THE IMPACT OF BREAST FEEDING PRACTICES ON INFANT AND CHILD MORTALITY IN AMAGORO DIVISION OF BUSIA, KENYA

by

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DEDICATION

To My Family - For being so caring. Thank you all.

DECLARATION

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

Sign. ____________

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This Thesis has been submitted for examination with our approval as University Supervisors.

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ABSTRACT

This study examined the impact of breastfeeding duration and age at supplementation on infant and child mortality, under prevailing socio-economic, environmental and demographic conditions. Primary data was collected for the last births and next to last births; from 1030 women aged 15-49 years resident in Amagoro Division, Busia District.

The data was analysed using frequencies, crosstabulations, the Chi-Square, Trussell Method of Mortality Estimation and Logistic Regression. The frequency distributions showed that most children are breastfed for 19-24 months and supplemented at 3-4 months. Cross-tabulation and the Chi-Square results have shown that for both the last and next to last births breastfeeding duration, age at supplementation, education, source of water, type of toilet facility and immunization were significant in child survival.

The crude mortality estimates have shown an infant mortality rate of 60 deaths per 1000 live births and childhood mortality of 97 deaths per 1000 live births. The q(2) estimates were 62 and 71 and q(5) were 70 and 72 using the North and West Models respectively.

The logistic regression results have significantly indicated less chances of child deaths in relation to breastfeeding duration, supplementation, type of toilet facility used by the household, work status of the mother, and immunizations received by the child.

Longer breastfeeding durations (13-24 months) decreased the chances of child deaths as compared to no or shorter breastfeeding durations (0-12 months).

Children who were supplemented between ages 4-6 months had higher chances of survival as compared to those who were supplemented at earlier (0-3 months) or later ages (7+ months).

Type of toilet facility used by the household was very significant in influencing child deaths. Those children whose households used bush had higher probabilities of dying than those whose households used pit toilets. Again, when this variable was controlled, it became the most significant to breastfeeding and age at supplementation.

The children who had received all the immunizations had higher survival chances than those who had none or only some.

Work status (employed away from home or not) was not significant in influencing child deaths for the case of last births, but was very significant for the next to last births. For the next to last births, those children whose mothers did not work had higher chances of dying than for those whose mothers worked.

The logistic regression results showed no significant relationship between age of mother, parity, marital status of the mother and infant and child deaths for both the last births and next to last births.

The major conclusion that was derived from the results of the study was that environmental factors (type of toilet facility) and socio-economic factors (immunization and work status) are very significant in influencing infant and child deaths. The impact of breastfeeding and age at supplementation was greatly modified by these factors.

The study therefore recommended that female employment opportunities should be increased because maternal education highly determines the nutritional, health care and sanitary conditions of the household as the woman would have more decision-making roles when her income is high. The study further recommended that public health education be intensified by the government and other agencies, especially on the importance of breastfeeding, proper nutrition and sanitation to the health of the children.

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CHAPTER ONE

1.0 PROBLEM STATEMENT, OBJECTIVES, STUDY JUSTIFICATION, LIMITATION AND BACKGROUND TO THE STUDY AREA

1.0.1 GENERAL INTRODUCTION

Evidence from studies of child mortality in developing countries suggests that child care practices are important determinants of infant and early childhood mortality (Mosley and Chen, 1984; Peterson et al., 1980). The argument is that child care practices such as feeding practices and health seeking behaviour have direct relationship with child survival, and also act as proximate factors through which parental (especially maternal) variables and environmental factors influence child mortality. Breast feeding stands out as a child care index that is consistently identified to be negatively associated with mortality, especially, in the first year of life. UNICEF (1984) has been at the forefront in the global promotion of a "child survival revolution" based on what is referred to as the GOBI-FF strategy, an acronym for "growth monitoring, oral rehydration therapy for diarrhoea, breast feeding, immunization, food supplements, and family planning".

This study attempts to examine the relationship between breast feeding practices and infant and childhood mortality in Amagoro Division, Busia District.

1.1 PROBLEM STATEMENT

Amagoro Division of Kenya is still experiencing fairly high infant and child mortality despite the improvements in health care facilities and general socio-economic development. One of the factors that have been postulated as affecting infant and child mortality is breast feeding (Mosley and Chen, 1984; Unicef, 1984; Peterson et al, 1980). There is a consensus that less breast feeding and early supplementary feeding of infants leads to high infant and child mortality.

Whereas breast feeding has, indeed, played a prime role in keeping mortality of children in check, the evidence has recently been accumulating that breast feeding is only significant before the age of 6 months and thereafter socio-economic, environmental and demographic factors play an important role (Gray, 1981; Cantrelle and Leridon, 1971; Wray, 1978; Akinrinole and Olakye, 1990).

The questions are: Does breast feeding have an impact on infant and child mortality? Secondly, do environmental, demographic and socio-economic factors modify the impact of breast feeding on infant and child mortality? Thus there is a need to measure this effect in Amagoro Division in particular. This is because, with increased formal education to women, many rural mothers have been known to discard breastfeeding and adopt bottle feeding which they think is most modern. This is unfortunately done without accompanying improvements in sanitation and quality of bottle feeds which are often more infected because of the unhygienic conditions under which the food supplements are prepared.

The many studies that have been carried out on infant and child mortality in Kenya have focused on socio-economic, cultural, environmental and demographic factors (Anker and Knowles, 1983; Kichamu, 1986; Mutai, 1987; Owino, 1988; Osiemo, 1986; Mott, 1982; Ocholla-Ayayo and Muganzi, 1986; Munala, 1988; Nyamwange, 1982). Behavioural and biological factors have not been adequately investigated. It is therefore important to find out the contribution of breast feeding practices towards reduction of infant and child mortality. This study attempted to investigate if there is any impact of breast feeding on infant and child mortality in Amagoro Division.

1.2 OBJECTIVES OF THE STUDY

1.2.1 General Objective

To find out what impact breastfeeding practices have on infant and child mortality under prevailing socio-economic, environmental and demographic factors.

