# THE EFFECT OF UTILIZATION OF MATERNAL HEALTH CARE SERVICES ON NEONATAL MORTALITY IN KENYA



BY

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## DECLARATION

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

John Anampiu Mwondo 9/09/2002

This thesis has been submitted for examination with our approval as university Supervisors.

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## DEDICATION

*This thesis is dedicated to my parents, Mr. M'anampiu and Mrs. Ciomucheke M'anampiu, my dear wife Janet and our beloved children Felix and Evans.*

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I wish to express sincere appreciation to all the people who have contributed to the completion of this thesis. Be blessed.

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## ABSTRACT

The study seeks to determine the effect of utilization of maternal health care services on neonatal mortality in Kenya. Furthermore, the study determines the level and differentials in neonatal mortality, in Kenya. Maternal health care factors included in the study are, tetanus toxoid immunization in pregnancy, type of prenatal care provider, type of place of delivery, type of delivery assistant, timing of first prenatal care visit and the number of prenatal care visits. The study uses the 1998 Kenya Demographic and Health Survey (KDHS) data. To guide the study, specific hypotheses were developed and tested based on the conceptual framework adapted from Meegama's (1980) conceptual framework for analysing neonatal mortality in developing countries.

Logistic regression analysis was the main method of data analysis. Cross-tabulation analysis and frequency distributions were also applied in the study. Cross-tabulation analysis with chi-square test was used to determine the differentials in neonatal mortality by the various explanatory variables. The 1998 Kenya demographic and health survey data for 3453 children born in three years preceding the survey served as the basic data set.

Results of simple descriptive analysis indicated that 2.9% of all the live births died during the neonatal period, showing a mortality rate of 28.7 per 1000 live births. Cross tabulation analysis results indicated that among all the health care factors, tetanus toxoid injections in pregnancy and type of prenatal care provider were significantly associated with neonatal mortality. Among control variables, maternal age at birth, maternal educational attainment, total children ever born, birth order,

type of floor material, ethnicity and size of child at birth were found to exhibit a statistically significant relationship with neonatal mortality.

The results of unadjusted effect of health care variables in multivariate analysis showed that receipt of at least two tetanus toxoid injections in pregnancy has statistically significant negative effect on neonatal mortality. After adjusting for proximate factors, receipt of at least two tetanus toxoid injections in pregnancy was found to have a statistically significant reducing effect on neonatal mortality at the 95 percent, confidence level. Children whose mothers received at least two tetanus toxoid injections in pregnancy have mortality risk estimated at about 51 percent lower than children whose mothers never received tetanus injection. Receipt of one tetanus toxoid injection in pregnancy on the other hand, has a significant suppressive effect on neonatal mortality, at the 90 percent, confidence level. The study also showed that size of child at birth had a statistically significant negative effect on neonatal mortality.

After controlling for the various socio-economic and demographic factors in the full multivariate model, receipt of at least two tetanus toxoid injections in pregnancy was established to have a significant reducing effect on neonatal mortality at the 95 percent confidence level. Children whose mothers had received the injections have mortality risk estimated at 48% lower than children whose mothers never received the tetanus injection. The effect of delivering in a health facility on neonatal mortality was found to be statistically significant at 90 percent, confidence level. Children delivered in a health facility have mortality risk of about 51 percent higher than that of those delivered elsewhere.

The study has also indicated useful findings on the effect of other factors used in the analysis as control variables. Secondary, complete and above level of maternal educational attainment, and the average and above size of child at birth had significant protective effect on neonatal mortality while the number of children ever born and belonging to the Kamba ethnic group, showed statistically significant positive effect on neonatal mortality.

In conclusion, receipt of at least two tetanus toxoid injections in pregnancy had statistically significant effect in reducing neonatal mortality while delivery in a health facility had statistically significant positive effect on neonatal mortality. Family health programmes should, therefore, be strengthened to ensure that all pregnant women receive at least two doses of tetanus toxoid injection. Furthermore, socio-economic condition of women that has been associated with use of health care services, such as place of delivery needs to be improved. Obstetric units at hospitals warrant some attention for enhanced survival chances of neonates. Finally the study demonstrates the need for further research using a more comprehensive dataset aimed at an in-depth analysis of the mechanisms through which type of place of delivery as well as other determinants operates to influence newborn survival chances.

## TABLE OF CONTENTS

**LIST OF TABLES**

## LIST OF FIGURES

**List of Acronyms**

AIDS: Acquired Immuno Deficiency Syndrome

ANC: Antenatal Care

CBS: Central Bureau of Statistics

GOK: Government of Kenya

HIV: Human Immuno Deficiency Virus

IEC: Information, Education and Communication

ICPD: International Conference on Population and Development

KDHS: Kenya Demographic and Health Survey

LBW: Low birth weight

MCH/FP: Maternal and Child Healthcare/Family Planning

MOH: Ministry of Health

NCPD: National Council for Population and Development

NFHS: National Family Health Survey

PHC: Primary Health Care

RH: Reproductive Health

TBA: Traditional Birth Attendant

UN: United Nations

UNICEF: United Nations Children Fund

WHO: World Health Organisation

# CHAPTER ONE

# INTRODUCTION

## 1.1 General Introduction

Globally, more than 5 million newborns (WHO, 1996) die during the first four weeks of life; 98 % of these deaths occur in developing countries. In the developing world an estimated 39 deaths take place in the neonatal period for every 1000 live births, making these deaths almost six times more frequent than in developed countries. Two thirds of neonatal deaths (i.e. almost 3.4 million) are estimated to occur during the first week of life.

According to the Ministry of Health (MOH, 1996), to ensure access to quality and affordable reproductive health services by the year 2010, there will be need to update the available facilities as well as creating new ones. Some parts of the country especially the arid and semi-arid areas, the coverage by health facilities is inadequate, and significant proportions of rural people have to travel long distances to services coupled with inadequately developed infrastructure and particularly the communications sector hamper access to the health services. Roads in some areas are seasonal and not regularly served by motor vehicles, making it difficult for people to travel the long distances to the clinics and for medical emergencies to be transported to a health facility without delay. In addition, inadequate equipment and supplies, and poor maintenance further interfere with effective functioning of health facilities.

Provision of high-quality reproductive health services requires availability of suitably and adequately-trained service providers. It is evident that training needs exist in almost all areas of reproductive health care, and particularly when newer reproductive health concepts including integration of services, quality improvement, and

interpersonal communication skills are concerned. According to the United Nations (1 Reproductive Health should be seen as a state of complete physical, mental, emotional and social well being and not merely the absence of disease or infirmity, in all matters relating the reproductive health system and to its functions and processes (UN, 1995).

The Kenya Government health goals for the year 2000 are: a one third reduction in under five death rates (or to 70 per 1000 births, whichever is less) halving of the 1990 maternal mortality rates, the achievement of 90 per cent immunization among the children aged below one year, the eradication of polio and the elimination of neonatal tetanus. It also includes a 90 per cent reduction in measles cases and a 95 per cent reduction in measles deaths (compared with pre immunized levels), halving child deaths caused by diarrhoeal diseases and a one third reduction in child deaths from acute respiratory infections (UNICEF et al., 1998). Health services utilization statistics in Kenya indicate that women and children under five years of age constitute about 70 per cent of all outpatient visitors. It is also evident that over the past thirty years, Kenya has recorded a steady improvement in the health situation as shown by a reduction in the rates of infant and child mortality and an increase in life expectancy at birth. The improvement can be attributed to the efforts of the government in the provision of comprehensive primary health care (PHC) and other social services.

However, in the last five years these gains have stagnated and, more recently, a downward trend has been recorded. This decline can be attributed to demographic, social and economic factors as well as the AIDS epidemic that has constrained the government's ability to ensure the adequate delivery of health care to the population (UNICEF et. al., 1998). According to the same study, in Kenya, the most common causes of infant and child deaths continue to be malaria, pneumonia, diarrhea, birth

trauma and asphyxia. Statistics indicate that neonatal deaths have declined over the past fifteen years from 34 per 1000 live births during 1978-1982 to 25.7 during the period 1988-1993. Stillbirths (after 28 weeks gestation) and deaths within the first seven days (perinatal mortality) remain high and contribute to 70 per cent of neonatal deaths. The reduction in neonatal deaths is attributed to increased tetanus toxoid immunization among expectant mothers and a higher proportion of clean and safe deliveries.

Luther et al., (1999:32) observed that the health and nutritional status of the mother is to a great extent transmitted to the child during pregnancy. They argued that certain practices of the mother during pregnancy, such as maintaining good nutrition, receiving antenatal care, and receiving at least the recommended two tetanus toxoid vaccines, can greatly affect the health and survival outcome of the pregnancy. So can conditions at the time of delivery, such as sanitation and expertise of assistance, especially if problems arise such as long labour, excessive bleeding, or the wrapping of the umbilical cord around the neck of the baby during delivery.

Available evidence indicates that some 24 million low-birth weight babies are born each year in developing countries, to mothers with poor nutritional status, reproductive tract infections, malaria, or other infections during pregnancy (WHO and UNICEF, 1992). The risk of death during childhood varies with age of the child, typically being highest immediately following birth and decreasing, as the child gets older. If mortality declines very rapidly after birth as in most developed countries, then infant and under-five mortality rates will be relatively low (NCPD et al., 1999). In these settings the highest proportion of under-five deaths are related to genetic, maternal and perinatal factors.

Maternal care during pregnancy and delivery is strongly associated with childhood mortality. Children born to women who obtained both antenatal and delivery care from medically trained persons have considerably lower mortality than children whose mothers received only antenatal or delivery care (NCPD et al., 1994). Pregnant women need to be adequately protected against tetanus. Tetanus has long been a major killer of the new born in developing countries (Luther et al., 1999: 34). Tetanus is preventable in new born, however, because immunity can be transmitted from mother to child through the placenta. Two doses of tetanus toxoid vaccine given one month apart during pregnancy prevent nearly all tetanus infections in both mothers and their newborn children (Baltazar and Sarol, 1994, cited in Luther et al., 1999: 34). Following the World Health Organization recommendations (WHO 1986), a pregnant woman should receive two does of tetanus toxoid vaccine, monthly, during the second trimester. If the woman received two doses less than three years earlier during a previous pregnancy, a single booster is adequate.

It has been observed that poor medical attention and unhygienic conditions during delivery can increase the risk of complications and infections that can cause the death or serious illness of either the mother or the baby or both of them (NCPD et al., 1999). The 1998 KDHS data indicate that 57% and 42% of all births in the three years preceding the survey were born at home and a health facility, respectively. Births that are delivered at home are more likely to be delivered without assistance from anyone whereas births delivered at health facility are more likely to be delivered by trained medical personnel (NCPD et al., 1999). However, Luther et al., (1999) are of the view that primarily mothers with anticipated or emergency medical problems deliver at medical institutions or at other places than home, and that such problems are

sufficiently acute that delivery away from home does not counteract the disadvantage that the mothers start with. They assert that where this holds true, many of the deaths from this situation should occur during the first month of life.

Luther et al., (1999), while analyzing Nepal Family Health Survey Data, found that adjusted mortality rates are much higher when a medically trained attendant assists the delivery than otherwise in the case of neonatal mortality. The argument was in line with the hypothesis that medical help is sought at delivery primarily when there are acute problems, because, then, ensuing deaths should occur predominantly within the first month. They point out that assistance at delivery variable is a better test of this hypothesis than the place of delivery variable since the only other category for the latter variable than "home" is "other" which may include many places and attendants besides medical institutions and their attendants.

The number of antenatal care visits made by the mother is an important predictor of both neonatal and post neonatal mortality, hence infant mortality (Luther et al., 1999:37). This was expected since multiple antenatal care visits made by the mother should affect the health of her newborn baby as well as indicate concern for the child's health thereafter.

This study seeks to determine the relative effect of utilization of various maternal health care services (i.e. tetanus toxoid injections in pregnancy and type of place of delivery) on neonatal mortality in Kenya. It is hoped that the findings of the study would contribute to a better understanding of the subject and provide a departure point both for policy formulation and further investigation.

## 1.2 Problem Statement

Although a number of studies on the correlates of neonatal mortality have been carried out in Kenya, the effect of utilization of maternal health care services is poorly understood. For instance, is utilization of maternal health care services such tetanus toxoid immunization and delivery at a health facility significantly related to neonatal mortality after controlling for other predictor variables? Furthermore, neonatal mortality contributes significantly to the level of infant and child mortality in any community. It is also evident that, in Kenya, the highest proportion of under-five deaths occurs in the first few days of life and is related to genetic, maternal and perinatal factors (NCPD et al., 1999).

Global estimates indicate that ninety-eight percent of the five million newborn deaths that occur every year take place in the developing countries (WHO1996). Furthermore, while death rates of children under the age of five have fallen dramatically in the past two decades, there has been relatively little change in newborn mortality, even though proven, cost-effective solutions to save most of these young lives exist.

The concept of neonatal mortality is highly complex and is influenced by a multiplicity of factors that may go back into pregnancy and even earlier. Studies on neonatal mortality have revealed that the health status of the mother before and during pregnancy as well as problems of labour and delivery is an important determinant of the conditions of the newborn (Meme 1976; Kenyi 1993; Okumbe 1996, Luther et al., 1999).

NCPD et al., (1999) indicate that infant mortality in Kenya stands at 74 deaths per 1000 births and it is estimated that in the first 12 months, there is roughly one neonatal death for every two post-neonatal deaths. Furthermore, there is evidence of a worsening mortality situation in the 1990's, which has been attributed to demographic, social and economic factors, as well as the AIDS epidemic that have constrained the government's ability to ensure the adequate delivery of quality health care to the population.

