removing unwanted daughters as early as possible by such means as infanticide, neglect at early ages and most recently feticide.

Ware (1986), in her study taking a sample of 700 for sex determination of a child before birth in one Indian hospital by

Amniocentesis, found out that 95 percent women bearing female fetuses choose to have them evacuated, but no pregnancy involving a male was terminated.

Coale (1991), in his study of punjab, India found out that, women were far less likely than men to receive medical care during their terminal illness; and when care was provided it was inferior quality to that given to men.

Borne and Walke (1991), argued that the excess mortality of girls in India to be not the result of active abuse, but of neglect, lack of adequate nutrition and failure to obtain medical attention for illness. They further argued that the geographical difference observed in mortality of boys and girls in India is greatly attributed to greater freedom of women in the south which is attained by higher levels of women's education and literacy. Education here is associated with income , social class, place of residence, degree of modernization and use of allopathic medicine. Among the daughters of illiterate mothers it is expected the gradual worsening of girls health to be reflected in increasingly unbalanced mortality sex ratios through early childhood, and in contrast the chances of survival at two, three and five years of age is expected to be proportionately greater for the daughters of educated mothers. This was further confirmed in the study of rural Uttar Pradesh at which mothers education was found to improve the survival only of girls children.

Caldwell et al.(1983), in an investigation of South India found that mothers education exerts an influence on infant and

child mortality and educated mothers are found more likely to share food more equally between the sexes.

In another study by Basu (1991), for both North and South Indian households female education was found to lower fertility and child mortality and to increase sex differential in child death rates. Women employment tended to lower fertility and the sex differential in child welfare, but to increase overall level of child mortality.

D'Souza et al. (1981), in their study of rural Bangladesh found that male mortality exceeded female mortality in neonatal period, but this differential was reversed in post-neonatal period, and this high female than male mortality continued through the reproductive ages. In their study, the most marked difference was observed in 1-4 years of age group, where female mortality exceeded male mortality by as much as 50 percent.This high female mortality is attributed to biased health and nutritional related behaviour favouring male children. These sex-biased health and nutritional behaviour found in rural Bangladesh is found to be related to the inferior status, role and work status opportunities of women. Grown sons have better prospects than grown daughters for income earning work and thus may become net contributors to family income. Also old age security of parents play an important role.

Arnold and Zhaoxiang (1986), argued that China's successful implementation of one child policy being hampered by lingering son preference, particularly in rural areas. They indicated this to be a reflection of deeply rooted Confucian tradition and the status of

women in China. In their further argument pointed out that even if equality in the political, socio-economic, and cultural spheres of life is guaranteed in china's constitution; patriarchal attitudes are still prevalent, particularly in the country side. They indicated the reasons why sons in China are traditionally considered advantageous to be that, sons are considered as assets for their parents in old age support and the provision of labour for the farm or family business. They also found that in China son preference is lower among more educated women, and is relatively lower in urban areas as well. Their finding was confirmed in Beijing and Shanghai two urban areas in which couples do not appear to have preference for sons unlike rural areas of China in which there are persistent rumours of female infanticide.

Hammoud (1982), showed that in some Arab countries like Egypt, Jordan, kuwait there were excess female mortality than males especially during the neonatal period. He indicated based on his findings that environmental factors do assume greater importance not only in the traditional post neonatal period, but also as early as the second week of life in these countries. The correlation results in the 1992 studies between the indicators of the level of living with the mortality sex ratio in Arab countries showed a positive or direct relationships between the sex ratio in infant mortality and the level of living .

According to U.N.Es.C.W.A (1989), in the direct estimates of male and female infant and childhood mortality for Egypt, Jordan, and Syria between 1955 and 1979, female IMRs were higher than those

for males for Egypt during 1955-59, for Jordan for periods 1955-59 and 1965-74, and for Syria for the periods 1955-59 and 1970-77. These were also reflected in the CMR for the three countries. The under five mortality rate, taken as the overall summary measure showed higher rate for females than for males for almost the whole period from the mid 1950s to the late 1970s in the three countries.

The UN (1973), noted out that in certain countries as Mauritius, Reunion and Egypt higher death rates were recorded for girls than for boys at ages 1-4 years. In Bahrain because of the advancement in health care and medical services, the annual decline in under five mortality rate of females was higher (9%) than that of males (7.7%) during the period 1967 to 1977 (U.N.Es.C.W.A 1989). The Kuwait data used showed sex differential in agreement with the general trend of higher mortality of males at the childhood period (ibid.). Egypt, Mauritius, Island of Mauritius recorded excess female mortality during the post neonatal period in 1989, 1992,and 1992 respectively (Demographic Year Book, 1994).

Suchindra and Abulakha (1989), observed that in several muslim countries of the Mediterranean where son preference for boys is very pronounced cultural norm, excess female mortality in childhood exists. Also based on fertility survey observed the existence of significant mortality differences between the sexes from age 1 to 5 in Egypt, and to a lesser degree in Tunisia, Syria, and Turkey.

Gbyon and Locoh (1989), argued that certain countries where excess post infantile female mortality is observed have predominantly muslim population, so this raises the possible

relationship between Islam and the status of women, as North Africa and the Near East.

2.1.4 Sub-Saharan Africa and Latin American studies

Bicego et al. (1991), in their study found out a larger decline of child mortality for girls than boys in Port-Au-Prince which is an urban area as compared to rural areas in Haiti. The ratio of boys to girls mortality in their finding between the first and fifth birth days have become increasingly favourable to girls in Port-Au-Prince, but continued to favour boys in the rural areas between the year 1972-79 and 1982-87. They concluded that the overall similarity in the decline of child mortality by sex observed at the national level during the above mentioned period masked the existed rural urban differences. The larger declines of mortality for girls than boys in Port-Au-Prince were compensated by smaller declines for girls in rural Haiti.

In highland Ecuador Scrimshan (1988), observed that the sex ratio for the first child were unrealistically higher in favour of male, that is 68 males to 32 females unlike other parts of Ecuador. She further indicated that Anthropological studies of the region found female neglect or even infanticide, and within the society it is important that the first child is male.

Regarding Africa Gbyon and Locoh (1989),argued that in Sub-Saharan Africa women's economic value to their families is generally large, while it remains true that women social status are often inferior to those of men. They also found evidence of high

relative female mortality ratios in African urban areas, despite the presence of higher levels of income and wealth. Their argument for this is that the presence of more extensive, curative medical facilities in urban areas increases the scope of possible discrimination in favour of boys.

Preston (1976), on the other hand, citing evidence from several studies argued that in African situation man's economic comparative advantage is larger in the rural areas where there is heavy agricultural work. It is therefore difficult for urban parents to monitor and acquire a sizable proportion of son's earnings within the urban settings. Therefore, the relative worth of sons to their families is lower in urban areas.

Legrand and Mback'e (1992), found out that in Bamako, low socio-economic status is associated with significantly higher female relative risks of death among children under one year; and for children aged 6 to 15 months in Bamako and Senegal was there some evidence that mother's schooling affects sex mortality risks of death, children of mothers reporting some education exhibiting higher female-to-male sex mortality ratios. For children aged 1-23 months higher sex mortality ratios(female to male) were documented for rural Senegal than in either of the urban areas,Bamako and Bobo-Dioulasso. Regarding ethnicity they found significant differences in estimated mortality risks by sex between different ethnicities. For the age groups 6 to 15 the sex in particular mortality ratios were high for the Sarakole, Malinke and to a lesser degree Bamaro in Bamako city.

Estimated ratios of infant and child mortality for the provinces of Kenya based on the 1969 census showed excess male mortality in all the cases but there existed variation in the ratios showing the variation of the relative risks of death for both sexes favouring one of them. The pattern also varied by rural and urban areas (Monsted et al., 1978). The results of the 1989 and 1993 KDHS show the existence of excess male infant and child mortality at the national level in Kenya. This is not considering the variations that might exist with different socio-economic and cultural factors (KDHS, 1989, 1993).

Gbenyon and Locoh (1989), based on the results of the 1977-78 world fertility survey concluded that Kenya exhibited excess female mortality in the post neonatal period. They further indicated that the 1979 census showed the child mortality rates for both sexes to be equal suggesting a certain degree of discrimination against females.

2.1.5 Summary of the literature review

As is clearly indicated or pointed out by various researchers the study of sex differences in mortality during infancy and early childhood in line with different socio-economic and cultural variables is given little attention in Sub-Saharan Africa. Most of the studies in the African situation are based on the overall estimation of the determinants of infant and child mortality for both sexes combined. In Sub-Saharan Africa the relative mortality risk faced by female children appears to lie between European and South Asian standards, being high as compared to the former and low

as compared to the latter. India and Bangladesh in this case have documented excess female mortality during the childhood period than any other country. In Europe and North America females are the ones who are favoured at all ages and the variation at any socio-economic and cultural set-up is almost negligible. But in countries where there is discrimination against the female sex, various socio-economic and cultural factors like; maternal education,type of employment, place of residence, marital status, region, religion and ethnicity have greater roles to play in variation of sex mortality differential.

2.2 CONCEPTUAL HYPOTHESES

Based on the study objectives and the review of various studies on infant and child sex mortality differential, the following conceptual hypotheses are derived for this study:

1. The various socio-economic factors among them, level of education of mothers', type of employment, place of residence, marital status and region combine to bring variation in infant and child sex mortality differential, favouring the female sex as the category under study becomes less discriminatory against the female sex.
2. The various cultural factors among them religion and ethnicity combine to bring variation in infant and child sex mortality differential, favouring the female sex as the category under study becomes less discriminatory against the female sex.

2.3 CONCEPTUAL FRAMEWORK AND ANALYSIS MODELS

2.3.1 Mosley and Chen framework

According to U.N.Es.C.W.A(1989), the estimation and specification of a model that captures the full complexity of the process of child mortality is not feasible. But to give a conceptual basis for the study, then operationalise and show the role of various socio-economic and cultural factors, the Mosley and Chen (1984), analytical framework for child survival is taken in addition to others.

The Mosley-Chen framework incorporates or identifies fourteen proximate determinants through which very large number of background factors operate to affect child mortality. The determinants are further grouped into five categories related to:

-Maternal fertility;

-Environmental contamination;

-Nutrient availability;

-Injuries and;

-Disease control

The basic concept is that any background factor, in order to exert an impact on child mortality necessarily operate through a common set of biological mechanisms. Child mortality here is seen as the final out come of a continual interaction between the child and its living environment. In the model the overall complex process of determining child mortality, involving social, economic, cultural and medical factors more or less identified. Other variables such as maternal education, income and family

composition, community infrastructure and health programmes, ecological factors and cultural factors such as tradition, norms and values are incorporated in the framework.

2.3.2 Theoretical basis

2.3.2.1 General

In this section effort is made to examine the relevant conceptual and operational relationships expected in the models of this study based on different literary sources.

The relationships to or the effects of the different socio-economic, cultural, demographic and biological factors on sex mortality differential are discussed in this section briefly. In all the cases here after SMD refers to sex mortality differential.

2.3.2.2 Biological causes of death and SMD

In this study the differential vulnerability of individual sex to biological causes of death is not examined in Kenyan situation, but being one of the factors leading to variation of sex mortality differential is discussed here briefly.

Age is considered to be the important factor for the variation of the different causes of death, and biological sex differences affect the sex mortality differential differently under different set of environmental conditions(Rutherford 1975; Legrand et al. 1992). In general mortality during the first weeks of life, i.e, at the neo-natal period is largely due to the birth process itself that disproportionately affect male infants, but during the post

neo-natal and early childhood periods infections and parasitical diseases like diarrhoea, malaria, measles and respiratory diseases are considered to be the main causes of death in Sub-Saharan Africa. Even if the incidence of these diseases seems to be equivalent for both sexes, everything being equal in terms of treatment, girls have biological advantage in surviving most of them with few exceptions (Mbacke'et al.,1992).

Various studies made by different researchers like Canterelle et al. (1986), Aaby et al. (1986), have shown that girls under five years of age being at a greater risk of dying from measles, while on the contrary, inspite of boys higher birth weight their lungs are not fully developed making them easily affected by respiratory diseases. Regarding accidents and other violence related deaths the rates are higher for males than females at all ages due to the fact that boys being less able to recover from injuries which bring biological damage.

2.3.2.3 The sex composition of older siblings and SMD

The countries where there exists preference to a particular sex, the sex composition of surviving older siblings in the family is hypothesised to affect the survival probability of the child in question.

Mbacke' et al.(1991), argued that in such societies boys and girls are not considered as perfect substitutes in terms of consumption, productive and pleasure values they give to their parents. So, they further argued that the degree of discrimination

greatly differ to boys and girls provided that the older siblings are of the same sex to the child in question, in that girls face higher discrimination than boys in the allocation of household resources.

For the Indian Sub-continent and Bangladesh studies made by Das Gupta(1978), and others showed the strong positive relationships between female child mortality risk and the number of surviving sisters. They are highly disadvantaged when the surviving older sibling is a female.

However, this study does not examine the effects of the sex composition of older siblings on infant and child sex mortality differential in Kenya.

2.3.2.4 Place of residence and SMD

The high urban rural imbalances in economic conditions, educational standards, access to health services and quality of such services in many respects are highly relevant to sex mortality differential in developing countries.

There are different arguments on which sex is in higher mortality risk in African urban and rural areas. Mbacke' et al.(1992), referred to the two opposing empirical evidences of the studies by Locoh et al.(1989), and Preston (1976). The first ones argued that the low status of women in Sub-Saharan African countries leads to a relatively higher female mortality than male in urban areas because of the availability of modern basic medical facilities. These facilitate the possible discrimination favouring

the male sex due to the high cost of services which determine who receives the available health care. But in African rural areas, the provision of such quality medical care is not possible, narrowing the possible discrimination in utilization of health facilities, so leading to the 'normal' relative excess male mortality. The second ones contrary to the above argument stressed on the point that, the economic advantage of male offsprings in rural areas is higher as compared to urban areas in African economic settings, which give them an upper hand advantage over females in relative worth to their families. They further indicated that in urban areas however females relative importance is higher as they are more likely to work in family environment making them less exposed to mortality risks as compared to their female counter parts in the rural areas because of the decreased discrimination.

2.3.2.5 Status of marriage and SMD

Africa, especially Sub-Saharan Africa is a stronghold of traditional behaviour. Virtually most women marry, frequently during adolescence, and they tend to be much younger than their husbands, also marriage is seen as primarily a family rather than an individual arrangement (UN, 1996). Because of these factors opportunities for education and economic activities are curtailed, so in such marital unions the male superiority in decision making at the household level prevails. Married women in most of the cases have economic security from their spouses. According to Bogue (1969), married men and who are living with their spouses are

mostly employed or have some income, and tend to accept any job if cannot find the job they like. This economic security will enable mothers married and living with their spouses to distribute household resources fairly with relatively low or no discrimination among the offsprings. Such marital status favour female children more as compared to those of mothers who are divorced, widowed or separated in a society where discrimination against the female sex is a social norm. According to Newland (1981), children whose fathers are dead or absent are more disadvantaged as mothers bear the entire responsibility for family income which could be meagre. If the culture allow discrimination against the female sex the limited income will force mothers to distribute household resources unproportionately favouring male children. Research in the USA on child support arrangements showed that very few children receive economic support from their fathers when parents are divorced or separated (UN, 1996).

Single mothers on the other hand are mostly considered to be economically self supportive or active and some what independent in their decision making. Lloyd (1996), argued that single women are more likely to engage in market work. Bogue (1969), also argued that the unemployment rate to be higher among women who are married than single women. This position makes single mothers economically self reliant and independent in decision making. The internal distribution of resources in economically independent female headed households is more child oriented with little or no discrimination against individual sex (UN, 1996).

2.3.2.6 Type of employment and SMD

Most women's work at home and agriculture, as well as in the subsistence sector in developing countries is not considered as economic activity, and perceived as having less value than other work (UN, 1996). In such situations, the long term economic value of boys is perceived by parents to exceed that of girls, leading to unequal distribution of resources (Legrand et al., 1992). Because of women's participation concentrated in low paying occupations, they do not have the same access to or control over economic and technical resources. According to the UN (1996), there are three dimensions through which women's type of employment or labour force participation can affect infant and child sex mortality differential.

(i) Women's paid labour force participation increases the overall family income, which benefit all family members leading to fair treatment of both the sexes.

(ii) Women's independent income increases their control over resources and indirectly benefit children of both the sexes.

(iii) Employment outside the home area may lead to diversion of women's time and attention from home, and the available little time will be used on individual sex largely if the cultural set-up or other factors support discrimination against an individual sex.

A mother's involvement in market work away from home might affect children negatively by their exposure to alternative care,

which for poor women in many developing countries consists of no care or care from siblings or otherwise from members of the extended family. In such settings the survival probability of an individual sex might be highly affected if there prevails discriminatory attitudes towards it in the society (UN, 1996). If mothers are engaged in work around home, such as small scale trading and agriculture, which allow them to take children to the work place, even if discriminatory attitudes prevail in the society the survival probability of individual child of either sex under question is far better than that of the children of mothers working away from home (ibid.).

The major difference between employed away and non employed or working at home mothers in developing countries is that, those employed away from and to the lesser extent those working at home tend to introduce supplementary nutrition sooner than those who are not employed because of the impediment of women's ability to breast feed young children. This practice could expose children to a variety of health risks. Since discrimination in provision of nutrition and medical care is the mechanism of discrimination against individual sex, the sooner introduction of supplementary nutrition could pave the way to unequal treatment of the sexes affecting the survival probability of the child under question (Cynthia, B.Lloyd, 1996).

2.3.2.7 Religion, ethnicity and SMD

Religious doctrines and ethnicity are hypothesised to dictate different ways of treating female and male infants and children

leading to variation in infant and child sex mortality differential. Bogue (1969), emphasised on the existence of cultural differences with the major religious groups of the world. He further stated that, the various cultural groups associated to the different religious groups differ; in urban rural residence, educational attainment, and educational and income distribution which can lead to the variation in sex mortality differential. Islamic doctrines especially at this time of rising fundamentalism has been argued to underly discrimination against daughters ,as some islamic nations openly declare the low status and treatment of women in the society (UN, 1996). But Gebyon and Locoh (1989), came to a conclusion that the sex mortality differential in Sub-Saharan Africa is not attributed to the Islamic religion, rather to cultural norms sanctioned by some religions which together bring discrimination against the female sex, as religion has a great influence in controlling societies' activities and individual behaviour.

Ethnicity often appears to have a significant effect on the relative risks of death by sex (Legrand et al.,1992). Different ethnic groups are characterised by unique customs and traditions which give different value to the worth of children of the different sex. At a place where the relative worth of male children as compared to female children differ by ethnicity, the variation of the relative risk of death by sex among different ethnic groups is evident. Some cultural practices like female circumcision, sex specific food taboos, child fosterage, and piercing of girls ears

are common during childhood period in some ethnic groups, leading to high risk of death among female children bringing variation in infant and child sex mortality differential (Mbacke' et al., 1992).

2.3.2.8 Region and SMD

Region which is a geographic area with some measure of homogeneity is hypothesised to affect infant and child sex mortality differential. The geographical pattern of sex mortality differential in countries of Sub-Saharan Africa is closely linked to the diversity of cultures and norms, and the socio-economic differences that prevail among the regions. Eubank et al.(1986), stressed on the importance of socio-economic development in reflecting geographical differential in mortality. Sex mortality differentials are therefore expected because of differences in culture, and other environmental factors. In geographical areas where the economic development has not reached a level to sustain the social and cultural change necessary to reduce or minimize discrimination against individual sex, the relative mortality risk of the child in question is higher than the children of the same sex from other regions in a better of socio-economic conditions. Residents of different geographical areas may see very different pay-offs for investments in their daughters according; to marriage customs, family organization and above all the prevailing cultural attitudes towards the treatment of sons and daughters bringing variation in the risk of exposure to death.

Bogue (1969), pointed out that within each nation there exists

very substantial differences in composition from region to region with respect of age, sex, ethnicity, religion, marital status, educational attainment, occupation and income bringing differential rates in mortality and morbidity.

2.3.2.9 Mothers' education and SMD

In developing countries, infant and child mortality is more closely related to maternal education than any other socio-economic factor (UN,1996). Women are universally under represented at all level of education which underlie a suitable situation to discriminate against female children.

Caldwell (1979), argued that mothers develop specially close attachment to their children regardless of sex, and as educational level of women increases their decision making power in the family improves, leading to a decline in relative mortality risks of female children. He strengthened his argument by pointing out that when women have a good deal of autonomy through education they will not only be in a position to treat their daughters more like their sons in terms of feeding and medical services, but also in keeping with the environmental views on females.

In South Asia the effect of mothers' education showed contradictory results. According to Caldwell et al.(1983), mothers education exerts a significant influence on infant and child mortality, and educated mothers are found more likely to share food more equally between the sexes in South India. For Punjab (Das Gupta, 1987), and Bangladesh (Buhiya et al.,1991), found out that

mothers' education being related to high female relative risks of death.