1.2.2 Specific Objectives

1. To estimate infant and child mortality rates for Amagoro division.
2. To examine the extent of the association between breastfeeding, age at supplementation and each of the other selected independent variables (intervening variables).
3. To examine the extent of the association between the selected indenpendent variables and infant and child deaths.
4. To examine whether breast feeding duration is related to infant and child mortality.
5. To investigate whether the age at which supplementary food is introduced to the child is related to infant and child mortality.
6. To examine whether the following affect the impact of breast feeding on infant and child mortality: Age, marital status, parity, educational level, work status of the mother, place of delivery of the child, source of water, type of toilet facility and immunisation of the child.

1.3 STUDY JUSTIFICATION

In Kenya, and elsewhere in Africa, only a few studies have been carried out on the impact of breast feeding on infant and child mortality (Akinrinole and Olakye, 1990; Eelens

1983). Many studies have focused on breast feeding correlates, patterns and fertility (Otieno, 1989; Sempebwa, 1981; Winikoff et al 1988; Mosley et al, 1982; Kenya Demographic and Health Survey, 1989). Kenya should be able to benefit from such studies which are aimed at establishing relationships between breast feeding and infant and child mortality.

The study also gives policy-makers insights into health-related development strategies in general.

This study is useful in initiating policies and programmes necessary for the protection, support and promotion of breast feeding among women who are breast feeding, facing difficulties in breast feeding and those who are not breast feeding respectively.

The study provides a basis upon which further research can be done.

1.4 SCOPE AND LIMITATION

1.4.1 Scope

The study focuses on all women of reproductive ages (15-49 years) who have had at least a live birth in the preceding 60 months before the survey.

On breast feeding practices, only information that took place in the last closed birth interval (second last child) and the open interval (last child) was collected. The closure of the birth interval could be by occurrence of another live birth or by occurrence of a subsequent birth. Breast feeding information during the last closed birth interval was felt to be relatively more reliable since the reference births constitute fairly recent events and do not involve a long recall period.

Breast feeding measurement covered age at which supplementary feeding was introduced to the child and duration of breast feeding. The breast feeding survival analysis has therefore been confined to the total length of time a baby was breast fed; and age at which supplements were introduced.

1.4.2 Limitations and Data Quality

Like other postpartum variables, there are major issues and problems that can arise concerning definition, measurements and analysis of breastfeeding data. These can be summarized as follows:

1. Those that are concerned with the clarity of definitions of concepts of breastfeeding and choice of appropriate data set for analysis.
2. Those arising from the quality of the data.

   These may arise from various sources such as research design, interviewing process, response and data processing.

Definitions and Choice of Data for Analysis

To estimate the duration of breastfeeding one needs to know the beginning and end points of the variable. While the beginning is usually taken as the time of delivery, the end points may not be clear. With breastfeeding, the frequency and intensity declines gradually over a long period of time, thereby making it difficult to define the end point, i.e. when significant breastfeeding stopped. Also some women introduce food supplements early while others introduce them very late (close to weaning time).

There is also the problem of circular causality in the breast feeding-mortality relationship because the length of breast feeding is itself affected by intervention of the next pregnancy, the hormonal effect of which stops the flow of milk and secondly, variations in breastfeeding durations among women can also be attributed to (i) death of the baby, (ii) absence of breast milk, and (iii) non-practice of breastfeeding though the baby is alive, and breast milk is available. These problems confound the measurement of breastfeeding duration. The only effect which can be separated is the first one, namely, the infant mortality effect. Therefore cases, where the child did not survive for 1 month will be excluded. This is because deaths occurring within the first 28 days of life are generally associated with other exogenous and endogenous factors rather than breast feeding.

Choice of Data for Analysis

Like other postpartum variables, analysis of breastfeeding data can be done in two ways: First, it can be viewed from the children's point of view, in which case one studies all the births occurring in a given period of time and the characteristics of the associated birth interval for each. Secondly, analysis can be done from the mother's view point. In this case, for each woman, one studies one birth or two. If information is got from each woman concerning only one birth (usually the last) the data are referred to as current open birth-interval data. When the data is on the second to the last birth, then the data is referred to as closed birth interval data. Using the two most recent births does not even define the same point in historical time for all women. Younger women who are still active in child bearing might have had their last two births in the three or four years preceding the survey, whereas older women who had ceased childbearing might have had their last two births in the 10 to 15 years before the survey. Even among younger women still childbearing, those with short birth intervals will be reporting on births that occurred more recently than those women with long interbirth intervals. In short, neither the current open birth interval data nor the closed birth interval data refer to the experience of women within the same time period. Analysis based on either may be less informative, especially if significant changes in breastfeeding have been taking place in the population.

Most studies carried out on breastfeeding have been based on either current open birth interval data or closed birth interval data. However, it has been suggested that estimation of durations of breastfeeding that are based on all births within a specified period of time is relatively 'cleaner' and appropriate than are the other two (Page et al, 1982). This choice of strategy will allow all women who have given birth(s) during the specified period to contribute to information; however, the number of births per woman during the specified period will depend on the length of the period, the parity and the average interbirth interval for that woman. If the period is short, e.g. two to three years before the survey, most women will contribute either one or two births. This choice of analysis has an advantage over the other two approaches in that estimated durations can refer to a specified period of time. This study has focused on data collected on next to last births and last live births which occurred since 1988.

Problems of Data Quality

A major problem in African demography is that of defective data. In the absence of vital registration system and well planned censuses, obtaining reliable estimates of demographic information such as on fertility and mortality has become increasingly difficult (Kpedekpo, 1982; Barclay, 1958).

Age misreporting due to ignorance by respondents is of deep concern. In Africa there is a widespread ignorance on birth dates and exact age in years (Blacker, 1967;

Kpedekpo, 1982). This is because birthdays are not traditionally celebrated and recalling of age is usually made with reference to persons falling within the same age set which may often have members with ages differing by as much as five years.

In this study, where age was not known, the sum of her reported age at marriage and her reported duration since marriage provided an estimate of a woman's age.