Poor medical attention and unhygienic conditions during delivery can increase the risks of complications and infections that can cause the death or serious illness of either the mother or the baby. The 1993 KDHS and 1998 KDHS results at the national level are essentially the same indicating no improvements in use of delivery services in Kenya, over the last five years (NCPD et. al., 1999: 101).

The study seeks to determine the effect of utilization of maternal health care services on neonatal mortality in Kenya. Specifically, the study aims at determining the level and differentials in neonatal mortality in Kenya as well as the relative effect of utilization of the selected maternal health care factors (i.e. Tetanus toxoid vaccination and place of delivery) on neonatal mortality in Kenya. A better understanding of the influence of the utilization of the health care factors would help design appropriate programmes for improved newborn survival.

## 1.3 Objectives

### 1.3.1 General Objective

The main objective of the study is to determine the relative effect of utilization of maternal health care services on neonatal mortality in Kenya.

### 1.3.2 Specific Objectives

1.To determine the level and differentials in neonatal mortality in Kenya.

2.To determine the relative effect of utilization of maternal health care services (i.e. tetanus injections in pregnancy and type of place of delivery) on neonatal mortality in Kenya.

## 1.4 Justification of the Study

This study is an analysis of the relationship between neonatal mortality and various components of maternal health care services. The study was prompted by the recognition that a woman's ill health affects not only her own opportunities and potentials but also those of her children (Tinker, 1995). Given the fact that the highest proportion of under-five deaths occurs in the first few days of life, there is need to understand the influence of maternal health care factors among other determinants as a possible guide to effective program interventions. The 1998 KDHS data in combination with similarly collected data from 1993 KDHS provide evidence of a worsening mortality situation in 1990s. To curb the observed trend in child survival, reducing the newborn mortality rate must become a national and international priority.

A number of studies have been done on determinants of neonatal mortality in Kenya (Meme 1976, Kenyi 1993, Okumbe, 1996) but none of these studies has specifically

looked at the effect of utilization of the selected maternal health care services (i.e. tetanus toxoid injection and type of place of delivery) on neonatal mortality. Most studies on neonatal mortality have been hospital based despite the fact that most births in Kenya do not take place in hospitals. Such studies culminate with findings applicable only to a sub-set of the population. For instance, Meme (1976) examined the effect of low birth weight on neonatal mortality in Kenya using data collected at Kenyatta National Hospital. However, a few community-based studies on neonatal mortality have been conducted in Kenya (Okumbe 1996, Kenyi 1993) that mainly undertook to determine the correlates of neonatal mortality in Kenya using data from the 1993 and 1989 KDHS, respectively.

Given the fact that there are essentially no improvements in use of delivery services in Kenya over the last five years, at the national level (NCPD et. al., 1999), there is, therefore, the need to analyse the possible implications of type of place of delivery among other factors on neonatal mortality in the country. The results of such an analysis might provide information on the possibility of reducing such deaths. It would, also help design appropriate programmes for improved survival chances of the newborn.

Furthermore, an analysis of the level and differentials in neonatal mortality would help in the identification of women at risk, which might be quite important for action oriented policy to curb neonatal mortality. The study, therefore, is likely to be useful in policy formulation and is expected to provide a basis for further investigation.

### 1.5 Scope and limitations of the Study

This study focuses on the analysis of neonatal mortality at the national level, using the 1998 Kenya Demographic and Health Survey (KDHS) data. The study is confined to the limitations of the National Sample Survey and evaluation programme (NASSEP) master, which excluded five percent of Kenya's population, mainly from four districts of Northern Province. Other problems derive from the retrospective nature of the survey, leading to such errors as differential misreporting of newborn births and deaths, memory recall lapse, and religious and cultural taboos concerning death in general and at young ages in particular.

## CHAPTER TWO

## LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### 2.1 Introduction

This chapter explores briefly studies on neonatal mortality, conducted not only in Kenya but also elsewhere in the world. The review also provides a summary of theoretical frameworks that serve to inform the study. It also permits us identify before hand appropriate statistical method(s) to use in the data analysis.

### 2.2 Literature Review

#### 2.2.1 Demographic factors

United Nations (1973) documented that young maternal age was a well-known correlate of higher infant mortality. The higher incidence of infant mortality and still births among the older mothers is because of their high susceptible to various diseases such as anaemia, diabetes, heart diseases and blood pressure which affect the health of the child in the womb (Meegama 1980). As for the young mothers it is because of their physical immaturity. Jain et al., (1988: 37) argued out that age and parity are usually highly correlated and therefore it is difficult to isolate their independent contributions to the risk of infant death. Each of these factors in general show a U- or a J shaped relationship with infant mortality, i.e. the infant mortality rate is found to be highest at the very young and old ages of childbearing and lower in the middle range (about 20-39 years). The studies found that the infant mortality rate was usually high for the first order and high order births (about 4 and higher parity) and low for middle range (second to fourth order births). In a prospective study involving 4267 deliveries in eight countries of Eastern, Central and Southern Africa, (Kinoti, 1993: cited in Okumbe, 1996) carried out a study on asphyxia of the newborn. The

study took a three months period in maternity units of central hospitals to determine the incidence, maternal service, and logistic risk factors for asphyxia of the new born as determined by an abnormally low agar score. The results of the study revealed that teenage mothers had higher risks of low birth weight. Asphyxia was also found to be prevalent among low birth weight babies.

### 2.2.2 Socio-economic factors

Studies in Africa have found a strong negative relationship between maternal education and infant and child mortality (Anker and Knowles, 1977, Mott, 1982, Kibet 1981, Caldwell 1979) and South Asia (Meegama 1986, DaVanzo and Habicht, 1986) have also established similar findings. On the mechanisms through which maternal education operate to influence mortality, Caldwell (1979) is of the view that maternal education affects infant and childhood mortality through changes in traditional family child health care practices.

In Kenya, an inverse association between maternal education and infant mortality has been confirmed (Ondimu 1987, Ndede 1989, Atichi 1989). The use of antenatal care is strongly associated with level of education. Women with no education are six times as likely as women with some secondary education to have received no antenatal care and 28 percent less likely to receive care from a doctor (NCPD et. al., 1999).

### 2.3.3 Health Care Factors

Meme (1976) while studying low birth weight and the incidence of neonatal mortality in Kenyatta National Hospital proposed that to reduce neonatal mortality, the health of the mother warrants first attention. Satisfactory weight at birth is essential for the

infants' survival and health. The author further confirmed that low birth weight is usually a consequence of complex factors in the mother and it constitutes condition of increased vulnerability contributory to disease and death within this continuum of interrelationship.

NCPD et al., (1999) observed that antenatal care can be more effective in avoiding adverse pregnancy outcomes when it is sought early in the pregnancy and continues through to delivery. Obstetricians generally recommend that antenatal visits be made on monthly basis to the $28^{th}$ week (seventh month), fortnightly to the $36^{th}$ week (eight months), and then weekly until the $40^{th}$ week (until birth) and if the first antenatal visit is made at the third month of pregnancy, this optimum schedule translates to a total of at least 12-13 visits during the pregnancy (NCPD et al, 1999).

Meegama (1980), in the analysis of early childhood mortality in Columbia found that there was high-level mortality due to several causes of death, namely death resulting from neonatal tetanus because of infection. He observes that tetanus neonatorum is one of the leading causes of infant death throughout the world accounting for up to one third of all neonatal deaths in some developing countries. The author observes that one approach to the prevention of this problem is through improving the quality of prenatal obstetrics and post-neonatal maternal and child health services.

One of the efforts to reduce the health risks of mothers and children are increasing the proportion of babies that are delivered in medical facilities. Proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that can cause the death or serious illness of either the mother or the baby (NCPD et. al., 1999). Omran and Standley (1976) have observed that in developing

countries most births occurred at home when compared with those in developed countries, which occurred in hospitals. Meegama (1980) suggested that prenatal care and the presence of a medically qualified attendant at a child's delivery could avert birth injuries and provide necessary medical care in the case of an emergency.

Luther et. al., (1998) examined infant and child mortality and their determinants for India as a whole and for individual states, using data for the 1992-1993 National Family Health Survey (NFHS). The findings showed a very sharp decline in unadjusted neonatal mortality as the number of antenatal care visits increased. The adjusted effect was much smaller but it remained statistically significant.

As regards tetanus immunization of pregnant mothers, the study found a substantial effect on unadjusted and adjusted neonatal mortality. They found that both unadjusted and adjusted effects are statistically significant, thus reflecting the importance of protection conferred by tetanus immunization. It was quite evident that the adjusted effect of the mothers' full tetanus immunization on neonatal mortality was statistically significant in India as a whole and was either statistically significant or substantial in 14 and 19 states, including most of India's populous states with high mortality. Based on the findings it was suggested that immunizing pregnant women against tetanus was an important program intervention for reducing neonatal mortality in India.

As pertains to the place of delivery, it was evident that for India as a whole, unadjusted neonatal mortality was lower for children delivered at home. The adjusted values showed the opposite effect. They observed that the apparent advantage of delivering in a medical facility is due mostly to the influence of other socioeconomic

variables, with place of delivery acting as proxy. After controlling for the effect of variables such as mother's literacy and household economic status, neonatal mortality was actually higher for children delivered in a medical facility than for children delivered at home. Both unadjusted and adjusted results were statistically significant. The study proposed that among health care interventions, immunization of pregnant women against tetanus has a substantial effect in reducing neonatal mortality. It recommends that family health programs should be strengthened to provide this basic health care service to all pregnant women.

In a related study, Luther et al. (1999), analyzed infant and child mortality in Nepal using Nepal Family Health Survey (NFHS). They found that several of the maternal and child health care variables stood out strong as predictors of neonatal mortality. Whether the mother had received two or more tetanus immunizations during pregnancy ranked next as the predictor of both neonatal and post neonatal mortality. However, as a predictor of neonatal mortality, the height of the mother was the strongest and whether the mother had ever used family planning was stronger than whether she had received at least two tetanus immunizations during pregnancy. In addition, whether the mother had excessive bleeding during delivery was slightly stronger.

The results for the maternal and child health care model showed high net mortality rates of both types (neonatal and post neonatal) for children born to mothers making no antenatal visits and not receiving the recommended tetanus immunization during pregnancy; high net neonatal mortality rates for children of mothers who are of small stature (height), who had excessive bleeding during delivery, who were assisted only by a friend, a relative or other at delivery, and who had never used family planning.

The study under review recommends that most of these problems could be greatly reduced by successful maternal heath Programmes.

The National Research Council (1997) is of the view that although prenatal care has been widely available and used in developing countries, the use of medical services for delivery and post partum care lags far behind. In addition, home births remain common, either for cultural reasons or because health facilities are inaccessible or perceived to be of poor quality. The study recognizes essential care for obstetric complications as including the ability to carry out surgery and to provide anesthesia, blood transfusions, intravenous drugs, other marked treatments, and special care for newborns.

As regards prenatal care the study indicates that it should be used to improve both maternal and newborn health through screening and treatment for syphilis and anemia, as well as detection and treatment of pregnancy-induced hypertension. In addition, prenatal counselling provides an opportunity to give women information about appropriate diet and other health behaviours and about pregnancy complications and where to go for care. The study recommends that obstetrics units at hospitals should be established or strengthened, and the quality of skills upgraded. Furthermore, professional providers such as midwives can provide some basic care through outreach to women in their homes.

Jain et al., (1988) observed that maternal care programs seek to provide pregnant women with iron and folic tablets, primarily during the last trimester of pregnancy. The authors proposed that immunization of pregnant women with tetanus toxoid could effectively eliminate neonatal tetanus, a cause of infant death during the

neonatal period. They argued that, assuming, that tetanus immunization should be classified as part of prenatal medical care, the other components of such care include the identification of 'high risk' cases and special effort to ensure that they are examined by a health professional in the primary health care (PHC), the sub center or their homes. The study postulates that this should theoretically be feasible if the village level health workers register all pregnancies and note the characteristics of pregnant women. However, they argued, the reality is far from the ideal and the cost of transport to the sub center or the PHC, the loss of wage, the difficult of making alternative arrangements to look after household chores, and the lack of adequate empathy among the health staff, all prevent women from consulting a health professional until a specific serious problem is identified.

On the other hand, competence and skills of the attendant to help avoid complications at delivery are among the factors relating to care at birth. While factors like prematurity or low birth weight (malnourishment) will reflect prenatal care factors, neonatal tetanus as well as asphyxia could be a function of care at birth (Jain et al., 1988). Many complicated cases seek the attention of trained health professionals a little too late; with the result that the infant mortality rates for babies attended by them exceed the corresponding rates for babies born without any trained attention (Rao 1985: cited in Jain et al., 1988).

Ewbank et al., (1993) are of the view that tetanus is a major cause of neonatal deaths in much of Africa, as well as among other age groups. They argued that because of the small proportion of population protected by immunization during childhood, and the large proportion of births that occur under poor hygienic conditions related

especially to home deliveries, tetanus mortality rates in Africa are probably among the highest in the world.

### 2.2.4 Child's Bio demographic characteristics

Certain biological and socio-economic factors like maternal age, height and income influence the incidence of low birth weight and these factors are closely related (Meme, 1976). Meme furthermore, established that 41.8 percent of all low birth weight (LBW) babies were associated with the cited background characteristics. UNICEF (1989) and WHO (1987) have established that of the 140 million children in the world every year some 22 million were of low weight at birth. Of this, developing countries had more than 20 million with South Asia topping the list with India in low weight at birth and high neonatal deaths. Available evidence further indicates that 24 million low birth weight babies are born each year in developing countries, from mothers with poor nutritional status, reproductive tract infections, malaria or other infections during pregnancy (WHO and UNICEF 1992).