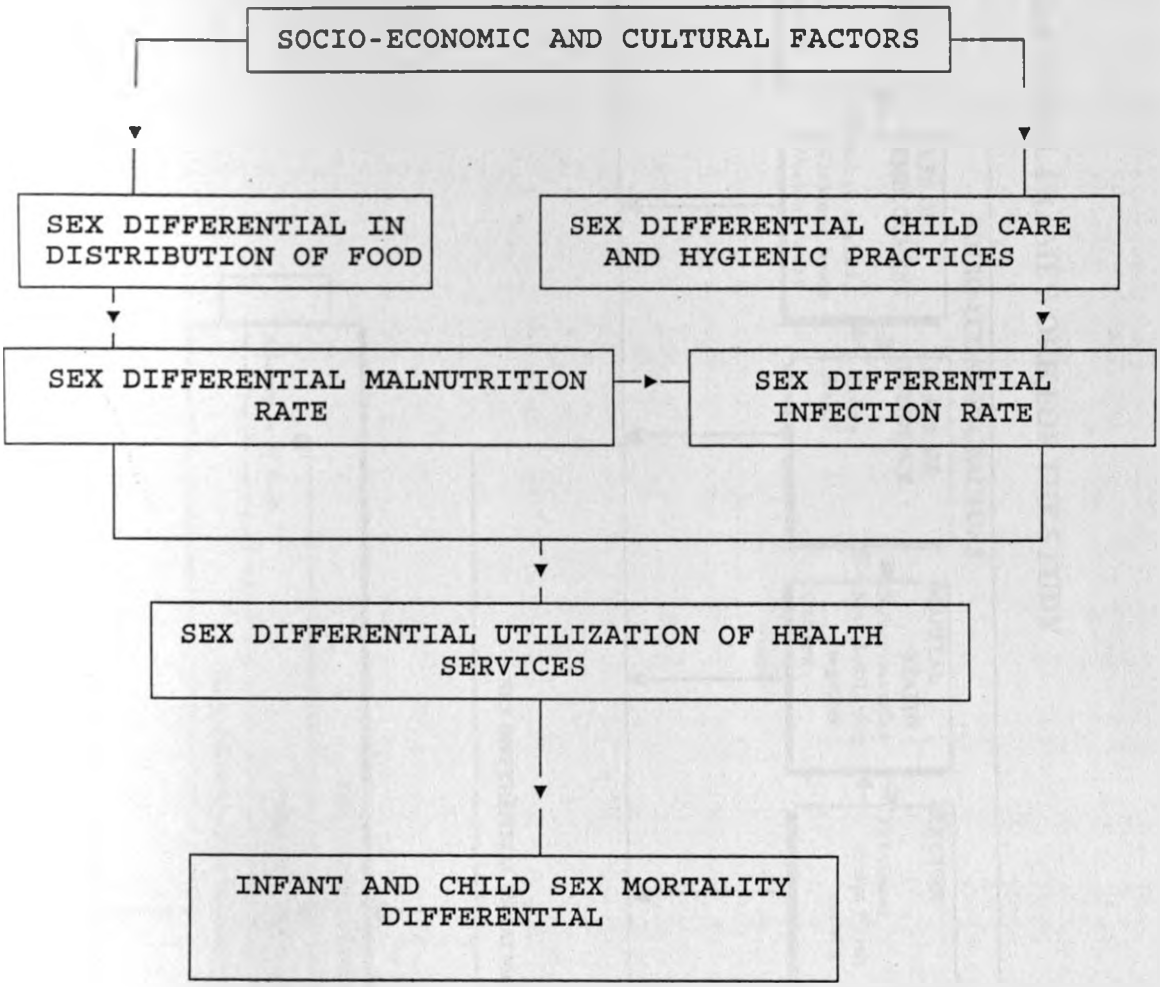
Most researchers agree that the differential exposure to diseases by sex is reduced parallel with the increase in the level of education of mothers' due to better hygienic practices, equal and fair distribution of nutrition, and effective and equal use of health care facilities among the sexes (U.N.Es.C.W.A, 1989).

Caldwell (1986), argued that when women have a good deal of autonomy, are more likely to take action about their sick children or about themselves, will assume broader responsibilities including those deciding early and with certainty that children are sick without worrying about consulting their husbands or brothers, and treat their daughters more like their sons.

In China son preference is lower among more educated women (Zhaoxiang et al., 1986). Bourne et al.(1991), argued that the gradual worsening of girls' health among daughters of illiterate mother is reflected in increasingly unbalanced mortality sex ratios through early childhood, while the chances of survival is proportionately greater for daughters of educated mothers.

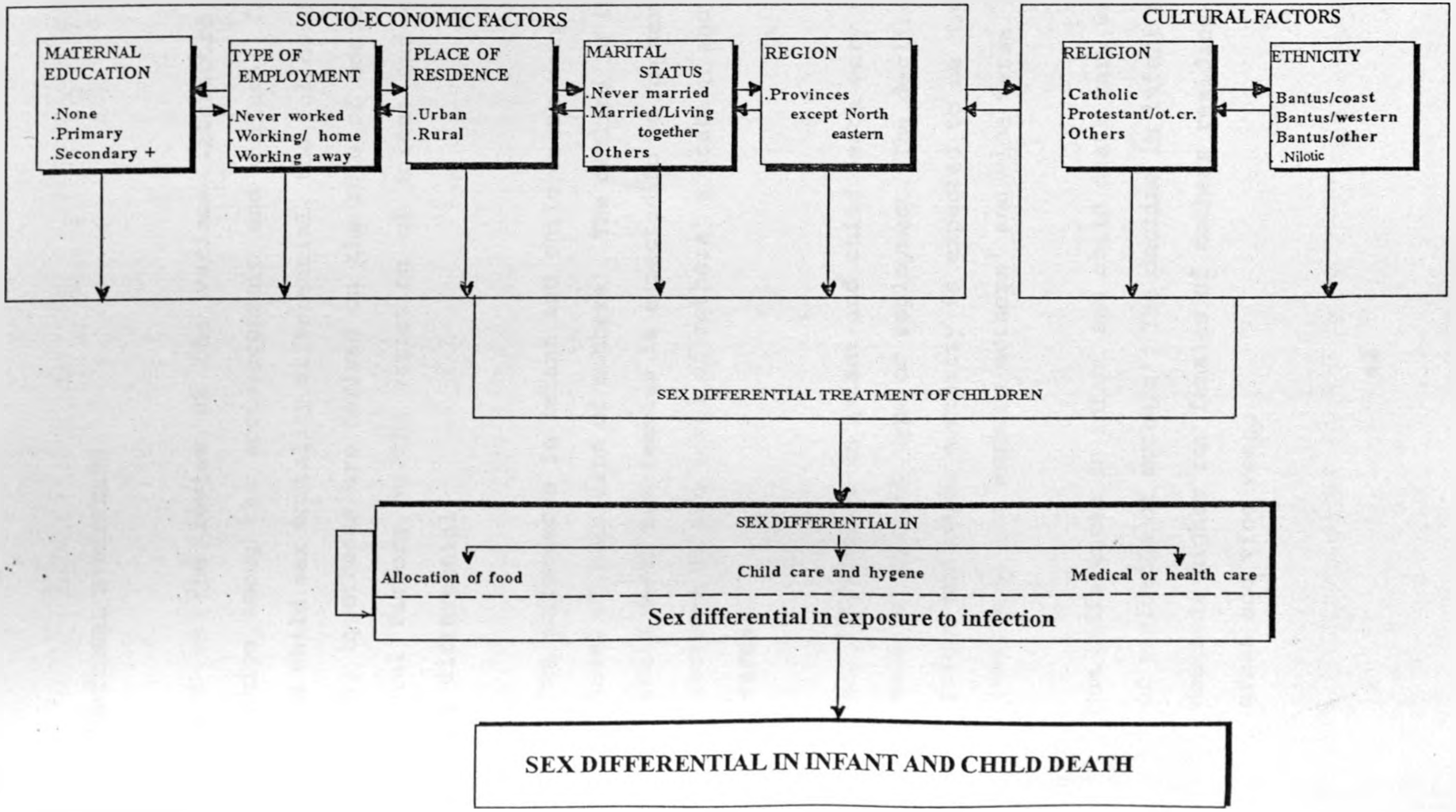
In general maternal education brings a key change in traditional societies by shifting of the inter household power relationships towards the mother to the benefit of the offsprings.

FIG 1 CONCEPTUAL FRAMEWORK OF THE STUDY



Source: constructed based on the Mosley-Chen framework, the literary basis and literature review,

Fig:-2 OPERATIONAL FRAMEWORK FOR THE STUDY



Source:- constructed based on the Mosley-Chen framework,the literary basis and literature review

2.4 OPERATIONAL HYPOTHESES

Based on the review of the various literature and the relationships among the socio-economic and cultural factors to infant and child sex mortality differential, the following general operational hypotheses are derived on the role of socio-economic and cultural factors on the variation of infant and child sex mortality differential.

1. Sex differences in infant and child death vary with the level of education of mothers'. The decline in infant and child death for females is expected to be higher with the increase in the level of mothers' education and vice versa.

2. Sex differences in infant and child death vary with mothers' current type of employment. The decline in infant and child mortality is expected to be higher for females of non working mothers' and vice versa.

3. Sex differences in infant and child death vary with place of residence of mothers'. The decline in infant and child death is higher for females of mothers residing in urban areas and vice versa.

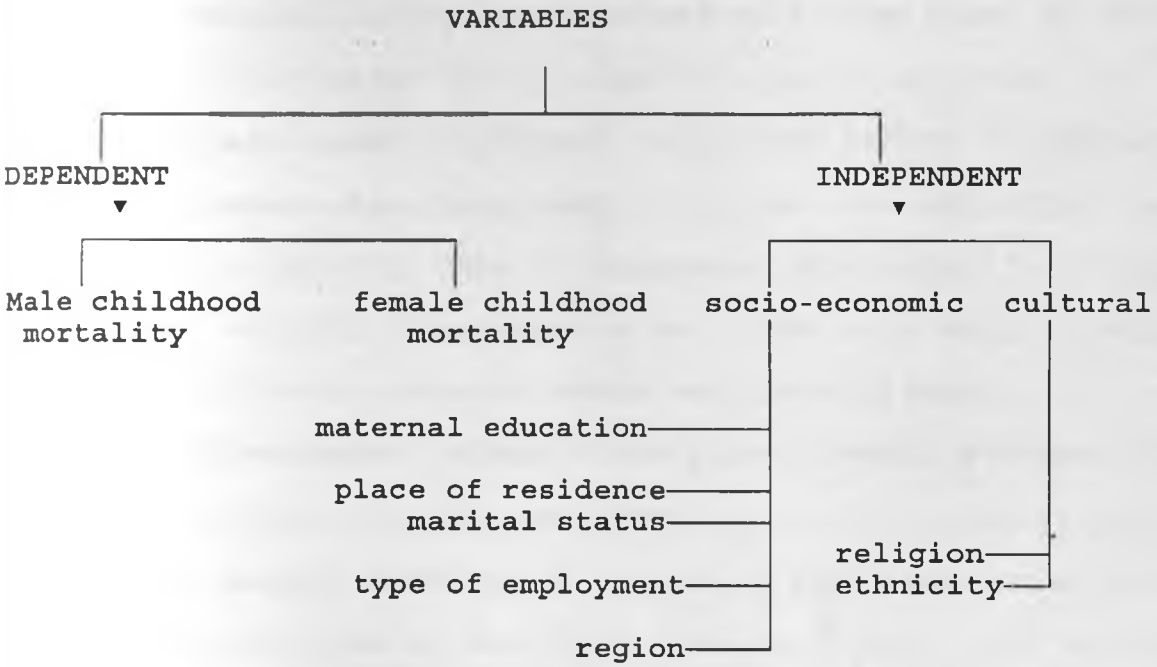
4. Sex differences in infant and child death vary with marital status of mothers'. The decline in infant and child death is expected to be higher for females as the status of marriage becomes more favourable for equal treatment of the sexes and vice versa.

5. Sex differences in infant and child death vary with the region of residences of mothers'. The decline in infant and child death is higher for females as the combination of socio-economic and cultural factors become less discriminatory against the female sex and vice versa.

6. Sex differences in infant and child death vary with the religious affiliation of mothers'. The decline in infant and child death is expected to be higher for females as the doctrines of mothers' religious affiliation becomes less discriminatory against the female sex and vice versa.

7. Sex differences in infant and child death vary with the ethnic background of mothers'. The decline in infant and child death is expected to be higher for females as the customs, traditions,and values of the ethnic group becomes less discriminatory against the female sex and vice versa.

2.5 VARIABLE IDENTIFICATION



2.6 DEFINITION OF KEY CONCEPTS

2.6.1-Independent variables and related concepts

(1) **Socio-economic status:** is a classification of an individual household or family according to occupation, education or some other indicators of economic or social status (Columbian encyclopedia, 1975).

(2) **Culture:** the way of life of a society. The custom, the ideas and attitudes shared by a group make up its culture. Culture includes such human institutions as social organization, religion, structure, economic organization and material culture (ibid.).

(3) **Maternal education:** education in general is a process either formal or informal that shapes the potentiality of the maturing organism. Maternal educations here refers to the level of formal education of the mother of an infant or a child of either sex.

(4) **Type of employment:** employment in general refers to occupation or the engagement of an individual in any economic activity to earn some income or benefit. Type of employment here refers to the type of economic activity of a mother of an infant or a child of either sex in reference to the work status and place of work.

(5) **Place of residence:** refers to the place at which a mother of an infant or a child of either sex live.

(6) **Marital status:** marriage is a socially sanctioned union of one or more men with one or more women (Pressat, 1985). And mother's marital status refers to the status of individual mother of an infant or a child of either sex with respect to marriage.

(6) **Religion:** is a system of thought, feeling, and action that is an object of devotion, a code of behaviour by which an individual may judge the personal and social consequences of his action and a frame of reference by which an individual may relate himself to his group and his universe (Colombian encyclopedia, 1975). Religious affiliation then refers to the religion of the mother of an infant or a child of either sex.

(7) **Ethnicity:-** refers to the national, racial or tribal group that an individual identifies himself sharing particular common cultural traditions. Ethnic background refers to the ethnic group to which a mother of an infant or a child of either sex identifies herself.

(9) **Region:** is a geographical area with some measures of internal homogeneity with respect to the characteristics, functions or interconnections of its constituent parts (Pressat, 1985). Region here refers to the province at which a mother of an infant or a child live.

2.6.2-Dependent variables and related concepts

(1) **Infant mortality**

(a) **Female infant mortality:-** refers to the death of live born female children who have not reached their first birthday.

(b) **Male infant mortality:-** refers to the death of live born male children who have not reached their first birthday.

(2) **Child mortality**

(a) **Female child mortality:-** refers to the death of female children between the age of one and five.

(b) **Male child mortality:-** refers to the death of male children between the age of one and five.

(3) **Mortality ratio**

(a) **Infant mortality ratio:-** refers to the ratio between the male infant mortality rate and the female infant mortality rate, and it is the male infant mortality rate divide by female infant mortality rate multiplied by hundred.

symbolically:

Infant sex mortality ratio=(IMR_m/IMR_f)*100

(b) **Child mortality ratio:-** refers to the ratio between the male child mortality rate and the female child mortality rate, and it is the male child mortality rate divided by female child mortality rate multiplied by hundred. Symbolically:

Child mortality ratio=$(CMR_{\_}/CMR_{,})*100$

CHAPTER THREE

SOURCE OF DATA AND METHODOLOGY

3.1 INTRODUCTION

The quality of the data and the methods employed to analyze the available data have paramount importance to estimate demographic parameters with high degree of accuracy.

Kenya being one of the countries lacking adequate vital registration system for the direct estimation of mortality levels, most studies done in these areas make use of data from the different censuses and surveys conducted in the country. In most of the studies indirect demographic techniques and different statistical methods have been used to asses both levels and trends of infant and child mortality.

Due to the facts mentioned above, one of the various surveys is taken as a data source. To analyze the survey data, indirect demographic technique and a statistical method are employed.

3.2 SOURCE OF DATA

To show the role of socio-economic and cultural factors on the variation of infant and child sex mortality differential in Kenya, the 1993 Kenya Demographic And Health Survey (KDHS, 1993) is used as a data source in the study.

The National council of Population and development (NCPD) and The Central Bureau of Statistics (CBS) of the government of Kenya conducted the survey from Mid-February until Mid-August 1993, covering all areas of Kenya except seven northern districts. The

sampling technique used to select the samples was a two stage stratified sampling consisting of 536 sample units. The questionnaires were designed to incorporate indirect questions to provide information for proper estimation of population parameters using the various indirect demographic techniques.

In this survey 7540 women between the age of 15-49 and 2336 men aged 20-54 were interviewed; with a plan of providing information on family planning knowledge and use, levels and trends of fertility, infant and child mortality, maternal and child health care and knowledge of AIDS. In the survey the names and certain characteristics of all usual members and visitors to a selected household were listed. The availability of the socio-economic, demographic and cultural characteristics of the sample population interviewed during the survey enables one to study the effect of multiplicity of causes on a single demographic parameter.

3.3 DEMOGRAPHIC METHOD OF DATA ANALYSIS

Coale and Trussells' indirect technique for estimating infant and child mortality

In Sub-Saharan African countries complete and reliable data for the direct estimation of demographic parameters are not available. Because of this impossibility of obtaining reliable demographic estimates directly from the different sources of data in most of the cases techniques which are developed for the indirect estimation of such demographic parameters are used.

Brass was the first person to develop the procedure of

converting proportion dead of children ever born reported by women of reproductive age groups, 15-49 years, grouped in five years age groups to estimates of probability of dying attaining an exact childhood ages (Manual X,1983). His procedures enables to convert the value of proportion dead among children ever born to women in five year age groups to estimates of the probability of dying between birth and exact age X to arrive at a basic estimation equation.

The methodology of Brass was developed based on the following basic assumptions:

i) The risk of a child dying is a function of only of his age.

ii) Fertility has remained constant in the recent past

iii) Infant and child mortality didn't change during the period preceding the census/survey.

iv) The infant and childhood age schedule of mortality conform approximately to a model life table, and

v) Reporting of data required for calculation is accurate.

The assumption here is that the omission rates for the dead and the surviving births are approximately the same, ïe., the omission is not biased towards the dead or those living. The women will not report on a biased manner regarding the dead more than those living (U.N.Es.C.W.A 1989).

Most of the basic assumptions of Brass are not in agreement with the existing real situation in Kenya. First of all the risk of a child dying is not only a function of the child's age, but rather

a function of the combination of risk factors like environmental, biological etc. The assumption of constant fertility and infant and child mortality in the recent past also is not valid in the Kenyan situation where both fertility and mortality were declining or changing in the recent past preceding the survey. In most of Sub-Saharan Africa, including Kenya, there exists a traditional refrain of talking about the dead than of living making the assumption of Brass made on the reporting of data invalid.

Brass used the age pattern of fertility to be able to get a set of conversion factors which incorporates parity one and parity two. Later Trussell (1975), and Sullvian (1972), computed another set of multipliers to increase the flexibility of the Brass original method. They used a wider range of observations and applying least square regression modified the multipliers, which are used in the conversion of the proportion of children dead for women at various ages to the probabilities of dying between birth and exact ages. The multipliers (K(i)) are meant to adjust non-mortality factors determining the values of proportion of children dead (D(i)).

Feeney (1976, 1980), and Coale and Trussell (1978), dealt with the problem of constant pattern and level of mortality by deriving time location equations which assign a date to each of the estimated mortality over time. This was done primarily depending on the age schedule of fertility and mothers' age group, and to a lesser extent on the age schedule of mortality.

The basic data required for the Trussell variant of the

original Brass method are:

i) The number of children everborn classified by sex and by five year age group of mothers'.

ii) The number of children surviving (or dead) classified by sex and five year age group of mothers'.

iii) Total number of women classified by five year age group (Manual X, 1983).

The Coale Trussell method of child mortality estimates is based on the Coale-Demeney model life tables, and different set of coefficients are provided for each of the four families of model life tables which are known as the North, South, East, West models.

According to the UN (1992), there are three ways which are used to select a mortality pattern from one of the model systems, depending upon the amount of relevant information available. The three ways are:

i) By plotting 1q0 against 4q1, preferably for a series of time points, on a graph which lines showing the relationship within a family of life tables at different levels of mortality are plotted.

ii) Based on the consistency between two successive data sets.

iii) If there are no direct indications or in the absence of inter survey consistency, geographical proximity can be used.

By using the second way of selecting model life tables and the 1969 and the 1979 censuses, the North model of life tables are

selected to be more appropriate for child mortality studies in Kenya (ibid.). Fig 3 shows how the probabilities of dying by age five of 1969 and 1979 censuses plotted against their reference dates of estimate fit neatly using North model as compared to the South model. Hill (1981), also found the North model to be more appropriate for mortality studies in Kenya.

The North model family life table is therefore considered to be more appropriate to the study of infant and child mortality in Kenya and is employed for this study.

