

**THE IMPACT OF BREASTFEEDING ON CHILDHOOD
MORTALITY IN KENYA**

BY IDALA, SHARON AJERWA

Q50/7022/02

**A Project Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Population Studies**

Population Studies and Research Institute

University of Nairobi



September, 2005

DECLARATION

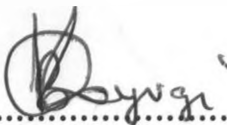
This Research Project is my Original work and has not been presented for a degree in any other University.

SIGNATURE.....


IDALA SHARON AJERWA

SUPERVISORS

This Research Project is submitted for the award of a Master of Arts degree in Population Studies under our approval as university supervisors

SIGNATURE.....

DR B. K. OYUGI

SIGNATURE..... 15/11/05

MR A. MUTUKU

DEDICATION

This work is dedicated to my mother, brother,sister, my dear daughter Sandra ad my late father.

ACKNOWLEDGEMENT

Several people and institutions played a major role in the successful completion of this research project. Firstly, am very grateful to the University of Nairobi for offering me the opportunity and funding to pursue a Master of Arts degree in Population Studies. Much appreciation goes to my supervisors for their support, advice and guidance.

I am thankful of the support and guidance given to me by other Population Studies Institute staff, both academic and non-academic staff. I would not also forget my fellow classmates for their support and friendship. My sincere gratitude also to my mother siblings, friends and Timothy for their moral support and encouragement.

Most important my gratitude goes to the Lord Almighty for seeing me through this challenging task.

ABSTRACT

The study assessed the relationship between duration of breastfeeding and infant and child mortality. The study had three specific objectives. First, to estimate the mean durations of breastfeeding of children by various maternal background characteristics. Second, to determine the patterns of survival status of children by the duration of breastfeeding. Third, to determine the effect to breastfeeding in infant and child mortality when maternal, Environmental, socio-economic and socio-cultural factors are controlled for.

The study was based on data from the 1998 Kenya Demographic and Health survey (KDHS). A sub sample of 3531 births that occurred to women aged 15-49 years three years prior to the survey was used for analysis. Out of these births, 256 died between 0-3 years. The analytical framework developed by Mosley and Chen (1984) for child survival was adopted to guide the study. The variables selected for the study were duration of breastfeeding, maternal education mother work status, type of place of residence, ethnicity, parity, maternal age at birth, and type of place of delivery, presence of a toilet /latrine facility and source of drinking water.

The quality of data used was assessed using internal checks by examining the age reporting of the study sample births and deaths as well as assessing age heaping for births, deaths and breastfeeding data. Incidence-prevalence method was used to calculate the mean durations of breastfeeding. The mean durations of breastfeeding gave the patterns and differentials of breastfeeding by various maternal background characteristics. Childhood mortality differentials according to duration of breastfeeding are obtained by computing the interval risks of death using life table technique. Bivariate

and Multivariate logistic regression models were run to determine the effect of breast feeding on infant and child mortality.

Shorter durations of breastfeeding were associated with children borne to more educated, working younger, parity one, urban mothers. Children borne in health facilities were also associated with shorter durations of breastfeeding than those borne in non-health facilities. Interval risks of death revealed that the interval risk of death in infancy (0-11) months is higher for children breastfed for shorter periods (0-6 months) as compared to those breastfed for at least 7 months. However, children breastfed for more than 18 months had a higher risk of death was almost the same for all durations of breastfeeding. This implies that child mortality does not vary according to the months a child is breastfed.

Bivariate logistic regression results indicated that maternal level of education, maternal work status, place of residence, maternal age at birth, place of delivery, source of drinking water, presence of toilet facility and ethnicity were statistically significant factors associated with the risk of infant and child death at 95% confidence level. Multivariate analysis established that duration of breastfeeding was only significant parameter estimates of duration of breastfeeding reduced insignificantly as other independent factors are controlled for. Thus, the mechanism of causation of the effect of duration of breastfeeding on childhood mortality is not clear.

The study recommended that since the benefits of breastfeeding to the mother and child are numerous and therefore should be encouraged so as to increase the survival chances of children. This recommendation is not acceptable before 6 months of age. Efforts should also be made to achieve high standards of sanitation and health services.

Government should enhance policies that ensure universal access to clean water. Since breastfeeding turned out to be a slightly significant factor in determining infant and child health, mothers should be educated on alternative hygienic methods of infant and child feeding and also on nutritious foods that can be given to children with or instead of breast milk.

NB. Exclusive breastfeeding is most important in the first 6 months and should start immediately after birth (30 minutes)

TABLE OF CONTENTS

DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENT.....	iii
ABSTRACT.....	iv
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1. Introduction.....	1
1.2. Problem Statement.....	2
1.3. Objectives of the Study.....	3
1.4. Justification of the Study.....	4
1.5 Scope and Limitation.....	4
CHAPTER TWO.....	5
LITERATURE REVIEW AND STUDY DESIGN.....	5
2.1 Introduction.....	5
2.2 Studies on effect of breastfeeding practices on childhood mortality in developing countries.....	5
2.2.1 Studies in Asia and Latin America.....	6
2.2.2 Studies in other African Countries.....	7
2.3 Studies on effect of breastfeeding practices on childhood mortality in Kenya.....	8
2.4 Studies on the effect of other factors on childhood mortality.....	10
2.4.1 Socio-economic Factors.....	10
2.4.2 Maternal factors.....	11
2.4.3 Environmental factors.....	12
2.4.4 Health care factors.....	13
2.4.5 Socio- cultural factors.....	13
2.4.6 Summary Of Literature Review.....	14
2.5 Conceptual Framework.....	14

2.6 Conceptual Framework for the Study.....	16
2.7 Conceptual hypotheses	16
2.8 Definition of key concepts.....	17
2.9 Operational hypotheses.....	18
2.10 Definition of variables	19
CHAPTER THREE	23
DATA AND METHODOLOGY	23
3.1 Introduction	23
3.2 Data Source.....	23
3.3 Quality Of The Study Data	24
3.3.1 Completeness of age reporting	25
3.3.2 Age heaping of the reported births and deaths	25
3.3.3 Quality of breastfeeding data.....	27
3.4 Methods of data analysis	27
3.4.1 Descriptive Statistics	27
3.4.2 Calculation of mean duration of breastfeeding.....	28
3.4.3 Calculation of the interval risks of death	28
3.4.4 Logistic Regression	31
CHAPTER FOUR	33
BREASTFEEDING AND CHILD MORTALITY	33
PATTERNS	33
4.1 Introduction	33
4.2. Survival Status Of Children By Various Characteristics.....	33
Duration of breastfeeding	35
4.3 Mean Duration of Breastfeeding	36
4.3.1 Patterns and Differentials of The Mean Breastfeeding Durations.....	36
4.4. Differential childhood mortality by duration of Breastfeeding	39
CHAPTER FIVE	41
EFFECTS OF DURATION OF BREASTFEEDING ON INFANT AND CHILD	
MORTALITY.....	41
5.1 Introduction	41

5.2. Bivariate Analysis Results.....	41
5.3. Multivariate Results.....	44
5.3.1 The Effect of Months of Breastfeeding on Childhood Mortality	44
5.3.2 The Impact of Socio-Economic Factors	44
5.3.3 Impact of Household Environmental Factors	45
5.3.4 Impact of Maternal Factors.....	45
5.3.5 Impact of Ethnicity	47
5.3.6 Conclusion.....	47
CHAPTER SIX.....	49
SUMMARY, CONCLUSION AND RECOMMENDATIONS	49
6.1 Introduction	49
6.2 Summary and Conclusion.....	49
6.3 Recommendations for Policy Makers.....	52
6.4 Recommendations for Further Research	52
REFERENCES	53

LIST OF TABLES

Table 1: Description and Measurement of Variables.....22

Table 3.1. Percent Distribution of Age Reporting of Births and Deaths used in the study.....25

Table 3.2 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 0-6 months.....29

Table 3.3 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 7-11 months.....29

Table 3.4 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 12-17 months.....30

Table 3.5 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 18 – 23 months.....30

Table 3.6 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 24-35 months.....31

Table 4.1: Distribution of survival status of children aged 0-3 years by background characteristics.....34

Table 4.2 Mean Durations of Breastfeeding According to Maternal Background characteristics using the incidence/prevalence method.....38

Table 4.3 Interval risks of death according to months of breastfeeding.....39

Table 5.1 Bivariate Regression results.....43

Table 5.2 Main effects estimates from Multivariate Models with the likelihood of death for children aged 0-3 years as the outcome variable.....45

P.S.M.I. LIBRARY
UNIVERSITY OF NAIROBI

LIST OF FIGURES

Figure 1: Mosley-Chen framework.....15

Figure 2: Modified Mosley and Chen Conceptual framework16

Figure 3: Operational framework.....18

Figure 3.1: Percentage distribution of reported births in Kenya: 1998 KDHS..... 26

Figure 3.2: Percentage distribution of all dead children by the age at death in months in Kenya: 1998 KDHS.....26

Figure 3.3: Percentage Distribution of children by duration of breastfeeding in months.....27

CHAPTER ONE

INTRODUCTION

1.1. Introduction

Increasing survival chances of children in developing countries is one of the primary health care goals. One of the corner stone of child survival promoted by the World Health Organization and UNICEF is breastfeeding. Breastfeeding practices can have a substantial effect on infant and child health and mortality in developing countries. Three reasons are well documented. First, breast milk contains the optimal combination of nutrients and is ideally suited to an infant's metabolism (Anandarah and Kim Choe, 2000). Second, breastfeeding allows a mother to pass on immunities to her child. Third, infants who are breastfed receive less of other foods and liquids that could be contaminated and cause disease (UNICEF, 1999).

According to UNICEF and the World Health Organization, breastfeeding should be initiated for all children immediately after birth, and all infants should receive breast milk only until about six months of age. At about six months of age, complementary solid or mushy foods should be added to infant feeding as needed, and breastfeeding should continue, with complimentary foods up to the second birthday or beyond (Naylor, 2000; UNICEF, 1999; WHO, 1999). Bottle feeding must be discouraged at all times.

Breastfeeding is nearly universal in Kenya and it continues for most children beyond infancy. 97 percent of children in Kenya are breastfed at some point, the same proportion as in 1998 (CBS et.al, 2004). As compared to the 1998 Kenya Demographic Health Survey, the patterns of breastfeeding have not changed, though the practice of exclusive breastfeeding for the first four to six months of a child's life has declined from 17 percent in 1998 (NCPD et.al., 1999) to 13 percent in 2003 (CBS et.al., 2004). The implications of this duration is important since it is recommended that all infants be exclusively breastfed for four to six months to prevent or reduce morbidity and mortality through contamination, diarrhoeal diseases, acute respiratory diseases and other infections (Leon-Cava et.al., 2002).

Evidence from studies of infant and child mortality in developing countries suggests that child care practices such as feeding practices and health seeking behavior have a direct relationship with child survival and also act as proximate factors through which parental (especially maternal) socio economic variables influence child mortality (Feyisetan, 1989). Breastfeeding stands out as a childcare index that is negatively associated with mortality especially in the first year of life. This study therefore seeks to find out if there is still a significant relationship between breastfeeding behaviour and infant and child mortality in Kenya.

1.2. Problem Statement

High levels of childhood mortality in developing countries especially in Sub Saharan Africa is a major concern to policy makers and program planners in the direction of resources to improve childhood morbidity and mortality situation. The under- five mortality rate in Kenya is relatively high and are increasing. The rate increased from 96 deaths per 1000 live births in 1993 to 112 deaths per 1000 live births in 1998(NCPD et al, 1999) and to 115 deaths per 1000 live births in 2003 (CBS et.al., 2004). Breastfeeding is one of the important factors that reduces the occurrence of some infectious diseases in early childhood and therefore reducing early childhood mortality.

Breastfeeding practices in the world are generally poor, no more than 35 percent of infants worldwide are exclusively breastfed even in the first four months of life (UNICEF, 2004). However, the duration of breastfeeding is increasing in most developing countries (Haggerty, 1999). Despite this increase, the practice of breastfeeding is declining in Kenya (NCPD et. al, 1999; IBFAN, 2001).

Although we have evidence of the relationship of breastfeeding and child mortality in literature, few studies are based on data from sub Saharan Africa. Thus very little is known about the relationship in this part of the world (Akinrinola and Olaleye, 1991; Jada, 1992). Several studies that have been carried out on infant and child mortality in Kenya have focused on socio-economic, socio-cultural, environmental and demographic factors. Few studies have investigated the effect of breastfeeding on infant and child mortality in Kenya (Jada, 1992; Akinrinola and Olaleye, 1991; Akwara, 1994). This

study attempts to investigate if breastfeeding still has any impact on infant and child mortality in Kenya when other factors are controlled for especially during this time when mortality is rising.

The information generated in this study information can be useful in guiding policy makers in formulation of policies and programmes that will help in the protection, promotion and of breastfeeding in Kenya.