Magadi (1999) carried out a study aimed at improving the understanding of factors associated with poor maternal health care and adverse pregnancy outcomes in Kenya. The specific objectives were to examine factors associated with maternal mortality in Kenya; establish determinants of maternal health care in Kenya; and identify the direct and the indirect determinants of poor birth outcomes and caesarean section in Kenya. The results of multilevel regression analysis showed that the risk of poor birth outcomes (premature delivery and small size of baby at birth) or caesarean section delivery was higher among first births than higher order births. In addition, the quality of antenatal care received in pregnancy was observed to play an important role in premature births, while the mother's nutritional status was significantly associated

with the size of the newborn. With respect to caesarean section deliveries, short maternal height was confirmed to be a significant risk factor.

Studies in developing countries (Africa, Asia and Latin America) have generally documented a significant variation in infant mortality by sex. Generally, male mortality rates in both neonatal and post-natal periods are higher than for female (Anker et al., 1979, D'souza and Chen, 1980). This is attributed to biological differences between the sexes. It is observed that female possession of 2X chromosomes, greater average level of oestrogen, higher birth weight and invisible generative organs and easy adjustment to environmental temperature have been found to give greater survival advantage of females compared to their male counterparts (Preston, 1976). However, the current observed higher female mortality rates in child ages in some countries are associated with differential parental treatment which tends to favour male children over female in so far as prenatal mother care, food distribution and medical treatment are concerned (Nadarajah, 1983).

Miller et al., (1990) conducted a study on perinatal, infant and childhood mortality in Machakos. They studied stillbirths, neonatal and maternal deaths over 1975-1978 periods. Women who had experienced a stillbirth, or had a child that died within the first week of life were interviewed to determine the most likely cause of death. It was found that out of 4,768 births that occurred in the period, 4,691 of the births were live births, 141 were stillbirths and 221 were perinatal deaths. The number of deaths was highest within the first 24 hours of life followed by a steady decline. The study revealed that the causes of neonatal deaths were birth injuries and prematurity or low birth weight.

Musoke et al., (1992) carried out a prospective study on neonatal morbidity and mortality at Kenyatta National Hospital, where 3,126 infants were delivered in the period of study. A total of 967 (30%) were admitted to the newborn unit out of which 59.8% of were of low birth weight. Most of infants who died were of very low birth weight less than one kilogramme. Their analysis of age at death revealed that highest deaths occurred in the first 24 hours of life and the leading causes of death were found to be respiratory distress, infections and asphyxia. In conclusion, the authors noted that neonatal morbidity and mortality were very high especially among the very low birth weight and gestation below 30 weeks. The authors call for improvement in antenatal and paediatric care especially for premature deliveries.

### 2.2.5 Socio-Cultural Factors

A study in Ghana stablished that infants of Christian mothers had better chances of survival than those of traditional mothers (Tawiah 1979: cited in Anker and Knowles, 1980). In Kenya, this finding has been confirmed by Bonkole and Olaleye (1991) who found that the children born to Christian mothers are more likely to survive than those born to mothers who are Muslims or other or no religion.

Breast-feeding may be considered a biological and /or behavioural factor or socio-cultural factor. It has been observed that maternal milk provides the best protection against both malnutrition and infection, especially where conditions of poverty, ignorance, and crowding and high morbidity are rampant. Knodel and Kentner (1977) argued that maternal milk has been associated with certain antibodies that protect the child against malnutrition and diarrhoeal diseases. Winikoff (1980) on the other hand, observes that nutrition wise, maternal milk is easily adapted to infant requirements than other food supplementation or substitutes. In a study conducted by

Musoke and Malenga (1984) at Kenyatta National Hospital benefits of breast milk have been confirmed when they noted the rarity of gastro-intestinal infection because all infants were on fresh human milk.

In Kenya, an upward trend in bottle-feeding at the expense of breast-feeding in both rural and urban areas has been established (Ocholla-Ayayo and Muganzi 1986). The study maintains that bottle-feeding is one of the causes of high child mortality in the country.

As regards ethnicity, Okumbe (1996) using the 1993 KDHS data found a statistically significant association between neonatal mortality and ethnic group of the mother. The study found a similar finding between neonatal mortality and religion of the mothers. Type of marriage union has also been associated with child survival in many settings. In Nigeria the death rates in polygamous unions was a third higher than that of children in monogamous unions (Caldwell 1979). Harrington (1971: cited in Caldwell, 1979) had found a similar finding that in Burkina Faso, the Niger, and in two regions of Ghana, infant mortality in rural areas was higher among polygamous unions.

### 2.2.6 Environmental factors

Meegama (1980) while analysing Sri Lanka data argued that an unsanitary environment could influence neonatal mortality in several ways. For instance, he argued that, if a child is born in a dwelling poor or where there were no toilet facilities, infections could be transmitted to the new-born by flies or, for that matter, through the mother who in all probability would have unhygienic habits. Meegama furthermore observed that, an infant born in a medical institution can be infected

during the few days of its stay; some hospitals and maternity homes do not have flush systems of sewerage disposal; and to make the matters worse, do not have stable supplies of water throughout the year.

Okumbe (1996) using the 1993 KDHS data found that neonatal deaths were significantly related to type of toilet facility. The study further found a statistically significant association between neonatal deaths and source of drinking water but an insignificant relationship with floor material of the main dwelling unit.

**2.3 Theoretical Framework**

Kikhela (1989) while analysing perinatal mortality in Kinshasa (Zaire) agrees with Meegama (1980) in his study of Sri Lanka, that data must be gathered not only on mother's behaviour and on demographic, economic, and social characteristics but also on the infrastructures of obstetric units. He notes that there are two broad categories and subcategories and five subcategories of variables to be researched. The first category consists of variables relating to care services while the second category consists of those relating to individuals.

The later, he says, can be classified in five subcategories: those variables that influence the child's risk of dying after birth (habitat and quality of care given the newborn if he or she becomes ill); those that pertain specifically to the child (weight, height, sex, multiple birth); those that relate to delivery (complications); those originating during the pregnancy (prenatal consultations, mother's nutrition); and those that existed before the child was conceived (i.e., the variables such as education,

social status, marital status, and number of pregnancies, by which the parents are identified).

He observes that because these variables intervene at different points in the chain of causality, we must avoid comparing the influence of two factors that do not act at the same level (e.g., birth weight and education). He is of the view that variables that existed before the child was conceived enable us to measure the disparities that, according to his conceptual framework, underlie differences in types of infant mortality. He points out that, to account for differences in mortality observed between types of families, we must use variables relating to pregnancy, delivery and the early neonatal period; which in the future will be known as intermediate variables.

A basic hypothesis that emerges from Kikhela's (1989) framework is that the families with the highest levels of mortality are those families at risk, i.e., those with a higher percentage of difficulty deliveries, of delivery complications that are not treated appropriately, and with low birth weight children. Kikhela asserts that the risk factors derive from a set of social disparities, existing at conception, that affect the mother's health, her use of care services, and her nutrition during pregnancy.

In a nutshell, Kikhela recognizes about four sets of variables that influence child survival at perinatal period: variables existing before conception; variables appearing during pregnancy; delivery related variables; and variables whose influence appears after delivery (i.e., in early neonatal period). The interrelationships between the various factors, and how they lead to neonatal mortality imply a number of relationships, which have been supported by the literature review. Kikhela's (1989)

framework has, however, been criticized as being a bit restrictive in the sense that it does not cover variables beyond the first week (7 days) of life.

Meegama (1980) using Sri Lanka Fertility Survey data for 1976 designed a broader conceptual framework for the study of factors affecting neonatal mortality in developing countries. He argued that a framework for the analysis of infant and child mortality must take into account several factors which influence and determine the level of mortality namely; demographic, economic and political, environmental, medical and health care, and geographic factors.

The author posits that there are two basic classes of demographic factors with the first referring to those demographic factors, which affect the health of the mother to the extent of exposing her offspring to a higher risk of infant mortality such as age of the mother, the birth interval, and birth order of the child; and the second class of variables referring to sex and age of the child.

As regards economic and political factors, Meegama suggests that they should be seen in two broad groups, one operating at the macro level and the other at the micro level. The macro level variables include resources to have a well-spread and accessible network of ante and post-natal clinics, maternity homes, trained midwives, and health care centres such as rehydration units. For him, the macro level factors do not only affect the availability of services but also the capacity to invest in a well-spread network of roads that promote the process of food distribution as well as enhancing the general educational level of the country.

At the micro level, the economic level of the household or family can greatly influence the health of children. For instance, it can determine whether a pregnant woman has sufficient food during the antenatal period, which in some cases could determine the number of infants born suffering from immaturity and debility; and providing adequate food to children after neonatal stage, especially important among groups where there is early weaning.

Furthermore, even in those third world countries which have reasonable health care systems, economic well being could determine whether a family could hire transport to take either a woman in labour or a sick child to hospital in time. At the same time where public health care is weak, the family's economic situation would determine whether it could afford private health care services from private practitioners, dispensaries or even hospitals. The economic well being is also one of the factors determining the level of sanitation as well as the availability of uncontaminated drinking water at the community and household levels.

Environmental factors include lack or presence of toilet facilities, unsanitary environment, availability of clean water, and mother's hygienic practices. Medical and health factors include antenatal clinic attendance, immunization during pregnancy, delivery assistance, and presence or absence of post-natal clinics while cultural factors include breast-feeding and weaning practices: in terms of nutritional value of food and infected food, making children an easy prey to other diseases.

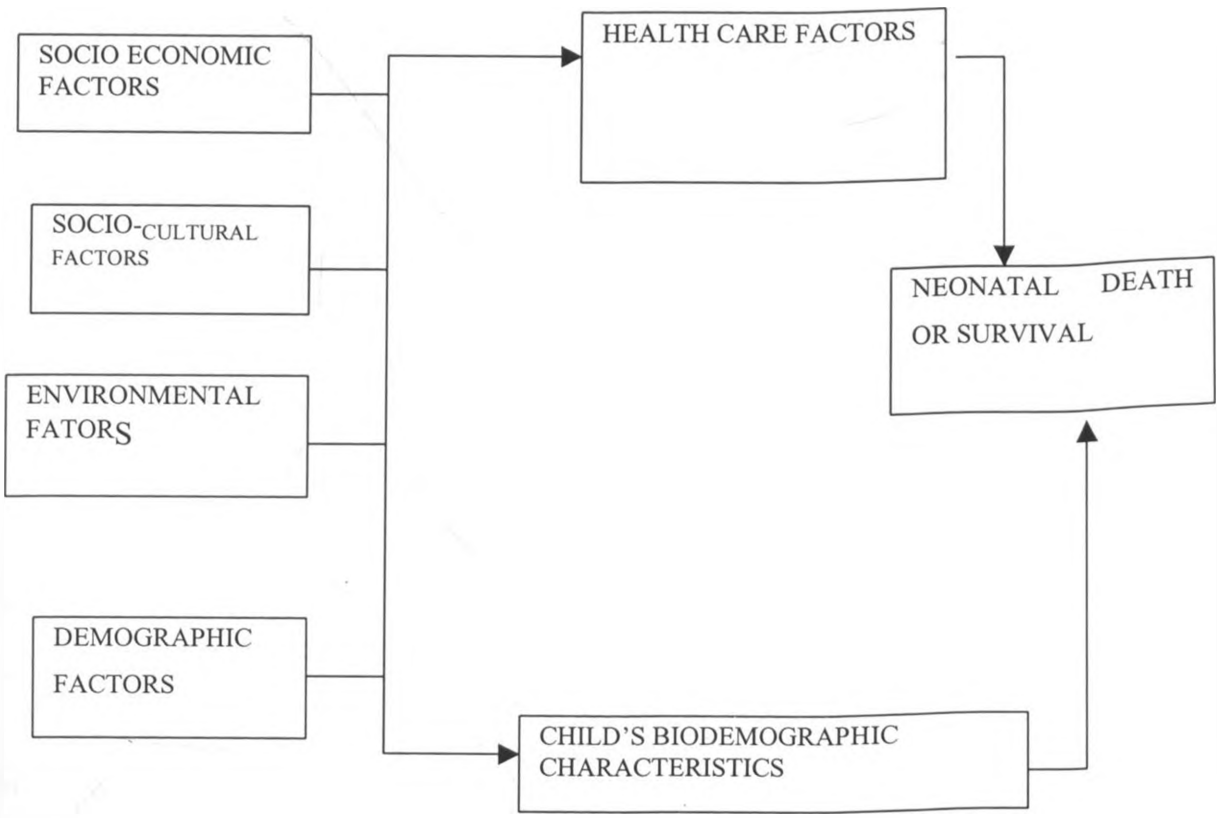
As pertains to the geographic factors, the author is of the view that even given all other factors are constant, geographic factors can have an effect on mortality in terms of extreme climatic conditions. For instance, where it is very cold or where there is

very heavy rain higher mortality could be realized mainly due to an increase in the incidence and severity of respiratory diseases. The author pointed out that given the significant differentials in mortality at different stages of childhood, there is need to analyse separately, perinatal, neonatal, and post-neonatal and child mortality.