The basic forms of the equations are:

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

where: q_x = probability of dying by age X

$D(i)$ = proportion of dead children belonging to women in that age group(i)

$K(i)$ = conversion factor

$D(i)$ = Children dead/children ever born

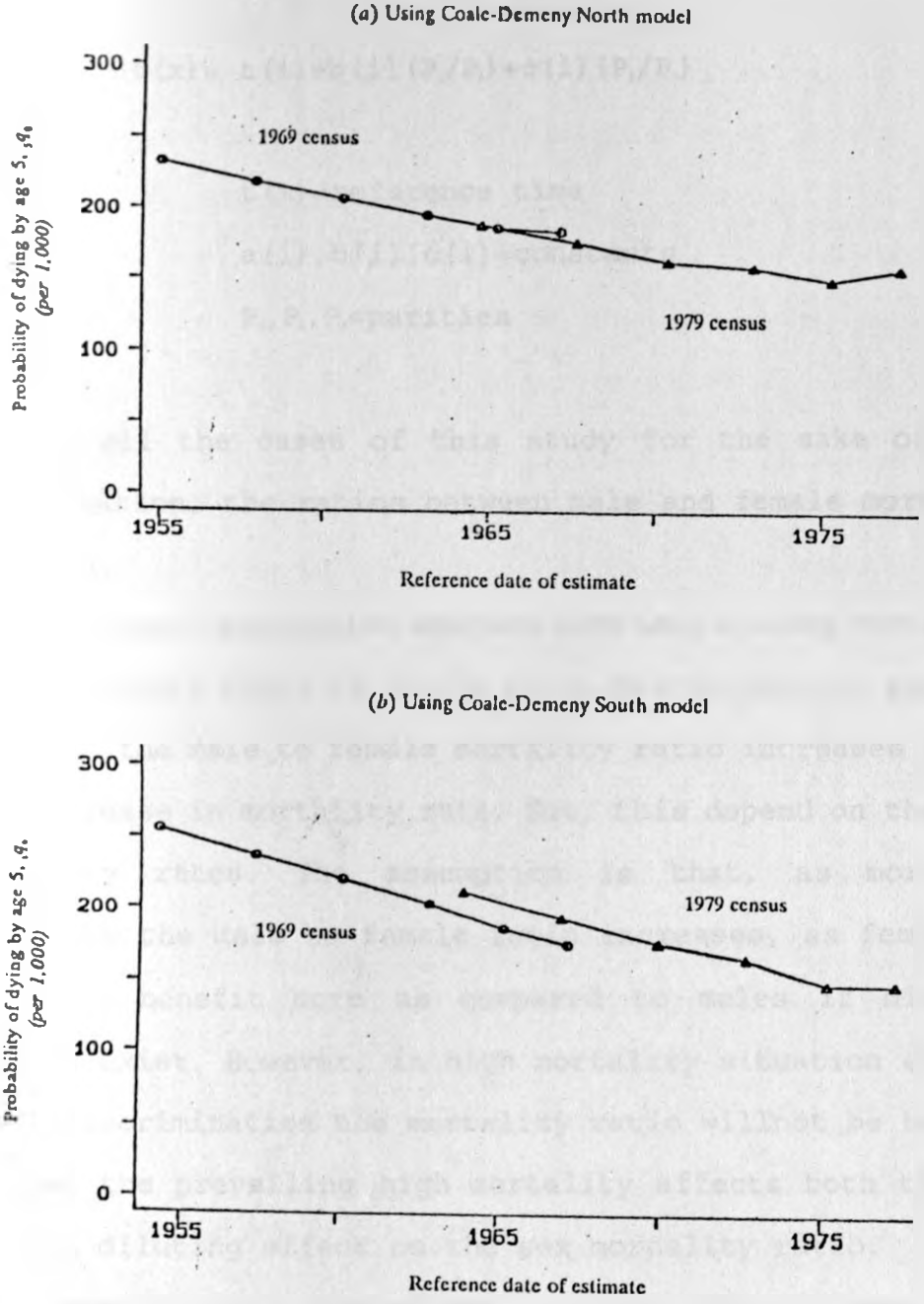
According to Trussell:

$$K(i) = a(i) + b(i)(P_1/P_2) + c(i)(P_2/P_3)$$

Where: $a(i)$, $b(i)$, $c(i)$ = constants

P_1, P_2, P_3 = parities that are average number of children ever born

Fig 3. Indirect estimates of child mortality using two different model life tables, 1969 and 1979 censuses



Source: UN, 1992

$$P_i = \frac{\text{Total number of CEB to women in age group X}}{\text{Total number of women in age group X}}$$

$$t(x) = a(i)+b(i)(P_1/P_2)+c(i)(P_2/P_3)$$

Where: $t(x)$=reference time

$a(i), b(i), c(i)$=constants

P_1, P_2, P_3=parities

In all the cases of this study for the sake of convenient investigation, the ratios between male and female mortality rates are used.

The basic assumption adopted here while using mortality ratios is that, where there is little or no discrimination against female children the male to female mortality ratio increases in line with the decrease in mortality rate. But, this depend on the prevailing mortality rates. The assumption is that, as mortality rate decreases the male to female ratio increases, as females are the ones who benefit more as compared to males if discrimination doesn't exist. However, in high mortality situation even if there is no discrimination the mortality ratio willnot be high. This is because the prevailing high mortality affects both the sexes and bring a diluting effect on the sex mortality ratio.

Computational procedures in the Coale-Trussel technique, estimation of mortality level, and steps in construction of life tables are presented in the appendix.

3.4 STATISTICAL METHOD OF DATA ANALYSIS

3.4.1 General

In the words of Cowen and Croxton coated by Gupta(1992),"an investigator in social sciences is considered as a blind man groping in a dark room for a black cat that is not there if he doesn't have adequate knowledge or understanding of statistics." The method of statistics is therefore considered as a useful and vital tool in understanding the over widening range of human activities in any field of thought in which numerical data may be had.

For this study, in order to asses the degree to which the dependent variable is related to the various independent variables, and to determine which independent variable is most strongly related, so that to find the most significant predictor of variation in infant and child sex mortality differential linear regression analysis is adopted.

3.4.2 A bi-variate linear regression approach

This study makes use of bi-variate regression analysis to determine the simple summary relationships between the dependent variable and each socio-economic and cultural variable.

The line of regression of dependent variable Y on independent variable X based on the formula for a straight line is the line which gives the best estimate for the value of the dependent variable Y for any specific value of an independent variable X. The linear regression model between a mortality indicator and any

individual socio-economic, cultural, environmental or health variable affecting it assumes that the independent variable X (predictor) affects the dependent variable Y(criterion) in a systematic way that is distorted by more or less random scatter disturbances.

The simple linear regression model is given by:

$$Y = B_{n}X + A_{n} + e$$

Where: B_{n} = regression coefficient, representing the rate of change of Y units per X unit.

A_{n} = intercept, representing the value of dependent variable when the value of the independent variable is 0.

Y = predicted dependent variable

X = independent variable

e = error component in the regression model

The assumption on the disturbances is that the variability in the dependent variable is accounted for partly by disturbances or error term that might have resulted from the data or partly from the effect of unconsidered variable and partly by a single explanatory variable. So, when the relationship is not perfect, we may nevertheless wish to show the mortality estimate we would obtain by using the best possible "average" conversion or prediction rule from the independent variable X in the sense that the computed values of Y will be as close to the actual values of the dependent variable Yi as is possible with a single linear conversion formula. Large differences between the actual and the

predicted scores of the dependent variable Yi-Y are indicators of large errors. The average error (Yi-Y)/n will equal zero whenever the overestimation of some scores is balanced by an equal underestimation of other scores, which can be accomplished by a number of conversion rules. The most common statistical procedure for fitting a line is the ordinary least square method. Using the OLS the sum of squared residuals is minimized. The proportion of variance in the mortality indicator explained by the individual independent variable serves as an index of strength of the relationship between the two variables while the sign of the regression coefficient, B, indicates the direction of the relative effect of the independent variable on the dependent variable.

Simple linear regression however, has strong limitation to be used in studying the effects of different socio-economic, cultural, environmental and health factors on the mortality indicator at a time. Mortality is a phenomenon which is affected by a multiplicity of factors to a marked extent bringing variation in observation from time to time, place to place and situation to situations. In such phenomenon in making true generalization a bi-variate statistical analysis is not adequate, in that there are likely to be many factors or variables that affect any individual situation. The social, economic and cultural structures of the Kenyan society at which this study is based, in themselves are "multivariable" having a complex relationships among themselves and to the given mortality situation.

This therefore, calls for the use of a multiple linear

regression model that incorporates all the independent variables (predictor) which affect the dependent variable (criterion) at a time.

3.4.3 Multiple linear regression approach

The study rely on the results obtained by using linear regression models for the sexes in the analysis of the proportion of male children dead and the proportion of female children dead at the childhood period.

The goal is to produce regression equations for the sexes for k independent socio-economic and cultural variables of the form:

$$E(Yi) = B_0+B_1X_1+B_2X_2+.....+B_kX_k+e$$

where: E(Yi)= the mortality index or indicator(criterion) for individual sex.

$X_1....X_k$= independent variables (predictors).

B_0= intercept, a value of mortality indicator when the values of all the independent variables are zero.

B_i= regression coefficients , the average or the expected change in E(Yi) for each unit increase in Xi when the values of the k-1 other independent variables held constant.

e= the error component in the model.

When the regression equation is applied to a given data, it yields a set of computed E(Yi) values for which the sum of the $(Yi-E(yi))^2$ values (the square of the difference between the actual

to the estimated scores) over n cases will be a minimum. That is the model requires the determination of a set of weights for the k socio- economic and cultural independent variables that, when used in the linear regression equation minimizes the average square deviation of the estimated, E(Yi) scores from the actual Yi scores.

By using the OLS method one can compute for each value of E(Yi), the regression curve corresponding to each of the independent variables Xi. The OLS method chooses the best fitting model which minimizes the sum of squares of the distances between the observed responses and those predicted by the fitted model. The idea is that the deviation of the observed from the predicted values becomes smaller as the fit becomes better.

If $\Sigma(Yi-E(Yi))'= \Sigma e_i'=\Sigma(Yi-B_0-B_1X_1-.....-B_kX_k)'$, is the sum of squares of deviations of observed Yi values from corresponding predicted E(Yi) values being the fitted regression model, then the OLS solution consists those values for which the sum is minimum.

Then if there are n observations in the given data considered for the analysis, according to Kibet (1981), the model takes the form:

$$\begin{bmatrix} E(Yi) \\ \vdots \\ E(Yi)_n \end{bmatrix} = B_0 \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} + B_1 \begin{bmatrix} X_{11} \\ \vdots \\ X_{1n} \end{bmatrix} + \ldots\ldots + B_k \begin{bmatrix} X_{k1} \\ \vdots \\ X_{kn} \end{bmatrix} + \begin{bmatrix} e_1 \\ \vdots \\ e_n \end{bmatrix}$$

The most efficient method of obtaining the regression coefficients associated to each socio-economic and cultural variable is by means of a computer program, in which Statistical

Package For the Social Sciences (SPSS) is used for this study. The OLS method is used to determine the regression curve corresponding to each of the socio-economic and cultural variables for each value of the mortality indicators.

Thus, through the multivariable technique, by making use of linear regression analysis the prediction equations that indicate scores on the socio-economic and cultural factors are weighed and summed to obtain the best possible prediction of the mortality indicator for the sample.

3.4.4 Basic assumptions and problems associated using linear regression

The validity of a regression model rests on the satisfaction of all or most of the basic assumptions.

The basic assumptions in the linear regression analysis to be considered are:

i) The independent variables must be linearly related to the dependent variable (linearity).

ii) The independent variables must not be highly inter correlated with each other (independence).

iii) While the independent variable affect the dependent variable there is no feed-back from changes in the dependent variable that affect the independent variable.

iv) The differences between the actual values and the estimated values must be approximately normally distributed ie., the various error terms are assumed to

be normally distributed with mean zero (normality).

However, there are problems associated with the basic assumptions on applying linear regression specially to a dichotomous response variable.

If a dichotomous response variable is used the model could most probably yield predicted children dead at the childhood period outside the acceptance 0 and 1 bounds. In order to tackle this problem and get dependent variables of an interval scale scores, the proportion of children dead by sex for each individual mother is calculated and taken as mortality indicator. Here each individual mother is taken to be the unit of analysis. This allows us to use the linear regression models to the given data with confidence.

Unfortunately, it sometimes happen that the independent variables display high inter correlation, so violating the assumption of independence. The existence of substantial correlation among a set of independent variables create difficulties usually referred to as "the problem of multicollinearity". The problem mostly arises when a large number of variables are included in the regression equation, because many independent variables are related to each other. In such situation the chances for the regression equation to be significant are smaller. This is because the variables involved lay claim to largely the same portion of the Y variance, ie. they cannot make much by way of unique contributions. In this case from the correlation matrices of both the sexes, it is evident that the

problem of multicollinearity is not serious if not absent. According to a common rule of thumb correlations among the independent variables less than 0.70 and -0.07 don't cause any serious problems. Also in order to minimise the effect of multicollinearity arising from dummy variables any one of the variables with highest frequency of cases is taken as a reference category so that the number of categories included in the equations are lowered reducing the problem of linear dependence.

Since the size of the sample used for this study is large enough the problem arising from the normality assumption is considered to be not critical.

Other statistical parameters and procedures used in this study are presented in the appendix.

3.4.5 Coding and description of the mortality indicators and independent variables (dummy variable coding)

This study is concerned in exploring the relationship between the proportion of male or female children dead at the childhood period of an individual mother and the various socio-economic and cultural variables considered to have significant effect on it. The codes and the descriptions for the variables included in the multiple regression analysis for male and female are given in table 3.1 below.

Table 3.1: Coding and description of the variables used

MALES				
VARIABLE	CATEGORY	CODE	DESCRIPTION	REFERENCE
DEPENDENT	-	DEDM	-A criterion indicating proportion of male children dead at the childhood period per individual mother	-
MATERNAL EDUCATION	PRIMARY	MED1	-Predictor indicating level of education of mothers'; 1 if primary, 0 otherwise	NO EDUCATION
	SECONDARY AND ABOVE	MED2	-Predictor indicating level of education of mothers'; 1 if secondary + ,0 otherwise	(MED0)
PLACE OF RESIDENCE	URBAN	MRES1	-Predictor indicating place of residence of mothers'; 1 if urban, 0 otherwise	RURAL (MRES0)
TYPE OF EMPLOYMENT	WORKING AT HOME	MWK1	-Predictor indicating type of employment of mothers;' 1 if working at home, 0 otherwise	NOT WORKING
	WORKING AWAY	MWK2	-Predictor indicating type of employment of mothers'; 1 if working away, 0 otherwise	(MWK0)
MARITAL STATUS	MARRIED AND LIVING TOG.	MMR1	-Predictor indicating marital status of mothers'; 1 if married/liv. to. 0 otherwise	NEVER MARRIED
	WIDOWED AND DIVORCED	MMR2	-Predictor indicating marital status of mothers'; 1 if widowed/divor. 0 otherwise	(MMR0)
RELIGION	PROTESTANT OR. CHRISTIAN	MREL1	-Predictor indicating the religious affiliation of mothers';1 if protestant/ot. ch. 0 otherwise	CATHOLIC
	OTHERS	MREL2	-Predictor indicating the religious affiliation of mothers'; 1 if others, 0 otherwise	(MREL0)
ETHNICITY	BANTUS/WESTERN	MET1	-Predictor indicating the ethnic background of mothers'; 1 if Bantus/Western, 0 otherwise	NILOTIC
	BANTUS/COAST	MET2	-Predictor indicating the ethnic background of mothers'; 1 if Bantus/Coast, 0 otherwise	(MET0)
	OTHER/BANTUS	MET3	-Predictor indicating the ethnic background of mothers'; 1 if other Bantus, 0 otherwise	

FEMALES				
DEPENDENT	-	DEDF	-Criterion indicating proportion of female children dead at the childhood period per individual mother	-
MATERNAL EDUCATION	PRIMARY	FED1	-Predictor indicating level of education of mothers'; 1 if primary, 0 otherwise	NO EDUCATION
	SECONDARY AND ABOVE	FED2	-Predictor indicating level of education of mothers'; 1 if secondary+,0 otherwise	(FED0)
PLACE OF RESIDENCE	URBAN	FRES1	-Predictor indicating place of residence of mothers'; 1 if urban, 0 otherwise	RURAL (FRES0)
TYPE OF EMPLOYMENT	WORKING AT HOME	FWK1	-Predictor indicating type of employment of mothers'; 1 if working at home, 0 otherwise	NOT WORKING
	WORKING AWAY	FWK2	-Predictor indicating type of employment of mothers'; 1 if working away, 0 otherwise	(FWK0)
MARITAL STATUS	MARRIED AND LIVING TOG.	FMR1	-Predictor indicating marital status of mothers'; 1 if married/ilv. tog., 0 otherwise	NEVER MARRIED
	WIDOWED AND DIVORCED	FMR2	-Predictor indicating marital status of mothers'; 1 if widowed/divorced, 0 otherwise	(FMR0)
RELIGION	PROTESTANT OT. CHRISTIAN	FREL1	-Predictor indicating the religious affiliation of mothers'; 1 if Protestant/o. ch., 0 otherwise	CATHOLIC (FREL0)
	OTHERS	FREL2	-Predictor indicating the religious affiliation of mothers'; 1 if other, 0 otherwise	
ETHNICITY	BANTUS/WESTERN	FET1	-Predictor indicating the ethnic background of mothers'; 1 if Bantus/Western, 0 otherwise	NILOTIC
	BANTUS/COAST	FET2	-Predictor indicating the ethnic background of mothers'; 1 if Bantus/Coast, 0 otherwise	(FET0)
	OTHER/BANTUS	FET3	-Predictor indicating the ethnic background of mothers'; 1 if other Bantus, 0 otherwise	

In this study groups of independent variables are entered in regression analysis and their regression coefficients and other statistical properties are determined using the SPSS computer program package.

3.5 QUALITY OF DATA AND METHODS OF DATA ANALYSIS

The 1993 Kenya Demographic and Health Survey which is the data source for this study is expected to suffer from errors common to data sets in Sub-Saharan Africa. It could suffer from several errors which could lead to biased interpretation of results, making the estimates least reliable. Some of the major errors which may be present in the data are:

i) Under reporting of dead children or infants.

ii) The inclusion of still births in the number of dead children.

iii) Under reporting of children everborn, and age misreporting for both children and mothers.

The omission of vital events like births, deaths is the most serious error that could be encountered which adversely affect the quality of data. Due to under coverage and personal errors in recording the events there could be missing cases under certain socio-economic, cultural or demographic variables. Sampling errors could also be encountered, since surveys are conducted on the portion of the population under study. Such factors which affect the quality of data hinder an accurate estimation of any demographic parameter in this study.

In addition to the quality of the data the demographic and statistical methods employed for analysis lay basic assumptions which in some cases don't hold on the real situation of Kenya.The imperfection in the methods in line with the situation in Kenya bring limitation to accurate and comprehensive estimation of

demographic parameters and the relative effects of the socio-economic and cultural variables on the estimated demographic parameters.

The above mentioned draw backs limits a comprehensive study of the role of socio-economic and cultural factors on infant and child sex mortality differential.

CHAPTER FOUR

SOCIO-ECONOMIC AND CULTURAL SEX DIFFERENCES IN CHILDHOOD MORTALITY

4.1 INTRODUCTION

In this chapter, the estimated results of infant and child sex mortality differential by socio-economic and cultural factors at the national level using the Trussell variant of the original Brass method are presented.

The socio-economic and cultural variables and the corresponding categories included in this estimation are:

(a) Socio-economic factors

(1) Mothers' level of education: which has been split into the following three categories

.Mothers with no education

.Mothers with primary level of education

.Mothers with secondary level of education

(2) Mothers' current type of employment: which has been split into the following three categories:

.Mothers never worked

.Mothers working home

.Mothers working away

(3) Place of residence: which has been split into the following two categories:

.Urban

.Rural

(4) Mothers' current marital status: which has been split into

the following three categories:

.Never married mothers

.Mothers married and living with their spouses

.Mothers widowed,divorced or separated

(b) Cultural factors:

(1) Mothers' religious affiliation: which has been split into the following three categories

.Mothers with catholic religious affiliation

.Mothers with protestant/other christian religious affiliation

.Mothers with other religious affiliation from those mentioned above

(2) Mothers' ethnic origin: which has been split into the following four categories:

.Bantus from Coast

.Bantus from Western province

.Other Bantus

.Nilotics

In addition to the above mentioned socio-economic and cultural variables, inter regional variation of infant and child sex mortality differential is estimated by taking the seven provinces included in the 1993 KDHS.

In this study the male and female infant mortality estimates are measured in terms of the probability of dying between age 0 and 1. The estimates are taken as infant mortality rates (IMR), which are simply derived by multiplying the values of the probability of

dying between age 0 and 1 (1q0), from the life table by 1000. For the measurement of male and female child mortalities the study makes use of two sets of estimates. The first one is using the qx values, where qx is the probability of dying by age x, x taking values 1,2,3,5,10,15,20. From these the q2, q3, and q5 values, which are the probability of dying by age 2, 3, and 5 respectively are used for child mortality estimates. The other qx estimates are omitted from mortality analysis; because they suffer from errors of omission, age and death misreporting etc. The other child mortality estimates used are the 4q1 values from the life tables, which are the probabilities of dying between age 1 and 5. The life tables are constructed based on the average levels derived from the q2, q3, and q5 values.

Percentage mortality decrease for individual sex as one goes from one category to the other is calculated so as to determine the sex which more benefited from the estimated mortality decline under each variable. The male to female sex mortality ratio is also calculated for each variable to get a single value which gives a clear picture of the variation in infant and child sex mortality differential. 1Q0 values for infant mortality and 4q1 values for child mortality are used while calculating both the percentage decrease and the male to female sex mortality ratios. In all of the cases the adjusted qx values by the corresponding average levels are used for mortality analysis.