The study will seek to answer the following questions;

1. Does breastfeeding still have a significant impact on infant and child mortality when other environmental, demographic, socio-economic and socio-cultural factors are controlled for?
2. What are the patterns of infant and child mortality by duration of breastfeeding?

1.3. Objectives Of The Study

The broad objective is to study the relationship between duration of breastfeeding and infant and child mortality.

The following are the specific objectives of the study;

1. To estimate the mean durations of breastfeeding of children by various maternal background characteristics.
2. To determine the patterns of survival status of children by the duration of breastfeeding.
3. To determine the effect of breastfeeding on infant and child mortality when maternal, environmental, socio-economic and socio-cultural factors are controlled for.

1.4. Justification Of The Study

Studies on childhood mortality are very important because childhood mortality is a major indicator of the socio- economic and health status of any society. Child survival depends upon adequate nutrient intake and the ability of a child to resist or recover from infections. Breast milk can provide the major nutrient source in a child's diet. It can also be an important contributor to the child's immunologic defense system, increasing resistance to disease. The consumption of breast milk in place of other food sources that

may be contaminated reduces the ingestion of certain infectious agents. Breastfeeding can also contribute to child survival through extending the period of post partum anovulation through post partum abstinence and by lengthening birth intervals.

The information obtained from this study can be used to guide policy makers and program planners to formulate policies and programmes that will promote and support breastfeeding thus averting some early childhood deaths. This study is also important in achieving the UNICEF's nutrition goal of protecting, promoting and supporting breastfeeding as a means of enhancing child survival.

It is important also to examine the effects of breastfeeding on childhood mortality during this time when childhood mortality is on the increase.

1.5 Scope And Limitation

This study will take cover the whole country. The study will look into the effect of breastfeeding on infant and child mortality in Kenya. The question on breastfeeding was asked to all women aged 15 – 49 for the last and next to last births for the period three years prior to the survey. The study will utilize secondary data from Kenya Demographic and Health Survey (KDHS) of 1998. This study will also rely upon an existing dataset collected for other purposes other than the research objective at hand. This greatly limits the variables available for the study especially the HIV/AIDS status of the mother, which has a major impact on breastfeeding.

CHAPTER TWO

LITERATURE REVIEW AND STUDY DESIGN

2.1 Introduction

This chapter is divided into two sections; the first section will be a critical review of relevant literature both in Kenya and other parts of the world and the second part will highlight the conceptual and operational frameworks that will guide the study as well as the conceptual and operational hypotheses.

Increasing survival chances of children in developing countries is one of the primary health care goals. One of the corner stone of child survival promoted by the world health organization and UNICEF is breastfeeding. Breastfeeding has received a lot of attention and has been shown to be negatively associated with child survival. The relationship between breastfeeding and early childhood mortality has been documented with varying results from study to study. Literature generally indicates that breastfed children tend to have a lower risk of dying than those who are not breastfed. In a pooled study by WHO (2000) in less developed countries, infants not breastfed had a six fold greater risk of dying from infectious diseases within the first two months of life than those who are breastfed.

2.2 Studies On Effect Of Breastfeeding Practices On Childhood Mortality In Developing Countries

Several studies in developing countries have found lack of breastfeeding and short duration of breastfeeding to having an increasing effect on infant and child deaths due to diarrhoeal diseases, acute respiratory infections as well as other causes (Arifeen et. al, 2001; WHO, 2000; Yoon et. al, 1996; Victora, 1992; Sachdev et. al, 1991; Palloni and Tienda, 1986).

A study by Barros and Victoria (1990) on breastfeeding among Brazilian children found that among babies whose mothers had never attended school, the median duration of breastfeeding was 6 months, 5 months for the group with one or two years of schooling and less than three months for those whose mothers attended school for 4 or more years. It was further found that maternal education more than income had an independent influence on the intensity and duration of breastfeeding.

Breastfeeding is associated in a dose-response manner with the risk of infant and child mortality with the lowest risk among exclusively breastfed infants, intermediate risk among partially breastfed infants, and the greatest risk among non-breastfed infants (Victora et. al, 1989). In Brazil, compared with exclusive breastfeeding, partial breastfeeding was associated with 4.2 times the risk of death and no breastfeeding was associated with 14.2 times the risk of death, after adjusting for age and other potentially confounding factors. Breastfeeding was also associated with a reduced risk of death at infancy due to respiratory infections.

A notable phenomenon in breastfeeding is the age pattern with respect to mortality. Many studies have found that the strong effects of breastfeeding on mortality in the early months of life wane gradually as the child grows older. A study of infant and early childhood mortality in Peru found a negative relationship between breastfeeding and childhood mortality between 1 and 23 months of age. (Palloni and Tienda, 1986). The results indicate that breastfeeding became less significant as the child grew older.

2.2.2 Studies in other African Countries

Manda (1999) in a nationwide study in Malawi using proportional Hazards model, found that children who had never breastfed or had stopped breastfeeding were 4.3 times more likely to experience infant mortality than children who continued to breastfeed. Stopping breastfeeding because of weaning or maternal pregnancy during the subject's first 12 months significantly increased infant mortality by a factor of 8.26. The effects of breastfeeding on child mortality were less notable.

2.2.1 Studies in Asia and Latin America

Arifeen et. al. (2001) in a study of urban slums in Bangladesh, found that infants who were partially breastfed or not breastfed had a risk of diarrhoeal deaths 3.94 times greater than exclusively breastfed infants. The risk of death due to diarrhoea among predominantly breastfed infant was also higher but not statistically different from that of exclusively breastfed infants. In India, in a study to examine the association between infant feeding mode and mortality among infants admitted in a hospital in the first seven days of life, exclusive breastfeeding was associated with the lowest rate of neonatal mortality compared with neonates who were not yet breastfed and those receiving supplements (Bhatia, 1994)

Yoon et. al (1996) using proportional hazards model to investigate the association between not breastfeeding and diarrheal related infant and child mortality in the Philippines found that in the first 6 months of life, there was a strong association between breastfeeding and diarrheal related infant and child mortality. Failing to initiate breastfeeding or ceasing to breastfeed was associated with a tenfold increase in diarrheal related infant and child mortality. However, there were no significant associations among the older age groups. The associations were greatest for low birth weight infants and infants whose mothers had little formal education. The association between breastfeeding and the risk of death was also insignificant.

Briend and Bari(1989) in a study in rural Bangladesh examined the association among infant feeding mode, nutritional status, and mortality among children aged between 12-35 months revealed that children who were breastfed had a significantly lower weight for age than children who were weaned. However, despite their better nutritional status, weaned children had a relative risk of dying of 2.6, compared with breastfed children. In a study in Bangladesh, Shahidullah (1994) concluded that overall, it was not the duration of any breastfeeding but unsupplemented breastfeeding that was the important determinant of childhood mortality.

In a study in Guinea-Bissau (Molback et al. 1994) found breastfed children to have lower nutritional status than weaned children but they were more likely to survive. In Rwanda, a study reported that non-breastfed children were twice as likely to die from pneumonia than were breastfed children (Victora et al, 1999). Arifeen et. al. (2001) found that infants who were partially breastfed or not breastfed had a risk of acute respiratory infection related death 2.4 times greater than exclusively breastfed infants.

In a cross-sectional study based on the World Fertility Survey, it was found that in Senegal, a 25% increase in breastfeeding duration would lead to almost all mothers spacing their births at least two years apart leading to almost a 20% reduction in mortality in the first year of life. (Thapa et al, 1988).

In Ethiopia never breastfed infants were over 100 times more likely to die in the first month of life than breastfed infants. The survival chances of never breastfed infants were considerably improved if they made it through the first month of life, although they were still almost three times as likely to die in any month before age one as infants that were breastfed. However, beyond the twenty fourth month, continued breastfeeding was significantly related to a higher risk of death, and the risk increased with age (Lindstrom and Berhanu, 1999). Kuate and Palloni (1995), in an analysis of survey data from Cameroon found no evidence of variation in the effects of breastfeeding across ethnic groups.

2.3 Studies On effect of Breastfeeding Practices on childhood Mortality in Kenya

Breastfeeding is nearly universal in Kenya, with 98 percent of children born in the five years preceding the 1998 KDHS having been breastfed for some period of time. However, exclusive breastfeeding is not common as only 28 percent of children under two months and 17 percent of children under four months of age were fed on breast milk alone (NCPD et al, 1998).

Akwara (1994) found that breastfeeding is inversely related to infant and child mortality. Similar results were also found in previous studies (Ngura, 1998; Jada, 1992, K'Oyugi, 1992). However there were contradictory results by Akinrinola and Olaleye (1991) that showed that breastfeeding was not an important determinant of infant and child mortality in Kenya.

Jada (1992) found that duration of breastfeeding had a significant effect on infant and child mortality in Kenya at a national level. The infant mortality rate for children whose mothers' breastfed was 46 per 1000 compared to 85 per 1000 for those whose mothers did not breastfeed. The difference in life expectancy was slightly over 9 years. At the provincial level he found that the q2 values for children whose mothers who did not breastfeed was more than thrice that of those whose mothers' breastfed. He concluded that the significant difference in infant and child mortality shows that breastfeeding can help reduce infant and child mortality to an acceptable level.

Akwara (1994) in another study in Amagoro division, found duration of breastfeeding to be inversely related to infant and child mortality both for the last and next to last births. Breastfeeding for a duration of 13 – 18 months reduced the odds of dying as compared to a duration of 0 – 12 months and was more significant compared to durations of 19-24 months and 25 + months. Ngura (1998) in a study of child survival in semi-arid and arid areas of Kenya found that duration of breastfeeding was significantly associated with child survival with mothers who breastfed their babies for a period of 13-56 months having a lower ratio of observed to expected child deaths than those who did not breastfeed at all.

Longer durations of breastfeeding reduces the risk of child deaths by enhancing proper growth of children both physically and mentally. Onyango (1999) in a longitudinal study in Western Kenya examined the value of breastfeeding on growth during the second year of life and found that children who were breastfed for the longest duration gained 3.4 centimeters and 370 grams more than those in the shortest duration group.

Contradictory results were found by Ankirinola and Olaleye (1991) using the KDHS for 1989. The results showed that breastfeeding was not an important determinant on infant mortality and after the first year of life breastfed children are more susceptible to the risk of dying. The odds of dying in the age segments 13 - 24 months for children who were breastfed up that age interval is 1.89 times that of the children who were not breastfed up to the beginning of that age segment.

2.4 Studies On The Effect Of Other Factors On Childhood Mortality

2.4.1 Socio-economic Factors

A mother's activity status is regarded as a proxy for maternal time allotted to child rearing. Reduction of maternal time devoted to child rearing may be directly related to infant and child mortality through the loss of specific elements in a desirable child care regime or indirectly related through deterioration in maternal health because of long hours or deficient conditions at work.

Basu and Basu (1991), using the 1991 census of India and another set of small-scale survey data, found contradictory results. They found that the children whose mothers were working experienced higher mortality than those whose mothers were not working due to the inability of working mothers to give adequate care to their children and to breastfeed them properly. However, their results have been contradicted by the results of a study by Tulasidhar (1993) based on the same 1981 data who found a statistically significant inverse relationship between child mortality and female labor force participation in India. This results support other studies that argue for favorable impact of maternal labor force participation on child survival. The difference in results obtained could be due to the fact that Basu and Basu used aggregated data, while Tulasidhar used disaggregated data and also used maternal education as a control variable.

Pant (1995) found higher risks of child mortality among children of working mothers than children of non- working mothers in Nepal. He attributed the elevated risks of child mortality among working Nepalese mothers to the inadequacy of the time allocated to child-care and fatigue suffered by working mothers.

According to K'oyugi (1992) available evidence in Kenya shows that children receive supplements generally through the use of bottles since the practice of daytime breastfeeding is declining especially working in formal employment and also during heavy work peak (weeding and harvesting season) in the rural areas.

Mothers' level of education has been found to be strongly and negatively associated with infant and child mortality. Mothers' formal education is an indicator of knowledge and skills that mothers have to effectively take care of their children. Cleland (1990) argued for the role of education in ensuring utilization of health care services for children. Educated women are more likely to be aware of health problems, as well as to have greater access to improved sanitation and health facilities and services (LeVine et al, 1991).

Maternal education may also affect child survival through its influence on demographic factors such as age at first marriage, age at first birth, parity and birth spacing. Educated women marry and start child bearing later thus avoiding the high risks to child health associated with early pregnancies (Hobcraft, 1993). Educated women also tend to make greater use of contraception, thus lengthening the intervals between their births.

2.4.2 Maternal factors

The age of mother at child birth, her parity have been found in the literature to be closely associated with infant and mortality (Hobcraft et al; 1984, Pebley and Stupp ;1987; Rutstein, 1984; Bicego and Ahmed; 1996 ;Dashtseren, 1999). The relationship between these variables and infant mortality has been explained through maternal depletion hypothesis, sibling competition, impaired lactation as a result of poor health and nutritional status of the mother and transmission of infections as well as lack of time to attend maternal health care services.