Reported breastfeeding durations could be subject to recall bias and digit preference. Memory lapses where the recall period is long may be one source of bias. Also heaping at certain preferred durations (typically 6, 12, 18 etc), is widespread because of rounding errors. These results in awesome peaks and troughs (Lesthaeghe and Page, 1980).

When concentrations at preferred digits are not genuine, most raw distributions for the duration of breastfeeding are subject to fluctuations that may conceal the true nature of the phenomena to a large extent. Lesthaeghe and Page (1980) have developed a system of model schedules for correcting postpartum variables data for heaping, although these are beyond the scope of this study.

1.5 BACKGROUND INFORMATION TO THE STUDY AREA

Busia district is situated in Western Province (Figure 1.1). It is approximately 1,776 sq km. It is bordered by Bungoma district in the north-east, Kakamega district to the east, and Siaya district to the south. The republic of Uganda makes its western boundary and lake Victoria is to the south-west (Busia District Development Plan [BDDP], 1989-1993).

Busia district has seven divisions, namely: Amagoro, Amukura, Budalangi, Butula, Funyula, Nambale, and Busia Township (Figure 1.2).

Amagoro division has a total area of 200 sq km with a population density of 204

Fig. 1 : Location Of District

Fig. 2.
BUSIA DISTRICT
ADMINISTRATIVE BOUNDARIES

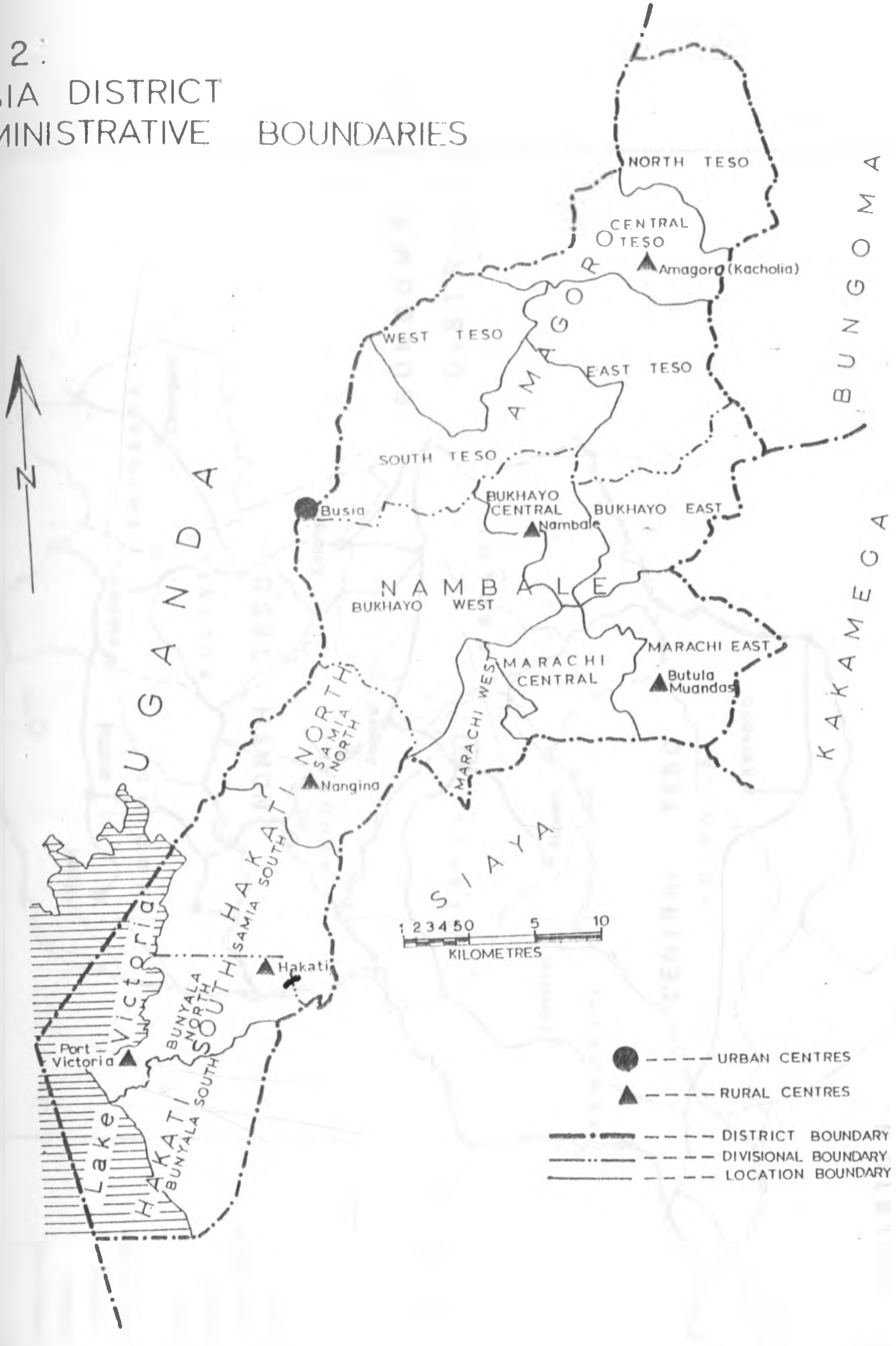


Fig. 3 : AMAGORO DIVISION (STUDY AREA)

(Figure 1.3). The mean annual rainfall is 1,300 mm. Large tracts of agricultural land in Amagoro and in the district in general are under either bushes, fallow or grazing. The main crops grown in Amagoro division are maize, cassava, cotton, sorghum, and finger millet. The area generally is of high agricultural potential and can sustain other crops such as beans, groundnuts, simsim, fruits, etc., which are successfully being grown at subsistence levels.

Busia district is populated by 2 major tribal groups: the Luhya and the Teso. According to the 1979 census, the district had a population of 297,841, out of whom 30% were Teso and 60% were Luhya. Other tribes such as Luo, Kikuyu, Kalenjin, etc., comprised the remainder (10%). Amagoro division in 1969 had a population of 19,673 and by 1979 it had risen to 40,851, a percentage change of 107.6 (the highest in the district). Amagoro division is mostly populated by the Teso, with isolated cases of Luhya and other Kenyan tribes.