4.2 INFANT AND CHILD MORTALITY ESTIMATES BY SEX AT THE NATIONAL LEVEL: ALL CASES COMBINED

In this section mortality estimates during childhood period for each sex have been estimated at the national level without considering any specific socio-economic, cultural or demographic factors. Effort is made to give a more clear picture of the steps discussed in the previous chapters followed in infant and child mortality estimation.

In the Coale-Trussell method for mortality estimation, the first steps as mentioned earlier are to calculate the average children everborn (P(i)), and the proportion of children dead (D(i)). Table 4.1 below shows the basic data set used and the calculated P(i) and D(i) values for each sex in Kenya. From the calculated P(i) values P1, P2, and P3 are picked and the ratios P1/P2 and P2/P3 are determined.

Table 4.1: FP, SEB, DEB, SD, DD, P(i) and D(i) values for Kenya 1993:All cases combined

AGE GROUP	(i)	FP	CEB		CD		PARITY P(i)		PROPORTION DEAD D(i)	
			Male	Female	Male	Female	Male	Female	Male	Female
15-19	1	1788	193	171	20	24	0.10794	0.09564	0.1036	0.1402
20-24	2	1605	1094	1099	102	87	0.68162	0.68473	0.0932	0.0792
25-29	3	1199	1871	1903	168	162	1.56047	1.58716	0.0897	0.0851
30-34	4	1112	2578	2537	288	244	2.31835	2.28147	0.1117	0.0962
35-39	5	743	2193	2300	243	254	2.95154	3.09556	0.1108	0.1104
40-44	6	653	2256	2297	301	277	3.45482	3.51761	0.1334	0.1206
45-49	7	440	1691	1696	244	242	3.84318	3.85455	0.1442	0.1426

Note: FP= female population, CEB= children everborn, CD= children dead

Males	Females
P1/P2= 0.107942/0.158361	P1/P2= 0.095638/0.684735
P2/P3= 0.681620/1.560467	P2/P3= 0.684735/1.587156

The qx and tx values which are the probability of dying at exact age x and the reference period respectively are then obtained following the steps discussed earlier of the Coale-Trusell method via the north models of the Coale-Demeney family of life tables. The results are shown in the table 4.2 below for each corresponding age groups of mothers by each sex of children.

After the average levels are determined the qx values are adjusted accordingly using the north model of life tables. The average mortality levels for each sex at the national level when all the cases are combined have been obtained by making use of the estimated q2,q3, and q5 values from table 4.2 below. The corresponding complements of the estimated q2, q3, and q5.; P2, P3 and P5 which are the probabilities of surviving from birth to exact ages 2, 3, and 5 respectively are first determined by subtracting the q2, q3 and q5 values from 1. The lower and upper l2, l3, and l5 values at which the exact corresponding P2, P3 and P5 values lie in between are assessed from the Coale-Demeney north model of life tables, and by using the linear interpolation the exact levels are determined for the three mortality estimates. The interpolated levels are determined by applying the formula given below in which the lower level is taken as the base of calculation.

$$\text{Interpolated level} = \text{Lower level} + \frac{(\text{Px value} - \text{lower lx value})}{(\text{upper lx value} - \text{lower lx value})}$$

Table 4.2: Child mortality estimates and estimated reference periods for each sex in Kenya: All cases combined

AGE GROUP	(i)	PROPORTION DEAD D(i)		CONVERSION FACTOR K(i)		X	MORTALITY ESTIMATE qx		REFERENCE PERIOD tx	
		Male	Female	Male	Female		Male	Female	Male	female
15-19	1	0.1036	0.1404	1.0268	1.0695	1	0.07247 *0.1064	0.06208 *0.1501	1.099	1.008
20-24	2	0.0932	0.0792	1.0138	1.0247	2	0.08645 *0.0945	0.07635 *0.0811	2.265*	2.163
25-29	3	0.0898	0.0851	0.9699	0.9718	3	0.09688 *0.0871	0.08577 *0.0827	3.924	3.852
30-34	4	0.1117	0.0962	1.0056	1.0030	5	0.11064 *0.1123	0.09901 *0.0965	5.905	5.889
35-39	5	0.1108	0.1104	1.0685	1.0633	10	0.12753 *0.1184	0.11979 *0.1174	8.131	8.189
40-44	6	0.1334	0.1206	1.0525	1.0476	15	0.13714 *0.1404	0.12997 *0.1263	10.614	10.740
45-49	7	0.1443	0.1427	1.0304	1.0264	20	0.15054 *0.1487	0.14234 *0.1465	13.477	13.613

* Unadjusted qx values

The average of the interpolated levels for the three age groups by sex is calculated and taken as to be the estimated mortality level for the case under study.

The survivorship probabilities for each age group by sex in Dale-Demeney north model family of life tables are obtained using the average mortality levels for each sex determined above. The lower and upper lx values of the lower and upper levels at which the average levels lie between are taken from the life tables

and by linear interpolation the exact value (Px) corresponding to the average level is determined.

Table 4.3: Estimated mortality levels for Kenya at the national level by sex: All cases combined

MALES								
X	qx	P(x) per 100,000	Lower		Upper		Interpolated level	Average level
			lx value	level	lx value	level		
2	0.094525	90548	90376	17	91759	18	17.1244	
3	0.087085	91292	90827	18	92309	19	18.3138	17.6717
5	0.112345	88766	87730	17	89526	18	17.5768	
FEMALES								
X	qx	P(x) per 100,000	Lower		Upper		Interpolated level	Average level
			lx value	level	lx value	level		
2	0.081118	91888	91802	17	93012	18	17.0712	
3	0.082732	91727	90773	17	92170	18	17.6829	17.4650
5	0.096117	90388	89335	17	90978	18	17.6409	

Table 4.4 below shows the survivorship probability values obtained by using the method of linear interpolation for each sex.The survivorship probability values obtained for the exact levels for each sex below are each multiplied by the radix l_0 to get the number of survivors at exact age x (l_x). The l_x values are then used to estimate the other life table functions. The radix (l_0) taken for the case under study is 100,000.

Table 4.4: Estimated survivorship probabilities (Px) for Kenya by sex: All the cases combined

Age group X	Lower lx value		Upper lx value		Interpolated P(x) value	
	Level 17 Males	Level 17 Females	Level 18 Males	Level 18 Females	Level 17.6717 Male	Level 17.4650 Females
1	0.92054	0.93372	0.93094	0.94274	0.92753	0.93791
5	0.87730	0.89335	0.89526	0.90978	0.88936	0.90099
10	0.85849	0.87652	0.87930	0.89589	0.87247	0.88553
15	0.84796	0.86658	0.87013	0.88744	0.86305	0.87628
20	0.83372	0.85490	0.85715	0.87723	0.84946	0.86528
25	0.81366	0.84064	0.83877	0.86454	0.83053	0.85175
30	0.79328	0.82439	0.82011	0.85004	0.81130	0.83632
35	0.77199	0.80625	0.80052	0.83387	0.79115	0.81909
40	0.74165	0.78579	0.77902	0.81556	0.76905	0.79963
45	0.72121	0.76177	0.75355	0.79349	0.74293	0.77652
50	0.68850	0.73493	0.72281	0.76840	0.71155	0.75049
55	0.64579	0.70018	0.68167	0.73518	0.66989	0.71646
60	0.59335	0.65586	0.63066	0.69258	0.61841	0.67293
65	0.52332	0.59347	0.56115	0.63165	0.54873	0.61122
70	0.43247	0.50593	0.46926	0.54453	0.45718	0.52388
75	0.32073	0.39053	0.35419	0.42710	0.34321	0.40754
80	0.19985	0.25770	0.22614	0.28792	0.21751	0.27175
85	0.09465	0..13119	0.11073	0.15105	0.10545	0.14042
90	0.02874	0.04362	0.03525	0.05244	0.03311	0.04772
100	0.00430	0.00724	0.00563	0.00925	0.00519	0.00817
95	0.00021	0.00039	0.00030	0.00054	0.00027	0.00046

NOTE: The survivorship probability at birth is considered to be 1.00000

Table 4.5: An abridged life table for males in Kenya : All the cases combined

AGE (X)	nqx	nPx	lx	ndx	nLx	Tx	ex
0	0.07247	0.92753	100000	7247	94927	5798086	57.981
1	0.04115	0.95885	92753	3817	360706	5703159	61.488
5	0.01899	0.98101	88936	1689	440458	5342453	60.071
10	0.01080	0.98920	87247	942	433880	4901995	56.185
15	0.01575	0.98425	86305	1359	428128	4468115	51.771
20	0.02229	0.97771	84946	1893	419998	4039987	47.559
25	0.02315	0.97685	83053	1923	410458	3619989	43.586
30	0.02484	0.97516	81130	2015	400613	3209531	39.560
35	0.02793	0.97207	79115	2210	390050	2808918	35.504
40	0.03396	0.96604	76905	2612	377995	2418868	31.453
45	0.04224	0.95776	74293	3138	363620	2040873	27.471
50	0.05855	0.94145	71155	4166	345260	1677253	23.572
55	0.07685	0.92315	66989	5148	322075	1331993	19.884
60	0.11268	0.88732	61841	6968	291803	1009918	16.331
65	0.16684	0.83316	54873	9155	251478	718115	13.087
70	0.24929	0.75071	45718	11397	200098	466673	10.207
75	0.36625	0.63375	34321	12570	140180	266539	7.766
80	0.51519	0.48481	21751	11206	80740	126359	5.809
85	0.68601	0.31399	10545	7234	34640	45619	4.326
90	0.84325	0.15675	3311	2792	9575	10979	3.316
95	0.94798	0.05202	519	492	1365	1404	2.705
100	1.00000	0.00000	27	27	39	39	1.444

Table 4.6: An abridged life table for females in Kenya: All the cases combined

AGE(X)	nqx	nPx	lx	ndx	nLx	Tx	ex
0	0.06209	0.93791	100000	6209	95654	6116698	61.17
1	0.03936	0.96064	93791	3692	365196	6021044	64.20
5	0.01716	0.98284	90099	1546	446630	5655848	62.77
10	0.01045	0.98955	88553	925	440453	5209218	58.83
15	0.01255	0.98745	87628	1100	435390	4768765	54.42
20	0.01564	0.98436	86528	1353	429258	4333375	50.08
25	0.01812	0.98188	85175	1543	422018	3904117	45.84
30	0.02060	0.97940	83632	1723	413853	3482099	41.64
35	0.02376	0.97624	81909	1949	404680	3068246	37.46
40	0.02890	0.97110	79963	2311	394038	2663566	33.31
45	0.03352	0.96648	77652	2603	381753	2269483	29.23
50	0.04534	0.95466	75049	3403	366738	1887730	25.15
55	0.06076	0.93924	71646	4353	347348	1520992	21.23
60	0.09170	0.90830	67293	6171	321083	1173644	17.44
65	0.14289	0.85711	61122	8734	283775	852606	13.95
70	0.22207	0.77793	52388	11634	232855	568831	10.86
75	0.33319	0.66681	40754	13579	169823	335976	8.24
80	0.48328	0.51672	27175	13133	103043	166153	6.11
85	0.66016	0.33984	14042	9270	47053	63110	4.49
90	0.82879	0.17121	4772	3955	13973	16075	3.37
95	0.96665	0.00335	817	801	2083	2102	2.57
100	1.00000	0.00000	16	16	19	19	1.19

In the summarized table 4.7 below, all the mortality estimates considered show greater male than female probability of dying during infancy and the childhood periods at the national level in

Kenya all cases taken combined.

Table 4.7: Mortality estimates and expectation of life at birth by sex in Kenya: All the cases combined

MORTALITY ESTIMATES										eo		SMR	
q2 *		q3 *		q5 *		1q0 *		4q1 *					
M	F	M	F	M	F	M	F	M	F	M	F	Inf.	Chi.
86.9	76.4	96.9	85.7	111	99.0	72.5	62.1	41.2	39.4	58.0	61.2	117	105

Note: SMR = sex mortality ratio; M = males, F = females
* Expressed per 1000

The estimated life expectancy at birth for females in kenya is more than three years higher than that of males, which confirm females biological supremacy of living longer than their male counterparts. But when we look at individual estimates and compare them with other mortality estimates there are some indications of unfavourable situations for female children specially at the childhood period. The percentage increase from probability of dying by age two to by age three is 11.42% for male children as compared to 12.34% for female children and the increase from the probability of dying by age three to by age five is 13.54% for male children as compared to 15.44% for female children. Even if in all the cases the probability of dying for female children are less than that of males, the progressive higher percentage increase of the female children probability of dying gives some indications of the differential exposure to the risk of death under certain socio-economic and cultural groups. The male to female sex mortality ratios show excess of 16.72% and 4.55% deaths of male infants and

children respectively, being reduced by 12.17% from infancy to the latter childhood period. The decrease in the mortality estimates from 1q0 to 4q1 of 36.61% and 43.22% for females and males respectively, show the relative advantage of male over female children in the process of mortality decline from infancy to the latter childhood period. Even the considerable decrease in the male to female mortality ratio from infancy to the childhood period in addition to the above mentioned factors clearly show the probable existence of discriminatory attitudes in Kenya against the female sex under certain socio-economic and cultural groups. These are confirmed with the empirical results in latter section of this study. The higher sex mortality ratio observed during the period of infancy might be attributed to the genetic advantage of females resistance to the biological causes of death specially at the neo-natal and early post-neonatal periods where the socio-economic and cultural factors have very little or no effect on sex mortality differentials. In this study, since the period of infancy is not divided into ages in months or into neonatal and post-neonatal periods, the exact turning point at which female children start to be disadvantaged is not determined specifically. But in general, it might be said that the high advantage of female children at the neonatal period contributed to a greater deal to the overall higher mortality ratio during infancy over the latter childhood period. The environmental factors are hypothesised to operate as early at the post neonatal period at the point where additional supply of food to breast feeding, provision of medical care and special

attention in physical and hygienic care are needed. In Kenya as far as breast feeding is concerned there is no indication of discrimination against the female sex. At the national level instead the 1993 KDHS data shows higher percentage of female children ever breast fed than male children (97.20% and 96.90% among female and male children respectively). The nutrition status of female children is also better than that of male children according to the 1993 KDHS.

Table 4.8: Nutrition status of children by sex in Kenya: All cases combined

SEX	HEIGHT FOR AGE		WEIGHT FOR HEIGHT		WEIGHT FOR AGE	
	% below -3SD	% below -2SD	% below -3SD	% below -2SD	% below -3SD	% below -2SD
Male	12.9	35.5	1.4	6.4	5.9	24.4
Female	11.5	30.0	1.0	5.4	5.5	20.2

Source:- KDHS 1993

From table 4.8 above the nutrition status measured in terms of height for age, weight for height and weight for age show better nutrition status of female children over male as far as Kenya is concerned.

Regarding the percentage taken to health facilities or provider among all children the 1993 KDHS data shows higher percentage of male than female children who has got opportunities for such medical facilities.

Table 4.9: **Percentage among all children taken to health facilities or provider by sex in Kenya for some specific types of diseases**

TYPE OF INFECTION (disease)	PERCENTAGE TAKEN TO HEALTH FACILITIES	
	Male	Female
Respiratory	52.2	51.3
Fever	49.2	45.5
Diahrroea	45.1	36.5

source: KDHS, 1993

From the above table if not highly pronounced, the discrimination against the female sex in the utilization of health facilities, which could expose them to the various infections resulting in higher risk of death can easily be observed. In some socio-economic and cultural factors the cases of discrimination might be considerably high. Since here all the cases are taken combined the effects of lowest discrimination cancels the effects of the highest, so in effect higher male mortality rates are generally observed.

Additionally, the calculated reference periods using the time location equation at the national level with all the cases combined are used to determine the reference date of estimate to which each the qx value refers. To determine the reference date of estimates each calculated reference period is first subtracted from the date

of the survey which is taken as 1993.67 (August, 1993), and the result is considered to be the corresponding reference date of estimate. In both figures 3a and 3b below plotted by taking the un adjusted qx values and the corresponding q5 equivalent values, female curves lie below the male curves showing lower mortality levels for females at almost all the periods.

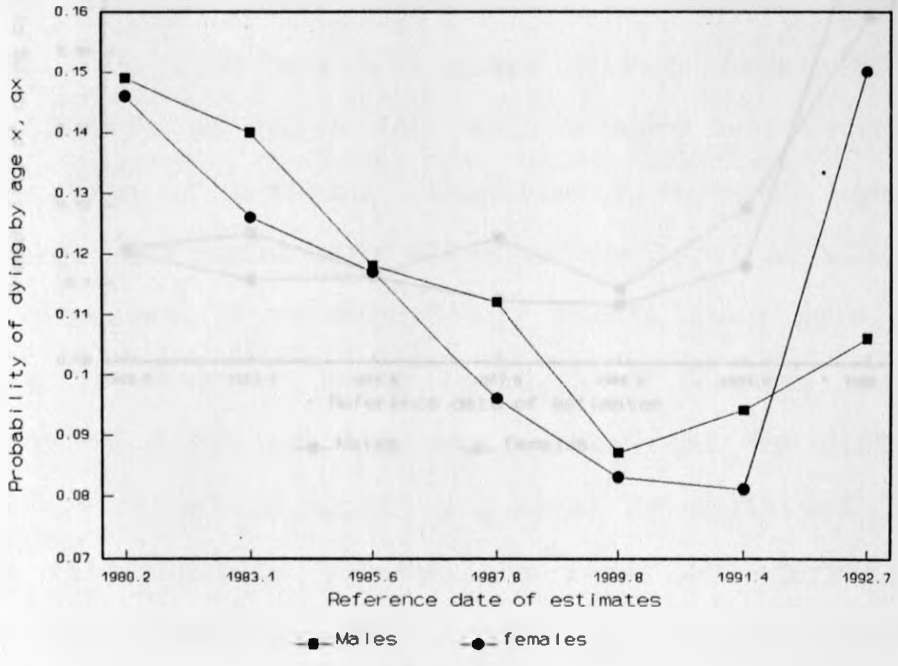
Table 4.10: qx and q5 equivalent values and their corresponding reference period and dates by sex for Kenya: All cases combined

X	qx		q5 equivalents		Reference period		Reference date	
	Male	Female	Male	Female	Male	Female	Male	Female
1	0.106404	0.150110	0.170267	0.201268	1.0995	1.0079	1992.7	1992.7
2	0.094525	0.081118	0.120132	0.105482	2.2651	2.1635	1991.4	1991.5
3	0.087085	0.082732	o.099371	0.095430	3.9244	3.8518	1989.8	1989.8
5	0.112345	0.096466	0.112345	0.096466	5.9058	5.8886	1987.8	1987.8
10	0.118402	0.117427	0.102762	0.101519	8.1886	8.1886	1985.6	1985.5
15	0.140432	0.126330	0.113294	0.101064	10.6148	10.7401	1983.1	1983.0
20	0.148683	0.146456	0.109208	0.107637	13.4773	13.6139	1980.2	1980.1

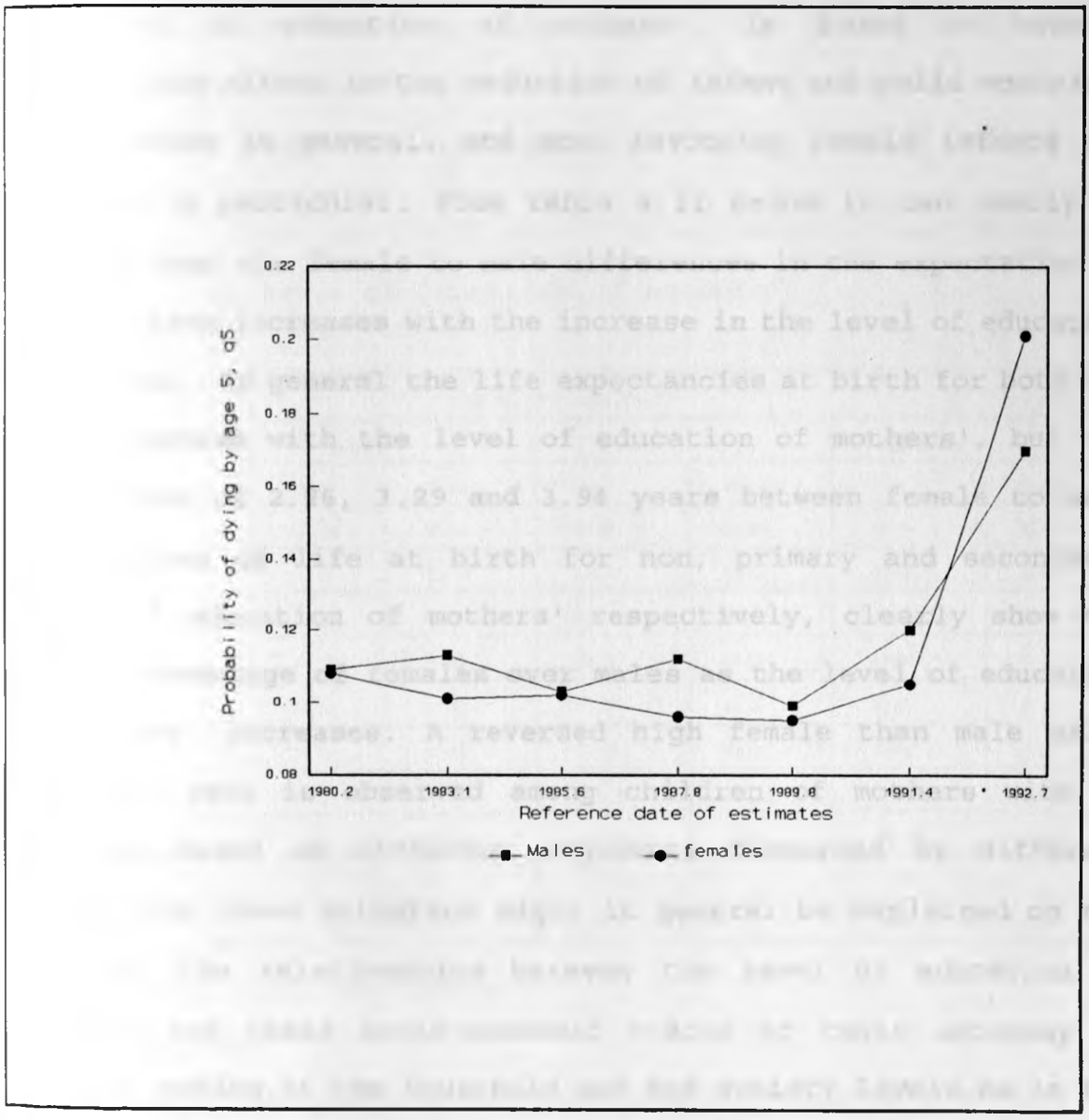
The female curves show relatively better declining trends with some consistency confirming a better data quality while the male curves show up and down trends within the reference dates showing somewhat inferior data quality. The curves so give some insight into the quality and reliability of the data set used. The q1 values and their q5 equivalent values however show highly inflated estimates which make them the most unreliable of all, so their significance in mortality estimation or analysis is very limited.