Jantrana (1999) in a study in India, found that children born to young mothers (less than 20 years) were three times as likely to die than as children born to mothers over 20 years of age at the infant stage. Young mothers may bear premature and low birth infants because of poor nutritional status, inadequate use of antenatal care and lower educational achievements (Gribble, 1993). Furthermore, they may be unable to obtain an inadequate share of food and other household resources for their children, since they may have little influence on allocation of household resources (Ikamari, 1996). Young mothers also tend to be socially and economically disadvantaged (Geronimus and Korenman, 1993). The higher risk of dying among infants born to older mothers (over 35 years) may be due to increased risk of delivering a genetically impaired birth, thus these infants are also likely to carry higher risks of death (Sullivan et al. 1994). This may be attributed to a decline in the efficacy of the reproductive system with age and economic pressure in the family.

2.4.3 Environmental factors

These factors are not only important for their direct effect on child survival, but they may also indicate the overall resource level of a child's family. These factors may directly mediate vectors of disease transmission or otherwise measure the level of contamination in the infant's home environment. Piped water and modern toilet facilities are believed to improve chances of survival of infants by minimizing contamination.

Al Hassan Conteh et al (1990) examined the environmental risk of childhood mortality in Liberia using Demographic and Health Survey data and found source of water to be a good predictor of childhood mortality. Hobcraft (1981) and Sastry (1996) also indicated that a toilet is an important household hygienic facility. They found that mortality rates for children who live who in households with a toilet facility. Improvement in water supply and quality of sanitation are important for decreasing mortality (Sastry, 1996). Jhamba (1995) found a negative but weak association between a household's source of water supply, sanitation and under five mortality.

2.4.4 Health care factors

Access and utilization of maternal and child health services such as use of antenatal services and delivery in a health institution are important predictors of infant and child mortality. The use of health services, especially prenatal and delivery care is often a function of other socio-economic factors, reduces infant mortality tremendously (Gaminiratne, 1991; Forste, 1994; Ahonsi, 1995). WHO (1994) noted that around 8.1 million infants die each year, one third of them within the first month of life and a large proportion within a few days of birth. The majority of the deaths occur as result of the complications during pregnancy and childbirth.

Winikoff et al, (1988) in a study on infant feeding in Nairobi, found that hospital birth was associated with a decreased tendency to breastfeed for six or nine months duration, even after controlling for socio – economic status, education, parity and urban birth of mothers. The same study also revealed that several health care facility practices are not supportive of breastfeeding including: the provision of free infant formula samples and literature to mothers in private hospitals; the separation of mothers from their new born infants in many maternity facilities; the routine feeding of breast milk substitutes; and the scheduling of breastfeeding in some institutions which may influence future infant feeding decisions.

2.4.5 Socio- cultural factors

Each ethnic group has its set of customs, rituals and practices associated with life events such as childbirth, marriages and deaths. Some of the practices and rituals that may have an effect on infant mortality include: obstetric methods used by traditional birth attendants, particularly the way the umbilical cord is handled and dressed; traditions affecting the initiation, type and duration of breastfeeding as well as the type and nutritional value of the weaning foods generally given to infants determine the risk of infant and child death.

Akwara (2000) indicated that regions of high mortality in Kenya are Nyanza, Western and Coast provinces occupied by the Luo, Luhya and Swahili speakers . It is among these

people that it has been difficult to break cultural practices and beliefs. Central province and most of the Rift Valley provinces are regions that were initially occupied by colonial settlers. Hence, these regions were greatly influenced by European lifestyles. Consequently, it has been easier to break through traditional cultural barriers. This may explain the lower infant mortality in these regions.

2.4.6 Summary Of Literature Review

From the literature reviewed, it is evident that there are several studies that have been carried out in understanding the relationship between infant and child mortality and breastfeeding behavior. Breastfeeding has been found to have a major effect during the first year of life and thereafter, its effect reduces as the child grows older. However, most studies have revealed that breastfeeding practices play a major role in the prevention of childhood morbidity and mortality. However, some studies have found breastfeeding to have an insignificant effect on infant and child mortality. The literature further revealed that breastfeeding behavior can be affected by maternal level of education, maternal work status, place of residence, parity, place of delivery, maternal age at birth, and ethnicity. Source of drinking water and presence of a toilet facility were also important factors in determining infant and child death.

2.5 Conceptual Framework

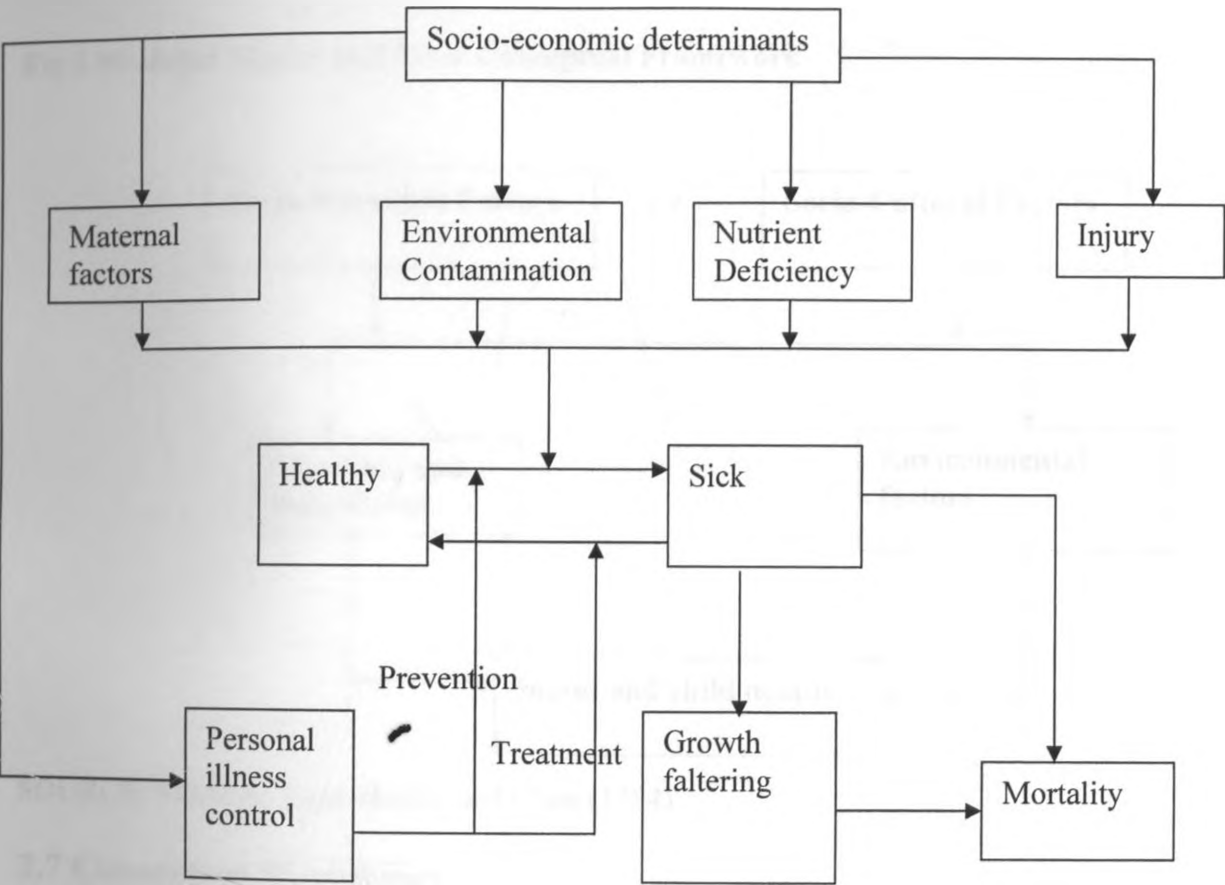
Mosley and Chen (1984) have developed an analytical framework for the study of child survival in developing countries. It encompasses a biosocial approach to child survival. It includes socio-economic determinants that operate through the proximate or intermediate variables that directly influence the risk of mortality. Correlations between mortality and socio-economic characteristics are used to generate causal inferences about the mortality situation. The framework is based on some premises.

The key to the model is the identification of a set of proximate determinants or intermediate variables that directly influence the risk of morbidity and mortality. All social and economic determinants must operate through these variables to affect child survival. The proximate determinants are grouped into five categories, namely; maternal

factors, environmental contamination, nutrient deficiency, injury and personal illness control.

Since the purpose of this study is to find out the impact of behavioral as well as demographic, socio-economic, socio-cultural and environmental factors on infant and child mortality, this model will be used for the purpose of this study. This model will be slightly modified because some of the factors such as personal injury will not be studied.

Fig 1: Mosley-Chen Framework



Source: Mosley and Chen (1984)

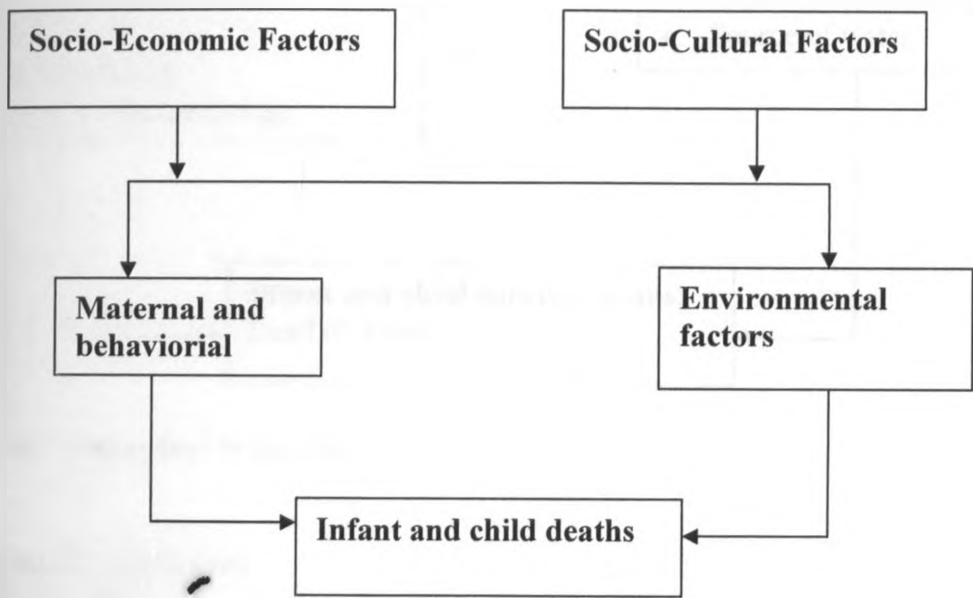
Socio- economic determinants like income, occupation, housing, education of mothers are combined together to influence infant and child mortality. Environmental contamination, maternal factors, type of food taken and also type of injuries that a child might get, all interact to either produce a healthy or sick child. Moreover, the kind of

preventive medicine used and treatment whether herbal or modern all affect the health of the child in which combined effects of all these factors ultimately lead either to death of the child or a healthy child.

2.6 Conceptual Framework for the Study

This work will be based on the Mosley and Chen (1984) theoretical framework that has been mentioned above. According to this framework, socio-Economic factors and socio-cultural factors act through proximate factors to influence infant and child mortality.