Busia district has 39 health facilities, of which 7 are hospitals (4 government and 3 private or Mission hospitals). In addition, there are 14 health centres and 16 dispensaries. Of these, Amagoro has 9 health facilities (the best coverage in the district) - 1 private hospital, 3 sub-health centres and 5 government dispensaries. Most of these are within walking distance (average distance of 3.6 km).

Busia district has about 27 water supplies. Eleven of which are operated and maintained by the Ministry of Water Development, 6 are institutional, 8 County Council facilities, and 2 are self-help facilities. In addition the district has communal water points, which are the most popular source of water. Some 1,396 communal water points have been established, most of them through Kenya Finland Rural Water Project (KEFINCO). These are either boreholes or shallow wells established in areas not yet served by piped water.

Amagoro division has the least water points as compared to other divisions - there are 6 institutional, 1 self-help, 1 Ministry of Water, and 150 communal water points. Despite these, many other people draw water from seasonal streams and rivers.

Busia district has an extensive road network of about 791 km of which 41 km is bitumen road; 399.4 km gravel road; and 350.5km earth road. Amagoro division is only served by earth road, except for the Great North Road which passes through it to Malaba. The earth roads are not in very good condition; and this makes travelling at times a painful exercise.

The major causes of disease in the district are malaria, respiratory diseases such as bronchitis, pneumonia, tuberculosis, skin diseases, eye and ear infections; diarrhoea; intestinal worms and urinary tract infections. Anaemia, measles, and marasmus and kwashiorkor may be related to malaria and poor diets but are major causes of hospital admissions. These causes are mostly environmental and can be prevented through improved personal and environmental hygiene.

Amagoro, Nambale and Butula divisions have the highest number of malnutrition cases with the majority being children within 0-4 years and lactating mothers. The causes of this are generally large polygamous families; low incomes; inappropriate eating habits; reliance on foodstuffs from the border, and irresponsible parenthood. In Amagoro divisions, most of the land is increasingly being devoted to the production of tobacco and oil seeds.

According to the data collected by the Rural Planning Department of Ministry of Planning and National Development and based on Central Bureau of Statistics Surveys, the infant mortality rate has been high in Busia District (BDDP, 1989-1993). In 1980, for example, the infant mortality rate was estimated to be 145 per 1000 which was the highest in Western province. The main causes of high infant mortality rates in the district are measles, diarrhoea, malaria, pneumonia and malnutrition. Other causes are intestinal worms, whose incidence is very high in the district. Omurundo (1989) estimated infant mortality rate in Amagoro division at 180 per 1000 using the 1979 census. This was still one of the highest compared to other parts of Kenya.

Busia district has 313 primary and 41 secondary schools. Amagoro division has 58 primary schools and 8 secondary schools with most of them within average walking distance (average of 2.8 km). The majority of the young people have at least attended a primary school; while most old people are either illiterate or have attempted adult literacy classes. But the district generally suffers from poor performance in the national examinations.

Busia district is relatively well supplied with health services though the majority of the people still prefer traditional medicine. Particularity of illness is identified by factors like witchcraft, sorcery, violation of food and moral taboos, evil eye and ancestral spirits. The Samia and the Teso believe that malnutrition is caused by adultery and evil eye. No connection is made between feeding and malnutrition.

Family planning is viewed with suspicion especially by men. They believe this encourages immorality and prostitution, and may lead to sterility. As a result very few of the women use modern forms of contraceptives.

1.6 SUMMARY

In this chapter the following items have been presented:

Problem statement, Objectives of the study, Study justification, Scope and limitation of the study, and Background to the study area.

The problem statement states that infant and child mortality are still quite high despite the socio-economic achievements so far. Hence, there are still underlying factors for these high mortality rates.

The objectives are stated in broad and specific terms so as to make them measurable. Broadly the study aimed at finding out the impact of breastfeeding practices on infant and child mortality under prevailing socio-economic, environmental and demographic conditions.

The study justification gives the reasons why this study is important. Notably, little has been done on breastfeeding and infant and child mortality in Kenya, hence the need for such research.

The scope and limitation give the extent of the coverage of the study and how this kind of study may be limited. The study focused on women of reproductive ages who had at least a live birth. The data was noted to be open to problems of heaping and misreporting.

The background to the study area has highlighted some socio-economic, demographic, cultural and environmental aspects of Busia District with particular reference to Amagoro Division. It was noted that though Amagoro is agriculturally productive, very few people grow suitable crops or enough food for consumption. This has resulted in high malnutrition cases in the division. Amagoro division also has the least water points in the district and most people draw water from seasonal streams and rivers. This therefore exposes many children to environmental hazards, such as disease causing germs.

CHAPTER TWO

2.0 LITERATURE REVIEW, CONCEPTUAL FRAMEWORK AND OPERATIONAL MODEL

2.0.1 Introduction

This chapter first gives a review of the studies done on: the effect of breastfeeding on infant and child mortality; breastfeeding differentials; and selected demographic, economic and environmental factors as they affect child survival.

Secondly, a review of some frameworks for the study of child survival is given. A modification of Mosley and Chen (1984) framework is used for the purposes of the study and the operational model is also given.

2.1 LITERATURE REVIEW

2.1.0 Introduction

In this section, a review of the following literature is given: breastfeeding and infant and child mortality; breastfeeding differentials and the influence of selected demographic, socio-economic and environmental factors on infant and child mortality.

2.1.1 Benefits of Breast feeding

In many traditional societies women breast feed their children for extended periods, and prolonged breast feeding is said to have an effect of safeguarding the health of the child (Buchanan, 1975).

Several clinical and epidemiological studies have shown that mother's milk has at least three properties which help to protect the health of infants. First, it is nutritious.