Meegama's (1980) conceptual framework was adopted for this study with minor modifications aimed at an expansion of medical and health care factors: to include as many of the factors as captured in the 1998 KDHS. The model was found suitable for the study in that it is detailed and broad enough to explain neonatal mortality, though slight modifications to the model were inevitable. The conceptual model provides and illustrates how the various factors interact and relate to directly or indirectly lead to neonatal mortality.

The broad based model provides a broader understanding of mortality and also helps in the collection and analysis of specific data on these factors, which can be tested for their relevance on mortality. This quality applies particularly to studies utilizing primary data where data collection is of ultimate importance. The model contains specific variables that can be tested directly while others need a further breakdown. Given the fact that the model was developed from data obtained from a developing country (i.e. Sri Lanka Fertility survey data for 1976), it therefore, proved quite relevant for this study. However, the broad model was not applied wholly in the study given the limited range of data in the 1998 KDHS.

**Figure 2.1: Conceptual Model for analysis of Neonatal Mortality**




Source: Modified from Meegama (1980)

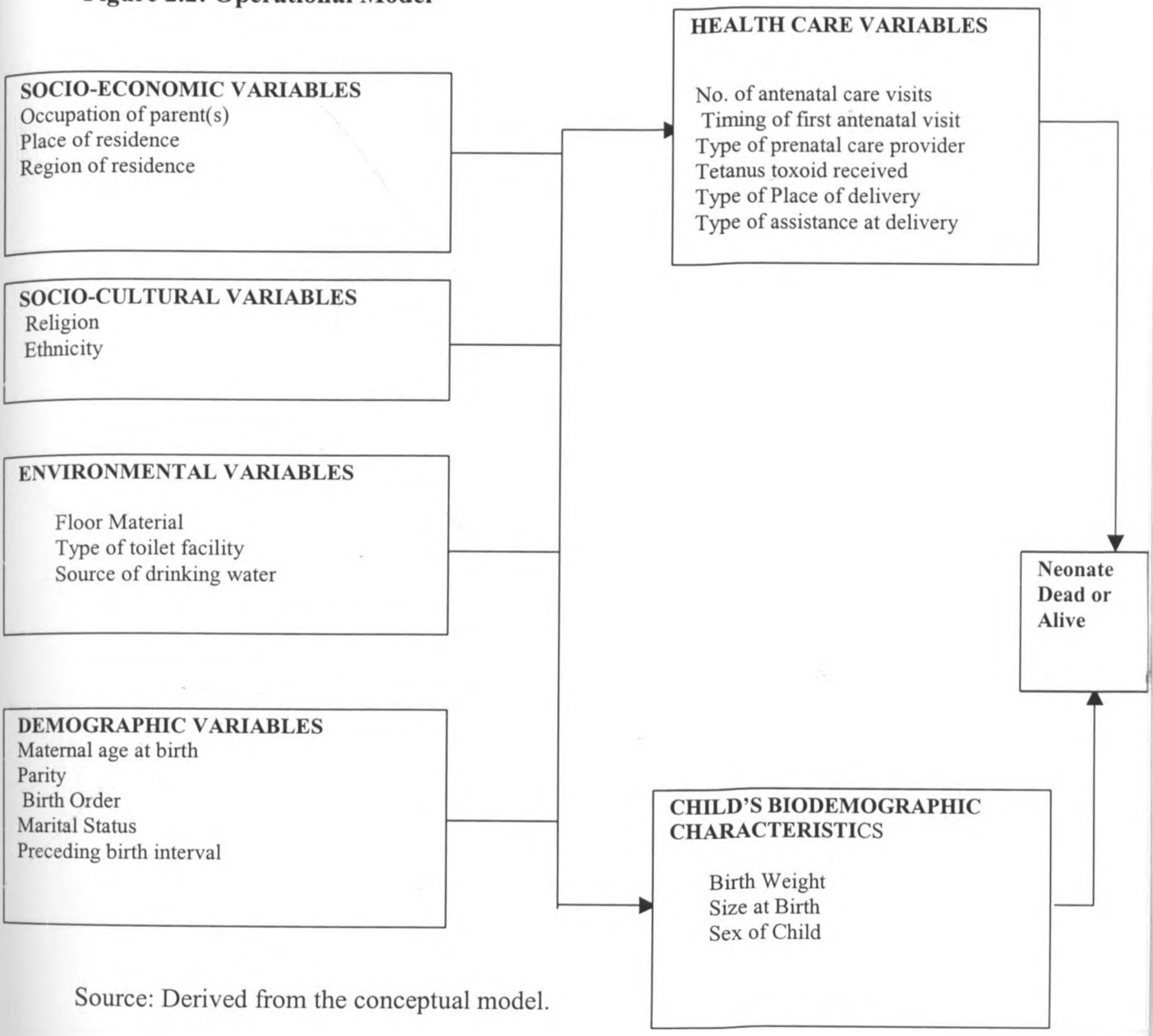
Note:

⟶ : Indicates the direction of effect

### 2.3.1 Conceptual Hypotheses

Socio-economic, socio-cultural, environmental, demographic, health care as well as child's bio demographic factors, affect neonatal mortality in any community.

**Figure 2.2: Operational Model**




Source: Derived from the conceptual model.

Note:

⟶ : Indicates the direction of effect

### 2.3.2 Operational Hypotheses

From the operational model the following operational hypotheses have been derived:

1. The quality household's floor material of the main dwelling unit has statistically significant negative effect on neonatal mortality.
2. The size of child at birth has statistically significant negative effect on neonatal mortality.
3. Giving birth at a health facility has a statistically significant negative effect on neonatal mortality.
4. Receipt of at least two tetanus toxoid injections in pregnancy has statistically significant negative effect on neonatal mortality.
5. Parity (total children ever born) has statistically significant positive effect on neonatal mortality.
6. Neonatal mortality rises significantly by ethnic background of the child.
7. Maternal education has statistically significant negative effect on neonatal mortality.
8. Neonatal mortality rises significantly by region of residence.
9. Neonatal mortality rises significantly by type of place of residence.
10. Neonatal mortality rises significantly by maternal employment status.
11. Neonatal mortality rises significantly by marital status of the mother.
12. The higher the preceding birth interval the lower the neonatal mortality rate.
13. There are significant differences in neonatal mortality by birth order.
14. There are significant variations in neonatal mortality by maternal age at birth.
15. There are significant variations in neonatal mortality by sex of the child.
16. There are significant variations in neonatal mortality rate by religion of the mother.

17. There are significant variations in neonatal mortality by type of water source.
18. There are significant variations in neonatal mortality by type of toilet facility
19. There are significant variations in neonatal mortality type of prenatal care provider.
20. There are significant differences in neonatal mortality by type delivery assistant.
21. There are significant differences in neonatal mortality by number of antenatal care visits.
22. There are significant differences in neonatal mortality by timing for the first antenatal care visit.

## 2.4 Definition of Key Concepts used in the Study

### 2.4.1 Demographic Factors

These factors include:

**Neonatal mortality:** whether a child died during the same month of birth. That is the probability of dying within the first month of life. This is the outcome variable in this study.

**Maternal age at birth:** refers to the age of the woman at the time she gave birth to her child.

**Parity:** refers to total children ever born.

**Birth order:** refers position of birth of the index child relative to their siblings. For instance, a first birth could also be referred to as a first order birth.

**Marital status:** whether the woman was single, married, separated or divorced at the time she gave birth to her child.

**Preceding birth interval:** refers to number of months between a child and its older sibling.

### 2.4.2 Health Care Factors

These factors include such factors as number of visits made by the mother during pregnancy, timing of the first visit, type of prenatal care provider during pregnancy, whether a woman has received tetanus injection prior to the birth of her child, and also type of place of delivery. It is assumed in this study that these factors interact with other factors to influence child survival during the neonatal period.

### 2.4.3 Socio-economic factors

These are essentially indexes of economic status of the household. They have been shown to have a strong bearing on the health of both the mother and infant before and after birth. For example, it has been found that the economic level of

the individual household's can determine both the quality and quantity of diet and care a pregnant women received which, it turn, determines the birth weight and height of the child. Variables analysed in the study include the type of place of residence, region of residence, education of the mother as well as parental occupation.

### 2.4.4 Socio-cultural factors

These are associated with cultural norms, which govern life in society. These include ethnic identity of the study respondents as well as religious affiliation.

### 2.4.5 Child's Characteristics

These include the child's bio-demographic factors such as weight, size at birth, and sex.

### 2.4.6 Environmental Factors

These include factors pertaining to the floor material of the main dwelling unit, Source of drinking water and type of toilet facility. These are sometimes referred to as exposure factors.

**Table 2.1: Summary of Variables and their Measurements**

| Variable | Measurement | Remark |
|---|---|---|
| Source of water | 0. Other/river<br>1. Tap/piped | Socio-economic indicator |
| Type of toilet facility | 0. None/bush<br>1. Better toilet (Flush/ pit/vent etc) | Socio-economic indicator |
| Floor material of the main dwelling unit | 0. Other/earth<br>1. Wood/tile/cement | Socio-economic indicator |
| Birth order | 0. First birth order<br>1. $2^{nd}$ - $5^{th}$ birth order<br>2. $6^{th}$ and above birth order | Demographic indicator |
| Marital status | 0. Never married<br>1. Currently married<br>2. Formerly married | Demographic indicator |
| Parity (Total children ever born) | 0. 1-3 children<br>1. 4-6 children<br>2. 7+ children | Demographic indicator |
| Maternal employment status | 0. Not working for cash<br>1. Working (paid cash) | Socio-economic indicator |
| Paternal employment status | 0. Not working for cash<br>1. Working (paid cash) | Socio-economic indicator |
| Region of residence | 0. Nairobi<br>1. Central<br>2. Coast<br>3. Eastern<br>4. Nyanza<br>5. Rift valley<br>6. Western | Socio-economic indicator |
| Type of place of residence | 0. Rural<br>1. Urban | Socio-economic indicator |
| Religion | 0. Catholic<br>1. Protestant<br>2. Other | Socio-cultural indicator |
| Ethnicity | 0. Kisii/Luhya/Luo<br>1. Kikuyu/Embu/Meru<br>2. Kamba<br>3. Kalenjin/Maasai<br>4. Other | Socio-cultural indicator |
| Maternal educational attainment | 0. No education<br>1. Primary incomplete<br>2. Primary complete<br>3. Secondary incomplete<br>4. Secondary complete+ | Socio-economic indicator |

**Table 2.1: Continued**

| Variable | Measurement | Remark |
|---|---|---|
| Preceding birth interval | 0. < 24 months<br>1. 24 + months | Demographic indicator |
| Maternal age at birth | 0. < 20 years<br>1. 20-34 years<br>2. 35 + years | Demographic indicator |
| Size of child at birth | 0. Very small/small<br>1. Average/larger | Biological indicator |
| Sex of child | 0. Male<br>1. Female | Demographic indicator |
| Type of prenatal care provider | 0. Other/untrained<br>1. Trained Personnel | Health care indicator |
| Type of delivery assistant | 0. Other/untrained<br>1. Trained personnel | Health care indicator |
| Tetanus Toxoid immunisation | 0. No injection<br>1. One injection<br>2. Two injections + | Health care indicator |
| Number of antenatal care visits | 0. No visits<br>1. 1 –11 visits<br>2. 12+ visits | Health care indicator |
| Timing for first antenatal care visit | 0. 1 - 3 months<br>1. 4 - 6 months<br>2. 7 - 9 months | Health care indicator |
| Type of place of delivery | 0. Home/Other<br>1. Health facility | Health care indicator |
| Birth weight | 0. < 2.5 kg<br>1. 2.5 + kg | Biological indicator |
| Child's survival status at age 30 days | 0. Alive<br>1. Dead | Outcome/dependent variable |

**Source: Author**

# CHAPTER THREE

# DATA AND METHODS OF ANALYSIS

## 3.1 Introduction

This chapter focuses on the sources of data, methods of data collection, data quality and the various analytical methods used to analyse the data. The methods of data analysis include cross- tabulation and logistic regression methods.

## 3.2 Sources of Data

This study was based on the 1998 Kenya Demographic and Health Survey data. The survey was meant to provide population and health data for use by researchers as well as policy makers. Experts from the National Council for Population and Development (NCPD) conducted the survey, in collaboration with the Central Bureau of Statistics (CBS) with significant technical support from the ministry of health and other governmental and non-governmental organisations. The survey was conducted between February and July 1998.



## 3.3 Methods of data collection

Three types of questionnaires namely household schedule questionnaire, women's and men's questionnaire were employed in data collection. The KDHS was designed to produce completed interviews with about 7881 women aged 15-49 years with a sub sample of 3,407 husbands aged 15-54 years. A total of 9,400 households were selected of which 8,661 were identified as occupied households during fieldwork, and thus eligible for interview. A total of 8,380 households were successfully interviewed giving a success rate of 97 percent. Out of 8,233 eligible women (aged 15-49 years) in the interviewed households, 7,881 were successfully interviewed giving a 96 per cent response rate.

### 3.3.1 Sample design

The 1998 KDHS is national in scope, with the exclusion of all three districts in North Eastern province and four other northern districts (Samburu and Turkana in Rift valley province and Isiolo and Marsabit in Eastern province). Together the excluded areas account for less than four percent of Kenya's population. The KDHS utilized a two stage, stratified sample consisting of 536 selected sample units (clusters). Six of the 536 clusters (1 percent) were not surveyed due to inaccessibility.