Fig 2 Modified Mosley and Chen Conceptual Framework



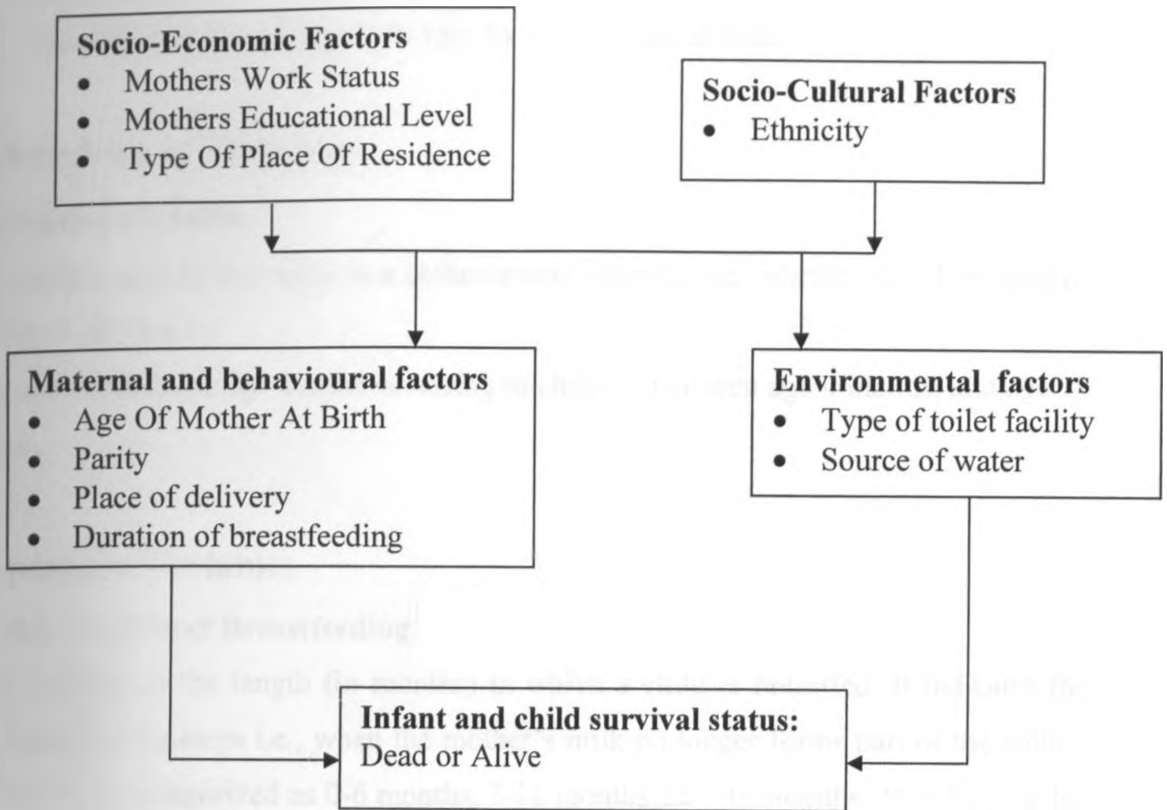
SOURCE: Modified from Mosley and Chen (1984)

2.7 Conceptual Hypotheses

From the above conceptual model the following conceptual hypothesis can be drawn:

1. Behavioral and maternal factors are likely to have an impact on infant and child mortality.
2. Socio-economic factors are likely to influence infant and child mortality.
3. Infant and child mortality is likely to be affected by socio-cultural factors.
4. Environmental factors are likely to have an impact on infant and child mortality

Fig 3. OPERATIONAL FRAMEWORK



SOURCE: From Conceptual framework

2.8 Operational hypotheses

1. Ethnicity is likely to have a positive effect on the duration of breastfeeding and consequently on childhood death.
2. Children of working mothers, highly educated mother's and mothers from urban areas are more likely to breastfeed for shorter durations and have lesser risk of death.
3. First and higher parity births are likely to affect breastfeeding behaviour and associated with higher infant and child deaths.
4. Shorter durations of breastfeeding are associated with higher risks of childhood death.

5. Children in households with a toilet facility and access to piped water are associated with lesser risks of childhood deaths.
6. Children borne in health facilities are less likely to die than those borne in non – health facilities.
7. childhood deaths are likely to vary by mothers age at birth.

2.9 Definition of Variables

Dependent variable

The variable used in the study is a dichotomous variable, i.e. whether the child died or not; Yes=1 and No =0

Infant and child mortality: deaths occurring to children between age 0 months and age 35 months.

Independent Variables

Duration/ Months of Breastfeeding

This is defined as the length (in months) in which a child is breastfed. It indicates the time breastfeeding stops i.e., when the mother's milk no longer forms part of the child's food. It will be categorized as 0-6 months, 7-11 months, 12 – 17 months, 18 – 23 months, and 24+ months. It is intended to measure the relative level of natural protection against infections for children. Longer breastfeeding durations are expected to provide higher natural immunity against infections due to richness of breast milk content in nutrient. Since the reporting of the duration of breastfeeding suffers from age heaping and digit preference bias especially in ages that are multiples of 6, the above categorizations ensures that no two ages that are multiples of six are in the same category and that the critical period of 0-6 months and infancy in general is studied.

The following factors will be used to assess the impact of breastfeeding practices on infant and child mortality. They include the following:

Socio-economic Factors

Mothers work status.

Refers to whether the mother was working or not working during the time of the survey. This variable is intended to measure access to resources in addition to being a proxy for household economic status and time allotted to childcare. This will be categorized as working and not working, with working as the reference category.

Maternal education

Refers to the level of formal education attained by the mother. It will be categorized into no education, primary education and secondary plus. It is intended to measure the knowledge and skills of mother in childcare with the assumption that the higher the educational level, the better would be the child's health care and also acts as a proxy for household income. Secondary + category will be used as the reference category.

Type of place of residence

This is measured in terms of the following two categories; rural and urban depending on the place of residence of the respondent.

Socio-cultural factors

Ethnicity

This will refer to the ethnic group that the mothers belongs to. It is intended to measure cultural attitudes, beliefs and practices that may affect breastfeeding to influence infant and child mortality. They are categorized as follows; Kamba & Kikuyu, Kisii, Luhya and Luo, Mijikenda/Swahili and other tribes. Kamba and kikuyu ethnic groups will be used as the reference category.

Environmental Factors

Source of drinking water

This refers to the main source of water used for consumption, drinking and cooking purposes. Two categories piped source and non-piped source will be created. The variable is intended to measure the household environmental conditions that have an

influence on disease causing agents. Piped source of drinking water was used as the reference category.

Safe sources of water are tap water in the house or compound, borehole, protected well and protected springs.

Unsafe sources of water are unprotected wells, unprotected springs, lakes and ponds.

Toilet facility

This refers to the method of human waste disposal. The variable will have two categories namely presence of toilet facility and absence of the same. It also intended to capture household environmental status and also acts as a proxy for household economic status. Presence of toilet facility was the reference category.

Health factors

Place of delivery

It denotes where the birth of the child took place. It has two categories namely health and non- health facility with the assumption that children born in health facilities were at a lesser risk of dying than those borne in non health facilities. Births in the health facility were used as the reference category.

Demographic factors

Maternal age at birth

This refers to the number of completed years at which the mother gave birth to the child. It is measured in terms of the following categories: 15-19, 20-34 and 35+. It is intended to capture the physiological ability to have a healthy pregnancy and a live birth.

Parity

This refers to the number of live births a woman has had in her reproductive life. It is also intended to capture the physiological ability to have a healthy pregnancy and a live birth. It will be measured in three categories namely; 2-3, 1 and 4+, with parity 2-3 as the reference category.

2.10 Definition of Key Concepts

- **Child Mortality**

This refers to the deaths of children between age one and five.

- **Infant Mortality**

Deaths occurring to children before exact age one.

- **Socio-economic Factors**

Refers to the prevailing conditions of communal relevance such as mother's education, mother's work status and type of place of residence.

- **Socio-cultural factors**

Ethnicity is taken into consideration, these factor include the cultural beliefs, norms and practices that people subscribe to.

- **Environmental factors**

These entail the surroundings of a given area such as sanitation, housing that may influence disease prevalence. In this study, they include source of water and type of toilet.

- **Behavioral factors**

These will refer to behavioral characteristics of the mother that have effects on infant deaths. In this study, the length of breastfeeding will be considered as the key behavioral variable.

- **Health care factors**

These will refer to the place of delivery of the child.

- **Demographic/ maternal factors**

Refer to the biological characteristics of the mother that have effects on infant and child deaths. In this study two factors are considered, namely; age of the mother at birth and parity are considered.

Table 1**Description And Measurement Of Variables**

Variable name	Description and measurement	Kind of variable
Infant and child survival	1=Dead 0=Alive	Dependent variable
Maternal education	1= No education 2= Primary education 3= Secondary + ^R	Control variable
Mothers work status	1= Working ^R 2= Not working	Control variable
Place of residence	1= Urban 2= Rural ^R	Control variable
Ethnicity	1= Kamba, Kikuyu ^R 2= Luo, Luhya 3= Mijikenda/Swahili 4= Other tribes	Control variable
Source of water	1= Not piped 2= Piped source ^R	Control variable
Presence of toilet facility	1= No toilet 2= Has toilet ^R	Control variable
Maternal age at birth	1= 15-19 2= 20-34 ^R 3= 35+	Control variable
Parity	1= 1 birth 2= 2-3 ^R 3= 4+	Control variable
Duration of breastfeeding	1= 0-6 months 2= 7-11 months 3= 12-17 months 4= 18-23 months ^R 5= 24-35 months	Key variable
Place of delivery	1= Health facility ^R 2= Non health facility	Control variable

Notes: ^R Represents the reference category based on the category with the lowest risk of infant and child mortality theoretically.

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Introduction

This chapter provides a description of data source, quality of the study data and methods of analysis that have been used to achieve the objectives of the study. The incidence/prevalence method was used for calculation of the mean duration of breastfeeding and bivariate and multivariate logistic regression used for bivariate and multivariate analysis are briefly discussed.

3.2 Data Source

The study utilizes data from the Kenya demographic and health survey (KDHS), 1998. The 1998 survey was the third round of demographic and health surveys carried out in several other developing countries worldwide. In Kenya the first DHS took place in 1989, the second in 1993 and the third in 1998.

The 1998 KDHS was a national survey carried out by the National council on population and development in collaboration with the central bureau of statistics. Financial and technical assistance was provided by Macro international Inc USA through USAID. Funding was provided by USAID and the DFID, (British department for international development). Logistical assistance was provided by the United Nations Fund For Population Activities UNFPA, the division of primary health care and national HIV-AIDS control programme. Data collection was conducted from February to July 1998.

The 1998 KDHS is national in scope. However seven districts were excluded. Three districts in North Eastern province, which are Garissa, Mandera and Wajir, were excluded due to logistical and Security reasons. Four other Northern districts (Samburu, Turkana, Isiolo and Marsabit in Eastern province were also excluded due to the costs involved, Logistical problems and high levels of insecurity in the area.

A total of 15 rural districts were selected over the sampling because more districts had been created. Consequently reliable estimates could not be produced from the KDHS for all the districts without expanding the sample to a larger size. These districts were Bungoma, Kakamega, Kericho, Kilifi, Kisii, Machakos, Meru, Muranga, Nakuru, Nandi, Nyeri, Siaya, South Nyanza, Taita Taveta, and Uasin Gishu.

A total of 9,465 households were selected. All women aged 15-49 were targeted for interview in the selected households. Every second household was identified for inclusion. In the male survey all men aged 15-54 were eligible for an interview in these households. While 9465 households were sampled, only 8380 units were interviewed giving a 97% response rate. Out of 8233 eligible women, 7881 were interviewed. For men, only 3407 were interviewed out of the 3845 eligible yielding a response rate of 89%. The number of matched couples interviewed was 1362. The KDHS sample points were selected from a national master sample maintained and developed by the Central Bureau of statistics. The third National sample survey and evaluation programme (NASSEP-3) master plan follows a two page sampling design stratified by urban/rural residence and by district.

For the purpose of this study, data relating to all live births that occurred during the three years preceding the survey were used to enhance accuracy of results, bearing in mind this data was collected retrospectively. Furthermore, most of the explanatory variables to be used in the study relate to this period.

3.3 Quality Of The Study Data

It is also important to note that data on breastfeeding suffers biases due to age heaping or digit preference. Another possible source bias that may be inherent in the dataset is the truncation bias when the duration of breastfeeding is truncated in the closed birth interval by the birth of another child or in the open birth interval by the date of the interview (Akin et.al., 1981) which prompts the use of methods that take censored data into consideration.

The assessment of age reporting for the births alive and the births dead is an important factor in this study because the dependent variable is the risk of death between ages 0 – 3 years. The quality of data used was assessed using internal checks by examining the age reporting of the study sample births and deaths.

3.3.1 Completeness Of Age Reporting

When the proportion of non- imputed dates is applied as a crude measure of completeness of age reporting, the reported birth dates for the 3531 births used in the study was of good quality. The results in table 4.1 indicate that 99.5 percent of all the 3531 births did not have their birth dates imputed (meaning that the month and year were reported by the respondent) and 0.5 percent of the births had their birth dates imputed (meaning that the month or year or both could not be provided by the respondent) For the deaths 99.6 percent of the 256 deaths did not have their dates imputed while the remaining 0.4 percent had their dates imputed.

Table 3. 1 Percent Distribution of Age Reporting of Births And Deaths Used in The Study.

Imputation of Dates	Percent of Births	Number of Births	Percent of Deaths	Number of Deaths
Not Imputed	99.5	3513	99.6	255
Imputed	0.5	18	0.4	1
Totals	100.0	3531	100.0	256

Source: computed from the 1998 KDHS

3.3.2 Age Heaping Of The Reported Births And Deaths

In this study, the extent of age heaping among children is assessed by investigating the percentage distribution of living children by their current age in months and the percentage distribution of all dead children by their age at death in months. Figure 3.1 shows heaping at 6,12, 16, 24 and 32 months. Heaping was lowest at ages 30 and 33 months. Figure 3.2 shows the ages at death for the 256 children reported that occurred by 36 months used in the study shows evidence of age heaping at 10, 12, 20, 24, 30 and 34.

months. Age heaping at ages 12 and 24 months could be the result of some children dying either before or after that exact age.