FIGURE 4: Indirect estimates of child mortality by sex, Kenya 1993 KDHS

(a) Using qx values directly



(b) Using the q5 equivalent values



4.3 SOCIO-ECONOMIC SEX DIFFERENCES IN CHILDHOOD MORTALITY

4.3.1 Infant and child mortality estimates for each sex by level of education of mothers'

Level of education of mothers', is found to have a considerable effect in the reduction of infant and child mortality of the sexes in general, and more favouring female infants and children in particular. From table 4.11 below it can easily be observed that the female to male differences in the expectation of life at birth increases with the increase in the level of education of mothers,. In general the life expectancies at birth for both the sexes increase with the level of education of mothers', but the differences of 2.26, 3.29 and 3.94 years between female to male expectations of life at birth for non, primary and secondary+ levels of education of mothers' respectively, clearly show the greater advantage of females over males as the level of education of mothers' increases. A reversed high female than male child mortality rate is observed among children of mothers with no education.Based on different arguments forwarded by different studies the above situation might in general be explained on the basis of the relationships between the level of education of mothers' and their socio-economic status or their autonomy in decision making at the household and the society levels.As it has been argued in different studies this might be due to the low status of women in developing countries associated with low level of education, resulting in very low autonomy in decision making. This will subject them to the existing cultural set ups which

entails preference to the male sex. The traditional and customary laws which might exist within the society coupled with the low socio-economic status and the highest fertility rates that might prevail among non educated mothers force them to allocate household resources disproportionately among the generations favouring the traditionally preferred male children.

Table 4.11: Infant and child mortality estimates by sex for Kenya: By level of education of mothers'

MORTALITY ESTIMATE		LEVEL OF EDUCATION					
		None		Primary		Secondary +	
		Male	Female	Male	Female	Male	Female
*q2		101.34	93.66	90.32	78.80	56.54	35.79
*q3		113.19	105.78	100.70	88.86	62.02	38.93
*q5		129.25	122.52	115.01	92.93	70.26	57.56
*1q0		83.21	74.86	75.01	63.91	48.94	39.09
*4q1		50.22	51.52	43.24	41.04	22.42	19.22
e_0		55.45	57.71	57.37	60.66	64.02	67.96
% Mor. dec.	Infant	0.00	0.00	9.85%	14.63%	34.76%	38.83%
	Child	0.00	0.00	13.90%	20.34%	48.15%	53.17%
SMR	Infant	115.15 (+11.15%)		117.37 (+17.37%)		125.20 (+25.20%)	
	Child	97.48 (-2.52%)		105.36 (+5.36%)		116.65 (+16.65%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio

* Expressed per 1000

Under such set-ups the relative exposure to the risk of death is higher for female children. Educated mothers on the other hand are active or fully participate in decision making concerning the wellbeing and treatment of their children as a whole. Being most probably engaged in a well income generating economic activity

the alternative care they provide and the additional nutrition they introduce are argued to be of high quality with minimum or no discrimination among the sexes, as they are in most of the cases free of traditions or customs which lay certain regulations in discriminating against the female sex.

Thus in general, it can be said that the increase in level of education of mothers' play a great role in eliminating discriminatory attitudes and practices against the female sex in that it increases the survival probabilities of female children more as compared to male children as far as Kenya is concerned.

4.3.2 Infant and child mortality estimates for each sex by the place of residence of mothers'

Place of residence is found to have a positive effect in the reduction of infant and child mortality in general as the place of residence becomes more urban, and favouring male children more in particular. From table 4.12 below it can be observed that the life expectancies at birth of both the sexes are higher at urban areas, but the differences in life expectancies of 1.93 years for females and 2.35 years for males between urban and rural areas show the higher advantage male children have in line with the decrease in infant and child mortality in urban areas. The differences in female to male expectations of life of 3.67 years and 2.84 years in rural and urban areas also confirm the relative higher advantage of male children in the urban set-up.A reversed higher female mortality rate is observed in urban residential areas. Even the non

considerable difference in the infant sex mortality ratios of urban and rural areas indicate higher male advantage.

When Nairobi which is a primate city is taken separately from the other urban areas the results obtained show a further decrease in infant and child mortality for both the sexes.

Table 4.12: Infant and child mortality estimates by sex for Kenya: By place of residence of mothers'

MORTALITY ESTIMATE		PLACE OF RESIDENCE			
		Rural		Urban	
		Male	Female	Male	Female
*q2		88.68	77.52	71.96	68.30
*q3		98.84	87.12	79.84	76.48
*q5		112.88	100.59	91.01	88.06
*1q0		73.77	67.95	61.06	56.06
*4q1		42.20	40.17	31.90	33.90
e_0		57.67	60.93	60.02	62.86
% Mort. dec.	Male	0.00	0.00	24.41%	17.49%
	Female	0.00	0.00	17.31%	15.61%
SMR	Infant	108.57 (+8.57%)		108.92 (+8.92%)	
	Child	105.05 (+5.05%)		94.10 (-5.90%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio
* Expressed per 1000

Unlike the further mortality decline observed in Nairobi the difference in the female to male expectation of life at birth lies between that of rural areas and the other urban areas. This shows the relative advantage female children have in line with the mortality decline from other urban areas to Nairobi and their still disadvantaged position as compared to their male counter parts in

child mortality decline from rural areas to Nairobi (the decline being 41.50% for males and 40.25% for females).

In general in all of the urban areas including Nairobi the percentage increase in the survival probabilities of male children are more than that of females in line with the overall decrease in infant and child mortality of the sexes from rural to urban areas.

Table 4.13: Infant and child mortality estimates by sex for Kenya: By place of residence

MORTALITY ESTIMATE		PLACE OF RESIDENCE					
		Rural		Other urban		Nairobi	
		Male	Female	Male	Female	Male	Female
*q2		88.68	77.52	79.12	72.69	60.06	53.35
*q3		98.84	87.12	87.98	81.54	66.27	59.15
*q5		112.88	100.59	100.41	94.04	75.23	67.65
*1q0		73.77	67.95	66.54	59.35	51.84	44.72
*4q1		42.20	40.17	36.30	36.88	24.67	24.00
e_0		57.67	60.93	59.18	61.92	63.25	66.22
% Mor. dec.	Infant	0.00	0.00	9.80%	12.66%	22.09%	24.65%
	Child	0.00	0.00	13.98%	8.19%	32.04%	34.92%
SMR	Infant	108.57 (+8.57%)		112.11 (+12.11%)		115.92 (+15.92%)	
	Child	105.05 (+5.05%)		98.43 (-1.57%)		102.79 (+2.79%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio

* Expressed per 1000

The main reason as has been argued by different researchers might be due to the prevailing high rural to urban migration. It is argued that, as people migrate they retain their customs and traditions of their origin for quite a long period of time. The prevailing better economic conditions, high educational standards,

access to hygienic and physical child care information together make urban areas superior over rural areas in minimizing the exposure to the risk of death, resulting in an overall low mortality situations for both the sexes. The results indicate the existence of a conducive environment for discrimination against the female sex or for unequal treatment of the sexes in urban areas. This probable unequal treatment of the sexes might be caused by situations put forward by Locoh et al. (1989), ie., the presence of more extensive, curative medical facilities in urban areas and the high cost of obtaining such services increase the scope of possible discrimination, and might be the explicitly choice of the male sex to receive "quality" health care in urban households where there is preference for the male sex. In rural areas on the other hand the availability of such services is very rare or doesn't exist at all. Therefore, the probability of providing isolated medical care or other facilities is very limited.

4.3.3 Infant and child mortality estimates for each sex by type of employment of mothers'

Type of employment of mothers' is found to have a considerable effect in the variation of infant and child sex mortality differential. In table 4.14 below the results show that the differences between female to male expectations of life at birth seems to increase with the type of employment of mothers' which increases their physical proximity to their children, and also which enables them to have ample time to spend and share to the proper care of their children. In general the expectations of life

at birth for both the sexes increase as mothers are more bound to their home area near their children. The differences of 1.54, 3.20 and 3.75 years between female to male expectations of life at

Table 4.14: Infant and child mortality estimates by sex for Kenya:By the type of employment of mothers'

MORTALITY ESTIMATE		TYPE OF EMPLOYMENT					
		Working away		Working at home		Didn't work	
		Male	Female	Male	Female	Male	Female
*q2		91.02	75.36	88.33	77.48	79.86	67.27
*q3		99.31	99.43	98.45	87.08	88.83	75.29
*q5		115.92	115.05	112.43	100.55	101.39	86.67
*1q0		75.54	70.83	73.52	62.93	67.11	55.29
*4q1		43.68	47.59	42.00	40.15	36.75	33.25
e_0		57.25	58.79	57.73	60.93	59.33	63.08
% Mor. dec.	Infant	0.00	0.00	2.67%	11.15%	8.72%	12.14%
	Child	0.00	0.00	3.85%	15.63%	12.50%	17.19%
SMR	Infant	106.65 (+6.65%)		116.83 (+16.83%)		121.38 (+21.38%)	
	Child	91.78 (-8.22%)		104.61 (+4.61%)		110.53 (+10.53%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio

* Expressed per 1000

birth under working away, working at home and not working mothers respectively show the relative advantage of female children over males in line with the decrease in mortality rates from one category to the other in the given order.

A reversed higher child mortality rate is observed under working away type of employment. Even if women's labour force participation is argued to increase women's control over resources

and their autonomy in general to the benefit of children of both the sexes, in the Kenyan situation the mothers' involvement in work specially away from home is found to have strong negative effect on the survival probabilities of both the sexes, with a relatively higher effect on female children. This might be because of the reasons forwarded by different studies, that most women in developing countries participate in low status economic activities with the exchange of meagre income, which for most mothers working away from home don't allow them to provide "quality" alternative care for their children. Children of both the sexes are to be affected under such settings, but the alternative care might concentrate on the preferred male sex. Since those working away mothers have little time to take care of their children, in households or society groups where there is discrimination against the female sex, the available little time might more favourably used to the male offsprings. In case of mothers working at home they most probably be engaged in small scale trading, and agriculture which couldn't diverse mothers' time and attention away from their children considerably. Most studies agree on the point that under such conditions even if mothers care is more available the working situation couldn't allow full time and attention to be invested on the proper care of children. Rather the available time might be used to the more preferred sex. But in general, because of their mothers physical proximity, children of both the sexes are in a better of conditions as compared to children of mothers who are working away. The non working mothers on the other hand are argued

by different researchers to be in a better of position to provide most of their time and energy to the proper care of their children. The nutrition status of children of these mothers is also argued to be higher because of appropriate and extended breast feeding which can easily be available at the proper time needed.

In Kenya therefore, based on the results we might say that the presence of high percentage of low income or non income working mothers contributed to a larger extent to the high level of infant and child mortality encountered for children of mothers who are working away in general, to the higher disadvantage of female children in particular.

4.3.4 Infant and child mortality estimates for each sex by marital status of mothers'

Current marital status of mothers' is found to have differential effects on the survival probabilities of the sexes. In line of the mortality decline observed from one category to the other, female children are found to be more advantaged than males. The difference in female to male expectations of life of 1.95, 2.74 and 4.7 years obtained under widowed/divorced, married/living together and never married mothers confirm the relative advantage female children enjoy in line with the decrease in the mortality rates.

Excess female than male child mortality rate is observed among children of widowed/divorced mothers. The probable reasons for the observed mortality patterns can be given based on different

arguments raised in different studies. Widowed/divorced mothers are argued to have high responsibility of generating family income entirely to support or to meet the basic needs of all the family members, otherwise they have to subordinate themselves to the support of relatives or outsiders, because of the terminated economic security provided by their spouses through divorce or

Table 4.15: Infant and child mortality estimates by sex for Kenya: By marital status of mothers'

MORTALITY ESTIMATE		MARITAL STATUS					
		Widowed/divorced		Married/living together		Never married	
		Male	Female	Male	Female	Male	Female
*q2		96.50	91.09	76.98	69.51	61.79	47.40
*q3		107.72	102.81	85.55	77.88	68.24	52.36
*q5		123.04	119.02	97.61	89.72	77.52	59.56
*1q0		79.65	72.97	64.90	56.98	53.18	40.21
*4q1		47.15	49.67	34.98	34.72	25.71	20.16
e_0		56.26	58.21	59.85	62.59	62.90	67.60
% Mor. dec.	Infant	0.00	0.00	18.52%	21.91%	18.06%	29.43%
	Child	0.00	0.00	25.81%	30.10%	26.50%	41.94%
SMR	Infant	109.15 (+9.15%)		113.90 (+13.90%)		132.26 (+32.26%)	
	Child	94.93 (-5.07%)		100.75 (+0.75%)		127.53 (+27.53%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio

* Expressed per 1000

death. In such arrangements the decision making power of mothers' concerning their children might be shifted to the other party, who might preferably provide their support to the male children in most traditional set-ups. Unlike the widowed/divorced mothers,

married/living together mothers are argued to have a relatively better economic security from their partners in generating most of or all of household income. Even if in most of such unions the male superiority prevails in household decision making; being fairly independent from outside influences it enables mothers to distribute the available income fairly among the offsprings. Concerning single mothers most studies agree on the point that, these mothers certainly engage in better income generating economic activities which put them to be economically self supportive and independent in decision making concerning household management and child care. The survival probabilities of both the sexes are highly improved, with female children more advantaged, because the internal distribution of household resources in economically self reliant autonomous female headed households is argued to be more child oriented without discrimination among the sexes.

4.3.5 Infant and child mortality estimates for each sex by region of residence of mothers'

Region taken as provincial divisions has been found to have a considerable differential effect on infant and child sex mortality of the sexes in Kenya. The results shown below in table 4.16 don't have similar direction of mortality declines for the sexes.

Unlike the general low infant and child mortality rates observed in Central, Nairobi and Rift valley provinces at which the expansion of the differences in the life expectancies at birth are expected in favour of females in line with the reduced mortality rates, the differences obtained are far below of that of Coast,

Table 4.16: Infant and child mortality estimates by sex for kenya; By region of residence of mothers'

MORTALITY ESTIMATE		REGION					
		Nyanza		Western		Coast	
		Male	Female	Male	Female	Male	Female
*q2		157.13	157.75	106.10	85.42	98.10	80.68
*q3		177.03	180.46	118.57	96.25	109.53	90.77
*q5		203.07	210.61	135.36	111.33	125.09	104.88
*1q0		124.41	120.86	86.71	68.81	80.83	65.31
*4q1		89.84	102.09	53.27	45.66	48.16	42.33
e_o		46.72	46.77	54.65	59.33	55.99	60.27
% Mor. dec.	Infant	0.00	0.00	30.66%	43.07%	6.78%	5.09%
	Child	0.00	0.00	40.71%	55.27%	9.59%	7.29%
SMR	Infant	102.94 (+2.94)		126.01 (+26.01%)		123.76 (+23.76%)	
	Child	88.00 (-12.00)		116.67 (+16.67%)		113.77 (+13.77%)	

REGION							
Eastern		Nairobi		Rift Valley		Central	
Male	Female	Male	Female	Male	Female	Male	Female
71.64	39.84	60.06	53.35	52.83	49.24	32.39	29.30
79.47	43.61	66.27	59.15	58.00	54.49	34.59	31.43
90.59	49.15	75.23	67.65	65.52	62.08	37.88	34.57
60.81	34.40	51.84	44.72	46.17	41.61	29.78	26.29
31.71	15.59	24.67	24.00	20.29	21.36	8.35	8.50
60.87	69.46	63.25	66.22	64.81	67.17	69.63	72.15
24.77%	47.33%	14.75%	-30.00%	10.94%	7.47%	35.50%	36.82%
34.16%	63.17%	22.20%	-53.94%	17.75%	11.00%	58.85%	60.21%
176.77 (+76.77%)		115.92 (+15.92)		110.96 (+10.96%)		113.28 (13.28%)	
203.40 (+103.40%)		102.79 (+2.79)		94.99 (-5.01%)		98 23 (-1.77%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio
* Expressed per 1000

Western and Eastern provinces.

A reversed higher female child mortality rates and probabilities of dying are observed for Nyanza province with almost equivalent expectations of life at birth for the sexes. The socio-economic development of each province with the existing ethnic mixture which mainly determine the cultural set-up of the provinces are the major factors behind the overall differences in infant and child mortality rates among the regions in general and the relative differential exposure of the sexes in particular. Nyanza province is characterised by low socio-economic development and strong cultural attitudes and beliefs towards the sexes. Among some of the major ethnic groups in the province sons are considered as carriers of family name to the generations, so are given special attention and care. Unlike the lowest level of infant and child mortality observed in Central province which is attained because of its high potential agricultural land and well developed infrastructure, the observed reversed higher female child mortality rate might be an indication of low socio-cultural development. The same trend is observed for the Rift Valley province. In both the cases the level of socio-cultural development might not be strong enough to bring changes in the deeply embedded cultural attitudes and beliefs which entail low status of women. The results of the Eastern province show highly exaggerated differences between female and male infant and child mortality rates and their probabilities of dying. The highly exaggerated differences don't look realistic, so there might be data errors due to differential omissions of female deaths or

other vital events. In addition to data errors female children in the society might have economic advantage to their parents, so the relatively higher income among certain ethnic groups in the province might be used or distributed among the generations without discrimination. The recurring draught at the area might also disproportionately affects male infants and children. For Coast and Western provinces on the other hand, the infant and child mortality rates show the normal trend of higher male than female deaths with no particular indication of pronounced discrimination among the sexes. The relatively low differences of female to male expectations of life at birth obtained in Nairobi unlike being a primate city might be due to the prevailing high rural to urban migration.

4.4 CULTURAL SEX DIFFERENCES IN CHILDHOOD MORTALITY

4.4.1 Infant and child mortality estimates for each sex by religious affiliation of mothers'

Religious affiliation of mothers' is observed to have a considerable effect in the differential survival probabilities of infants and children of the sexes. The estimated results shown in table 4.17 below don't show the same direction of mortality decline for the sexes.

Amazingly, the qx values for children of mothers under other religious category show high differences among the sexes. This in addition to other reasons could be due to data errors, resulting from differential omission of female children deaths.

Table 4.17: Infant and child mortality estimates by sex for Kenya: By Religion

MORTALITY ESTIMATE		Religion					
		Others		Protestant/other chris.		Catholic	
		Male	Female	Male	Female	Male	Female
*q2		110.18	66.37	90.33	77.64	73.24	76.23
*q3		183.19	74.28	100.72	87.26	81.29	85.56
*q5		140.60	85.45	115.03	100.75	92.69	98.85
*1q0		89.71	54.61	75.02	63.04	62.04	62.00
*4q1		55.91	32.62	43.25	40.25	32.68	39.29
e_o		53.81	63.32	57.37	60.88	60.57	61.19
% Mor. dec.	Infant	0.00	0.00	16.37%	-15.44	17.30%	1.65%
	Child	0.00	0.00	22.64%	-23.39	24.44%	2.39%
SMR	Infant	164.27 (+64.27%)		119.00 (+19.00%)		100.06 (+0.06%)	
	Child	171.40 (+71.14%)		107.45 (+7.45%)		83.18 (-16.82%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio,

* Expressed per 1000

The percentage mortality decrease in the respective lines of mortality decline show the relative advantage of male children over female children. A reversed excess female child mortality rate is observed for children of mothers with catholic religious affiliation. This might be due to the reason that Catholic being the major religion in Kenya have a large member of followers with mixed cultural and socio-economic backgrounds. The religion assimilates itself in the existing social and cultural structure of the society without tempering its normal functioning. In some of the cases it sanctions traditional and customary set ups which entail son preference. The lowest infant and child mortality rates

as the two sexes combined and at the same time the excess female child mortality indicate, on average economically developed society group to lower the overall level of mortality but with dominant cultural attitude of son preference. On the other hand for protestant/other christian, even if the combined infant and child mortality show an average lower economic development the non existence of excess female mortality indicate a better socio-cultural state of development.