Despite the need for obtaining district level data for planning uses, reliable estimates could not be produced in the KDHS from all districts in the country-which have increase in number from 48 to 75 since 1993- without expanding the sample to an unmanageable size. It was fact however that reliable estimates for certain variables could be produced for the rural areasin15districts: Bungoma, Kakamega, Kericho, Kilifi, Kisii, Machakos, Meru, Murang'a, Nakuru, Nandi, Nyeri, Siaya, South Nyanza, Taita Taveta, and Uasin Gishu. These areas plus Nairobi and Mombassa were targeted because: Subdivision, they were generally the larger districts in their provinces. Most were districts in which the NCPD had posted district population officers, and the districts were also targeted in the 1989 and 1993 KDHS projects. Although most of these districts were subdivided in the recent past, the previous boundaries have been used in order to maintain compatibility with the two previous KDHS surveys.

During the late 1997 and early 1998, field staff from the central bureau of statistics conducted a household listing in each of the selected clusters. From those households' lists, a systematic sample of households was drawn: 22 households per urban cluster and 17 households per rural cluster totalling 9,465 selected households.

All women age 15-49 were to be interviewed (i.e. eligible) in these households. Every second household was included in the male sample and, in those households; all men age 15-54 were also eligible for interview.

### 3.3.2 Questionnaire

Three types of questionnaires were used in the 1998 KDHS: the household Questionnaire, the women's Questionnaire and the men's questionnaire. A series of meetings were held with policy experts, program managers, and other professionals to review, adapt, and revise the questionnaires. This process culminated in the use of set of ethnic languages: Kalenjin, Kamba, Kikuyu, Luyha, Luo, Masai, Meru, and Mijikenda.

## 3.4 The Quality of KDHS Data

The Kenya's Demographic and Health Survey data set was from the very beginning intended to yield high quality information. A team of well-trained researchers and research assistants manned the exercise. The KDHS of 1998 is a relatively representative survey of 7,881 women aged 15-49 and 3,407 men aged 15-54.

The neonatal mortality rates were calculated from information drawn from the questions asked in the birth history section of the women's questionnaire. Preceding the history, probing questions were posed on the aggregate childbearing experience of respondents (i.e., the number of sons and daughters who live with the mother, the number who live elsewhere, and the number who have died. In the birth history, for each live birth, information was collected on sex, month and year of birth, survivorship status, and current age, or if the child had died, the age at death.

The quality of mortality estimates calculated from retrospective birth histories depends on the completeness with which births and deaths were reported and recorded. Potentially the most serious data quality is the selective omission from birth histories of births that did not survive, which can lead to underestimation of mortality rates. Other potential problems include displacement of birth dates, which can cause a distortion of mortality trends, and misreporting of the age at death, which may distort the age pattern of mortality.

When selective omission of childhood deaths occurs, it is usually most severe for deaths in early infancy. If early neonatal deaths are selectively underreported, the result is an unusually low ratio of deaths under seven days to all neonatal deaths and an unusually low ratio of neonatal deaths to infant deaths (NCPD et al., 1999). Underreporting of early infant deaths is commonly observed for births that occurred longer before the survey; hence, it is useful to examine the ratios over time.

Inspection of these ratios (NCPD et al., 1999) indicates that no significant numbers of early infant deaths were omitted in the 1998 KDHS. First, the proportion of neonatal deaths occurring in the first week of life is high, 74 percent. Furthermore, this proportion is roughly constant over the twenty years before the survey (between 68 and 77 percent). Second, the proportion of infant deaths occurring during the first month is entirely plausible in level (42 percent), and is stable over the 20 years before the survey (varying between 39 and 46 percent). The inspection of the mortality data indicated that there was no evidence of selective underreporting of deaths or misreporting of age at death.

It is important to recognise that any method of measuring childhood mortality that relies on mothers' reports (e.g. birth histories) rests on the assumption that adult female mortality is not very high or, if it is high there is little or no correlation between the mortality risks of mothers and their children. In countries with high rates of adult female mortality, these assumptions will seldom hold and the resulting childhood mortality rates will be underestimated to some degree.

### 3.5 Methods of Data Analysis

#### 3.5.1 Introduction

The methods used in data analysis include frequency distributions, cross-tabulations and logistic regression method. The Statistical Package for Social Scientists (SPSS) was used for data analysis.

#### 3.5.2 Frequency Distribution

A frequency distribution is a function, each of a set of classes, paired with their frequencies. The distribution entails listing of classes: each paired with its frequency number and the number of cases in that category (Hays, 1973). Frequencies in this study are used to show the distribution of characteristics of live births. This gives a first level summary of the findings of the study. It also helps in determining the level of neonatal mortality in Kenya. Furthermore, it is the objective of the study to determine the level of neonatal mortality in the country.

#### 3.5.3 Cross-tabulation and Pearson's chi-square ($X^2$) test

The Pearson's chi-square is a statistic that is more often used to test whether row and column variables are statistically independent. In this study, the statistic was used to

determine the statistical significance of the association between neonatal mortality and categories of each of the selected variables:

- To determine whether these associations were statically significant, a chi-square test is undertaken.
- The chi-square is used to measure the extent of association as well as the statistical test of hypotheses that a relationship does not exit.
- The use of chi-square is to measure the hypothesis that two variables of a cross tabulation are independent.

The Pearson's chi-square is a statistic is calculated by summing over all the cells of the squared residuals by expected frequencies (Obwana, 1994).

$$X^2 = \sum \frac{(O_i - \mathrm{E}_i)^2}{\mathrm{E}_i}$$

Where, $O_I$: Refers to the observed frequency

$E_I$: Refers to the corresponding expected frequency obtained by assuming that the null hypothesis is true.

In computing $X^2$, several steps were followed as put below:

(i) The null hypothesis (Ho) was stated: The chi-square technique has been used to test the rule hypothesis that there is no relationship between the dependent and independent variables.

(ii) The level of significance at which the hypothesis is tested was specified. The chi-square test has been set at 0.05 levels for the entire cross tabulations in this study.

(iii) The degrees of freedom for an R x C table were worked out as (R-1) (C-1).

**(iv)** The null hypothesis (Ho) was rejected only when the calculated value of $X^2$ is equal to or more than the tabulated value of $X^2$ at the specified level of significance (i.e. 0.05), using the stated degrees of freedom.

In this study, the Pearson's chi-square test was used to find out whether or not a statistical significant relationship exists between the selected socio-economic, socio-cultural, demographic, environmental, maternal health care, child's bio demographic factors and neonatal mortality.

### 3.5.4 Logistic Regression Analysis

The study uses logistic regression analysis because the dependent variable is dichotomous, that is whether a child died or survived during the neonatal period; from the mathematical point of view, it is an extremely flexible and easily used function and it lends itself to a socially meaningful interpretation.

The odds ratio was used to measure the effect of the explanatory variables on the dependent variable. In this case the values change from negative to positive infinity. An odds ratio of value less than one represents a negative effect of the variable or variable category on neonatal mortality. A value greater than one shows a positive effect of the variable or variable category on neonatal mortality. The standard error was used to determine the accuracy of the regression equation. The error shows the standard deviation of the residuals thus indicating the extent to which the actual

values of the dependent variable can be expected to deviate from the expected predicted scores.

However, logistic regression method has some limitations. For instance when too many variables are fitted into the model, it may produce unstable estimates. Over fitting is typically characterized with unrealistically large estimated coefficients and or estimated standard errors. This may be especially troublesome in instances where the number of variables is very large relative to the number of subjects and or when the over all proportion responding (y =1) is close to either 0 or 1 (Hosmer and Lemeshaw, 1989). The study undertook to collapse such categories whenever they arose. At the same time, the magnitude of the estimates of the regression coefficient does not tell us which variable is more important than the other, in explaining the dependent variable.

# CHAPTER FOUR

# LEVEL AND DIFFERENTIALS IN NEONATAL MORTALITY

## 4.0 Introduction

In this chapter the results of frequency tables and cross-tabulation analysis are presented and discussed. Frequency distributions have been used to show the basic characteristics of the live births as well as determine the level of neonatal deaths at the national level. Cross-tabulation analysis has been used to assess the association between the dependent and each of the explanatory variables. It has been used to assess differentials of the dependent variable by the various explanatory factors included in the study.

The Chi-Square test has been used in the study to test the null hypothesis that there is no relationship between the dependent and each of the explanatory variables. The Chi-Square test has been set at 0.05 levels of significance for the entire cross tabulations in this study. If the significance level is greater than 0.05 then we accept the null hypothesis but if it is less than 0.05, we reject the null hypothesis and accept the alternative hypothesis, that there is a relationship between the dependent and the explanatory variables. In addition, the chapter contains a brief discussion of the basic characteristics of the 3453 live births that occurred in three years preceding the 1998 Kenya Demographic and Health Survey (KDHS).

## 4.1 Basic Characteristics of Study Population

Table 4.1 presents the basic characteristics of the study population. The results show that most of the births (74.6 per cent) belonged to households with unsafe water source (i.e. well, river, lake and stream) while the rest of the births (25.4%) had a safe source of water (pipe/tap water source). A higher percentage of the births (81.8 per

cent) belonged to households with better toilet facility while the rest of the births (18.2 percent) belonged to households that had none or used bush.

It is also evident that most of the births (72.5 percent) belonged to households with dung/mud/other types of floor material of the main dwelling unit while the rest of (27.5 percent) belonged to households with wooden/ tiled or cemented floors. The results show that 53.7 percent of the births were of between second and fifth birth order while 24.6 percent of the births were first order births. The rest 21.7 were of sixth and above, birth orders. The table also shows that most of the births (85.3 percent) belonged to mothers who were currently married. 9.2 percent were born of mothers who were never married while 5.5 percent of the births belonged to mothers who were formerly married (divorced, separated or widowed).

As regards parity (total children ever born) 57.2 per cent of the births belonged to mothers of between one and three children. About 27.3 per cent of the births belonged to mothers whose total children born (parity) ranged from four to six children while 15.5 percent of the births belonged to mothers with a total of seven children and above. Over half of the births (54.7 percent) belonged to mothers who were employed while the rest of the births (45.3 percent) belonged to mothers who were unemployed. The table further depicts that well over half of the births (97.0 percent) belonged to mothers whose partners were working while the rest (3.0 per cent of the births) had mothers with no working partners.

Rift Valley Province had the majority of births (28.5 per cent) among the eight provinces. This was followed by Nyanza (17.7 per cent), Coast (15.2 per cent), Eastern (13.8 per cent), Western (13.7 per cent), Central 7.8 per cent), Nairobi (3.3

per cent) in that order. It is also clear that majority of the births (85.0 per cent) belonged to mothers who resided in rural areas while the rest of the births (15.0 percent) had mothers living in urban centres.

The results show that majority of the births (63.9 percent) belonged to Protestant mothers. It is evident that 26.4 percent of the births belonged to mother who belonged to Catholic Church. About 9.6 percent of the births belonged to mothers of other religious groups. The majority of the births (36.3 percent) belonged to mothers of Kisii/Luhya and Luo ethnic Communities. Kalenjin and Maasai accounted for 20.7 percent of the live births while Kikuyu, Embu and Meru accounted for 18.2 of the births. Kamba and Other ethnic groups accounted for 10.4 and 14.4 percent, respectively.

Most births belonged to mothers who had attained primary incomplete level of education followed by those whose mothers had completed primary level of education. The rest of the births belonged to mothers who had attained secondary level of education and above, no education and secondary incomplete level of education in that order. It was established that ten percent of the births belonged to mothers aged below 20 years. 73.7 percent of the births belonged to mothers, aged between 20 years and 34 years while only 16.4 per cent of the births were born to mothers aged 35 years and above.

The findings show that 84.5 percent of the births were of average size and above while15.5 percent of the births were very small or small, in size at birth. The table also indicates that 50.8 percent of the births were males while 40.2 percent were females. The majority of the births (93.9 percent) belonged to mothers who had been

attended by a professional during pregnancy. 6.1 percent of the births belonged to mothers who received no professional care during pregnancy. It is also evident that 53.3 percent of the births had received professional assistance during delivery while 46.7 percent lacked professional assistance at birth. The table shows that 51.5 and 39.7 percent of the births were born to mothers who had received at least two injections and one injection, respectively, during pregnancy. About 8.8 percent of the births had mothers who had not received an injection during pregnancy.

The results indicate that 5.2 percent of the births had mothers not visiting antenatal care during pregnancy. About 91.4 percent of the births belonged to mothers who had made between two and eleven visits during pregnancy while about 3.5 percent of the births belonged to mothers who had made twelve visits and above. The majority of the births (69.6 percent) belonged to mothers who visited antenatal care within the second trimester. The rest 13.8 percent and 16.7 percent of the births belonged to mothers who visited antenatal care during the first and the third trimesters respectively. The findings support the view that antenatal care utilization in Kenya is high (NCPD et. al., 1999). The analyses show that majority of the births (60.4 percent) were born at home while 39.6 percent of the births were born at a health facility. This shows that despite the high level of utilization of antenatal care services, most women do not seek delivery care services from health facilities. This could be partly due to inaccessibility and quality of the services, particularly in rural areas where most health institutions lack basic facilities. Over ninety per cent of the births weighed less than 2.5 kilogram's at birth while only 0.7 per cent of the births weighed 2.5 kilogram's and above, at birth. It also evident that majority of births had a preceding birth interval of at least twenty four months while about twenty two per cent of the births had a preceding birth interval of less than twenty four months.