Figure 3.1 Percentage distribution of reported births in Kenya: 1998 KDHS

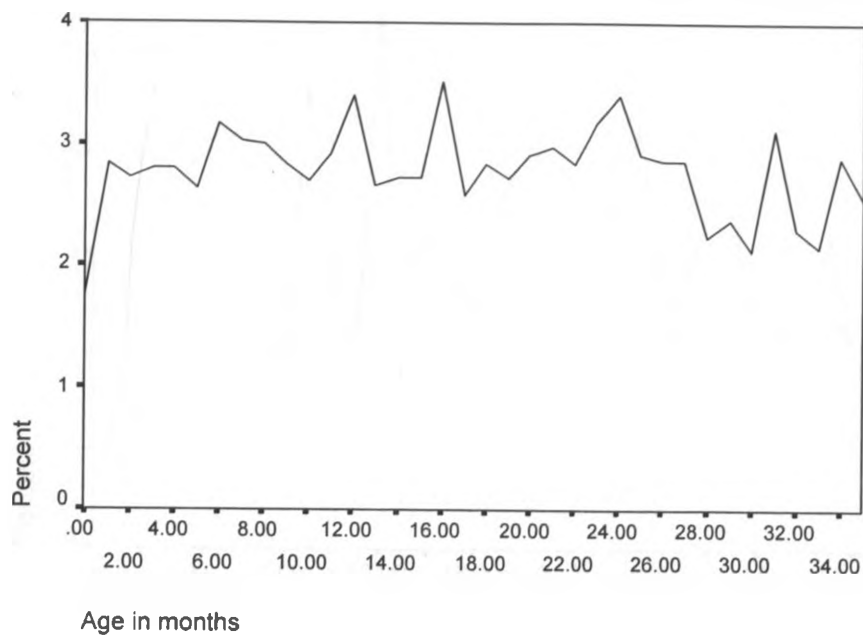
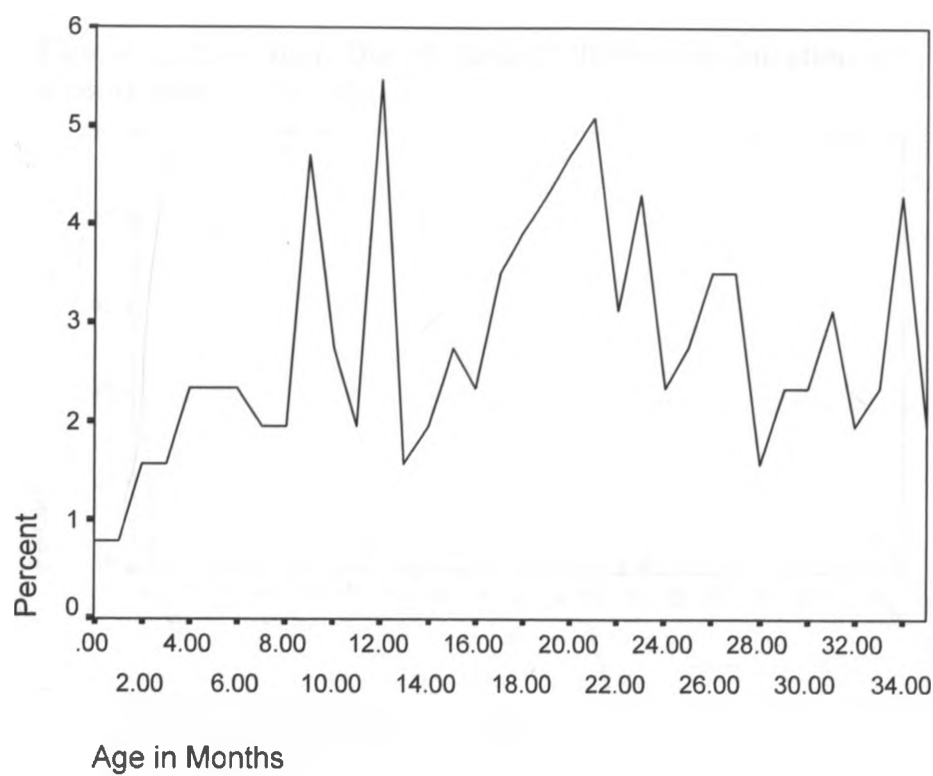


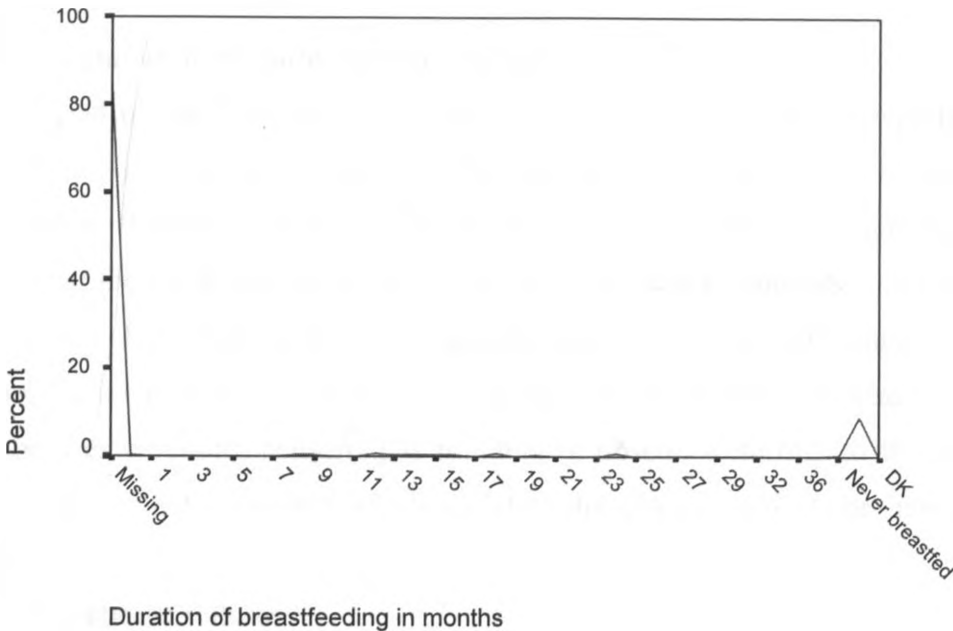
Figure 3.2 Percentage distribution of all dead children by the age at death in months in Kenya: 1998 KDHS



3.3.3 Quality Of Breastfeeding Data

In order to determine the quality of breastfeeding data, the extent of heaping was determined by examining the plot of the percent distribution by the duration of breastfeeding. Figure 3.3. shows that heaping was at 12, 18, 20 and 24 months. This problem will be taken care of by the categorization of the variables. The variable is categorized in such a way that no two durations that are multiples of six are in the same category i.e. 0-6 months, 7-11 months, 12-17 months, 18-23 months and 24+ months.

Figure 3.3 Percentage Distribution of Children by Duration of Breastfeeding in Months



3.4 Methods Of Data Analysis

3.4.1 Descriptive Statistics

Frequency and percentage description has been used in the study in order to make a sound basis for interpreting the results. This is useful in explaining and describing the selected socio-economic, socio-cultural, demographic, environmental and behavioural variables used in the study.

3.4.2 Calculation Of Mean Duration Of Breastfeeding

Incidence/ Prevalence Method

The formula to be used is

$$Y = B/N$$

Where Y denotes the mean duration of breastfeeding, B the total number of children currently breastfed and N the number of births per month.

This method assumes that the number of births per month has been constant throughout the three years preceding the survey. It is an extremely simple and rather robust estimation procedure. (Mosley et. Al, 1982). This method will be used to obtain the mean durations of breastfeeding according different characteristics of the mother.

3.4.3 Calculation of the interval risks of death

This method is based on the survival life tables. In survival analysis experience of any given event is viewed as failure with the time attached to this event known as failure time. The total duration of time lived by an individual is viewed as survival time. The rationale of the method is based on the risk of failure at given intervals. In this study, the intervals 0 – 11 months and 12 – 35 months were considered and death as a failure. In essence the interval risk of death is equal to the number of deaths divided by the number of exposures assuming censoring is minimal or absent. Referring to this method, the information on the following was required in the computation of the interval risks of death:

- Number of failures
- Number of survivors
- Number of exposures

This was done by calculation of the deaths and total exposures in months for each of the 36 months of the children and cross classified by the five categories for the duration of breastfeeding. Births that survived the interval contributed to the total number of months exposures in the age interval while the births that died in the age segment contributed only the months lived in the segment as the months of exposure in the interval.

Table 3.2 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 0-6 months.

X	D	S	S+D	X (S+D)
0	2	931	933	0
1	4	927	931	931
2	3	924	927	1854
3	6	921	924	2772
4	6	912	918	3672
5	7	905	912	4560
6	6	899	905	5430
7	8	891	899	6293
8	3	888	891	7128
9	4	884	888	7992
10	2	882	884	8840
11	1	881	882	9702
Total	52	10842	10894	59174

Source: computed from KDHS 1998

Table 3.3 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 7-11 months.

X	D	S	S+D	X (S+D)
0	4	622	626	0
1	3	619	622	622
2	0	619	619	1238
3	2	617	619	1857
4	2	615	617	2468
5	2	613	615	3075
6	4	609	613	3678
7	2	607	609	4263
8	3	604	607	4856
9	2	602	604	5436
10	0	602	602	6020
11	0	602	602	6622
Total	24	7331	7355	40135

Source: computed from KDHS 1998

Table 3.4 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 12-17 months.

X	D	S	S+D	X (S+D)
0	2	929	931	0
1	6	923	929	929
2	4	919	923	1846
3	4	915	919	2757
4	3	912	915	3660
5	4	908	912	4560
6	1	907	908	5448
7	7	900	907	6349
8	5	895	900	7200
9	3	892	895	8055
10	5	887	892	8920
11	3	884	887	9757
Total	44	10871	10918	59481

Source: computed from KDHS 1998

Table 3.5 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 18-23 months.

X	D	S	S+D	X (S+D)
0	4	608	612	0
1	1	607	608	608
2	2	605	607	1214
3	4	601	605	1815
4	5	596	601	2404
5	1	595	596	2980
6	3	592	595	3570
7	1	591	592	4144
8	4	587	591	4728
9	3	584	587	5283
10	2	582	584	5840
11	2	580	582	6402
Total	32	7128	7160	38988

Source: computed from KDHS 1998

Table 3.6 Deaths, survivors and exposure months in 0-11 months interval for children breastfed for 24-35 months.

X	D	S	S+D	X (S+D)
0	1	375	376	0
1	1	374	375	375
2	1	373	374	748
3	1	372	373	1119
4	2	370	372	1488
5	2	368	370	1850
6	3	365	368	2208
7	0	365	365	2555
8	3	362	365	2920
9	2	360	362	3258
10	2	358	360	3600
11	2	356	358	3938
Total	20	4418	4398	24059

Source: computed from KDHS 1998

The interval risk of death between 0-11 months is obtained by dividing the number of deaths by the total exposures.

$$R_1 = \Sigma D / \Sigma x(S+D),$$

Where: R_1 is the interval risk of death

S is the number of survivors in each age

D is the number of deaths in each age

$X(S+D)$ is the number of exposure months

In the same way the previous procedure is repeated for the 12 – 35 age interval and the durations of breastfeeding.

3.4.4 Logistic Regression

Logistic regression has been used to determine the probability of an event occurring (for example, death) given certain existing conditions (independent variables). The objective is to establish the best fitting model to describe the relationship between the outcome variable and a set of independent variables, often called covariates. This method has been chosen because the dependent variable (i.e. infant and child survival status) is

dichotomous or binary denoting whether or not an infant failed to survive through to age three. It is also an extremely flexible and easily used function and, it lends itself to a biologically meaningful interpretation.

Bivariate logistic regression has been used in assessment of the gross effects of each independent variable on the risk of infant and child death. Multivariate logistic regression has been used to assess the net effect of the duration of breastfeeding on the risk of infant and child death.

The specific form of the Logistic regression model is as follows:

$$P(x) = \frac{e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}}{1 + e^{\beta_0 + \beta_1 x_1 + \dots + \beta_p x_p}}$$

- Where $P(x)$ = the probability of an event occurring
- e = the base of the natural logarithm, approximately 2.718.
- β = Coefficients estimated
- x = Independent variables

The formula for the logit transformation is

$$g(x) = \ln \frac{P(x)}{1 - P(x)} = \beta_0 + \beta_1 x_1 + \dots + \beta_p x_p$$

This transformation is important because it has many desirable properties of linear regression model. The logit, $g(x)$ is linear in its parameters, may be continuous and may range from $-\infty$ to $+\infty$ depending on the range of x (independent variables).

Interpretation of Results

The odds exp (β) are used to measure the effect of the explanatory variables on the dependent variable. If β_i is positive, the odds will be of a value less greater one that represents a positive effect of the variable or variable category on infant deaths. If negative, the odds will be less than one that represents a negative effect of the variable on infant deaths. When β_i is zero, the odds remain unchanged thus the variable has no effect on infant deaths.

CHAPTER FOUR

BREASTFEEDING AND CHILD MORTALITY PATTERNS

4.1 Introduction

This chapter presents the frequency distribution, mean duration of breastfeeding by maternal background characteristics and interval risk of death by duration of breastfeeding. This chapter is important in giving the differentials of child survival and duration of breastfeeding in Kenya and also giving a quick look at some of the significant factors affecting child survival in Kenya.