On the extreme side the strong believe based on the principle that the earthly living is worthless and one has to prepare and live to the next life after death might make mothers or parents in general to resist and be above some cultural set ups which entail unequal treatment of the sexes.The highest male infant and child mortality rates and the lowest female infant and child mortality rates observed for mothers under other religious category which includes muslims, no religion and others, aside from questioning the quality of the data might be because of the reason that since most of the muslim mothers are from the areas of the coastal belt where malaria is prevalent, which might disproportionately affect male children while female children relatively resist the risk because of their innate biological nature.

4.4.2 Infant and child mortality estimates for each sex by ethnic background of mothers'

Ethnic differences or the ethnic chemistry of Kenya .is found to have a considerable role to play in the relative risk of death

of infants and children of the sexes. The tabulated results in table 4.18 below don't show similar direction of mortality decline.

Table 4.18: Infant and child mortality estimates by sex for Kenya: By ethnicity

MORTALITY ESTIMATE		ETHNICITY							
		Nilotic		Bantus/Coast		Bantus/Western		Other Bantus	
		Male	Female	Male	Female	Male	Female	Male	Female
*q2		109.24	104.84	105.87	73.02	100.19	88.15	57.27	48.57
*q3		122.13	118.75	118.32	81.95	111.89	99.40	63.09	53.71
*q5		139.40	137.71	135.07	94.51	121.77	115.02	71.51	61.15
*1q0		89.02	82.93	86.54	59.62	82.36	70.81	49.67	41.10
*4q1		55.30	59.73	53.13	37.12	49.49	47.58	22.98	20.91
e_o		54.12	55.64	54.69	61.83	55.64	58.80	63.82	67.32
%Mo dec	Male	0.00	0.00	2.79%	28.11%	4.83%	-18.77	39.69%	41.96%
	Female	0.00	0.00	3.92%	37.85%	6.85%	-28.18%	53.57%	56.05%
SMR	Infant	107.34 (+7.34)		145.15 (+45.15%)		116.31 (+16.31%)		120.85 (+20.85%)	
	Child	92.58 (-7.42)		143.13 (+43.13%)		104.01 (+4.01)		109.90 (+9.90%)	

Note: Mor. dec. = mortality decline; SMR = sex mortality ratio

* Expressed per 1000

The observed high differentials in the female to male probabilities of dying at certain ages under Bantus from Coast ethnic category, still force as to question the quality of the data set used for the analysis. The percentage mortality decline in the respective direction of the sexes show a relatively better advantage for female children. A reversed excess female than male child mortality is observed under Nilotic ethnic group. Among some Nilotic ethnic groups, sons are considered as carriers of the

family name, because of this wives who don't give birth to sons are considered as infertile or as they don't give birth to any child even having some daughters. Such strong preference for sons among the community might force parents to give priority to the male offspring in resource allocation among their children. This unproportional treatment of the sexes might lead female children to be more exposed to the existing high mortality situation.The prevailing low socio-economic development might slow down the changes in eliminating or rather minimizing the high son preference which is deeply embedded in the prevailing culture.

For Bantus from Coast in addition to the quality of the data set used, due to the higher prevalence of malaria at the Coastal belt male children might disproportionately be affected. Also there might exist some economic interest on female children which minimize the differential treatment of the sexes. Bantus from Western province and other Bantus relatively show excess male than female mortality at all the periods. The availability of high potential agricultural land with well developed physical and social infrastructure at the areas where most of the tribes included under other Bantus ethnic category live play major role in the low levels of infant and child mortality of the sexes observed.

4.5 CHAPTER SUMMARY

In this chapter the results of the analysis using the Coale-Trussell variant of the original Brass method revealed the existence of substantial variation in infant and child sex

mortality differential by socio-economic and cultural factors. Two distinct patterns of infant and child mortality declines were observed for the sexes, by socio-economic factors on one side and by cultural factors on the other side. In the case of the former, under each socio-economic factor considered except region of residence, the infant and child mortality declines followed the same direction for both the sexes while in the case of the latter including region of residence the declines followed different directions by sex. The percentage mortality declines among the categories under the level of education of mothers', current type of employment, marital status and ethnicity were found to be in favour of female infants and children, whereas among the categories under place of residence and religion were found to be in favour of male infants and children. Under each variable for at least one category excess female children deaths or higher probability of dying were observed. Nyanza province recorded the highest excess female child deaths, whereas Eastern recorded the highest excess male child deaths.

The above analysis in general gives precise and accurate picture of the socio-economic and cultural complexity of the Kenyan society. In addition it provides some insights into the quality and reliability of the data set used for the analysis.

CHAPTER FIVE

SOCIO-ECONOMIC AND CULTURAL DETERMINANTS OF SEX DIFFERENCES IN CHILDHOOD MORTALITY

5.1 INTRODUCTION

In this chapter the results of the statistical analyses which are used to determine the effects of socio-economic and cultural factors on indicators of mortality at the childhood period of the sexes are presented. Different sets of regression models are used to asses the relative effects of the predictors socio-economic and cultural factors on the female and male mortality criterion at the childhood period. A cross sectional regression analyses on the individual mother level statistics are done to determine the coefficients related to each category of the socio-economic and cultural indicators via the ordinary least square method, and the corresponding significant coefficients for the male and female models are interpreted in terms of their relative effects on the criterion. The different socio-economic and cultural factors used in the Coale-Trussell method of analyses except the provinces, which are assumed to play major roles in the differentials of mortality levels of the sexes or which have differential effects on the child exposure to the risk of death of the sexes are used in the models. Maternal education, type of employment, place of residence, marital status, religion and ethnicity are the socio-economic and cultural factors considered. The proportion of children dead by sex at the childhood period of individual mother as dependent variable is studied as a function or in relation to

the above mentioned factors.

In addition to the problems associated to the basic assumptions of multiple linear regression analysis; based on the arguments forwarded by U.N.Es.C.W.A (1989), other problems are assumed to be embedded in the analyses particularly when using a mortality indicator as a criterion.

The proportions of dead children are calculated assuming that distribution of children by exposure to the risk of death don't differ systematically with the covariates used within different ages or among different mothers. But in some cases those died could be lower not because of the underlying mortality risks, but rather because of shorter exposure to such risks. In most of the cases women of higher socio-economic status bear children at latter ages, reducing the period of exposure to the risk of death. Here regression analysis will thus give an exaggerated estimate of the reduction in child mortality.

Another problem arises when child mortality is declining and socio-economic indictors have been rising at the same time. Here the regression coefficient on some indicators will pick up spurious magnitude from the exogenous decline.

Also an indicator of mortality includes a large random variation component, as a result the models have been found to explain small proportion of total variance. In addition, another shortcoming of mortality as a criterion is that, its aggregate nature. It is averaged over children of a wide range of ages, so cannot efficiently identify factors that affect mortality at only

one age range of childhood, or identify factors that might have effects in different directions and magnitudes in different age ranges.

Since our main objective in this study is to identify the determinants of sex differences in childhood mortality the aforementioned problems are considered to be equally distributed among the sexes, so are assumed to have minimum effects on the outcome of the analyses. The socio-economic and cultural factors identified are assumed to be important correlates of sex mortality differential which has got approximate proportional effect at all ages of childhood.

The results of the bi-variable and multi-variable analyses are presented in the given order. The results of the partial correlation analyses intended to determine the magnitude of relationships among the independent variables so as to asses the existence of the problem of multicollinearity are presented in the appendix. The correlation matrices are used in this case.

5.2 BIVARIATE REGRESSION ANALYSIS RESULTS

Here in this section the results of the statistical analysis using bivariate regression analysis are presented. The results presented show the existence of significant relationships between certain socio-economic and cultural variables with the dependent variables. Almost all of the directions of the relative effects of the selected socio-economic and cultural variables on the dependent variables are found to be in agreement to that of the results obtained using the Coale-Trussell technique.

Table 5.1 Summary results of bivariate regression for the household level variables, 1993 KDHS

Males' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	R^2	SIGNIFICANT LEVEL OF B (P)
LEVEL OF EDUCATION				
MED0	Reference	Reference	Reference	Reference
MED1	-0.00449	0.00668	0.00010	0.500
MED2	-0.06150 *	0.00835	0.01169	0.001
TYPE OF EMPLOYMENT				
MWK0	Reference	Reference	Reference	Reference
MWK1	0.00327	0.00745	0.00004	0.700
MWK2	0.01506 *	0.00715	0.00097	0.050
PLACE OF RESIDENCE				
MRES0	Reference	Reference	Reference	Reference
MRES1	-0.02721 *	0.01003	0.00160	0.010
MARITAL STATUS				
MMR0	Reference	Reference	Reference	Reference
MMR1	-0.01469	0.00859	0.00064	0.150
MMR2	0.04477 *	0.01042	0.00401	0.001
RELIGION				
MREL0	Reference	Reference	Reference	Reference
MREL1	-0.00261	0.00678	0.00003	0.700
MREL2	0.02850 *	0.01179	0.00127	0.020
ETHNICITY				
MET0	Reference	Reference	Reference	Reference
MET1	0.01450	0.00925	0.00054	0.150
MET2	0.02484 *	0.01112	0.00109	0.025
MET3	-0.04526 *	0.00666	0.00998	0.001

Note : The codes are as described in chapter three.
* significant in this study (α =0.1)

Table 5.2 **Summary results of bivariate regression for the household level variables, 1993 KDHS**

Females' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	R^2	SIGNIFICANT LEVEL OF B (P)
LEVEL OF EDUCATION				
FED0	Reference	Reference	Reference	Reference
FED1	-0.00127	0.00639	0.00001	0.850
FED2	-0.06080 *	0.00792	0.01266	0.001
TYPE OF EMPLOYMENT				
FWK0	Reference	Reference	Reference	Reference
FWK1	-0.00771	0.00716	0.00025	0.300
FWK2	0.01147 *	0.00683	0.00062	0.100
PLACE OF RESIDENCE				
FRES0	Reference	Reference	Reference	Reference
FRES1	-0.01414	0.00954	0.00048	0.150
MARITAL STATUS				
FMR0	Reference	Reference	Reference	Reference
FMR1	-0.02056 *	0.00824	0.00135	0.020
FMR2	0.05270 *	0.01009	0.00590	0.001
RELIGION				
FREL0	Reference	Reference	Reference	Reference
FREL1	-0.00813	0.00649	0.00034	0.020
FREL2	0.02201 *	0.01114	0.00590	0.001
ETHNICITY				
FET0	Reference	Reference	Reference	Reference
FET1	0.02424 *	0.00883	0.00164	0.010
FET2	0.01797 *	0.01053	0.00063	0.100
FET3	-0.05130 *	0.00637	0.01331	0.001

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

The relative effects of primary, secondary and above levels of education, urban place of residence, married and living together marital status, protestant and other christian religious affiliation and other Bantus ethnic origin on the proportion of children dead of both the sexes at the childhood period of individual mother are found to be negative as compared to their respective reference categories. On the other hand the relative effects of working away, working at home types of employments, widowed and divorced marital status, other religious affiliation, Western Bantus and Bantus from Coast ethnic origins on the proportion of children dead of both the sexes at the childhood period of the individual mother are found to be positive as compared to their respective reference categories. Their relative effects are in the direction of increasing the proportion of children dead of the sexes as compared to their respective reference categories. But, from these the bivariate regression coefficients of secondary and above level of education, working away type of employment, urban place of residence, widowed and divorced marital status, other religious affiliation, Bantus from Coast and other Bantus ethnic origin for males as well as the bivariate regression coefficients of secondary and above level of education, working away type of employment, married and living together and widowed and divorced marital status, other religious affiliation, Bantus from Western and Bantus from Coast ethnic origins for females are found to be statistically significant.

The proportion of variance of the proportion of children dead

by sex at the childhood period of the individual mother explained by the selected socio-economic and cultural variables in the bivariate models are found to be low. Even if perfect relationships between the dependent and independent variables are expected, because of the high random variations encountered while using a mortality indicator as a dependent variable and the existence of some deviations from perfect linear relationships are considered to be the major reasons for the observed low values of the proportions of variance explained by the independent variables.

However, the F-test values found associated to secondary and above level of education, working away from home type of employment, married and living together and widowed and divorced marital status, other Bantus and Bantus from Coast ethnic origins bivariate regression models for both the sexes including those associated to the bivariate models of urban place of residence for male and Bantus from Western ethnic origin for females show that the multiple coefficients of determination for each of the above explanatory variables are sufficiently greater than zero. For both the sexes the proportion of the dependent variables explained by secondary and above level of education and other Bantus ethnic categories are found to be the highest.

The standard errors of the unstandardized regression coefficients in each of the cases are found to be quite small. For the considered relatively large sample size these values can be taken as equivalent to standard deviations of normal distributions.

The magnitude of the partial correlation coefficients between

the independent variables are found to be small enough not to create any serious problem of multicollinearity in the course of the multiple linear regression analyses.

5.3 MULTIVARIABLE LINEAR REGRESSION ANALYSES RESULTS

Here in this section the results of the three stage linear multiple regression analyses are presented. Almost all of the results obtained are in line with expectations.

In all the cases the proportion of variance of proportion children dead at the childhood period of individual mother by sex accounted for by the variables in the regression equations as should be noticed by the R^2 values are very low, which can be due to three major reasons. First, as pointed out earlier the low proportion of variance explained are partly due to the characteristics of the mortality indicator used as criterion which include large random variation component. The argument here is that since women have a finite number of children, and since children die in units of one, most women cannot have the expected number of dead children which in effect determine the proportion of children dead for the actual parity. Due to this the actual number of dead children don't follow binomial distribution which is desired, therefore resulting in large random rather than uniform variation. Second, the low proportions of variance explained suggest that factors not included or proxies in the analyses like household income, use of health facilities, toilet facilities, piped drinking water, birth interval, contraceptive use and others which may have

Table 5.3 Summary results of multivariable regression; Kenya, 1993.

Males' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	SIGNIFICANT LEVEL OF B (P)
LEVEL OF EDUCATION			
MED0	Reference	Reference	Reference
MED1	-0.03964 *	0.00823	0.001
MED2	-0.08368 *	0.01058	0.001
TYPE OF EMPLOYMENT			
MWK0	Reference	Reference	Reference
MWK1	0.01416 *	0.00809	0.100
MWK2	0.02728 *	0.00787	0.001
PLACE OF RESIDENCE			
MRES0	Reference	Reference	Reference
MRES1	-0.02052 *	0.01035	0.050
MARITAL STATUS			
MMR0	Reference	Reference	Reference
MMR1	0.01159	0.01320	0.400
MMR2	0.04741 *	0.01501	0.005
RELIGION			
MREL0	Reference	Reference	Reference
MREL1	0.00413	0.00728	0.600
MREL2	0.01394	0.01501	0.360
ETHNICITY			
MET0	Reference	Reference	Reference
MET1	-0.00400	0.01058	0.700
MET2	-0.01312	0.01357	0.340
MET3	-0.04123 *	0.00770	0.001
R^2= 0.03260		F= 12.84744	
CONSTANT= 0.13156		STANDARD ERROR= 0.22094	

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

substantial impacts on individual survival regardless of sex have affected the outcome. Third, the deviation of some of the relationships in the models from linearity also contributed to the low proportion of variance explained.

The basic models shown in table 5.3 and 5.4 for males and females respectively identify seven major factors for males and six major factors for females which are potential determinants of mortality at the childhood period.

Primary and secondary and above levels of maternal education in both the models show relative effects of lowering proportion of children dead of individual mother compared to non educated mothers reference categories. The relative effects are almost similar for both the sexes with slightly higher for males. This can be due to the inclusion of children of wide range of ages or otherwise might be because of the non inclusion of some variables which could likely be proxied by maternal education in the females' models. In general the upward social and economic mobility associated with the power of decision making of mothers' at the household and community levels as the level of education increases might be the major reason which make maternal education of mothers' to be potential determinant of mortality of the sexes at the childhood period.

Type of employments of mothers', ie., working at home and working away have been found to have relative effects of increasing proportion of children dead of individual mother as compared to not working reference categories for both the sexes. The results suggest the importance of mothers' proximity to their children so

in effect the availability of their abundance care for the survival of children of the sexes, at the same time indicating the inability of most working mothers to provide "quality" alternative care. The results also give good insight on the abundance of low income or non income working mothers included in the data.

The relative effects of urban place of residence on the proportion of children dead at the childhood period are found to be decreasing in both the models, but the relative effects are not found to be important in the case of females compared to the rural place of residence reference category. This shows the relative higher importance of urban place of residence for male survival at the childhood period.

Regarding marital status, the relative effects of widowed and divorced marital status in both the models are found to increase the proportion of children dead at the childhood period compared to the never married reference category. Married and living together marital status on the other hand is found to have relative effects of increasing the proportion of male and female children dead, but the relative effect on the proportion of children dead of the sexes are found to be non substantial as compared to the reference category. From this it can be implied that anything that breaks the family either death, separation or divorce leave great burden on the mother, highly affecting the survival chances of children of both the sexes.

The religious categories considered in both the models are found to be non important determinants of mortality of the sexes at

the childhood period. However, the relative effects of Protestant and other christian and other religious categories are found to increase proportion of male children dead whereas are found to decrease proportion of female children dead compared to the catholic religion reference category.

Undoubtedly the relative effects of other Bantus ethnic origin n both the models compared to the Nilotic ethnic origin refere ategory makes it one of the important predictors of the risk eath of the sexes at the childhood period. In both the cases elative effects are found to be in the direction of lowering roportion of children dead compared to the above mentic eference category. The relative effects of Western Bantus antus from Coast ethnic origins of mothers' are not found tc ubstantial compared to the reference category. The resu btained show that Western Bantus and Bantus from Coast l elative effects of lowering proportion of male children de hereas for female children the effects are lowering the proport ead in case of Bantus from Coast and increasing in the case estern Bantus compared to the reference category. The high inc ifferences and the high differences in the development of physi and social infrastructure between the regions of residences of n f other Bantus and Nilotic ethnic groups might be the major rea o the observed results.

The F-test values corresponding to both the models show t he proportion of variance explained by the selected variat ncluded in the models sufficiently exceed zero. In addition

standard errors of the unstandardised coefficients are found to be small enough to be considered as equivalent to the standard deviations of normal distributions to the relatively large sample size used.

The second stage of the multivariable regression analysis is effected by dropping one of the highly significant socio-economic variables, ie., the maternal education variable which was found to be an important determinant of the risk of death of the sexes at the childhood period.

The basic models identify four and five categories which are important determinants of the proportion of children dead of males and females at the childhood period. The 36.86% and 40.58% decrease in the R^2 values of female and males respectively when excluding the maternal education variable give good insight in the importance of the variable in explaining the risk of death of the sexes at the childhood period. The effect is found to be relatively higher in the case of male children.

Instead of the decrease in the magnitudes, working away and working at home types of employments remain to be important determinants of female children risk of death whereas only working away type of employment is found to be important determinant of male child risk of death relative to the reference category. This suggests that the type of employment considered are proxies of the level of education of mothers' in the case of male children risk of death as is confirmed by the significant correlation that exist between them. The direction of the relative effects however

Table 5.5 Summary results of multivariable regression; dropping the level of education variable; Kenya, 1993

Males' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	SIGNIFICANT LEVEL OF B (P)
TYPE OF EMPLOYMENT			
MWK0	Reference	Reference	Reference
MWK1	0.011579	0.008141	0.160
MWK2	0.020712 *	0.00787	0.010
PLACE OF RESIDENCE			
MRES0	Reference	Reference	Reference
MRES1	-0.036433 *	0.010203	0.001
MARITAL STATUS			
MMR0	Reference	Reference	Reference
MMR1	0.023631 *	0.013195	0.100
MMR2	0.066980 *	0.016010	0.001
RELIGION			
MREL0	Reference	Reference	Reference
MREL1	-0.00000	0.007311	1.000
MREL2	0.02366	0.04990	0.120
ETHNICITY			Reference
MET0	Reference	Reference	0.330
MET1	-0.01022	0.01029	0.550
MET2	-0.00844	0.01364	0.001
MET3	-0.04748 *	0.00771	
R^2 = 0.01937		F= 9.04238	
CONSTANT = 0.090537		STANDARD ERROR = 0.22240	

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

Table 5.6 Summary results of multivariable regression; dropping the level of education variable; Kenya, 1993

Females' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	SIGNIFICANT LEVEL OF B (P)
TYPE OF EMPLOYMENT			
FWK0	Reference	Reference	Reference
FWK1	0.01605 *	0.00781	0.050
FWK2	0.01647 *	0.00751	0.050
PLACE OF RESIDENCE			
FRES0	Reference	Reference	Reference
FRES1	-0.01994 *	0.00970	0.050
MARITAL STATUS			
FMR0	Reference	Reference	Reference
FMR1	0.01931	0.01244	0.150
FMR2	0.07145 *	0.01521	0.001
RELIGION			
FREL0	Reference	Reference	Reference
FREL1	-0.00776	0.00698	0.280
FREL2	0.01022	0.01422	0.480
ETHNICITY			
FET0	Reference	Reference	Reference
FET1	-0.00297	0.00986	0.770
FET2	-0.01418	0.01298	0 270
FET3	-0.05298 *	0.00740	0.001
R^2= 0.02290		F= 10.74398	
CONSTANT= 0.09235		STANDARD ERROR= 0.21302	

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

remains the same.