**Table 4.1: Percent distribution of live births that occurred in three years preceding the survey by selected background characteristics, Kenya, KDHS 1998.**

| Variable | Percentage | No. of Cases |
|---|---|---|
| **Source of water** | | |
| Other/river | 74.6 | 2561 |
| Tap/piped water | 25.4 | 873 |
| **Type of toilet facility** | | |
| Other/bush | 18.2 | 625 |
| Trad/vent/flush toilet | 81.8 | 2803 |
| **Floor Material of the main dwelling unit** | | |
| Other/Earth | 72.5 | 2489 |
| Wood/tile/cement | 27.5 | 942 |
| **Birth Order** | | |
| First Birth Order | 24.6 | 849 |
| 2nd – 5th birth order | 53.7 | 1854 |
| 6th + Birth Order | 21.7 | 749 |
| **Marital Status of the Mother** | | |
| Never married | 9.2 | 318 |
| Currently married | 85.3 | 294 |
| Formerly married | 5.5 | 191 |
| **Parity (total children ever born)** | | |
| 1-3 children | 57.2 | 1974 |
| 4–6 children | 27.3 | 944 |
| 7+ children | 15.5 | 535 |
| **Maternal Employment Status** | | |
| Not working for cash | 45.3 | 1563 |
| Working for cash | 54.7 | 1885 |
| **Paternal employment status** | | |
| Not working | 3.0 | 1563 |
| Working | 97.0 | 1885 |
| **Region of residence** | | |
| Nairobi | 3.3 | 115 |
| Central | 7.8 | 270 |
| Coast | 15.2 | 524 |
| Eastern | 13.8 | 476 |
| Nyanza | 17.7 | 611 |
| Rift valley | 28.5 | 984 |
| Western | 13.7 | 473 |
| **Type of place of residence** | | |
| Urban | 15.0 | 519 |
| Rural | 85.0 | 2934 |
| **Religion** | | |
| Catholic | 26.4 | 910 |
| Protestant | 64.0 | 2207 |
| Other | 9.6 | 329 |
| **Ethnicity** | | |
| Kisii/Luhya/Luo | 36.3 | 1253 |
| Kikuyu/Embu/Meru | 18.3 | 630 |
| Kamba | 10.4 | 360 |
| Kalenjin/maasai | 20.7 | 714 |
| Other | 14.4 | 496 |
| **Maternal Education** | | |
| No education | 11.7 | 405 |
| Primary incomplete | 38.2 | 1319 |
| Primary complete | 25.9 | 895 |
| Secondary incomplete | 9.2 | 318 |

**Table 4.1: Continued**

| Variable | Percentage | No. of Cases |
|---|---|---|
| Secondary complete+ | 14.9 | 516 |
| **Preceding birth Interval** | | |
| < 24 months | 22.3 | 578 |
| 24 + months | 77.7 | 2013 |
| **Maternal age at birth** | | |
| <20 years | 10 | 344 |
| 20-34 years | 73.7 | 2544 |
| 35 and above years | 16.3 | 565 |
| **Size of Child at birth** | | |
| Very small/small | 15.5 | 533 |
| Average/larger | 84.5 | 2902 |
| **Sex of child** | | |
| Male | 50.8 | 1544 |
| Female | 40.2 | 1496 |
| **Prenatal care provider** | | |
| Other/untrained | 6.1 | 1612 |
| Trained personnel | 93.9 | 1841 |
| **Delivery Assistance** | | |
| Other/untrained | 46.7 | 1612 |
| Trained personnel | 53.3 | 1841 |
| **Tetanus toxoid Injection** | | |
| No injection | 8.8 | 302 |
| Had one injection | 39.7 | 1366 |
| Two injections + | 51.3 | 1771 |
| **Freq. Of ANC visits** | | |
| No visits | 5.3 | 178 |
| 1-11 visits | 91.4 | 3155 |
| 12 visits + | 3.5 | 120 |
| **Timing for ANC Visits** | | |
| 1-3 months | 13.8 | 450 |
| 4- 6 months | 69.6 | 2271 |
| 7-9 months | 16.7 | 544 |
| **Place of Delivery** | | |
| Other /home | 60.4 | 2087 |
| Health facility | 39.6 | 1366 |
| **Birth weight** | | |
| < 2.5 kg | 99.3 | 1487 |
| 2.5 kg + | 0.7 | 11 |
| **Child Survival Status at exact age 30 days** | | |
| Alive | 97.1 | 3354 |
| Dead | 2.9 | 99 |
| Total | 100 | 3453 |

**Source: Computed from 1998 KDHS data**

## 4.2 Level of Neonatal Mortality

The findings (Table 4.1) indicate that 2.9 per cent (28.7 per 1000) of the live births died during the neonatal period. The findings address the first objective of the study that sought to determine the level of neonatal mortality in Kenya. According to NCPD (1999) mortality situation has worsened over years with 1993 and 1998 DHS data sets indicating a neonatal mortality level of 25.5 per 1000 live births estimated for 5-9 years, 28.4 deaths per 1000 live births, for 0-4 years, and 28.8 deaths per 1000 live births, for 10-14 years preceding the survey.

## 4.3 Differentials in Neonatal Mortality

### 4.3.1 Neonatal Mortality and Number of Antenatal Care visits

Table 4.2 presents the results of cross tabulation between neonatal mortality rate and each of the selected explanatory variables. The findings show that the level of neonatal mortality decreases with increase in the number of visits. Highest level of neonatal mortality occurred among births whose mothers had made no visits in pregnancy, followed by births whose mothers made between one and eleven visits while the lowest level of mortality occurred among those to mothers who had made twelve and above visits during pregnancy.

However, the chi-square test shows that the relationship between neonatal mortality and the number of antenatal care visits was not statistically significant. The finding does not conform to the hypothesized relationship between neonatal mortality and number of antenatal care visits.

### 4.3.2 Neonatal Mortality and Timing of Antenatal Care visits

The results show that the level of neonatal mortality was highest among births whose mothers made their first antenatal care visit during the first trimester. This was followed by those whose mothers made the first visit during the second trimester while the lowest level of neonatal mortality occurred to those whose mothers made the first during the third trimester.

However, the Chi-Square test of the relationship between neonatal mortality and timing of the first antenatal care visit in pregnancy is not statistically significant. Studies have shown that the timing of an antenatal check is important because some pregnancy related problems, if not diagnosed and treated early, may endanger the life

**Table 4.2: Differentials in Neonatal Mortality, Kenya, KDHS, 1998**

| Variable Name | Number Surviving | Number Dead | Neonatal Mortality Rate | Number of Cases |
|---|---|---|---|---|
| **ANC visits** | | | | |
| None | 168 | 10 | 56.2 | 178 |
| 1-11 Visits | 3068 | 87 | 27.6 | 3155 |
| 12+ visits | 118 | 2 | 16.7 | 120 |
| | $\chi^2$ = **5.594** | **DF = 2** | **P= 0.061** | |
| **Timing for ANC** | | | | |
| First trimester | 435 | 15 | 33.3 | 450 |
| Sec. Trimester | 2209 | 62 | 27.3 | 2271 |
| Third Trimester | 532 | 12 | 22.1 | 544 |
| | $\chi^2$ = **1.181** | **DF = 2** | **P= 0.55** | |
| **Place of Delivery** | | | | |
| Home | 2026 | 61 | 29.2 | 2087 |
| Health facility | 1328 | 38 | 27.8 | 1366 |
| | $\chi^2$ = **0.059** | **DF= 1** | **P= 0.808** | |
| **Tet. Injection** | | | | |
| None | 286 | 16 | 53.0 | 302 |
| One injection | 1326 | 40 | 29.4 | 1366 |
| Two injections | 1728 | 43 | 24.3 | 1771 |
| | $\chi^2$ = **7.621** | **DF= 2** | **P= 022** | |
| **ANC Provider** | | | | |
| None/Untrained | 199 | 11 | 52.4 | 210 |
| Trained provider | 3155 | 88 | 27.1 | 3243 |
| | $\chi^2$ = **4.514** | **DF= 1** | **P= 0.034** | |
| **Delivery assistant** | | | | |
| None/untrained | 1563 | 49 | 30.4 | 1612 |
| Trained assistant | 1791 | 50 | 27.2 | 1841 |
| | $\chi^2$ = **0.324** | **DF= 1** | **P= 0.569** | |
| **Water source** | | | | |
| River/lake/other | 2479 | 82 | 32.0 | 2561 |
| Piped | 856 | 17 | 19.5 | 873 |
| | $\chi^2$ = **3.660** | **DF= 1** | **P= 0.056** | |
| **Toilet facility** | | | | |
| None/bush | 602 | 23 | 36.8 | 625 |
| Pit/Flush toilet | 2727 | 76 | 27.1 | 2808 |
| | $\chi^2$ = **1.710** | **DF= 1** | **P= 0.191** | |
| **Floor material** | | | | |
| Earth/dung | 2408 | 81 | 32.5 | 2489 |
| Cement/tile/wood | 924 | 18 | 19.1 | 942 |
| | $\chi^2$ = **4.402** | **DF = 1** | **P = 0.036** | |
| **Birth order** | | | | |
| First birth | 818 | 31 | 36.5 | 849 |
| $2^{nd}$ – $5^{th}$ birth | 1817 | 37 | 20.0 | 1854 |
| $6^{th}$ birth + | 718 | 31 | 41.4 | 749 |
| | $\chi^2$ = **11.277** | **DF = 2** | **P = 0.004** | |
| **Marital Status** | | | | |
| Never married | 306 | 12 | 37.7 | 318 |
| Current married | 2867 | 77 | 26.6 | 2944 |
| Former married | 181 | 10 | 52.4 | 191 |
| | $\chi^2$ = **5.455** | **DF = 2** | **P = 0.065** | |

**Table 4.2: Continued**

| Variable Name | Number Surviving | Number Dead | Neonatal Mortality Rate | Number of Cases |
|---|---|---|---|---|
| **Parity (CEB)** | | | | |
| 1-3 children | 1927 | 47 | 24 | 1974 |
| 4-6 children | 920 | 24 | 25.4 | 944 |
| 7+ children | 507 | 28 | 52.3 | 535 |
| | $\chi 2 =$ **12.792** | **DF = 2** | **P = 0.002** | |
| **Part. Occup.** | | | | |
| Not working | 89 | 5 | 53.2 | 94 |
| Working | 2940 | 82 | 27.1 | 3022 |
| | $\chi 2 =$ **2.281** | **DF = 1** | **P = 0.131** | |
| **Mat.occupation** | | | | |
| Not working | 1515 | 48 | 30.7 | 1563 |
| Working | 1834 | 51 | 27.1 | 1885 |
| | $\chi 2 =$ **0.409** | **DF = 1** | **P = 0.522** | |
| **Region** | | | | |
| Nairobi | 114 | 1 | 8.7 | 115 |
| Central | 264 | 6 | 22.7 | 270 |
| Coast | 510 | 14 | 26.7 | 524 |
| Eastern | 458 | 18 | 37.8 | 476 |
| Nyanza | 587 | 24 | 39.3 | 611 |
| R. Valley | 957 | 27 | 27.4 | 984 |
| Western | 464 | 9 | 19.0 | 473 |
| | $\chi 2 =$ **7.654** | **DF = 6** | **P = 0.265** | |
| **Place of Reside.** | | | | |
| Urban | 508 | 11 | 21.2 | 519 |
| Rural | 2846 | 88 | 30.0 | 2934 |
| | $\chi 2 =$ **1.226** | **DF = 1** | **P = 0.268** | |
| **Religion** | | | | |
| Protestant | 880 | 30 | 33.0 | 910 |
| Catholic | 2147 | 60 | 27.2 | 2207 |
| Other | 320 | 9 | 27.4 | 329 |
| | $\chi 2 =$ **0.796** | **DF = 2** | **P = 0.672** | |
| **Ethnicity** | | | | |
| Luo/Kisii/Luhya | 1215 | 38 | 30.3 | 1253 |
| Kikuyu/embu/meru | 618 | 12 | 19.0 | 630 |
| Kamba | 341 | 19 | 52.8 | 360 |
| Kalenjin/Maasai | 695 | 19 | 26.6 | 714 |
| Other | 482 | 11 | 22.3 | 493 |
| | $\chi 2 =$ **10.546** | **DF = 4** | **P = 0.032** | |

**Table 4.2: Continued**

| Variable Name | Number Living | Number Dead | Neonatal Mortality | Number of Cases |
|---|---|---|---|---|
| **Educ. Level** | | | | |
| None | 391 | 14 | 34.6 | 405 |
| Pry.incomplete | 1274 | 45 | 34.1 | 1319 |
| Pry. Complete | 869 | 26 | 29.0 | 895 |
| Sec.incomplete | 308 | 10 | 31.4 | 318 |
| Sec.Complete+ | 512 | 4 | 7.8 | 516 |
| | $\chi 2 =$ **10.11** | **DF = 4** | **P = 0.039** | |
| **Age** | | | | |
| < 20 years | 325 | 19 | 52.2 | 344 |
| 20 – 34 years | 2484 | 60 | 23.6 | 2544 |
| 35 years + | 545 | 20 | 35.4 | 565 |
| | $\chi 2 =$ **11.996** | **DF = 2** | **P = 0.002** | |
| **Size of child** | | | | |
| Small | 501 | 302 | 60.0 | 533 |
| Average/larger | 2839 | 63 | 21.7 | 2902 |
| | $\chi 2 =$ **24.599** | **DF = 1** | **P = 0.000** | |
| **Sex** | | | | |
| Male | 1506 | 38 | 24.6 | 1544 |
| Female | 1463 | 33 | 22.1 | 1496 |
| | $\chi 2 =$ **0.217** | **DF = 1** | **P = 0.641** | |
| **Birth weight** | | | | |
| < 2.5 Kg | 1474 | 24 | 16.1 | 1487 |
| 2.5 Kg + | 11 | 0 | 0 | 11 |
| | $\chi 2 =$ **0.180** | **DF = 1** | **P = 0.671** | |
| **Prec. Interval** | | | | |
| < 24 months | 559 | 19 | 32.9 | 578 |
| 2 4+ months | 1967 | 46 | 22.9 | 2013 |
| | $\chi 2 =$ **1.844** | **DF = 1** | **P = 0.175** | |
| **Total** | **3354** | **99** | **28.7*** | **3453** |

**Source: Computed from1998 KDHS data**

***: Neonatal mortality rate, at the National Level.**

of the mother and the unborn baby. Antenatal care is most effective if the visits are started early and continued at regular intervals through out the pregnancy (NCPD, et al. 1994). The observed pattern in the level of neonatal deaths by timing of first antenatal visit could be explained by the fact that despite the high level of antenatal care utilization in Kenya, relatively few births had their mothers attending antenatal care within the first trimester.