Breast milk appears to meet the nutritional requirements for the normal growth of an infant for at least six months (Wray, 1978). Consumed in sufficient quantities it provides protection against malnutrition syndromes such as kwashiorkor and marasmus (Kleinman,1984). The absence of breast feeding is related to an excess incidence of diseases, such as diarrhoea and gastrointestinal infections, that are exacerbated by malnutrition (Barros & Victora, 1990). Although many substitutes contain a substantial proportion of the basic nutrients, none are as rich or complete as mother's milk. Second, breast milk contains immune protein substances that serve to prevent infections of the intestinal system, and those of a more general character which enter the host through the intestinal tract. Finally, mother's milk is a sterile fluid containing substances that prevent the growth of bacteria. These make breast milk a highly hygienic product.

Some of the benefits from these properties, particularly the first two, gradually diminish as the nutritional requirements of the infant increase. Gray (1981) and others (Cantrelle and Leridon, 1971; Wray, 1978) have argued that the relative advantages from both the immune and nutritional potential of mother's milk decrease rapidly after the sixth month. The importance of each of these properties for the health of a child depends on conditions that heighten or lower the child's exposure to deleterious factors that can be neutralized by mother's milk (Millman, 1985).

2.1.2 Findings in the World

The relationship between breast feeding and infant and child mortality, has been substantially documented. Although the magnitude of the estimates differ from study to study and across culture, most research in developing countries attest to the importance of breast feeding as a determinant of child survival. In general, the literature indicates that breast fed children are less susceptible to the risk of infant and child death relative to the artificially fed children. Furthermore, even among breast fed children, the duration as well as the intensity of breast feeding are positively associated with child survival. Thus, wholly breast fed children tend to have a lower risk of dying than partially breast fed ones (Knodel and Kintner, 1977; Da Vanzo et. al., 1983; Palloni and Tienda, 1986).

Health care services and availability of breastmilk substitutes have been associated with less initiation of breastfeeding and shorter durations. In the urban areas, births to women often occur in hospitals and maternity centres where women have to contend with the required hospital routines and are also exposed to the practices of trained health personnel. Many health personnel also consider infant formula to be as good as, if not better, than breast milk and they influence the mother's view of adequacy of her breastmilk for the child's health (WHO/UNICEF, 1981). In contrast, mothers in rural areas often deliver at home and are, therefore, more removed from such influences, since in many developing countries, provision of health services are often concentrated in the urban areas. The WHO (1979) survey report indicated that, in countries such as Nigeria, Guatemala, and the Philippines, commercial firms often distribute powdered milk samples and feeding bottles in hospital maternity wards. Bottle feeding can then result in serious health problems in many developing countries. Among the rural and illiterate families, living in unsanitary conditions, mothers who rely on formulas often dilute the powdered milk with water to the extent that it inhibits the food value which leads to impaired physical growth and malnutrition of the infant. Also, many of these women lack proper facilities to sterilize bottles and nipples or to refrigerate mixed formula or milk. The water often used to dilute formulas may be unclean and this often results in gastrointestinal diseases, one of the major causes of death in infants in developing countries (Surjono et al, 1980).

A report of a study done among 15 rural communities of Chile shows that infants who were introduced to bottle feeding within the first three months of life were three times as likely to die in the post-neonatal period as opposed to those who were wholly breast fed during that time. Also, in another study conducted in 1975 in Guatemala City, children who were breast fed for less than 6 months were found to have substantially higher risk of dying than those who were breast fed for more than 6 months (Knodel, 1977).

Wray (1981) found that wholly-breast fed infants had mortality and morbidity ratios of 1:1.2 and 1:12.8 respectively compared to partially-breast fed infants. The mortality and morbidity ratios were 1:1.4 and 1:134.7 respectively when the wholly-breast fed babies were compared to artificially fed babies. This shows clearly that artificially fed children have the highest susceptibility to morbidity and mortality compared to partially breast fed and wholly breast fed children (Winikoff, 1980, table 7). A study in the Khanna district of the Indian Punjab showed that only one out of twenty children who were never breast fed survived the first year of life compared to 12% of their 739 counterparts who were breast fed from birth (Knodel, 1977; Winikoff, 1980).

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

Da Vanzo et al., (1983) found similar age patterns in the relationship between breastfeeding and infant mortality in Malaysia. In general their results show a significant negative relationship between the two variables. The impact of breastfeeding declined in importance as the child grew from the first week of life to the 12th month. Using the same data employed by Da Vanzo et al., Holland (1989) also found a negative relationship between breast feeding and infant mortality. The relationship was, however, significant only in the first 6 months.

Despite the negative relationships above, some studies have reported findings that are contrary to the expected results. The results of infant and childhood mortality in Latin America using the World Fertility Survey (WFS) data show some variations between countries (Palloni and Millman, 1986). The study found that the results are consistent with the expected estimates in most of the countries, especially Colombia, Mexico, Peru, Costa Rica and Ecuador. In these countries a monotonic relationship was found between breast feeding and infant mortality, and the estimates were significant at least upto the fifth month. In some other countries, a significant negative relationship was found only in some age segments - as in Jamaica and Panama where significant relationship was reported in the 1-2 months and 6-11 months age intervals respectively.

The reasons for the differential findings across countries and between studies are yet to be fully understood. The situation has been attributed to various factors. These include: (1) the mortality level of the country or study area as well as the quality of substitute foods and the sanitary condition under which the babies are artificially fed (Knodel, 1977; Palloni and Millman 1986); (2) the quality of the data which may differ from country to country or from study to study (Akin et al., 1986; Palloni and Millman, 1986); (3) the different model specifications employed in different data sets (Palloni and Tienda, 1986); and (4) socio-economic factors (Mosley and Chen, 1984).

Finally, with regards to the factor underlying the relationship between breast feeding and infant and child mortality, much is yet to be known. Infact, the little that is known about the process is derived from clinical and epidemiological evidence that breast milk has some properties that relate to child survival. Breast milk is said to meet the nutritional requirements for the normal growth of a child for the first 6 months of life. A well breast fed child is protected during this time against malnutrition and diseases, such as diarrhoea (Knodel and Kintner, 1977). Breast milk has some substances which prevent growth of bacteria, and also protects the child from intestinal system infection as well as respiratory infections (Stevenson, 1947; Winikoff, 1980). The claim that breast milk alone may no longer satisfy the nutritional requirements of the child after the sixth month may account in part for the declining importance of breast feeding that is noted particularly after that age by many studies. It is becoming apparent that supplementation and environmental factors may have a greater impact on infant and child mortality after 6 months of age.