The urban place of residence becomes an important determinant of both male and female proportion children dead. The relative effects in both the cases are found to be in the direction of lowering the proportion of children dead of the sexes relative to the reference category.

The relative effects of widowed and divorced, and married and living together marital status remain the same in case of females, but for males the relative effects of married and living together marital status become significantly high. The direction of the relative effects however remained the same.

Religion still remains to be non important determinant of the risk of death of children of both the sexes. While the direction of the relative effects remains the same for the remaining religious categories the relative effects of the other religious category in the case of female children turn to increasing the proportion dead relative to the reference category. Also Protestant and other christian category ends to have no effect or no relationship on or to male children risk of death.

As far as ethnicity is concerned there is no marked change observed except the direction of the relative effect of Western Bantus ethnic category in the case of female children which turns out to be lowering the proportion of children dead relative to the reference category.

The third stage of the multivariable regression analysis is conducted by dropping the highly significant ethnicity variable.

Table 5.7 Summary results of multivariable regression; dropping the ethnicity variable; Kenya, 1993

Males' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	SIGNIFICANT LEVEL OF B (P)
LEVEL OF EDUCATION			
MED0	Reference	Reference	Reference
MED1	-0.04211 *	0.08218	0.001
MED2	-0.08892 *	0.01052	0.001
TYPE OF EMPLOYMENT			
MWK0	Reference	Reference	Reference
MWK1	0.01291	0.00811	0.012
MWK1	0.02823 *	0.00788	0.001
PLACE OF RESIDENCE			
MRES0	Reference	Reference	Reference
MRES1	-0.01899 *	0.01037	0.100
MARITAL STATUS			
MMR0	Reference	Reference	Reference
MMR1	0.01542	0.01321	0.250
MMR2	0.04900 *	0.01614	0.005
RELIGION			
MREL0	Reference	Reference	Reference
MREL1	0.00722	0.00727	0.320
MREL2	0.02273 *	0.01308	0.010
R^2 = 0.02557		F= 13.34927	
CONSTANT= 0.10827		STANDARD ERROR= 0.22167	

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

Table 5.8 Summary results of multivariable regression; dropping the ethnicity variable; Kenya, 1993

Females' results

VARIABLE	REGRESSION COEFFICIENT B	STANDARD ERROR OF B	SIGNIFICANT LEVEL OF B (P)
LEVEL OF EDUCATION			
FED0	Reference	Reference	Reference
FED1	-0.03838 *	0.00786	0.001
FED2	-0.08640 *	0.01003	0.001
TYPE OF EMPLOYMENT			
FWK0	Reference	Reference	Reference
FWK1	0.01670 *	0.00779	0.050
FWK2	0.02411 *	0.00754	0.002
PLACE OF RESIDENCE			
FRES0	Reference	Reference	Reference
FRES1	-0.00335	0.00987	0.750
MARITAL STATUS			
FMR0	Reference	Reference	Reference
FMR1	0.01091	0.01248	0.400
FMR2	0.05203 *	0.01538	0.001
RELIGION			
FREL0	Reference	Reference	Reference
FREL1	-0.00020	0.00697	0.980
FREL2	0.00752	0.01240	0.550
R^2= 0.02561	F= 13.39226		
CONSTANT= 0.10607	STANDARD ERROR= 0.21270		

Note : The codes are as described in chapter three
* significant in this study (α =0.1)

The 29.39% and 21.56 decrease in the R^2 values of female and male children respectively show the relative importance of the variable in explaining the risk of death of the sexes at the childhood period with a relatively higher say in the case of female children.

The absence of the ethnicity variable does not bring any marked change in the relative effects of the education variables on the proportion of children dead of both the sexes in relation to the reference category.

The direction of the relative effects of the type of employments of mothers' considered remains the same. The only change encountered here is that in the case of male children, working at home type of employment becomes non important determinant of the proportion of male children dead. This indicates that this category is a proxy of the ethnicity variable, as is confirmed by the significant inter correlation that exists between them.

Urban place of residence still retains its position of being an important determinant of the male children proportion dead at the childhood period, while its relative effect found to be non significant in the case of female children proportion dead at the same period. Otherwise there are no changes of the direction of the relative effects encountered.

In the case of the marital status of mothers' variable there are no changes encountered both in terms of importance and direction of the relative effects.

Religion on the other hand records some marked changes both in the importance and direction of the relative effects. While remains to be non important determinants of female children risk of death the direction of the relative effects of the other religious category changes from decreasing to increasing the proportion of female children dead at the childhood period relative to the reference category. In the case of male children the direction of the relative effects remains the same, but the other religious category turns out to be important determinant of male children risk of death relative to the reference category. This indicates that in the original model the effects of the other religious category have been mostly explained by the ethnicity variable reducing the magnitude of its relative effect on the criterion.

5.4 CHAPTER SUMMARY

In this chapter effort was made to identify the potential determinants of the proportion of children dead of individual mother by sex. Even if the analyses were carried out by sex, since the risk of death of an individual child is considered in practice, the non inclusion of some important variables related to the risk of child death, those proxies of the already considered variables, the high random variation that might exist in the dependent variables, in addition to the non linearity of some relationships resulted in low R^2 values. However, the F test values in all the cases of the multivariable analyses showed that the proportion of variance explained by the predictors were significantly different from zero to make the analyses dependable.

In all primary and secondary and above levels of maternal education, working away and working at home types of employments of mothers', widowed and divorced marital status of mothers', and other Bantus ethnic origin of mothers' were found to be important determinants of proportion children dead of both the sexes at the childhood period. In addition urban place of residence was found to be an important determinant in the case of male children. In the absence of the level of education of mothers', urban place of residence became an important determinant in the case of female children. In the case of male children the relative effects of working at home type of employment became non important determinant in the case of male children, and at the same time the married and living together marital status turned to an important determinant. Dropping the ethnicity variable made the working at home type of employment of mothers' to a non important determinant of male children proportion dead relative to the reference category, and at the same time the other religious category became an important determinant.

Thus in general, the results of the multivariable analyses on individual mother level statistics by sex revealed important relationships between child risk of death and the selected socio-economic and cultural variables. The relative effects and direction of these effects are found to be mostly consistent with expectations, internally between groups and externally between the sexes.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 SUMMARY AND CONCLUSION

On the basis of the importance of the study of differential ortality for policy intervention designed to improve the robability of individual survival, this study at the out set dentified and set the problem of sex mortality differential in ine with selected socio- economic and cultural variables. In order o tackle the problem and bring in to picture the existence and ariation of sex mortality differential, two specific objectives f showing the existence and variation of the death rates among the exes during the childhood period and determining the relative ffects of the selected socio-economic and cultural factors on the ariation of the rate of death among the two sexes were drawn. From he problem, the objectives, and the review of the various iterature, operational hypotheses to be tested in the course of he study were formulated.

To fulfil the desired goal two methodological approaches were mployed. The Coale-Trussell technique have been applied to stimate the infant and child mortality levels for all the lifferentials by sex via the probability of dying at exact age X nd the life tables. Multiple linear regression analysis was onducted to isolate the potential predictors of the proportion of hildren dead of the sexes and then asses the relative effects.

Based on the fact that, in developing countries like Kenya lata on mortality is far from complete or accurate, the variables

which were considered to be particularly important in infant and child sex mortality differential have been picked from the 1993 KDHS data.

Some of the important things worth mentioning here are that besides the outcomes of the analyses which give good insight in infant and child sex mortality differential in Kenya, a number of problems are observed to affect the outcomes. The first problem is the non accuracy and unreliability of mortality data, which resulted in some doubtful results beyond expectations. The other problem is the non inclusion of some variables which might be high potential determinants of individual survival whereas having less role to play in sex mortality differential that affected the outcome of the statistical results. Also, the problems associated using a mortality indicator as a dependent variable in multiple linear regression analysis must not be undermined. However, almost all of the outcomes of this study are found to be in agreement with different studies conducted elsewhere and the general differential mortality studies in Kenya. Therefore, the results of this study can be confidentially taken as reliable and dependable to make some tentative conclusions.

In line with the specific objectives of the study and the underlined operational hypotheses to be tested, the following major findings were obtained.

The analysis in chapter four using the Coale-Trussell method revealed the existence of sex mortality differentials in the childhood period in line with the selected socio-economic and

cultural variables. The differences observed suggest the complex nature of the Kenyan society where there is co-existence of socio-economic and cultural groupings having significantly different conditions of mortality by sex.

Level of education of mothers' was found to bring mortality differences by sex at its different levels. High percentage of decrease in infant and child mortality was obtained for both the sexes from mothers' with no education to that with secondary and above level of education. However, the decline was found to be in favour of female infants and children. Excess female child deaths were observed when a mother has received no formal education.

Place of residence is another socio-economic variable found to increase the survival chances of the sexes as the place of residence became more urban. But strikingly, besides the decline male children were found to be more favoured. Excess female child deaths were observed in urban areas, and even the primate city Nairobi was found to be in favour of male children survival. This might be due to the abundant availability of means of discrimination in urban areas coupled with the prevailing high rural to urban migration.

Type of employment of mothers' also showed striking differences in infant and child death by sex. The results obtained show that when mothers are working away from home or working at home the survival chances of children decreases in general as compared to children of the non working mothers. This might be due to the abundance of low income or non income working mothers which

couldn't able to provide "quality" alternative care to their children. Therefore, their physical proximity or abundance care is found to increase the survival chances of the sexes. The effects were found to be highly pronounced on female infants and children. Even excess female child deaths were observed when mothers are working away from home.

Marital status of mothers' is another socio-economic variable which was found to bring differential mortality of the sexes. Being widowed and divorced mother is the one which was found to result in the highest infant and child mortality of both the sexes. Here female children were found to be more affected as was shown by the higher female child mortality rate than that of males'. The declines in infant and child mortality rates from one category to the other were found to be in favour of female infants and children. One important point worth mentioning here is that, any situation which terminates or breaks marriage greatly affects the survival chances of children of both the sexes in general, having relatively greater effects on female children in particular.

The analysis by region showed the existence of variation in sex mortality differential along regional places of residence of mothers', ie., provinces. Central province has recorded the lowest male and female infant and child mortality rates Whereas Nyanza recorded the highest. Reversed higher female child mortality rate was recorded in Nyanza province. The declines in infant and child mortality rates were found to follow different directions to the sexes. The overall differences suggest regional variations in

ethnic compositions, cultural believes, socio-economic developments etc.

Sex differential in childhood mortality was also observed by the religious affiliation of the respondents. Here also the directions of the mortality declines were not found to be the same for the sexes. However, the lowest female infant and child mortality rates were observed under other religious category whereas for males the lowest were found under the Catholic religious category. Higher female child mortality rate was obtained under the Catholic religious category. All these outcomes can be due to the combining effects of the socio-economic and cultural groupings under the given religious categories.

The ethnic origin of the respondents also recorded marked differences of mortality by sex during the childhood period. Here also like region and religion the directions of mortality declines were found to be different by sex. The highest male and female infant and child mortality rates were found under Nilotic ethnic category, whereas other Bantus ethnic origin recorded the lowest. A reversed excess female child deaths were observed under Nilotic ethnic group. The decline in infant and child mortality rates from Nilotic to the other Bantu groups was found to be in favour of female infants and children. The differences observed can be due to the differences in socio-economic and cultural developments which prevail among the different ethnic groups considered.

So far the investigation of chapter four have shown that there exist socio-economic and cultural differentials in infant and child

mortality by sex. Without any doubt many factors account for the observed differences of which most of the probable reasons were used to elaborate the observed patterns in chapter four. However, the differences in sex mortality observed in all the variables involved do not imply that all have similar effects or are important determinants of the risk of death of the sexes at the childhood period. In chapter five effort was made to isolate and determine the important socio-economic and cultural predictors of the proportion of children dead of the sexes at the childhood period. Based on the individual mother level of information and using multiple linear regression technique three stage analyses were conducted. The outcome showed that maternal education of mothers', type of employment of mothers', marital status of mothers' and the ethnic origin of mothers' are important determinants of the proportion of children dead of the sexes at the childhood period. In addition to these, place of residence of mothers' was found to be an important determinant in the case of male children risk of death.

Dropping the maternal education variable and the ethnicity variable at a time showed the relative importance of the two variables in explaining the proportion of children dead of the sexes at the childhood period. In each of the cases the changes in the relative importance and direction of the relative effects of some of the variables were observed. This suggests that some of the variables included in the models are proxies of the dropped variables.

In all the F test values of all the multivariable models confirmed that the values of the coefficients of determinations ie. the proportions of variances explained by the predictors sufficiently exceeded zero. In addition, the low standard errors associated to the unstandardised coefficients obtained for all the models suggested that these values are equivalent to the standard deviations of normal distributions, as the sample size of the data used is relatively high.

Based on the general outcome of the analyses summarised above the following major conclusions can be drawn:

- Sex differential in infant and child mortality, in view of the estimates based on the results in line with socio-economic and cultural factors considered, is high in Kenya so as to affect the expected underlined biological differences of death among the sexes.
- The socio-economic factors considered in the study such as, maternal education, place of residence, type of employment, marital status and region were found to contain large variation in infant and child sex differences in mortality, recording a higher female child mortality rate at least in one of the categories under each variable. Therefore, these variables are considered to play considerable roles in infant and child sex mortality differential.
- The cultural variables considered in the study, religion and ethnicity were also found to contain large variation

in infant and child sex differences in mortality, recording a higher female child mortality rate at least in one of the categories under each variable. These variables therefore, are considered to play vital roles in infant and child sex mortality differentials.

- In terms of importance, higher levels of education, Other Bantus ethnic category, Widowed and divorced marital status, working away and working at home types of employments were found to be important predictors of the proportion of children dead of the sexes. In addition place of residence was also found to be an important determinant in the case of male children.The degree of the effects of each of the above mentioned categories were found to vary among the sexes. These factors therefore, are taken to be important determinants of the variation of proportion children dead among the sexes.
- The highest differences in the levels of infant and child mortality rates observed between the provinces and the ethnic origins of mothers' and the corresponding highest disadvantage of female children under the recorded highest mortality situations can lead us confidently conclude that there is an existence of high socio-economic and socio-cultural imbalances among the different regions and ethnic groups in Kenya.

6.2 RECOMMENDATIONS

6.2.1 Recommendations for policy

The importance of integrating population into development planning is one of the themes of present day policy formulation. The integration of women at the process of social and economic development is the other issue which draws a greater attention in curbing the unfair treatment of females in general. Therefore, the following basic recommendations are drawn based on the study which are considered to be important for policy intervention or formulation in Kenya.

(1) Policies has to be formulated in the goal of urban rural balance so as to curb the high differences in infant and child risk of death by place of residence at the childhood period, in effect to reduce discrimination against the female sex.

(2) Policies and efforts that ensure and set child support systems that will reduce the high infant and child mortality risks affecting the female sex after the disruption of marital unions have to be formulated and made.

(3) Policies must be formulated in the goal of minimizing the negative effects of working mothers' on child survival, particularly affecting the female sex by studying the underlying possible reasons.

(4) Development policies and strategies must give special attention to improve and equalize the school enrolment and attendance of girls and boys at all level of formal educatio female education is one of the most important factors of redu

unfair treatment of female children.

(5) Development policies must be culture sensitive so as to target and gradually remove discriminatory attitudes and believes that disproportionately affect females of all ages in general and female infants and children in particular.

(6) Development plans have to target and must be designed to minimize the gap in the socio-economic and socio-cultural developments among regions and ethnic groups.

(7) Efforts should be made in educating parents of all walks of life to provide and use preventive and curative health care regardless of sex.

6.2.2 Recommendations for further research

There is need to carry out further research to fully understand sex mortality differentials in Kenya. Therefore, the following few areas of research are recommended for special attention:

(1) Research has to be made at much smaller units, ie., district levels to enhance deeper analysis which would cover much wider scope.

(2) There is a great need to carry out deep anthropological studies that could provide essential missing information and isolate the responsible cultural factors on the differential treatment of boys and girls.

(3) Studies that pay particular attention to the interplay between cultural attitudes and the availability, and actual use of different health care options in different areas may help

to identify differential use of health facilities by sex.

(4) The social and economic roles of males and females in different groups, the resulting long term expected values to their families, the differences among ethnic groups and regions should be examined.

(5) Different methodological approaches which are well designed for quantitative and causal analysis should be used on the same set of data used in this study so as to get a more comprehensive results.

(6) Separate research to understand the underlying reasons or the mechanisms through which different socio-economic and cultural factors operate to bring mortality differential by sex should be carried out.

(7) The effects of the sex composition of older siblings on the exposure to the risk of death of children by sex has to be examined.

(8) To determine the exact turning point where discrimination against individual sex starts to operate, research has to be conducted dividing the period of infancy into different age groups.

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APPEDICES

APPENDIX I. COMPUTATIONAL PROCEDURES IN THE COALE-TRUSSELLS METHOD, ESTIMATION OF MORTALITY LEVELS AND LIFE TABLE CONSTRUCTION

Computational procedure in the Coale-Trussell method for estimating child mortality

The following steps or computational procedures are followed while using the Coale-Trussell method for estimating child mortality.

1- **Calculation of average children everborn (Parity, P(i)) per woman**

Parity is calculated using the following formula:

$$P(i)=CEB(i)/FP(i)$$

Where: CEB(i), refers to the number of children everborn to women in the age group i.

FP(i), refers to the total number of women in age group i, irrespective of their marital status.

For the Coale-Trussell method P(1), P(2), and P(3) values, which are parities referring to mothers of age group 15-19, 20-24, and 25-29 are calculated.

2- **Calculation of proportion of children dead (D(i)):** which is defined as the ratio of reported children dead to reported children everborn for each age group of mother in the respective reproductive age (15-49).

Proportion dead is calculated using the following formula:

$$D(i)=CD(i)/CEB(i)$$

Where: D(i)=proportion of children dead of mothers in the age group i.

CD(i)=number of children dead of mothers in the age group i.

CEB(i)= number of children everborn for mothers in the age group i

Table A.1: Coefficients from the North model of the Coale Demeney life table for estimation of the conversion factors

AGE GROUP	INDEX (i)	COEFFICIENTS		
		a(i)	b(i)	c(i)
15-19	1	1.1119	-2.9287	0.8507
20-24	2	1.2390	-0.6865	-0.2745
25-29	3	1.1884	0.0421	-0.5156
30-34	4	1.2046	0.3037	-0.5656
35-39	5	1.2586	0.4236	-0.5898
40-44	6	1.2240	0.4222	-0.5456
45-49	7	1.1772	0.3486	-0.4624

source: Manual X, UN. 1983

3- **Calculation of the conversion factor (multipliers, K(i))**

These are meant to adjust for non mortality factors determining the value of the proportion of children dead.

Using the coefficients from the North model of the Coale-Demeney life tables the multipliers(K(i)s), are estimated by the following formula:

$$K(i)=a(i)+b(i)(p1/p2)+c(i)(p2/p3)$$

Where: K(i)= conversion factor for women in age group i.

a(i), b(i),c(i)= constants.

p1, p2, p3= parities one, two, and three respectively.

4- **Calculation of the probability of dying and surviving**

The probability of dying at exact age X, q(x) is obtained as a product of the reported proportion dead (D(i)) and the corresponding multiplier (K(i)).

$$q(x) = D(i).K(i)$$

The compliment of q(x), the probability of surviving from birth to exact age X, l(x), is obtained by subtracting the corresponding q(x) value from one.

$$l(x) = 1-q(x)$$

Table A.2: Coefficients from the North model of the Coale Demeney life tables for estimation of the reference period

AGE GROUP	INDEX (i)	AGE (X)	qx	COEFFICIENTS		
				a(i)	b(i)	c(i)
15-19	1	1	q1	1.0921	5.4732	-1.9672
20-24	2	2	q2	1.3207	5.3751	0.2133
25-29	3	3	q3	1.5996	2.6268	4.3701
30-34	4	5	q5	2.0779	-1.7108	9.4126
35-39	5	10	q10	2.7705	-7.3403	14.9352
40-44	6	15	q15	4.1520	-12.2448	19.2349
45-49	7	20	q20	6.9650	-13.9160	19.9546

Source: UN, 1983. Manual X

5- **Calculation of reference period (t(x))**

The reference period is an estimate which is used to assign a date to each of the child mortality estimate, q(x), obtained. It gives the number of years before the survey data to which the q(x)

values refer, and is calculated or estimated by the following formula:

$$t(x) = a(i) + b(i)(P_1/P_2) + c(i)(P_1/P_3)$$

The p1, p2, p3 which refer to parities have the same values with the ones used for calculating the multipliers in estimation of q(x) values. The coefficients a(i), b(i) and c(i) however have different values from the previous coefficients used for calculating the multipliers in the estimation of the q(x) values.

Estimation of mortality level

Mortality levels for a certain region are estimated by making use of the calculated q(x) values by the Trussell method.