### 4.3.3 Neonatal Mortality and Type of Place of Delivery

The results indicate that there is no major difference in the level of neonatal deaths by type of place of delivery. The level of neonatal mortality for births delivered at a health facility and at home was 27.8 and 29.2 deaths per 1000 live births, respectively. The relationship between neonatal mortality and place of delivery was not statistically significant. This is indicated by the Chi-Square test. Luther et al. (1999) are of the view that primarily mothers with anticipated or emergency medical problems deliver at medical institutions and that such problems are sufficiently acute that delivery away from home does not counteract the disadvantages that most mothers start with.

### 4.3.4 Neonatal Mortality and Tetanus Toxoid Injection in pregnancy

The highest level of neonatal mortality occurred to births whose mothers did not receive tetanus toxoid injection in pregnancy. Those that had received one and at least two injections in pregnancy followed, in that manner. The relationship between neonatal mortality and tetanus injection was found to be statistically significant.

WHO (1986) recommends that a pregnant woman should receive two doses of tetanus toxoid vaccine, given one month apart, during mid-term of her pregnancy. If the

mother received two doses less than three years earlier during a previous pregnancy, a single booster is adequate.

### 4.3.5 Neonatal Mortality and Type of prenatal care provider

A higher level of neonatal mortality occurred among births whose mothers were attended by untrained personnel during pregnancy than for those whose mothers were attended by trained personnel. The association was found to be statistically significant indicating that neonatal mortality is significantly associated with the type of care received during pregnancy. The results are consistent with the expectations of the study that neonatal mortality vary significantly by type of prenatal care.

This shows that there is a high likelihood that being attended by a trained personnel increases the chances that one will receive tetanus immunization among other services that has been found to protect the new born against neonatal tetanus. According to N.C.P.D et al., (1999) an important component of antenatal care in Kenya is ensuring that pregnant women, and children are adequately protected against tetanus.

### 4.3.6 Neonatal Mortality and Type of Delivery Assistant

Births that were assisted by untrained personnel experienced a higher level of neonatal mortality than those that were assisted by trained personnel. However, the difference was quite minimal. The Chi-Square test shows that neonatal mortality is not significantly associated with the type of assistance that the mother received during delivery. These findings are inconsistent with the hypothesised relationship between neonatal mortality and type of assistance during delivery.

### 4.3.7 Neonatal Mortality and Source of Water

Births to households with unsafe water supply (e.g. River, lake) had higher level of neonatal mortality than those belonging to households with a safe source of water (e.g. Piped). However, the chi-square test shows that the relationship between neonatal mortality and source of water is not statistically significant. These results are inconsistent with earlier studies that have found a significant relationship between neonatal mortality and source of water. This finding is in line with held view that neonatal mortality is mainly as a result of endogenous factors.

### 4.3.8 Neonatal Mortality and Toilet Facility

A higher level of neonatal mortality occurred to births from households without a toilet facility or used bush than those from households with a toilet facility. However, the chi-square test shows that the relationship between neonatal deaths and toilets facilities is not statistically significant. Furthermore the finding contradicts the hypothesised relationship between neonatal mortality and toilet facility.

### 4.3.9 Neonatal Mortality and Floor Material of the main dwelling unit

It is evident that a higher level of neonatal mortality occurred in households with poor floor material (mud, dung etc.) than to those with improved material (i.e. made of wood, tile or cement). The chi-square test shows that there is a statistically significant relationship between neonatal mortality and type of floor material. This observation is in conformity with the study hypothesis relating the households' floor material of the main dwelling unit and neonatal mortality.

### 4.3.10 Neonatal Mortality and Birth order

Higher order births (sixth and above), experienced the highest level of neonatal mortality, followed by First births while the lowest level neonatal mortality occurred to births between the second and fifth birth orders. The chi-square test shows that the association between neonatal mortality and birth order is statistically significant. The finding is quite consistent with the study expectation.

### 4.3.11 Neonatal Mortality and Marital status of the mother

The highest level of neonatal mortality occurred among births to whose mothers were formerly married, followed by those to mothers who were never married while the lowest mortality level was experienced by to the currently married. However the chi-square test shows that the relationship between neonatal mortality and marital status is not statistically significant, hence invalidating the study expectation.

### 4.3.12 Neonatal Mortality and Parity (total children ever born)

The results show that the level of neonatal mortality increased with increase in the total number of children one had. The highest level of neonatal mortality occurred among births to mothers with seven children or more. This was followed by births to women with between four to six children while the lowest level of neonatal mortality was realized among women with between one and three children. The chi-square test shows that there is a statistically significant relationship between neonatal mortality and total children even born (parity).

### 4.3.13 Neonatal Mortality and Paternal Employment

A higher level of neonatal Mortality occurred to mothers whose partners were not working for cash as compared to those belonging to mothers whose partners were

working for cash. However, the chi-square test shows that the relationship between neonatal mortality and employment status of the mother's partner is not statistically significant. This means that despite the difference in the level of neonatal mortality by employment status of the mothers' partners, there are other factors that better explain the phenomenon.

### 4.3.14 Neonatal mortality and Maternal Employment

An analysis of neonatal mortality by maternal employment status reveals that a higher level of neonatal mortality occurred among births to mothers not working for cash than to those working for cash. However, the relationship between neonatal mortality and employment status of the mothers is not statistically significant. This finding disapproves the hypothesised relationship.

### 4.3.15 Neonatal Mortality and Region of Residence

Most neonatal deaths occurred in Nyanza Province while the lowest was Nairobi. The second highest occurred in Eastern, followed by Rift Valley, Coast, Central and Western provinces, in that order.

However, the chi-square test shows that the relationship between neonatal mortality and region of residence is not statistically significant. This finding is in contradiction with the hypothesis that neonatal mortality varies significantly by region of residence. The observed differences in neonatal mortality by region of residence, though statistically insignificant, reflect possible differences in the socio-economic development of the provinces.

### 4.3.16 Neonatal Mortality and Type of place of residence

The results show that births to mothers residing in the rural areas experienced higher neonatal mortality compared to those of mothers residing in the urban areas. This means that mothers living in the urban areas can easily access the use of health services that has been associated with higher chances of child survival during the neonatal period. However, the chi-square test shows that the association between neonatal mortality and the type of place of residence is not statistically significant. The finding is inconsistent with the study expectation.

### 4.3.17 Neonatal Mortality and Religious affiliation of the mother

The highest level of neonatal mortality occurred to mothers who belonged to the protestant churches, followed by those of 'other' religious groups while the lowest level of neonatal mortality occurred among births to those that belonged to the Catholic Church. However, the chi-square test shows that the relationship between neonatal mortality and religion of the mothers is not statistically significant, thus contrary to the study expectation.

### 4.3.18 Neonatal Mortality and Ethnicity

As regards ethnicity, the highest level of neonatal mortality occurred among the Kamba ethnic group, followed by the Luhya, Luo and Kisii category, Kalenjin and Maasai, 'Other' ethnic groups while the Kikuyu, Embu and Meru category, in that order.

The chi-square test shows that the association between neonatal mortality and ethnicity is statistically significant. The finding is consistent with the expectation of the study as well as other studies that have found a similar relationship.

### 4.3.19 Neonatal Mortality and Maternal Education Level

The highest level of neonatal mortality occurred to mothers who had never gone to school while the lowest level occurred among births to mothers who had at least completed secondary level of educational attainment. The second highest level of neonatal occurred among births to mothers who had not completed the primary level, followed by those to who had not completed secondary level, and to those who had completed primary level of educational attainment, in that manner. The results of the chi-square test indicate that the association between neonatal mortality and maternal educational attainment is statistically significant. The finding is in conformity with hypothesised relationship between neonatal mortality and maternal educational attainment.

### 4.3.20 Neonatal Mortality and Maternal Age at birth

The study findings indicate that the highest level of neonatal mortality occurred among births to mothers aged below twenty years followed by births to those aged thirty-five years and above. The lowest level of neonatal mortality occurred to births to mothers aged between twenty and thirty four years. There is an indication that births to mothers aged below twenty years (adolescent age group) as well as to those who are thirty years and above are at a relatively higher risk of death as compared to those of mothers aged between twenty and twenty nine years.

The chi-square results indicate that the relationship between neonatal mortality and age of the mother at birth is statistically significant. The finding confirms the study hypothesis that neonatal mortality is significantly associated with maternal age at birth.

### 4.3.21 Neonatal Mortality and Size of child at birth

Births reported as being very small or small at birth experienced a higher level of neonatal mortality than to those reported as being of average and above, in size at birth. The chi-square test shows that the relationship between neonatal mortality and size of child at birth is statistically significant. The findings show that there is a relationship between size of child at birth and weight at birth where by small or smaller than average size at birth could be compared to low birth weight, which has been associated with neonatal mortality in many studies.

### 4.3.22 Neonatal Mortality and Sex of child

Male births experienced a higher level of neonatal mortality than female births. However, the chi-square test shows that the relationship between neonatal mortality and sex of child is not statistically significant. Furthermore, the finding disapproves the hypothesised relationship.

### 4.3.23 Neonatal Mortality and Birth weight

The results show that a higher level of neonatal mortality occurred among births weighing below 2.5 kilogram's as compared to those that weighed 2.5-kilograms and above. However, the relationship between neonatal mortality and birth weight is not statistically significant. This finding could be attributed to the fact that well over half

of the total births that occurred in the three years preceding the survey had missing information as regards birth weight.

### 4.3.24 Neonatal Mortality and Preceding Birth Interval

The analysis results show that the highest level of neonatal mortality occurred to births with a preceding birth interval of less than twenty-four month while the lowest level of neonatal mortality occurred among births with a preceding birth interval of at least twenty-four months. However, the chi-square results indicate that relationship between neonatal mortality and preceding birth interval is not statistically significant. This finding is in contradiction with the expectation of the study.

# CHAPTER FIVE

# EFFECT OF UTILIZATION OF MATERNAL HEALTH CARE SERVICES ON NEONATAL MORTALITY

## 5.0 Introduction

In this chapter, the results of multivariate logistic regression analysis are presented and discussed. Basically, the chapter is concerned with an investigation on the effect of utilisation of maternal health care services on neonatal mortality in Kenya. In the previous chapter it is evident that there are differentials in neonatal mortality by the selected variables but it is not clear how utilisation of maternal health care services influences the differentials.

The enter Method of variable selection was applied. In this method, all the coefficients of the model are retained irrespective of their significance in influencing the outcome variable. The method tends to force all the variables into the equation regardless of their significance in explaining the outcome variable. This is important in the study since some study variable(s) will be observed at various stages of model building despite their being insignificant in the bivariate analysis. As stated earlier, the analysis consist of 3453 live births in three years preceding the survey, of which 99 died during the neonatal period.

## 5.1 Logistic Regression Results

The results (Table 5.1) indicate that the effect of having received at least two tetanus toxoid injections in pregnancy on neonatal mortality is statistically significant at 99 percent, confidence level. The immunization reduces neonatal mortality by 66 percent, relative to the reference category (i.e. the not immunized). It is also evident that receipt of one tetanus toxoid injection in pregnancy has a statistically significant

effect on neonatal mortality at 95 percent, confidence level. The injection suppresses neonatal mortality by 46 percent, relative to the reference category. The finding is consistent with the previous studies that have found a significant effect of tetanus toxoid injection on neonatal mortality. The finding also confirms the hypothesized relationship that having received at least two tetanus toxoid injections in pregnancy has a significant negative effect on neonatal mortality.

**Table 5.1: Parameter Estimates and Standard Errors for the Gross Effect of Utilization of Maternal Health Care factors on neonatal Mortality, Kenya, KDHS 1998**

| Variable Name | Log Odds (B) | S.E (B) | Odds Ratio Exp. (B) |
|---|---|---|---|
| **Tetanus Injection** | | | |
| No Injection (Ref.) | 0.0000 | | 1.0000 |
| One Injection | - 0.6198** | 0.3036 | 0.5380 |
| Two Injection+ | - 0.8148*** | 0.3031 | 0.4427 |
| **Place of Delivery** | | | |
| Home/other (Ref.) | 0.0000 | | 1.0000 |
| Health Facility | 0.0240 | 0.2126 | 1.0242 |
| **Significance of constant = 0.000** | | **S.E of Constant = 0.2624** | |

**Source: Computed from 1998 KDHS data**

**NOTE**

**: Significant at 95 per cent confidence level

***: Significant at 99 per cent confidence level

Ref.: Reference category

Introduction of control proximate mortality determinants (Table 5.2) changes the relative odds of all the categories of the maternal health care factors. The effect of having received at least two tetanus toxoid injections in pregnancy on neonatal mortality declines from being statistically significant at 99 per cent to 95 per cent, confidence level. The protective effect conferred to the neonate against the risk of death changes from 66 percent in the previous model to 51 per cent in the current model, relative to the reference category.