2.1.3 Breast feeding Patterns in Kenya

The Kenya Fertility Survey (KFS, 1977/78) found that most Kenyan women full breastfed for 2 months and thereafter tended to supplement breast milk and by the end of 2 months, 66% had given supplementary food. So the actual problem in Kenya is not initiation of breast feeding but the duration and intensity of breast feeding.

The KFS found that breast feeding situation in Kenya was still quite good., The mean duration at the time for all women was 16.5 months but for those below 25 years it was 14.3 months, and for the above 35 years, 20.6 months. This trend already showed a downward slope, depicting a decline in breast feeding duration for younger women.

The Kenya Rural Child Nutrition Survey (1977/78), found that on average mothers in the rural areas breastfed their children for 14 months while urban mothers breastfed for only 10 months. Mothers in the urban parts of Coast Province breastfed their children the shortest (9.3 months).

The Kenya Demographic and Health Survey (1989) found that rural women had longer mean durations of breastfeeding than their urban counterparts. It also found an inverse relationship between education and the mean duration of breastfeeding. This is attributed to the fact that a better educated woman is more likely to work away from home. This makes breastfeeding more difficult.

A study organized by WHO on infant feeding practices in Nairobi indicated that most Nairobi women breastfed their babies, with 97% initiating and the majority continuing to breast feed for over 12 months (Winikoff et al., 1988). The mean duration of breast feeding was calculated as 16.2 months, which is not too far from the findings of KFS of 16.5 months. These findings in Nairobi showed a high prevalence and long duration of breastfeeding, but accompanied by early mixed feeding. Even in the first few months of life, a high proportion of Nairobi infants were receiving breast milk substitutes - most commonly, infant formula from a baby bottle.

Eelens (1983) has shown that in healthy areas in Kenya where Malaria is not prevalent, both full and partial breastfeeding reduce mortality. In areas where malaria is rife only full breastfeeding has any effect on child survival. In adverse circumstances partial breastfeeding can contribute only minimal protection against disease and death. It is evident from the available literature that hardly any studies have been done in rural parts of Kenya.

especially those relating breastfeeding to infant and child mortality.

Sempebwa (1981) found that in Kawangware, Nairobi, younger women tended to supplement breastmilk with other foods much earlier and this made them to breastfeed for shorter durations as compared to older ones. Age groups 15-19 and 40+ introduced supplementary foods when the babies were 3.2 and 7.2 months old on average respectively.

Otieno (1989) carried out a study in Siaya district and found that on average women breastfed for 17.7 months. He found that breastfeeding duration increased with an increase in mother's age and parity. The variables that were negatively related to breastfeeding duration were parent's occupation and educational levels.

However, the literature available was on studies that were broad based in Kenya and there was no specific literature on Busia or Amagoro in particular.

2.1.4 Education and Breastfeeding

Education, urbanization and income are recognized as the principal factors affecting the incidence and duration of breastfeeding, however, they act through the intervening socio-cultural factors, health services, employment status of women and availability of breastmilk substitutes (Huffman, 1984). The effect of urbanization is seen to reflect the differences in education and income distribution between urban and rural communities. The use of health care services and ability to purchase breastmilk substitutes may, in turn, depend on the woman's education (Jelliffe and Jelliffe, 1978).

In Metropolitan Lagos, Nigeria, Lesthaeghe et al (1980) observed an average duration of breastfeeding for women with no education to be about 5.1 months longer than the overall sample average (11.0 months), while the average for those with secondary education was 5.5

months shorter. Even after adjusting for the separate effects of several economic, cultural, ethnic and religious variables, one-half of the original difference between educational categories remained. They then hypothesized that schooling removes children from the socializing influence of kinship groups thus blocking transfer of traditional norms, values and beliefs.

A number of recent surveys in less developed countries have indicated a very strong negative relationship between female education and breastfeeding. The duration of breastfeeding tends to go down as the education of mothers increases. Using the World Fertility Survey data, Jain and Bongaarts (1981) estimated the mean duration of breastfeeding for mothers with three different educational levels in 8 countries. For each country, mothers with no education had a longer mean duration than the grand mean, whereas those with secondary or higher education had a shorter mean duration. They also found that educational effect was independent of other factors. Similar findings resulted from surveys in the following countries: Taiwan (Jain et al, 1970; Nigeria (Dow, 1977; Lesthaeghe et al, 1981); and several other African countries (Cantrelle et al, 1978).

A study by Barros and Victora (1990), on breastfeeding among Brazilian children found that among babies whose mothers had never attended school, the median duration of breastfeeding was 6 months, being 5 months for the group with 1 or 2 years of schooling and less than 3 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.

2.1.5 Women's Work Status And Breastfeeding

Women's work affects breastfeeding practice. Women's activities may include type of work (e.g. wage or non-wage, farm or off-farm), place of work, and relationship with the employer. The inconvenience of breastfeeding for women employed outside the home is generally accepted as a major factor in the recent decline of breastfeeding.

Jain and Bongaarts (1981), using World Fertility data for 8 countries, found that, after adjusting for age, parity, education, place of residence and husband's occupation, work status of the mother had only a very small effect on the duration of breastfeeding. In Thailand, women who engaged in agricultural work, whether for wages or not, breastfed least, and women who worked on farms, especially, family farms, breastfed most, with non-working mothers being intermediate (Knodel and Devavalya, 1980). Other studies have indicated that breastfeeding tends to decrease as the distance of women's work places from their homes increases (Popkin and Solon, 1976).

In a study carried out in Bangkok on breastfeeding practices (Winikoff et al. 1988), it was found that breastfeeding initiation was substantially the same among women who did not work, those who worked at home, and those who worked away from home. Work appeared to affect duration of breastfeeding much more strongly than it affected initiation.

The study also found that women who worked at home were only slightly less likely to breast feed for 3 or 6 months than those who did not work for pay; but women who worked away from home had only about one-half the probability of breastfeeding for 3 or 6 months. It further concluded that despite many mothers initiating breastfeeding, breast milk substitutes were introduced early, with most children receiving some form of supplementation by the fourth month.