The first step is to calculate the probability of surviving up to age X from birth, which is derived from the q(x) values as:-

$$P(x) = 1 - q(x) \quad \text{for } x = 1, 2, 3, 5, 10, 15, 20$$

Where: P(x) = probability of surviving up to age x and,

q(x) = probability of dying at exact age x.

Then the lower and the upper mortality levels for each P(x) values are taken from the selected Coale-Demeny model life table. Linear interpolation which is an estimation carried out within the range of values given is then used to determine the exact level of p(x). The linear interpolation is based on estimating the gradient of a line between two sets of coordinate points. If a rectangular coordinate (U(1), V(1)) is taken to represent the lower mortality level with its corresponding probability of survival and if (U(2),

V(2)) is taken to represent the upper mortality level with its probability of survival, then a point (U, V), between the two rectangular coordinate points is determined as:

$$V(2)-V(1)/U(2)-U(1)= V-V(1)/U-U(1)$$

Practically the difference between U(2) and U(1) is equal to unity since the two lower and upper mortality levels are consecutive integers.

Then if either of the U or V is known the other is automatically determined.

If V is known, U is determined by the formula:

$$U=U(1)+(V-V(1))/(V(2)-V(1))$$

And if U is known V is determined by the formula:

$$V=V(1)+(V(2)-V(1))(U-U(1))$$

Thus the corresponding mortality levels for each corresponding probability of survivals can be calculated using above formula.

In this study q(2), q(3), q(5) values which are the probability of dying by age 2, 3 and 5 are used to determine mortality levels. After calculating the probability of survivals and determining the corresponding mortality levels by the method of linear interpolation the average of the three levels is taken as a mortality level for the case under study.

Life table construction

Life table which is detailed description of the mortality situation at a particular time among a population is the most important analytical technique for mortality analysis. Using life

tables, exact and complete comparison between the mortality situations of different population or population of different socio-economic and socio-cultural groupings is possible. The great advantage of life table is that it provides measures which are not affected by differences in age structure (Pressat, 1985). Life table is constructed with the assumption that a "hypothetical cohort" represented by the radix lo in the life table and which takes values like 1,10,100,1000,100000 etc. persons is subjected to the probabilities of dying that are observed in the actual population during a particular period.

For this study abridged life tables in which values of the life table functions are presented in terms of groupings of age rather than for single year of age are used.

In the construction of life tables the first step is to calculate the probability of survival (V=P(x)), by using linear interpolation as discussed in the previous section. Each calculated P(x) is then multiplied by the radix (l_o) to obtain the number of survivors at age x (l_x). From this the other life table functions are calculated as follows:

1- $_nP_x$:- is the probability of survival which shows the proportion of the cohort who have survived between age x and x+n, and is given by:

$$_nP_x = l_{x+n}/l_x$$

2- $_nq_x$:- is the probability of dying which shows the proportion of the cohort who were alive at the age interval x, and who will die at the end of the age interval x+n, and is given by:

$$_nq_x = 1 - {}_nP_x$$

3- $_nd_x$:- is the number of persons who die between age x and x+n out of the original cohort, and is given by:

$$_nd_x = l_x - l_{x+n}$$

4- $_nL_x$:- is the number of the persons years lived between age x and x+n or it shows the number of persons in the stationary population in the age interval, and is given by:

$$_nL_x = n/2(l_x + l_{x+n})$$

There are certain exceptional age groups for which the above given formula don't apply. These age groups are, 0 to 1, 1 to 5 and the last age group. The nLx values for these age groups are given by:

$_1L_0 = 0.3l_0 + 0.7l_1$; for age group 0 to 1

$_4L_1 = 1.3l_1 + 2.7l_5$; for age group 1 to 5

and; $L_\omega = l_\omega . Log\ l_\omega$; for the last age group

5- **Tx**:- is the total number of population from age x or it shows the total number of persons in the stationary population in the indicated and all subsequent age intervals, and is given by:

$$T(x) = T(x+n) + nLx$$

6- e_x:- is the expectation of life at age x or the average number of year remaining to be lived by those surviving to age x on the basis of the prevailing mortality and is given by:

$$e_x = Tx/l_x$$

For this study; 1qo, 4q1 and e_x values from the constructed life table are extracted and used to show the variation of infant and child mortality differential by sex.

APPENDIX II. DUMMY VARIABLES, COEFFICIENT OF DETERMINATION, AND TEST OF SIGNIFICANCE IN LINEAR REGRESSION ANALYSIS

Dummy variables

The explanatory or background variables that might be used in the linear regression model can be:

i) Scaled continuous variables, like age.

ii) Dichotomous variable with some degree of ordering between categories, like education.

iv) Dichotomous variables with no ordering between categories, like work status.

Interval scale covariates or scaled continuous variables are introduced into the regression model without coding. But the introduction of categorical variables is effected by means of dummy variables. Different categories of qualitative (nominal) variables are identified by dummy variables, which is any variable in an equation that takes finite number of values. The idea of dummy variable coding is that to render the information of membership in one of N groups by a series of N-1 dichotomies. In addition to enabling one to compare several regression equations by single multiple regression model, the use of dummy variables produce the same results as produced by analysis of variance and discriminate analysis. In dummy variable coding one group is selected as a reference group, and the partial coefficients compare each of the remaining groups with it. This is very appropriate for research in which one group is to be a control group and the others are to be

compared with it. And this also helps to reduce linear dependence among variables. The inclusion of all the dummy variables without taking one as a reference category will make the normal equations unsolvable in that the Nth dummy variable is determined by the first N-1 dummy entered into the equations. The only formal requirement is that the observation be assignable to N mutually exclusive and exhaustive categories, ie. each case be assigned to one of the N groups. A dummy indicator variable is defined for each N-1 categories taking value of 1 for those falling in the category and 0 other wise.

Thus, dummy variable coding enables categorical variables to be represented or introduced in the regression model by treating each category of a nominal (qualitative) variable as distinct and assigning arbitrary scores for all cases depending upon their presence or absence in each of the categories.

Significant test

According to Gupta (1994), from the knowledge of the sampling distribution of a statistic, it is possible to find the probability that a sample statistic would differ from a given hypothetical value of a parameter or from another sample value, by more than a certain amount and hence to answer the question of validity. Accordingly, a process to asses a validity of a statistic or difference between two independent statistic is known as test of significance. Null hypothesis testing in which the probability sample result is compared to pre-specified significance criterion

α is the principle behind the test. If $p<\alpha$, the null hypothesis is rejected and the sample result is considered as statistically significant at the α level.

For this study F and T test values and the significant levels are obtained as part of the computer out put in the regression analysis.

F-test

This test is used to test the overall significance of the regression models. It is used to test the null hypothesis, that all the k independent variables considered together don't explain a significant amount of variation in the dependent variable Y or whether the net regression coefficient in the model are zero. Then the hypotheses are given as:

Null hypothesis:

Ho: B1=B2=B3=.....=Bk=0

And the alternative hypothesis:

H1: not all the Bs are zero

F test is thus computed as:

SST=SSR+SSE

Thus:

$$F=\frac{SST-SSE/K}{SSE/N-K-1}=\frac{SSR/K}{SSE/N-K-1}=\frac{R'/K}{(1-R')/N-K-1}$$

Where: SST=Σ(Yi-Y)' is the total sum of squares.

SSR=Σ(Yi-Y)'-Σ(Yi-Y')' is the squared sum of the regressors which shows the sum of squares

explained by the entire regression equation.

SSE=Σ(Yi-Y')' is the regression sum of the squares or squared sum of the error deviation.

N = the total sample.

K = the number of regressors in the equation.

K,N-K-1= the number of degrees of freedoms.

R' = coefficient of determination.

Then, if the computed F value is greater than the table value, the null hypothesis is rejected and the alternative hypothesis is accepted.

T-test

The T-test is used to determine the statistical significance of the independent variables, ie. in testing whether a single independent variable makes a significantly unique contribution to the multiple R'. It is given by:

$$Ti = \frac{S_n}{\sqrt{\frac{1-R'}{(N-k-1)1/2}}}$$

Where: Sri, is the semi partial correlations which express the correlation of Xi from which the other independent variables are partialled.

N= sample size.

k= number of regressors.

N-k-1= degrees of freedom.

Coefficient of determination, R'

The coefficient of determination is another important measure used in this study. It is the proportion of dependent variable variance shared with the optimally weighted independent variables. In other words R' indicates the proportion of total variation that is explained by all the variables considered. It is given by:

$$R' = SST-SSE/SST = 1- \Sigma(Yi-Y')'/\Sigma(Yi-Y)'$$

Where: SST = $(Yi-Y')'$ is the total sum of squares.

SSE = $(Yi-Y)'$ is squared sum errors.

R' = coefficient of determination.

APPENDIX III. AVERAGE CHILDREN EVERBORN BY SOCIO-ECONOMIC AND CULTURAL VARIABLES: KENYA, 1993

a. Males

VARIABLE	AGE GROUP OF MOTHERS'						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
LEVEL OF EDUCATION							
.None	0.283	0.963	1.831	2.728	3.046	3.405	3.923
.Primary	0.116	0.800	1.821	2.430	3.083	3.600	3.930
.Secondary and above	0.030	0.407	1.076	1.746	2.390	2.536	2.190
PLACE OF RESIDENCE							
.Urban	0.077	0.498	0.969	1.705	2.347	2.333	2.371
.Rural	0.113	0.727	1.701	2.434	3.074	3.562	3.970
TYPE OF EMPLOYMENT							
.Never worked	0.082	0.624	1.667	2.501	3.212	3.547	3.820
.Working away	0.151	0.701	1.336	2.082	2.796	3.147	3.820
.Working at home	0.235	0.810	1.724	2.385	3.031	3.667	3.588
MARITAL STATUS							
.Never married	0.044	0.253	0.659	0.871	0.833	1.083	2.111
.Married/ living tog.	0.427	0.926	1.694	2.456	3.119	3.651	3.963
.Widowed/ divorced	0.619	0.900	1.402	1.890	2.620	2.775	3.403
RELIGION							
.Catholic	0.100	0.651	1.522	2.370	2.933	3.543	3.885
.Protestant/ other chr.	0.106	0.693	1.609	2.309	2.995	3.449	3.951
.Others	0.163	0.722	1.346	2.210	2.974	3.064	3.023
ETHNICITY							
.Bantus/ Coast	0.093	0.630	1.388	2.215	3.120	3.415	3.298
.Bantus/ Western	0.132	0.727	1.547	2.270	3.233	3.669	4.288
.Other Bantus	0.086	0.599	1.431	2.091	2.676	2.962	3.920
.Nilotic	0.133	0.826	1.820	2.807	3.226	3.719	3.845
REGION							
.Nyanza	0.138	0.853	1.823	2.578	3.064	3.622	3.747
.Western	0.135	0.731	1.602	2.424	3.263	3.959	4.339
.Coast	0.094	0.595	1.379	2.104	2.939	3.313	3.000
.Eastern	0.090	0.776	1.642	2.262	3.000	3.384	4.246
.Rift Valley	0.111	0.727	1.741	2.736	3.185	3.690	4.343
.Central	0.071	0.475	1.304	1.792	2.424	3.127	3.513
.Nairobi	0.086	0.476	0.974	1.522	2.080	2.000	2.071

b. Females

VARIABLE	AGE GROUP OF MOTHERS'						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
LEVEL OF EDUCATION							
.None	0.217	0.939	2.056	2.574	3.145	3.576	4.069
.Primary	0.101	0.810	1.731	2.363	3.253	3.594	3.738
.Secondary and above	0.056	0.402	1.211	1.870	2.500	2.815	2.286
PLACE OF RESIDENCE							
.Urban	0.081	0.442	1.130	1.653	2.357	2.456	2.286
.Rural	0.098	0.745	1.696	2.399	3.194	3.616	3.694
TYPE OF EMPLOYMENT							
.Never worked	0.069	0.640	1.631	2.384	3.154	3.534	4.011
.Working away	0.192	0.653	1.500	2.109	2.812	3.469	3.713
.Working at home	0.176	0.824	1.641	2.375	3.200	3.552	3.718
MARITAL STATUS							
.Never married	0.047	0.235	0.690	1.210	1.167	1.583	1.667
.Married/ living tog.	0.360	0.942	1.713	2.403	3.211	3.666	3.921
.Widowed/ divorced	0.286	0.900	1.315	1.881	2.870	3.018	3.649
RELIGION							
.Catholic	0.095	0.680	1.552	2.443	3.265	3.538	4.108
.Protestant/ other chr.	0.091	0.691	1.590	2.212	3.061	3.361	3.858
.Others	0.140	0.667	1.692	2.295	2.776	3.085	3.070
ETHNICITY							
.Bantus/ Coast	0.079	0.649	1.645	2.132	2.870	2.943	3.574
.Bantus/ Western	0.074	0.740	1.729	2.658	3.301	3.656	3.831
.Other Bantus	0.095	0.605	1.385	2.151	3.130	3.028	3.970
.Nilotic	0.110	0.804	1.838	2.376	3.074	3.860	3.918
REGION							
.Nyanza	0.119	0.833	2.033	2.472	3.064	3.672	4.190
.Western	0.071	0.756	1.875	2.616	3.169	3.795	4.250
.Coast	0.101	0.626	1.480	2.073	2.824	2.828	3.491
.Eastern	0.122	0.692	1.562	2.331	3.124	3.344	4.368
.Rift Valley	0.090	0.692	1.567	2.408	3.333	3.824	3.970
.Central	0.071	0.635	1.345	2.048	2.989	3.327	3.313
.Nairobi	0.086	0.429	0.974	1.283	2.160	2.250	2.000

APPENDIX IV. PROPORTION OF CHILDREN DEAD BY SOCIO-ECONOMIC AND CULTURAL VARIABLES: KENYA, 1993

a. Males

VARIABLE	AGE GROUP OF MOTHERS'						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
LEVEL OF EDUCATION							
.None	0.118	0.089	0.119	0.164	0.127	0.152	0.179
.Primary	0.102	0.098	0.100	0.107	0.128	0.125	0.105
.Secondary and above	0.105	0.076	0.046	0.058	0.039	0.101	0.000
PLACE OF RESIDENCE							
.Urban	0.105	0.075	0.081	0.097	0.130	0.143	0.084
.Rural	0.105	0.096	0.091	0.114	0.117	0.133	0.147
TYPE OF EMPLOYMENT							
.Never worked	0.071	0.070	0.075	0.113	0.125	0.117	0.121
.Working away	0.229	0.115	0.100	0.107	0.111	0.143	0.167
.Working at home	0.091	0.103	0.100	0.104	0.113	0.145	0.145
MARITAL STATUS							
.Never married	0.076	0.096	0.024	0.093	0.100	0.000	0.053
.Married/ living tog.	0.114	0.086	0.092	0.109	0.119	0.122	0.137
.Widowed/ divorced	0.154	0.152	0.101	0.148	0.131	0.224	0.195
RELIGION							
.Catholic	0.086	0.072	0.061	0.107	0.126	0.124	0.162
.Protestant/ other chr.	0.114	0.106	0.096	0.101	0.103	0.132	0.131
.Others	0.095	0.077	0.153	0.181	0.173	0.215	0.162
ETHNICITY							
.Bantus/ Coast	0.050	0.103	0.113	0.149	0.153	0.204	0.129
.Bantus/ Western	0.128	0.131	0.087	0.127	0.121	0.137	0.150
.Other Bantus	0.081	0.064	0.053	0.073	0.093	0.113	0.129
.Nilotic	0.141	0.103	0.129	0.145	0.139	0.165	0.168
REGION							
.Nyanza	0.182	0.182	0.170	0.193	0.193	0.183	0.257
.Western	0.118	0.142	0.098	0.122	0.127	0.125	0.169
.Coast	0.038	0.106	0.094	0.133	0.169	0.222	0.121
.Eastern	0.100	0.072	0.086	0.086	0.089	0.134	0.103
.Rift Valley	0.064	0.037	0.068	0.076	0.074	0.101	0.095
.Central	0.000	0.029	0.027	0.050	0.067	0.078	0.117
.Nairobi	0.400	0.050	0.053	0.114	0.058	0.050	0.103

b. Females

VARIABLE	AGE GROUP OF MOTHERS'						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
LEVEL OF EDUCATION							
	0.077						
.None	0.153	0.091	0.106	0.144	0.133	0.133	0.165
.Primary	0.095	0.088	0.094	0.089	0.111	0 115	0.118
.Secondary and above		0.038	0.055	0.062	0.044	0.086	0.000
PLACE OF RESIDENCE							
.Urban	0.250	0.064	0.081	0.086	0.113	0.086	0.175
.Rural	0.126	0.081	0.086	0.098	0.110	0 123	0.152
TYPE OF EMPLOYMENT							
	0.128						
.Never worked	0.162	0.066	0.085	0.095	0.114	0.106	0.113
.Working away	0.121	0.104	0.105	0.098	0.126	0.117	0.168
.Working at home		0.084	0.092	0.099	0.095	0 142	0.162
MARITAL STATUS							
.Never married	0.099	0.066	0.045	0.040	0.071	0.053	0.133
.Married/ living tog.	0.149	0.079	0.084	0.095	0.100	0 111	0.128
.Widowed/ divorced	0.500	0.101	0.124	0.131	0.177	0.146	0.199
RELIGION							
.Catholic	0.145	0.072	0.086	0.105	0.100	0.105	0.151
.Protestant/ other chr.	0.122	0.088	0.088	0.086	0.112	0.131	0.127
.Others	0.222	0.036	0.066	0.141	0.123	0.172	0.220
ETHNICITY							
.Bantus/ Coast	0.235	0.050	0.084	0.120	0.136	0.173	0.160
.Bantus/ Western	0.273	0.095	0.099	0.104	0.144	0.138	0.195
.Other Bantus	0.087	0.043	0.057	0.067	0.077	0.079	0.127
.Nilotic	0.132	0.123	0.113	0.122	0.132	0.170	0.135
REGION							
.Nyanza	0.237	0.209	0.166	0.159	0.199	0.195	0.163
.Western	0.278	0.089	0.104	0.092	0.155	0.130	0.210
.Coast	0.143	0.072	0.076	0.135	0.151	0.166	0.151
.Eastern	0.148	0.014	0.067	0.070	0.098	0.098	0.108
.Rift Valley	0.026	0.043	0.046	0.083	0.055	0.109	0.107
.Central	0.000	0.026	0.044	0.035	0.033	0.063	0.117
.Nairobi	0.200	0.056	0.092	0.034	0.037	0.067	0.321

APPENDIX V SUMMARY RESULTS OF THE PARTIAL CORRELATION ANALYSES: KENYA, 1993

VAR.	MALES											
	MED1	MED2	MRES	MWK1	MWK2	MMR1	MMR2	MREL1	MREL2	MET1	MET2	MET3
MED1	1.000											
MED2	-0.448**	1.000										
MRES	0.057**	0.166**	1.000									
MWK1	0.004	0.104**	0.073**	1.000								
MWK2	0.019	-0.017	-0.077**	-0.409**	1.000							
MMR1	0.024**	-0.004	-0.065**	-0.074**	0.032*	1.000						
MMR2	-0.031*	-0.055**	0.054**	-0.068**	-0.013	-0.857**	1.000					
MREL1	0.089**	0.053**	-0.082**	0.042**	0.003	0.005	-0.008	1.000				
MREL2	0.168**	-0.049**	0.179**	-0.078**	-0.001	-0.008	0.227**	-0.374**	1.000			
MET1	-0.114**	-0.061**	0.089**	-0.079**	0.003	-0.009	0.029*	-0.180**	0.575**	1.000		
MET2	0.043*	0.040*	0.010	0.071**	0.053**	0.053**	-0.034*	0.109**	-0.100**	0.142**	1.000	
MET3	0.046*	0.060**	-0.051**	0.024*	0.040**	0.044**	0.015	0.002	-0.202**	0.117**	-0.360**	1.000

VAR.	FEMALES											
	FED1	FED2	FRES	FWK1	FWK2	FMR1	FMR2	FREL1	FREL2	FET1	FET2	FET3
FED1	1.000											
FED2	-0.450**	1.000										
FRES	-0.057**	0.181**	1.000									
FWK1	0.013	0.116**	0.014*	1.000								
FWK2	0.017	-0.036**	-0.070**	-0.448**	1.000							
FMR1	0.025**	-0.015	-0.070**	-0.088**	0.035**	1.000						
FMR2	-0.037**	-0.047**	0.042**	0.055**	-0.019	-0.853**	1.000					
FREL1	0.078**	0.070**	-0.078**	0.051**	-0.012	0.001	0.004	1.000				
FREL2	-0.160**	-0.059**	0.173**	-0.084**	0.003	0.008	0.013	-0.369**	1.000			
FET1	-0.117**	-0.048**	0.053**	-0.073**	0.004	0.006	0.018	-0.161**	0.528**	1.000		
FET2	0.043*	0.043*	-0.024*	0.063**	-0.047**	0.051**	-0.052**	0.111**	-0.103**	0.143**	1.000	
FET3	0.055**	0.055**	-0.018	0.027*	0.033*	-0.054**	0.015	-0.014	0.189**	-0.252**	0.375**	1.000

NOTE: The codes are as described in chapter three

* Significant at $\alpha = 0.01$

** Significant at $\alpha = 0.001$