Similarly, the effect of one tetanus toxoid injection on neonatal mortality drops from being statistically significant at 95 per cent to 90 per cent, confidence level. The suppressive effect conferred to the neonate by receiving the injection changes from 46 per cent in the preceding model, to 37 per cent in current the model, relative to the reference category.

**Table 5.2: Parameter Estimates and Standard Errors for the Effects of Utilization Maternal Health Care factors on neonatal Mortality adjusting for Proximate Factor(s), Kenya, KDHS 1998.**

| Variable Name | Log Odds (B) | S.E (B) | Odds Ratio Exp. (B) |
|---|---|---|---|
| **Tetanus Injection** | | | |
| No Injection (Ref.) | 0.0000 | | 1.0000 |
| One Injection | - 0.4679* | 0.3128 | 0.6263 |
| Two Injections+ | -0.7235** | 0.3153 | 0.4850 |
| **Place of Delivery** | | | |
| Home/other (Ref.) | 0.0000 | | 1.0000 |
| Health facility | 0.0368 | 0.2184 | 1.0375 |
| **Size of child** | | | |
| Small (Ref.) | 0.0000 | | 1.0000 |
| Average/Larger | -1.0170*** | 0.2239 | 0.3617 |

**S.E of constant = 0. 3007 Significance of constant = 0. 000**

**Source: Computed from 1998 KDHS data**

**NOTE**

*: Significant at 90 per cent level of significance

**: Significant at 95 per cent level of significance

***: Significant at 99 per cent level of significance

Ref.: Reference category

The changes observed with the introduction of the control variable, particularly with respect to tetanus toxoid immunization in pregnancy, whose changes were substantial; indicate that the size of child at birth partially explains the effect of utilization of the health care services on neonatal mortality. It is possible that births to immunized mothers were reported to be of average and above in size at birth. Equally, births reported as average and above in size at birth could share an advantage of being delivered at a health facility. It could also be possible that the health care factors operate through the size of child at birth (i.e. a biological factor) to influence child survival during the neonatal period. The size of child could also be a reflection of the socioeconomic status of the mother that has been associated use of the health care services (Owino 2000; Luther et. al., 1998,1999; Magadi 1999; Meegama 1980).

Introduction of background socioeconomic and demographic control variables (maternal education, ethnicity, floor material of the main dwelling unit and total children ever born), in the full multivariate model (Table 5.3), indicate substantial shifts in the relative risk estimates of some of the categories of the study variables. The effect of receipt of at least two tetanus toxoid injections in pregnancy on neonatal mortality remains statistically significant at 95 per cent, confidence level, as in the preceding model. However, its protective effect on the neonate reduced from 51 per cent in the preceding model to 48 per cent, relative to the reference category. The findings confirm the study expectation that receipt of tetanus toxoid injection in pregnancy has a significant reducing effect on neonatal mortality. The findings show that the control factors operate through health care factors to influence neonatal mortality.

The utilization of maternal health care services has been linked with the social status of the mother a product of her socioeconomic conditions such as educational level (Owino, 2000; NCPD et al., 1998; Meegama, 1980; Luther et al., 1998 1999). For instance, maternal educational level influences her level of understanding of hygiene and care, and prenatal care clinic attendance; to know whether pregnancy would be difficult or whether mother is anemic. Furthermore, the results are consistent with the World Health Organization recommendations (WHO 1986) that a pregnant woman should receive two doses of tetanus toxoid vaccine one month apart, during mid-term of her pregnancy. At the same time, if mother received two doses less than three years earlier during a previous pregnancy, a single booster is adequate.

**Table 5.3: Parameter Estimates and Standard Errors for the Effect of Utilization Maternal Health Care factors on Neonatal mortality, adjusting for both Proximate and Background factors, Kenya, KDHS, 1998**

| Variable Name | Log Odds (B) | S.E (B) | Odds Ratio Exp (B) |
|---|---|---|---|
| **Tetanus Injection** | | | |
| No Injection (Ref.) | 0.0000 | | 1.0000 |
| One Injection | - 0.4048 | 0.3177 | 0.6671 |
| Two Injections+ | - 0.6590** | 0.3210 | 0.5174 |
| **Place of Delivery** | | | |
| Home/other (Ref) | 0.0000 | | 1.0000 |
| Health facility | 0.4154* | 0.2391 | 1.5149 |
| **Size of Child** | | | |
| Small/v. small (Ref.) | 0.0000 | | 1.0000 |
| Average/larger | 1.0057*** | 0.2282 | 0.3658 |
| **Parity** | | | |
| 1-3 children (Ref.) | 0.0000 | | 1.0000 |
| 4 - 6 children | 0.1143 | 0.2645 | 1.1211 |
| 7 children + | 0.8120*** | 0.2728 | 2.2523 |
| **Ethnicity** | | | |
| Kisii/Luhya/luo (Ref.) | 0.0000 | | 1.0000 |
| Kikuyu/Embu/Meru | -0.3828 | 0.3623 | 0.6820 |
| Kamba | 0.6260** | 0.3063 | 1.8702 |
| Kalenjin/Masai | -0.2337 | 0.2971 | 0.7916 |
| Other | -0.1851 | 0.3713 | 0.8310 |

**Table 5.3: continued**

| Variable | Log Odds | S.E | Odds Ratio |
|---|---|---|---|
| **Maternal educ. Level** | | | |
| No Education (Ref.) | 0.0000 | | 1.0000 |
| Primary incomplete | 0.1806 | 0.3477 | 1.1979 |
| Primary complete | 0.0528 | 0.3818 | 1.0543 |
| Secondary incomplete | 0.1879 | 0.4685 | 1.2067 |
| Secondary complete + | - 1.0558* | 0.6243 | 0.3479 |
| **Floor material** | | | |
| Earth/other (Ref.) | 0.0000 | | 1.0000 |
| Cement/wood/tile | - 0.3323 | 0.2892 | 0.7172 |

**S.E of Constant = 0. 4714 Sign. of Constant = 0. 000**

**Source: Computed from 1998 KDHS data**

**Note**

*: Significant at 90 percent confidence level.

**: Significant at 95 percent confidence level.

***: Significant at 99 percent confidence level.

Ref.: Reference Category

# CHAPTER SIX

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 6.0 Introduction

The study examined the extent to which utilization of maternal health services influences neonatal mortality in Kenya. Earlier studies on neonatal mortality have been based on data generated from hospitals. On the other hand, the current study is based on a community data set that might be more representative of the Kenyan situation.

Neonatal mortality refers to the probability of dying between birth and exact one month. Maternal health care services essentially consist of prenatal examinations (type of prenatal care), administration of tetanus toxoid vaccinations, delivering in a health facility and professional assistance in delivery.

Establishing the effect of utilization of these services on neonatal mortality is useful particularly for policy makers to facilitate in designing appropriate and adequate interventionist measures. Such action is possible only when the effects of these factors are identified. Moreover, the utilization of maternal health services has implications for not only the mother's health, but also for child health and survival.

In order to achieve the study objectives, data from the Kenya demographic and health survey of 1998(KDHS 1998 dataset) were used. Data analysis entailed both bivariate and multivariate approaches. In addition, frequency distributions came in handy to provide a summary description of the study population in terms of its basic characteristics.

## 6.1 Summary of Findings

To address the first objective of the study, a frequency distribution of the outcome variable was conducted. The findings indicate that the 2.9 percent (28.7 deaths per 1000 live births) of the live births that occurred three years preceding the survey died during the neonatal period. This mortality rate is relatively high given that infant mortality rate in the country is estimated at 74 deaths per 1000 live births (NCPD et. al. 1999).

To meet the second objective cross tabulation and chi square test was undertaken. The results showed that factors significantly related to neonatal mortality include receipt of tetanus toxoid injection, type (choice) of prenatal care, size of child at birth, total children ever born (parity), birth order, maternal age at birth, type of floor material of main dwelling unit, maternal educational attainment and ethnicity. The findings demonstrate that programmatic interventions should target both the preventive health care services as well as socio-economic and demographic factors for an attainment of better newborn survival.

The third objective sought to determine the relative effect of utilization maternal health care factors (i.e. tetanus toxoid injection in pregnancy and type of place of delivery) on neonatal mortality. To accomplish the objective, multivariate logistic regression analysis using the enter method of variable selection was employed. The findings indicate that receipt of at least two tetanus toxoid injections by the mother, during pregnancy has a statistically significant suppressive effect on neonatal mortality, relative to the reference category. It is also evident that delivery at a health facility substantially raises the risk of neonatal mortality, relative to the reference

category, after adjusting for the various socio-economic and demographic explanatory variables.

### 6.1.1 Conclusion

The results indicated that the level of neonatal mortality stands at 28.7 deaths per 1000 live births. The risk of neonatal mortality was found to vary significantly by maternal educational attainment, parity (total children ever born), birth order, size of child at birth, floor material of the main dwelling unit, tetanus toxoid injection, type of prenatal care provider and ethnicity.

Among health care interventions receipt of at least two tetanus injections in pregnancy has a significant effect in reducing neonatal mortality. Family health programs, therefore, should be strengthened to provide this basic health care service to all pregnant women. Surprisingly, delivery at a health facility showed a statistically significant positive effect on neonatal mortality, after adjusting for the various socio-economic and demographic control variables in the analysis. This could be a reflection of the selective nature in use of delivery services by mothers such that it is mostly those with or anticipate delivery complications that seek delivery in health facilities. It is also true that poor socio-economic position could discourage one from seeking the service and only seek it when complications develop; sometimes so acute that delivery in the facility does not counteract the complications the mothers start with. The findings are consistent with studies obtained elsewhere (Luther et al., 1998, 1999; Jain et al., 1988). This study, therefore, calls for an improvement in the socio-economic conditions of women that has been associated with utilization of maternal health care services.

As regards the control variables, size of child at birth, maternal educational attainment, being Kamba, and being born to mothers with seven and above, total children ever born, have statistically significant relative effect on neonatal mortality. This implies that to adequately address the question of child survival, particularly during the neonatal period, the factors warrant some attention.

### 6.2 Recommendations

The results of this study have important implications both for the improvement of child survival chances during the neonatal period as well as for further research.

#### 6.2.1 Recommendations for policy

The study established that receipt of at least two tetanus toxoid infections in pregnancy significantly reduces neonatal mortality. This study, therefore, recommends that Family health programmes be strengthened to provide this basic health care service to all pregnant women. Pregnant women should receive at least two tetanus toxoid injections to significantly protect the newborn from the neonatal tetanus, a risk factor to new-borns.

With regard to the type of place of delivery, the study showed that delivering at a health facility positively influences neonatal mortality. The findings were quite inconsistent with the expectations of the study but with studies done elsewhere. This could be attributed to the fact that in Kenya like in other developing countries the apparent advantage of delivering in a health facility is due mostly to the influence of other socio-economic factors, with place of delivery acting as proxy. This study, therefore, recommends that programmes aim at improving the socio-economic status

of women that has been associated with use of health services in general and delivery services, in particular.

The study recommends that obstetrics units at hospitals should be established or strengthened, and the quality of skills upgraded. Health care planners should adequately address the question of quality, accessibility and affordability of maternal and child health services with a view to improve the survival chances of the newborn. Policy makers should appreciate the important role that could be played by interventions such as tetanus toxoid immunisation of all pregnant women and delivery in a health facility. Furthermore, professional providers such as midwives can provide some basic care through outreach to women in their homes.

The findings indicate that births to women who are attended by trained personnel during pregnancy were less likely to die during the neonatal period. This could be attributed to the fact that women attended by trained personnel (i.e. doctors, nurses/midwives as well as trained traditional birth attendants) were more likely to receive adequate health information in terms of nutritional and general personal care in pregnancy. It is also among this group that high-risk pregnancies could be detected and cases of anaemia identified. This study, therefore, recommends that pregnant women should be advised to seek antenatal care from trained personnel to ensure a healthy pregnancy and childbirth.

The results indicated that births to young mothers (i.e. below 20 years old) were more likely to die during the neonatal period. This could be explained in terms of the physiological immaturity of the mothers as well as the general lack of appropriate information on motherhood. The study recommends that the community and the

family in particular should be enlightened on the dangers associated with early pregnancies, particularly neonatal mortality.

As regards size of child at birth, births reported by their mothers, as very small or small were more likely to die during the neonatal period. This could partly reflect the nutritional and general health status of the mothers during pregnancy such that poor health status could most likely result to the poor pregnancy outcome (new-born death). The study, therefore, suggests that public health workers particularly community nutritionists, should focus on pregnant women to reduce incidences of very small births that are likely to exhibit low birth weight, a risk factor during neonatal period.

### 6.2.2 Recommendations for Further Research

Further research needs to be done on mechanisms through which type of place delivery operates to affect the risk of child survival, at the neonatal period. It would be vital to understand why delivery in a health facility showed positive effect on neonatal mortality. This study has not been conclusive on this but has only provided possible explanations.

This study confined itself to the limitations of the 1998 KDHS, which served to restrict the study to the available variables. A more comprehensive study on neonatal mortality needs to be done. Such a study should be based on primary data and should capture as many of the intrapartum and post partum factors as possible, including birth injuries, immaturity and infections of the newborn.

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