2.1.6 Mother's Age and Parity and Breastfeeding

Older women are said to breastfeed longer than younger women. Using the World Fertility Survey data for developing countries, Smith and Ferry (1984) found that younger women had shorter breastfeeding durations than older women. The differences were rarely significant between ages 15-24 and 25-29, but became significant between 15-24 and 30-34 and above.

In Nepal Krishna (1984) found that when parity was held constant the mean durations of breastfeeding increased with the increasing age groups of the mothers. The same trend was indicated in Pakistan (Shah, 1980), where women in the age group 15-24 breastfed for 20.4 months, 25-34 for 22 months and those in age group 35-44 breastfed for 25.2 months.

2.1.7 Education and Infant and Child Mortality

Several studies in the world have in no doubt indicated that education is a great determinant of infant and child mortality (Anker and Knowles, 1983; Caldwell, 1979; 1983; Mott, 1982; Osiemo, 1986; Kichamu, 1986).

Caldwell (1983) has attributed the relationship between mother's education and child mortality to the following; education makes a mother aware of proper diet for the family; aware of personal hygiene and cleanliness; and greater use of medical facilities available. Caldwell (1979) has also noted that mother's education and not father's is the most significant determinant of child survival. Caldwell argues that if the mother is more educated she may play a larger role in family decision-making with respect to alternative and improved child care that is preventive and curative; and also she may break away from tradition which may favour high child mortality.

In Kenya, Mott (1982) found that primary education of the mother reduced infant and child mortality by 10%, and secondary education by 25%. This shows that increased education has an inverse relationship with infant and child mortality. Osiemo (1986) and Ocholla-Ayayo (1991) have also suggested that education increases the woman's awareness of hygiene, nutritious diet and use of medical facilities.

Some studies have shown that education leads to improved income, urbanization and better occupations and social status hence they are always advantaged (Anker and Knowles, 1983).

Nag (1981) found that in Kerala state in India, there was lower infant mortality because of higher literacy levels of the women. This literacy made them use maternal and child care services more. This was compared to West Bengal where female literacy levels are low and hence higher infant mortality.

2.1.8 Marital Status and Infant and Child Mortality

Studies on infant and child mortality have shown that there exist disparities by marital status. Owino (1988) found that in South Nyanza, the married and widowed had the highest infant and child mortality levels and single and divorced or separated had the least. Kichamu (1986) on the other hand found that infant and child mortality was lowest for the married and the widowed had the highest. These show inconsistencies but this may be due to misreporting or other underlying factors such as culture and socio-economic status of the different regions. Mortality data in Sub-Saharan Africa generally suffers from errors of omission and misreporting. In Kenya, studies carried on mortality disparities have shown that infant and child mortality are lowest in Central, Eastern, Nairobi and Rift Valley

Provinces, and highest in Nyanza and Western; whereas it is intermediate in Coast (Kibet, 1982; Kichamu, 1986; Muganzi, 1988). These disparities generally point to the regional differences and hence differential mortality levels.

2.1.9 Age and Parity

The health of the child in the initial stages of life is also found to vary by age (proxy of biological age) and parity of the mother. Children born to young mothers, under 18 years of age, have higher mortality risks owing largely to biological factors (Davanzo et al 1983).

First parity children are found to have higher mortality as a result of low birth weight, whereas higher-parity children exhibit higher mortality as a result of behavioral factors (Davanzo et al, 1983).

2.1.10 Work Status

There is a fairly specific connection between occupation and exposure to conditions that result in disease. The income of parents, as well as residential arrangements are often associated with infant and child mortality (Twumasi, 1986). Poverty, often cited as the major social enemy of child's health, appears to be at work in a number of situations ranging from deficiency diseases resulting from malnutrition to a high incidence of infection attributed to overcrowding and, in fact, to the total way of life of people.

Depending on the type of work done, income level of a particular household or individual parent affects the type of clothing, housing, fuel consumption, food, information flow, and use of health services. Without doubt, income is a powerful determinant of child morbidity and mortality (Twumasi, 1986).

2.1.11 Water

Anker and Knowles (1983) have attributed low infant and child mortality in urban areas to availability of clean piped water as opposed to the rural areas. Also at a micro-level, Anker (1977) has shown that households with piped or well water have higher survival chances than those who use river or lake water.

Nag (1981) has also shown that there was high infant and child mortality in West Bengal state than in Kerala because people in Kerala were of higher education levels and socio-economic status and hence were more careful in treatment of water for drinking. This resulted in less prevalence of diarrhoeal and intestinal diseases which were very prevalent in West Bengal. Also Kerala was found to have more running streams which provided plenty of drinking and washing water.

Lack of an adequate water supply for households leads to smaller quantities of water being used for household purposes that is necessary for the maintenance of health (Twumasi, 1986). It is difficult for such households to prevent diseases such as diarrhoea, dysentery, and many skin infections.

2.1.12 Type of Toilet Facility

Lack of proper toilet facilities may lead to the prevalence of insect vectors such as flies which may cause food contamination etc. A study carried out by Meegama (1980) in Sri Lanka found that improper toilet facilities or lack of them led to the breeding of flies and hence transmission of disease through food eaten.

Furthermore, poor sewage disposal encourages the spread of parasites such as hookworm.

2.1.13 Place of Delivery

Nag (1981) has indicated that there is more use of health facilities in Kerala than in West Bengal. This is because in Kerala, health facilities are easily accessible because of availability of transport facilities. Women who use health facilities are also likely to deliver their children in hospitals or in maternity clinics. Those who deliver at home may be attended to by untrained midwives (traditional) who may use unsterilized instruments to cut the umbilical cord thus leading to death by neonatal tetanus. In Sri Lanka, Meegama (1980) found that the presence of trained midwives and use of sterile equipment to cut the umbilical cord resulted in low neonatal mortality.

2.1.14 Immunisation

The Kenya Demographic and Health Survey Report (1989) shows that measles ranks third as a cause of death in the post-neonatal period, and first at ages 1-4 years.