The study population consists of a sub-sample of 3531 births out of which 256 died between the ages 0-3 years. These births occurred between 1995 and 1998 among women aged 15-49 years.

4.2. Survival Status of Children By Various Characteristics

This section presents the distribution of the survival status of children aged 0-3 years by the selected background characteristics. Table 4.2 shows the survival status of children by maternal background characteristics and the associations of each independent variables and the risk of infant and child mortality in Kenya.

From the table, children borne to mothers with no education contributed 10.6 percent of the deaths while those with above secondary education accounted for 7.1 percent of deaths. Similarly, children in urban areas had 8.2 percent deaths whereas 9.0 percent of those in rural areas died within the age 0 –3 years. 9.1 percent of children borne to working mothers did not survive beyond three years while 8.6 percent of those borne to non working mothers did not survive beyond age three.

Table 4.1: Distribution of children aged 0-3 years by background characteristics

Characteristic	Number alive	Number dead	Total
Maternal education			
No education	89.4	10.6	411
Primary education	90.8	9.2	2266
Secondary + education	92.9	7.1	854
Total	91.1	8.9	3531
Type of place of residence			
Rural	91.0	9.0	3002
Urban	91.8	8.2	529
Total	91.1	8.9	3531
Maternal work status			
Not Working	91.4	8.6	1604
Working	90.9	9.1	1922
Total	91.1	8.9	3526
Ethnicity			
Kikuyu, Kamba	94.4	5.6	827
Luo, Luhya	89.1	10.9	1283
Mijikenda/Swahili	93.2	6.8	307
Others	95.6	4.4	1114
Total	91.1	8.9	3531
Source of drinking water			
Not Piped	90.4	9.6	2613
Piped	93.1	6.9	898
Total	91.1	8.9	3511
Presence of toilet facility			
Has no toilet/latrine	87.0	13.0	640
Has toilet/latrine	92.0	8.0	2865
Total	91.1	8.9	3505
Maternal age at birth			
≤19 years	89.0	11.0	513
20-34	91.7	8.3	2551
35+	90.5	9.5	467
Total	91.1	8.9	3531
Parity			
1 birth	91.9	8.1	727
2-3 births	94.1	5.9	1292
4+ births	88.2	11.8	1512
Total	91.1	8.9	3531
Type of place of delivery			
Non-Health facility	93.2	6.8	2130
Health facility	94.3	5.7	1386
Total	93.6	6.4	3516

Table 4.1 continued

Duration of breastfeeding			
0-6 months	94.1	5.9	933
7-11 months	92.8	7.2	626
12-17 months	92.4	7.6	931
18-23 months	95.1	4.9	612
24-35	94.9	5.1	376
Total	93.6	6.4	3478

Source: Analysis of 1998 KDHS data.

The results further indicate that 10.9 per cent of the deaths were attributed to the Luo and Luhya while the Kikuyu and Kamba had only 5.6 percent of deaths. Children in households with access to piped water had 6.9 percent of deaths while in households with no access to piped water 9.6 percent of the children died. The results further indicate that children who belonged to households with no toilet facility, 13.0 percent of them died within the age 0 – 3 years while those who belonged to households with a toilet facility only 8.0 percent of them died.

11.0 per cent of the children borne to mothers below 19 years at the time birth died, 8.3 percent of children borne to mothers aged 20 – 34 years at the time of birth died while 9.5 percent of those borne to women aged 35 years and above died within the age 0 – 3 years. These results conform to the study by Rustein (1984) in developing countries that found a U- shaped pattern between maternal age at birth and infant and child mortality in developing countries. The results further indicate that children of parity one and mothers of higher parity contributed 8.1 percent and 11.8 percent of the deaths respectively while those of parity 2-3 had 5.9 percent of the children dead. Of the children born in non-health facilities 6.8 percent of them died while those born in health facilities only 5.7 percent of them died. Finally, the distribution by duration of breastfeeding indicates that children breastfed for less than 18 months had a higher risk of infant and child mortality than those breastfed for more than 18 months.

4.3 Mean Duration of Breastfeeding

In this section the mean duration of breastfeeding is calculated direct method. For the direct method, the incidence prevalence method was used. The mean durations of breastfeeding give the patterns and differentials of breastfeeding by various maternal background characteristics.

4.3.1 Incidence/prevalence method

Table 4.2 shows the mean duration of breastfeeding by selected background characteristics. The mean duration for all children was 21.0 months. The maternal level of education and the duration of breastfeeding have an inverse association. The higher the education level, the lower the average breastfeeding duration. Women with no education had a mean duration of breastfeeding of 21.4 months while those with primary education and secondary education had means of 21.3 and 20.1 months respectively. These results are as expected as the mothers with higher education usually to breastfeed for a shorter duration than their counterparts with lower levels of education. This could be due to the fact that most women with secondary plus education are employed in the formal sector and therefore spend less time with their children. Secondly, it is likely that these women with secondary plus education tend to abandon traditional practices easily, long durations of breastfeeding being one of the traditional practices. Ahmed (1986), Ferry and Smith (1983) and Giashuddin and Kabir (1990) in different studies in Bangladesh also found similar inverse relationships.

Maternal work status seems to have a major impact on the average duration of breastfeeding because the means of duration between working mothers and non-working differed significantly. The mean duration for non-working mothers was 26.4 months while for working mothers was 16.5 months. This may be due to working mothers having less time to spend with their children unlike non-working mothers. Type of place of residence gave expected results, children in the urban residence were breastfed for a shorter duration of 19.4 months while the children in the rural areas were breastfed for 21.3 months.

Table 4.2 Mean Durations of Breastfeeding According To Maternal Background Characteristics Using The Incidence/Prevalence Method

Explanatory variable	Total births	Currently breastfeeding	Mean duration of breastfeeding in months
Maternal education			
No education	411	244	21.4
Primary education	2266	1341	21.3
Secondary +	854	478	20.1
Total	3531	2063	21.0
Maternal work status			
Not working	1604	1177	26.4
Working	1922	883	16.5
Total	3526	2060	21.0
Place Of Residence			
Rural	3002	1778	21.3
Urban	529	285	19.4
Total	3516	2063	21.0
Ethnicity			
Kikuyu, Kamba	828	480	20.9
Luo, Luhya	1283	750	21.0
Mijikenda/Swahili	307	178	20.9
Others	1114	655	21.2
Total	3531	2063	21.0
Maternal age at birth			
< 19 years	513	288	20.2
20-34 years	2551	1501	21.2
35+ years	467	274	21.2
Total	3531	2063	21.0
Parity			
1 birth	727	375	18.6
2-3 births	1292	768	21.4
4+ births	1512	920	21.9
Total	3531	2063	21.0
Presence of toilet			
No toilet	640	396	22.3
Has toilet	2865	1655	20.8
Total	3505	2051	21.1
Source of drinking water			
Not piped	2613	1550	21.4
Piped	898	507	20.3
Total	3511	2057	21.1
Place of delivery			
Health facility	1383	746	19.4
Non-health facility	2123	1316	22.3
Total	3506	2062	21.2

Source: Analysis of 1998 KDHS data

For all births, children of mothers who gave birth at less than 19 years of age breastfed on average for 20.2 months while those aged 20 – 35+ breastfed for 21.2 months, implying that above the age of 19, maternal age at birth did not cause any major variation in the duration of breastfeeding. Parity demonstrates a positive association with duration of breastfeeding. Children of mothers of parity one breastfed on average for 18.6 months while those of parity 4+ breastfed for 21.9 months on average. Huffman et al (1980) and Haider and Nurul (1995) observed such an association which may be expected since women of higher parity are also those who are likely to be older, younger women may be expected to have a higher level of education and be more likely to break with traditional behaviour and patterns than older and less educated women.

Children borne in non-health facilities tend to breastfeed for longer durations compared to children borne in a health facility. On average children borne in a health facility breastfed for 19.4 months while those borne in a non health facility breastfed for 23.3 months. There are minimal differentials according to ethnicity, ethnic groups that are known to have high infant and child mortality such as the Luo, Luhya, Mijikenda/Swahili had almost the same mean durations of breastfeeding with the ethnic groups associated with low risks of infant and child mortality such as the Kikuyu. The Luo and Luhya had slightly longer mean durations of breastfeeding. This may be because they adhere more to traditional practices that promote breastfeeding than other ethnic groups. (Akwara,1994).

Households with no piped water and with no toilet facilities had longer durations of breastfeeding than those with piped water and toilet facilities. This may be attributed to the association between the presence of piped water and toilet facilities with education. More educated mothers tend to have toilet facilities and piped water because they are knowledgeable on hygiene and are more economically empowered, they also tend to be in formal employment and have adopted modern practices thus less duration of breastfeeding.

4.4 Differential Childhood Mortality by Duration of Breastfeeding.

This section focuses on the general differentials observed for the children in the study according to the duration of breastfeeding and childhood mortality. This is important in establishing the patterns of child survival by duration of breastfeeding. Childhood mortality differentials according to duration of breastfeeding are obtained by computing the interval risks of death.

This sub-section highlights the differentials observed for children born 35 months preceding the survey according to the duration of breastfeeding with regard to interval risks of death for intervals 0-11 months and 12-35 months. Table 4.1 below shows results obtained from the calculated risk of death per every interval according to months of breastfeeding. The method of computation is shown in section 3.3.3 in chapter three.

Infant and child mortality is expected to vary according to the months a child is breastfed. Longer breastfeeding periods are expected to be associated with lower risks of mortality than shorter periods of breastfeeding.

Table 4.3 Interval Risks Of Death According To Months Of Breastfeeding

Interval (0-11) months					Interval (12-35) months			
Duration of breastfeeding	Deaths	Exposures	Risk	Risk per 10,000	Deaths	Exposures	Risk	Risk per 10,000
0-6 months	52	59174	0.00088	9	93	474288	0.00020	2
7-11 months	24	40135	0.00060	6	66	319184	0.00021	2
12-17 months	44	59481	0.00074	7	80	469777	0.00017	2
18-23 months	32	38988	0.00082	8	53	309745	0.00017	2
24-35 months	20	24059	0.00083	8	40	187677	0.00021	2

Source: Computed from KDHS 1998

The results in table 5.1 show that the interval risks of death in infancy (0-11) months is higher for children breastfed for shorter periods (0-6 months) as compared to those breastfed for at least 7 months.. However, it is observable that children breastfed for more than 18 months had a higher risk of death at infancy than those breastfed for 7-18 months. This findings conform to findings in a study (Akwara, 1994) in Western Kenya found that children breastfed for more than 18 months had a higher risk of death than those breastfed for 13-18 months. Similarly, Linderstrom and Berhanu(1999) in a study in Ethiopia also found that beyond the 24th month of, continued breastfeeding increased the risk of death, and the risk increased with age.

In the 12-35 months interval, the risk of death was almost the same for all durations of breastfeeding. This implies that child mortality does not vary according to the months a child is breastfed. This conforms to previous studies in Kenya (Ankinrola and Olaleye, 1991) and in other parts of the world (Yoon et al, 1996; Palloni and Tienda, 1986) who found the differentials of mortality according to duration of breastfeeding beyond the infancy stage being insignificant.

In conclusion, this chapter looked at the survival status of children aged 0-35 months, the mean duration of breastfeeding by maternal background characteristics as well as the interval risk of death by duration of breastfeeding. The mean durations of breastfeeding behaved as expected in all the categories of maternal background characteristics. The interval risk of death demonstrated that breastfeeding duration is an important factor in determining infant mortality but its importance diminishes after infancy.

CHAPTER FIVE

EFFECTS OF DURATION OF BREASTFEEDING ON INFANT AND CHILD MORTALITY

5.1 Introduction

This is important in establishing the effect duration of breastfeeding has on infant and child mortality when other factors are controlled for. This section presents the bivariate and multivariate results on the main effects of duration of breastfeeding on childhood mortality. The impact duration of breastfeeding has on infant and child mortality was established by use of logistic regression models. A total of five models were fitted.

A total of 3531 children were born 3 years preceding the survey of which 256 were dead and 3275 were alive at the date of interview. This implies that a total of 3531 children born 3 years preceding the survey were exposed to the risk of death.

5.2 Bivariate Analysis Results

In this sub section bivariate logistic regression was carried out in order to establish the gross effects of each explanatory variable on infant and child mortality in Kenya. Logistic regression was preferred to cross tabulations because apart from showing the strength of the association between the explanatory variables and the dependent variable, it also shows the direction of association. A total of nine bivariate models were run. In each model, the category of the variable known to have the lowest risk of death was used as the reference category. The results of the bivariate analysis are summarized in Table 5.1.

The study established that there was a significant relationship between maternal education and infant and child mortality. Children of mothers with no education were 1.8 times more likely to die than children of mothers with secondary education and above. The results further indicate that children of non-working mothers were 1.05 times more likely to die than children of working mothers. The relationship was statistically significant at the 95 percent level. Children from rural areas were 1.05 times more likely

to die than children from the urban areas, the association was only statistically significant at 90% confidence level.

Maternal age at birth, parity and place of delivery were statistically significant maternal factors associated with lower risk of death of children under the age of three. The results indicate that the children born to mothers who were nineteen years and less at the time of birth were twice more likely to die than children born to mothers who were aged 20-34 years at the time of birth. Children born to mothers who were of parity 4+ were 1.6 times more likely to die than those who were born to mothers of parity 2-3. children born in a non-health facility are 1.5 more times more likely to die than those borne in a health facility.

Presence of toilet facility and source of drinking water were statistically significant environmental factors associated with lower risk of death. Children in households without a toilet facility and with a non piped source of drinking water are 1.4 and 1.5 times respectively more likely to die than those children in households that have piped water and a toilet facility.

Ethnicity is also a statistically significant socio-cultural factor associated with the risk of childhood death. Children from the Luo, Luhya communities were twice more likely to die than children from the Kikuyu and Kamba communities while children from the Swahili/ Mijikenda were 1.2 times more likely to die than children from the Kikuyu and Kamba ethnic groups.

From the results above, the socio-economic factors, maternal factors, environmental and socio-cultural factors are significantly associated with the risk of death for children under the age of three in Kenya and therefore will be included in the logistic regression analysis.

Table 5.1 Bivariate Logistic Regression Results

Variables	β	Standard error	Exp β
Maternal Education			
Secondary+	0.000		1.0000
Primary	0.475	0.18	1.608***
None	0.563	0.24	1.756***
Maternal Work Status			
Working	0.000		1.0000
Not Working	0.116	0.13	1.050**
Place of Residence			
Urban	0.000		1.000
Rural	0.045	0.18	1.046*
Maternal Age At Birth			
20-34	0.000		1.000
19 & below	0.735	0.16	2.086***
35-49	0.370	0.19	1.448***
Parity			
2-3	0.000		1.000
1	0.266	0.19	1.305*
4+	0.483	0.15	1.621**
Place of Delivery			
Health Facility	0.000		1.000
Non health facility	0.397	0.15	1.488***
Presence of toilet			
Yes	0.000		1.000
No	0.357	0.16	1.429**
Source of drinking water			
Piped	0.000		1.000
Not piped	0.421	0.17	1.524**
Ethnicity			
Kikuyu & Kamba	0.000		1.000
Luo, Luhya	0.732	0.18	2.080***
Mijikenda/ Swahili	0.220	0.27	1.247
Others	-0.247	0.21	0.781

*Notes: *** significant at 99 percent confidence level using two-tailed t –test; ** significant at 95 percent confidence level; * significant at 90 percent confidence level.*

5.3. Multivariate Results

Variables included in the multivariate analysis models were entered in blocks so as to establish both the impact and the mechanism of causation while using the analytical framework that guided the study. Months of breastfeeding was entered first, followed by the block of variables containing socio-economic variables, followed by the block of variables that contained environmental variables, followed by the block of variables containing maternal and health variables, and finally ethnicity. A total of five multivariate models were fitted. The results are presented in Table 5.2.

5.3.1 The Effect of Months of Breastfeeding on Childhood Mortality

It is evident from Table 5.2 that only 12-17 months of breastfeeding has statistically significant effect on infant and child mortality at 95% confidence level as is indicated in model 1. However, when other explanatory variables are fitted into the model as is shown in models 2,3,4,5 the significance reduces. This implies that some of its effect is captured by the other explanatory variable in the study. Generally, duration of breastfeeding has no significant effect on infant and child mortality.

It is evident in model 1 that the children breastfed for 18-35 months have a lower likelihood of dying than those breastfed for less than 18 months and those breastfed for more than 23 months. The highest risk of death is associated with children breastfed for 12-17 months and 7-11 months with likelihood of dying being 1.6 and 1.5 more times respectively than children breastfed for 18-23 months.

The pattern is similar in models 2, 3, 4 and 5 when socio-economic, maternal, health, environmental and socio-cultural factors are controlled for. However, the parameter estimates of duration of breastfeeding slightly reduce as other independent factors are controlled for. This implies that only a small effect of duration of breastfeeding on infant and child mortality can be explained by the other explanatory variables in the study. Thus, the mechanism of causation of the effect of duration of breastfeeding on childhood mortality is not clear.

5.3.2 The Impact of Socio-Economic Factors

Two socio-economic variables maternal work status and maternal level of education were included in models 2, 3, 4 and 5. In all models, lower levels of maternal education and mothers not working were associated with a higher risk of infant and child deaths. Mothers work status had no significant effect on infant and child mortality. Children born to mothers who were not working had a higher risk of mortality than children born to working mothers.

The results were as expected, the risk of mortality was negatively associated with the level of education, the lower the risk of education, the higher the risk of death before age three. Though the likelihood of death reduces when model 3 and 4 are fitted, none education remains highly significant at the 95 percent confidence level in model 2, 3 and 4. In model 5 when ethnicity is controlled for, maternal non- education has no significant effect on infant and child mortality. This indicates that there may be an interaction between maternal level of education and culture in influencing infant and child mortality.

5.3.3 Impact of Household Environmental Factors

The results in model 3, 4 and 5 show that presence of a toilet facility had a significant effect on the risk of infant and child mortality at 95 percent confidence level. Children in households with no toilet facility and children in households with no piped source of drinking water had a substantially higher risk of mortality than children in households with a toilet facility and a piped source of water. Presence of a toilet facility indicates better hygienic conditions in the home hence, lower risk of death. Piped water indicates less morbidity and mortality arising from use of contaminated water.

Table 5.2. Main Effects Estimates From Multivariate Models With The Likelihood Of Death For Children Aged 0-3 Years As The Outcome Variable.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Months of Breastfeeding					
18-23 ^R	1.000	1.000	1.000	1.0000	1.0000
0-6	1.215(0.23)	1.157(0.24)	1.120(0.24)	1.110(0.24)	1.098(0.24)
7-11	1.503(0.24)	1.462(0.25)	1.418(0.25)	1.401(0.25)	1.359(0.25)
12-17	1.602(0.22)**	1.520(0.23)*	1.513(0.23)*	1.518(0.23)*	1.512(0.23)*
24-35	1.032(0.30)	1.039(0.30)	1.056(0.31)	1.057(0.31)	1.052(0.31)
Maternal Education					
Secondary ^R		1.000	1.000	1.000	1.000
Primary		1.725(0.29)*	1.596 (0.29)	1.500(0.29)	1.310(0.29)
None		3.671(0.28)***	2.136 (0.30)**	1.860(0.31)**	1.059 (0.31)
Maternal work status					
Working ^R		1.000	1.000	1.000	1.000
Not working		1.217(0.15)	1.029 (0.15)	1.035(0.15)	1.059(0.16)
Source of drinking water					
Piped ^R			1.000	1.000	1.000
Non-piped			1.778(0.15)**	1.773(0.15)**	1.771(0.16)**
Presence of toilet facility					
Presence of toilet			1.000	1.000	1.000
No toilet			2.897(0.17)***	2.884(0.17)***	2.109(0.19)***
Maternal age at birth					
20-34 ^R				1.000	1.000
< 20 years				1.647 (0.17)***	1.650(0.04)***
35+				0.647 (0.29)	0.639(0.29)
Parity					
2-3 ^R				1.000	1.000
1				2.165(0.38)***	2.016(0.38)***
4+				2.268(0.24)***	2.158(0.24)***
Place of delivery					
Health facility ^R				1.0000	1.000
Non-health				1.425(0.15)**	1.499(0.16)**
Ethnicity					
Kikuyu, Kamba ^R					1.000
Luo, Luhya					5.148(0.45)***
Mijikenda/Swahil					2.036(0.23)***
Others					2.134(0.31)**

Notes: standard errors are in parenthesis. *** significant at 99 percent confidence level using two-tailed t – test; ** significant at 95 percent confidence level; * significant at 90 percent confidence level. Model 1 = months of breastfeeding variable only, model 2 = model 1 plus all Socioeconomic variables, model 3 = model 2 plus all maternal and health factors, model 4 = model 3 plus all environmental factors, model 5 = model 4 plus ethnicity. ^R represents the reference categories.

5.3.34 Impact of Maternal Factors

Parameter estimates for maternal factors in model four and five conformed to theoretical expectations. Children born to mothers who were less than 20 years at the time of birth had a significantly higher mortality risk at 99 percent confidence level when compared to those children born to mothers in their prime reproductive age (20 –34) years. However, the results indicate that children borne to mothers of over 35 years are less likely to die at childhood than children to mothers of 20-34 years.

Parity was also a statistically significant factor in predicting mortality of children under the age of three at 99 percent confidence level. Children of mothers of parity one and those of parity four and above had a higher risk of mortality than those of parity 2-3. In model 4 and 5, the likelihood of mortality for children of mothers of parity one and parity 4+, is more than twice that of children born to mothers of parity 2-3.

Maternal age at birth was intended to capture the physiological strength of a mother to give birth and nurse a child. Very young mothers (<20 years) may not be physiologically and emotionally mature enough to adequately manage a pregnancy and may lack child care skills and access to health care services (Pebley and Stupp, 1987). The higher risk of infants born to older mothers (35 years and over) may be due to the decline in efficacy of the reproductive system with age hence an increased risk of delivering a genetically impaired birth, which may have a higher risk of mortality (Sullivan et.al., 1994)

It is evident in model 4, and 5, that type of place of delivery had a statistically significant effect on infant and child mortality at 95 percent confidence level. The parameter estimates did conform to the theoretical expectations. Children delivered in non- health facilities exhibited higher rates of mortality than those born in health facilities. Children borne in non- health facilities are 1.5 times more likely to die before age 3 than those borne in a health facility.

5.3.5 Impact of Ethnicity

It is clearly evident in model 5 that ethnicity had a statistically significant effect at 99 percent confidence level on the level of infant and child mortality. The highest risk of mortality is associated with the Luo and Luhya Communities. The parameter estimates indicate that a child borne to a Luo or Luhya mother has a probability of dying of 5 more times compared to a child born to a Kikuyu or Kamba mother. Similarly children born to a Swahili/ mijikenda mother have a likelihood of dying of 2 times more compared to a child born to a Kikuyu Mother. This differential in mortality due to ethnicity may be due to cultural attitudes, beliefs and practices that promote the increase in infant and child mortality. These cultural practices are prevalent among the Luo, Luhya and Swahili/ Mijikenda communities.

5.3.6 Summary

In this chapter, the effects duration of breastfeeding has on infant and child mortality were established. First, a bivariate analysis was carried out to determine which independent variables were statistically significantly related to the risk of infant and child mortality and the direction of association. The directions of associations were as expected in all variables. Maternal level of education, maternal work status and place of residence were statistically significant factors related to infant and child death. Maternal age at birth, parity and place of delivery were statistically significant maternal factors related to infant and child death while source of drinking water and presence of toilet facility were statistically significant household environmental factors associated with the risk of infant and child death. Ethnicity was a significant socio-cultural factor.

The significant factors in the bivariate analysis were used in fitting the multivariate models. To get the effect duration of breastfeeding had on infant mortality a total of five models were fitted. Duration of breastfeeding turned out to be an insignificant factor associated with the risk of infant and child mortality in all the models, only breastfeeding for 12-17 months had a significant effect on infant and child mortality. The likelihood of dying was higher for children breastfed for 7- 17 months as compared to the 18-23 months category. However, when other factors are controlled for in model 2, 3, 4. and 5

the parameter estimates for the durations of breastfeeding decreased. This conforms to the earlier findings of other studies (Ankinrola and Olaleye, 1991; Yoon et al, 1996; Palloni and Tienda, 1986) who found that breastfeeding becomes an insignificant factor related to infant and child death beyond infancy.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of the research findings, conclusion and recommendations for policy makers and for further research are presented. Recommendations are made for policy makers and future researchers based on the findings.

6.2 Summary and Conclusion

The broad objective of this study was to examine the relationship between duration of breastfeeding and infant and child mortality. More specifically, the study estimated the mean durations of breastfeeding by maternal background characteristics, the study also determined the survival status of children born 36 months prior to the survey by duration of breastfeeding. The study further determined the effect of breastfeeding on infant and child mortality when other explanatory factors are controlled for.

The data for the study was extracted from 1998 KDHS. The study population consists of a sub-sample of 3531 births that occurred 36 months prior to the survey of which 256 of them died. The study was restricted to children born three years prior to the survey because the data on breastfeeding was for children born three years prior to the survey. The quality of data was assessed by examining the age reporting of the study sample births and deaths as well as establishing the extent of age heaping of the reported births, deaths and duration of breastfeeding.

Chapter one was the introduction of the study, chapter two was the literature review and the study design. In chapter three data quality and methods of analysis used in the study were briefly discussed. Chapter four presented infant and child mortality differentials and patterns of breastfeeding. Crosstabulations was run to determine the survival status of the children by selected background characteristics. Secondly, the mean duration of breastfeeding was established using the incidence/ prevalence method in order to

determine the breastfeeding patterns by maternal background characteristics. Finally, the interval risk of death was established so as to determine the patterns of infant and child survival by duration of breastfeeding.

The study established that maternal level of education and duration of breastfeeding had a negative linear association. Children born to mothers with secondary + education had lower average breastfeeding duration than children born to mothers with lower education levels. Children of working mothers exhibited longer average duration of breastfeeding than non- working mothers while children in the rural areas had a higher average duration of breastfeeding than children in urban areas. Children born to mothers who were 19 and below years at the time of birth had a lower average duration of breastfeeding. Similarly, children born to mothers of parity 1 had a lower mean duration of breastfeeding compared to children born to mothers of higher parities. The Luo and Luhya had the lowest mean duration of breastfeeding while the Kikuyus and Kambas had the highest average duration of breastfeeding. When the interval risk of death is considered, the duration of breastfeeding tended to be only a significant predictor of the risk of infant death and not child death. The highest risk of infant death was for the children who breastfed for 12-17 months, followed by the children who breastfed for 18 months and above. The children who breastfed for 18-23 months had a lower probability of dying during infancy.

In chapter five bivariate and multivariate hazards regression model were fitted. The bivariate analysis indicated that maternal education, maternal work status, place of residence, maternal age at birth, parity, place of delivery, ethnicity, source of drinking water and presence of toilet facility were significantly related to infant and child mortality in Kenya. Higher risks of mortality were associated to children borne to less educated mothers, mothers in rural areas, and non-working mothers. Similarly, children born to mothers who were 35+ at the time of birth, children born to mothers of high parities and those borne in health facilities were also associated with higher risks of infant and child death. Absence of a toilet facility and lack of access to piped drinking water was also associated with a higher risk of infant and child death. Children borne to

mothers from the Luo/ Luhya ethnic groups were also associated with a higher risk of infant and child mortality.

The effects of duration of breastfeeding were established by fitting five models. The first model established the gross effect of duration of breastfeeding on infant and child mortality. In the second model socio-economic variables were controlled for in addition to the variable in model 1. In the third model, household environmental factors were controlled for in addition to the variables in model 2 while in the fourth and fifth model, maternal variables and ethnicity were controlled for simultaneously. The study established that duration of breastfeeding was not a significant factor related to infant and child death in all models. This finding conforms to other previous studies that found breastfeeding not to be significantly related to infant and child death (Ankininola and Olaleye, 1991; Palloni and Millman, 1986).

The likelihood of dying for those whose duration of breastfeeding is of 12-17 months compared to the 18-23 months category. However, when other factors are controlled for in model 2, 3, 4. and 5 the parameter estimates for the durations of breastfeeding decreased. In model 3, 4 and 5 when household environmental factors are controlled for the shorter durations of breastfeeding (<12 months) and a lower relative risk of infant and child mortality than those who were breastfed for longer durations. This conforms to the earlier findings in the literature that breastfeeding becomes an insignificant factor related to infant and child death beyond infancy (Khasakala, 1998).

Generally, the parameter estimates for the other explanatory variables were as expected. However, the addition of other variables in the models had a reducing effect on the parameter estimates of duration of breastfeeding. The study also demonstrated that maternal education is a highly significant predictor of infant and child mortality in all models except in model 5. Maternal work status was also a significantly related to infant and child mortality in gross terms. It became insignificant when other factors were controlled for implying that its effect may have been captured by some other factors such as maternal education. Parity, maternal age at birth and place of delivery emerged as

significant factors related to the risk of infant and child death at 95 percent confidence level. Similarly, presence of toilet facility, source of drinking water and ethnicity were strong predictors of infant and child mortality.

6.3 Recommendations for Policy Makers

The study established that the effect of duration of breastfeeding on infant and child mortality is negative but not significant. The benefits of breastfeeding to the mother and child are numerous and therefore should be encouraged so as to increase the survival chances of children.

Though not in this study, HIV/AIDS could be a factor that contributed to duration of breastfeeding being an insignificant predictor of infant and child mortality. And therefore, more vigorous campaigns should be carried out to discourage HIV+ mothers from breastfeeding their babies to prevent mother to child transmission. In addition to this, HIV/AIDS related stigmatisation should be eliminated at the grass root level because most infected women are likely to be discriminated against if other people discover that they are not breastfeeding because they are infected with the HIV/ AIDS virus.

Efforts should also be made to achieve high standards of sanitation and health services. If the above conditions are achieved any loss of benefits from breastfeeding will be made up by the use of health facilities and the high sanitation standards. Government should enhance policies that ensure universal access to clean water and good.

Breastfeeding overrides any feeds given to children especially at infancy.

6.4 Recommendations for Further Research

Further research should be carried out on the relationship between breastfeeding behaviour and infant and child mortality in the wake of HIV/ AIDS especially now that the 2003 KDHS dataset dealt with issues related to HIV/AIDS.

REFERENCES

- Akinirola, B. and Olaleye (1991). The effects of breastfeeding practices on Infant and child mortality in Kenya. Proceedings of the Demographic Health Surveys World Conference, Vol II, Washington D.C.
- Akwara, A.P (2000): Socio-cultural factors and child health in Kenya. What strategies for development in population and development in Kenya. PSRI publication, Nairobi Kenya.
- Akwara, P. A., (1994). " The Impact of Breastfeeding on infant and child mortality: A case study of Amagoro Division, Busia, Kenya. Unpublished M. A. Thesis, PSRI University of Nairobi.
- Al Hassan Conteh, Patricia H. D. and Evasius K. B. (1990). Environmental risk factors of childhood mortality in Liberia: Evidence and policy implication. In Hill G.H(eds).
- Anker R. and J.C Knowles (1977) An empirical analysis of mortality differentials in Kenya at macro and micro levels. *Population and Employment Working paper*, No.60.
- Barros, F. and C. G. Victora, (1990). Breastfeeding and Diarrhoea in Brazilian children. The Population Council, New York.
- Basu, A. M. and K. Basu(1991). Women's economic roles and child survival, the case of India. *Health Transition Review*, 1(1) pp 83-104.
- Bradley, J., S. Baldwin and H. Amstrong (1987). Breastfeeding, a neglected household level weaning, food resource: Improving young child feeding in Eastern and Southern Africa. Proceedings of a workshop held in Nairobi, Kenya, October 1987.
- Caldwell J. C (1980) "Education as a factor of mortality decline". An examination of Nigerian data. *Population studies vol.33 pp 398-402 1979*.
- Caldwell J. C. and McDonald P. (1981) " Influence of maternal education on infant and child mortality" International population Conference, solicited papers, IUSSP (2) pp 79-96.
- Cleland, J.G. (1990). Maternal Education and child survival: Further evidence and explanations, in J Caldwell et al.(eds), *Health Transition series* No. 2(1). In what we know about health transition: The cultural, social and behavioural determinants of health.
- Eelens, F (1983). The impact of breastfeeding on infant and child mortality with varying incidence of malaria. Evidence from the Kenya Fertility Survey, 1977-78. Interuniversity programme in Demography working paper, 1983(3).
- Farah A. and S. H. Preston (1982) " Child mortality Differentials in Sudan". *Population and development review* 8 No. 2 pp 365-383.

Forste, R. (1994). The effects of breastfeeding and birthspacing on infant and child mortality in Bolivia. *Population studies*, vol 48 pp 497-511.

Gaminiratme, K. H.(1991). Socio-economic and behavioral determinants of diarrhoeal morbidity among children in Sri Lanka. DHS World Conference proceedings. Vol 1 pp 754-784. macro International Inc. Calverton MD.

Geronimus, A.T. and S. Korenman (1993). The socioeconomic cost of teenage childbearing: Evidence and Interpretation. *Demography* 30(2) pp 281-290.

Golding J, P. M. Emmelt and I. S. Rogers (1997). Breastfeeding and infant mortality. *Early Human Development Supplement*, series 143(55).

Gribble, J. N (1993). Birth intervals, gestational age and low birth weight: are relationships confounded? *Population studies*, 47 pp 133-146.

Gursoy, A (1992) Parental education and child mortality. *Health transition review Vol 4(2)* pp 183-185.

Haggerty, P. A. (1999). Breastfeeding and Complimentary Infant feeding and the Postpartum effects of Breastfeeding, DHS Comparative Studies No. 30. Macro International Inc. Calverton, Maryland U.S.A.

Helsing E. and S. King (1983). Breastfeeding in practice: A manual for health workers. Oxford University Press.

Hobcraft J. (1992): " Fertility patterns and child survival". A comparative analysis "Population bulletins of the United Nations." No 33 pp1-31. Department of economic and social development, New York United Nations.

Hobcraft J. N, McDonald, J.W and Rutstein S.O (1984). Socio-economic factors in infant and child mortality. A cross-national comparison. *Population studies* 38 pp 193-223.

Ikamari, L. D.E. (1996). Determinants of Child survival in Kenya. Unpublished Ph.D Thesis, Demography Program, Research school of social services, Canberra, Australian National University.

Iqbal H. S. and Jitendra K. (1998). Breastfeeding, infant health and child survival in the Asia-Pacific Context. *Asia Pacific Population Journal*, Vol. 5, No 1.

Jain, A. (1988). "Determinants of Regional Variations in Infant Mortality in Rural India." In A. Jain and L. Visaria (eds), *Infant Mortality in India: Differentials and Determinants*. Sage publications pp 127-167.

Jellife, D. B. and E. F. P. Jellife (1978). Human milk in the modern world. Oxford University Press, Oxford.

K' Oyugi B. O. (1992). Impact of household and community level environmental factors on infant and child mortality in rural Kenya. Unpublished Ph.D Thesis. P. S. R. I., University of Nairobi.

Knodel, J. (1977). Breastfeeding and Population Growth. *Science*, 198 pp 1111-1115.

Levine, R. A., S. E. Levine, A. Richman, F.M.T. Uribe, C. S. Correa and P.M. Miller (1991). ' Women's schooling and childcare in the demographic transition.' *Population and Development review*, 17(3).

Majumber A. K. (1989), "determinants of infant and child mortality in Bangladesh". Unpublished Ph.D Thesis, Demography Program, Research school of social services, Canberra, Australian National University.

Markos E. and E. Gurmu (1997). Breastfeeding, birth intervals and child survival: Analysis of the 1997 Community and Family Survey Data in Southern Ethiopia. *Journal of Health Development*.

Mosley, W. H. and Chen, L.C. (1984). An analytical framework for the study of child survival in developing countries. *Population and Development Review*, 10(supplement), pp 25-45.

Mosley, W. H., L.H. Werner and S. Becker (1982). The Dynamics of Birth Spacing and Marital Fertility in Kenya. WFS Scientific Reports No. 30.

National Council for Population and Development (NCPD), Central Bureau of Statistics (CBS) and Macro International (1989, 1998). Kenya Demographic Health Survey. Calverton MD, NCPD, CBS and Macro International.

Ngura, D.K (1998). Child survival determinants in the Arid and Semi-arid lands: A study of Machakos, Kilifi and Taita Taveta Districts. Unpublished M.A Thesis, PSRI, University of Nairobi.

Palloni (1981). Mortality in Latin America emerging patterns. *Population and Development review* 17(4) pp 623-649.

Palloni A. and M. Tienda (1986). The effects of Breastfeeding and Pace of childbearing on mortality at early ages. *Demography* 23(1) pp 31-52.

Pant, P.D (1995), " Infant and child mortality in Nepal: Socio-economic, demographic and cultural factors", Unpublished Ph.D Thesis, Demography Program, Research school of social services, Canberra, Australian National University.

Pebley A. R. and P.W Stupp ,(1987). Reproductive patterns and child mortality in Guatemala, *Demography*, 24(1) pp 43-60.

Rajna P. N., A.K. Mishra and S. Krishnamoorthy (1998). Impact of maternal education and health services on child mortality in Uttar Pradesh, India. *Asia-Pacific Journal*, vol 13 No 2.

Rutstein, S.O. (1984). Infant and child mortality: Levels, trends and demographic differentials. WFS Comparative Studies No. 43. Voorburg, Netherlands: International Statistical Institute.

Sastry, N. (1996). Community characteristics, individual and household attributes, and child survival in Brazil. *Demography* 33(2) pp 211-229.

Trussell J and C. Hammerslough (1983). "A Hazards-Model Analysis of the covariates of infant and child mortality in Sri Lanka, *Demography* 20 pp 1-26.

Tulasidhar, V.B (1993). Maternal education, female labour force participation and child mortality: Evidence from the Indian census. *Health and transition review*, 3(2) pp 177-190.

UNICEF (2000). Trends in breastfeeding patterns, 1990-2000: Facts and figures.
United Nations (2002) State of the World Population; New York. United Nations

Ware H. (1984). Effects of maternal education, women's roles and child care on mortality. *Population and development review* vol. 10.

Winikoff B., M. A. Castre and Y. H. Laukaran (1988). Feeding infants in four societies: Causes and Consequences of Mothers' Choices. Greenwood Press, London.

Woldemicael, G.(2000). The effects of water supply and sanitation on childhood mortality in Urban Eritrea. *Journal of Biosocial Science*, 32 pp 207-227.