A study in Kwale by UNICEF (1988) showed that measles is a major cause of death in the post-neonatal period and childhood mortality being second to diarrhoea.

According to the Busia district development plan (1988/93) measles is a major cause of hospital attendance and admissions in Busia district. This is because few women make use of the available immunization programme and also because of inadequate health centres which can offer such services.

The child acquires active immunity by previous exposures to infections and disease and through immunization programs. The resistance in the child can be enhanced greatly by following the recommended immunization schedule for polio, measles, typhoid, tetanus, and pertussis. The child's resistance is also built up by breastfeeding, optimal use of baby foods.

and proper medical care (Venkatacharya and Teklu, 1986).

2.2.15 Summary of Literature Review

From the above literature review it can be noted that breast feeding has an impact on infant and child mortality. However, other factors such as education, age, marital status, parity and work status of the mother have been found to be determinants of breastfeeding as well as child survival. Also, availability of water, type of toilet facility, immunisation and place of delivery have an influence on infant and child mortality.

2.2 CONCEPTUAL FRAMEWORK

2.2.0 Introduction

From the literature review given above it can be seen that breastfeeding practices may affect infant and child mortality. However, this can be modified by socio-economic, demographic and environmental factors. The conceptual statement will thus be: "Breastfeeding practices have an effect on infant and child mortality and these can be modified by socio-economic, demographic and environmental factors in any given society".

2.2.1 Frameworks on Infant and Child Mortality

Several frameworks that have been advanced for the study of child survival during the past decades particulary during the 1980's, have tended to use fertility related variables, making it difficult for most of the researchers to put a distinction between mortality determinants on one hand and those of fertility. A review of some of them is hereby given and finally one is chosen for the purposes of this study.

2.2.2 Mahadevan Framework (1986)

Mahadevan (1986) has developed a model that has concepts and terminologies that are specifically related to mortality.

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

He avoided use of the terms intermediate and proximate determinants which are more related to fertility, but instead used the terms "Life Affecting Variables" [LAVs] and "Imminent Variables" to specifically refer to mortality determinants. Life affecting variables, are first broadly classified under situational and sequential events from the stage of polity-cum-policy through factors such as institutions and stages of development of life. These are then sub-classified into more LAVs depending upon the requirements of the researcher.

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

The model provides room for much flexibility in that

it assumes that at a certain stage the number and diverse nature of the variables is less and at another stage it is more; and that some of the factors are likely to cut across different stages and are repeatedly mentioned to show their influence at these different stages.

The model has a number of advantages that make it appropriate for mortality studies. One is that, it incorporates both micro and macro variables whose influence on the health and consequent death of the child is diverse. Again it clearly recognizes the fact that several LAVs either similarly or in a dissimilar manner may influence mortality in any society.

Nonetheless, the model has one main shortcoming, that of incorporating far too many determinants of mortality which may make it hard for one to isolate the key mortality determinants.

However, the author of the model recommends that a group of relevant and related variables can be considered from the list of variables mentioned in the model and their influence on mortality can be examined. This means that the model is flexible and allows each researcher to identify those variables that are relevant in a particular study as dictated by the kind of society and environment being studied.

The model incorporates far too many variables that can not be easy to choose from especially if the type of study is not intended to cover detailed micro and macro level determinants of mortality, (for a detailed discussion on the model refer to Mahadevan et al, 1986). As a result, this model was found not appropriate for the purposes of this study.

2.2.3 Venkatacharya and Teklu Framework (1986)

Venkatacharya and Teklu (1986) have tried to develop a framework within which the health and mortality of the children under 5 years of age may be studied. It draws heavily on research in the field of fertility, and particularly on the concept of proximate determinants.

In the proximate determinants framework of Mosley (1985), nine variables of fertility and mortality are integrated under four main categories. These are shown below:

I Conception exposure factors

- (1) Sexual union
- (2) Intercourse frequency

II Lactation factor

- (3) Breastfeeding

III Ecological risk factors

- (4) Dietary deficiency
- (5) Environmental contamination
- (6) Accidents

IV Direct interventions

- (7) Personal prevention measures
- (8) Curative measures

(9) Intentional injury

Venkatacharya (1985) suggested a second approach with a biomedical bias. This examines health and mortality as a life process from birth to death of a child. The model shows a chain causation and the ultimate cause of mortality is difficult to determine. Figure 2.1 illustrates the spectrum of causes of mortality. Mosley's general framework of proximate determinants is illustrated in figure 2.2.

Following those suggested by Mosley (1985) Venkatacharya and Teklu (1986) attempted to list the proximate determinants under five categories:

I Demographic (fertility) variables

(1) Age, parity, and birth intervals

II Maternal and child nutrition

(2) Maternal nutrition during pregnancy

(3) Breastfeeding

(4) Child feeding

III Sanitation and environmental variables

(5) Safe drinking water and good toilet facilities

(6) Incidence and prevalence of diseases such as diarrhoea, measles, malaria, and tetanus

IV Preventive and curative measures

(7) Birth practices

(8) Immunization and preventive care

(9) Curative medical care

V Accidents and intentional injuries

(10) Accidents and practices such as infanticide and female circumcision.

However, despite this simple classification one noticeable problem with this model is that it has ignored socio-economic variables such as education, income, occupations etc., which have been widely found to influence infant and child mortality. As a result this model was not used in this study.

2.2.4 Mosley and Chen Conceptual Model

Mosley and Chen (1984) have developed an analytical framework for the study of child survival in developing countries (Figure 2.3 below). It encompasses a biosocial approach to child survival. It includes socio-economic determinants which operate through the proximate or intermediate variables, that directly influence the risk of mortality. The behaviourial-biological mechanisms can be grouped into five categories as follows:

(i) Maternal factors: age, parity, birth interval;

(ii) Environmental contamination;

(iii) Nutrition availability/deficiency;

(iv) Injuries: accidents/intentional;

(v) Personal illness control measures.

The socio-economic determinants are grouped into three broad categories of variables that are often used by the social scientists, namely:

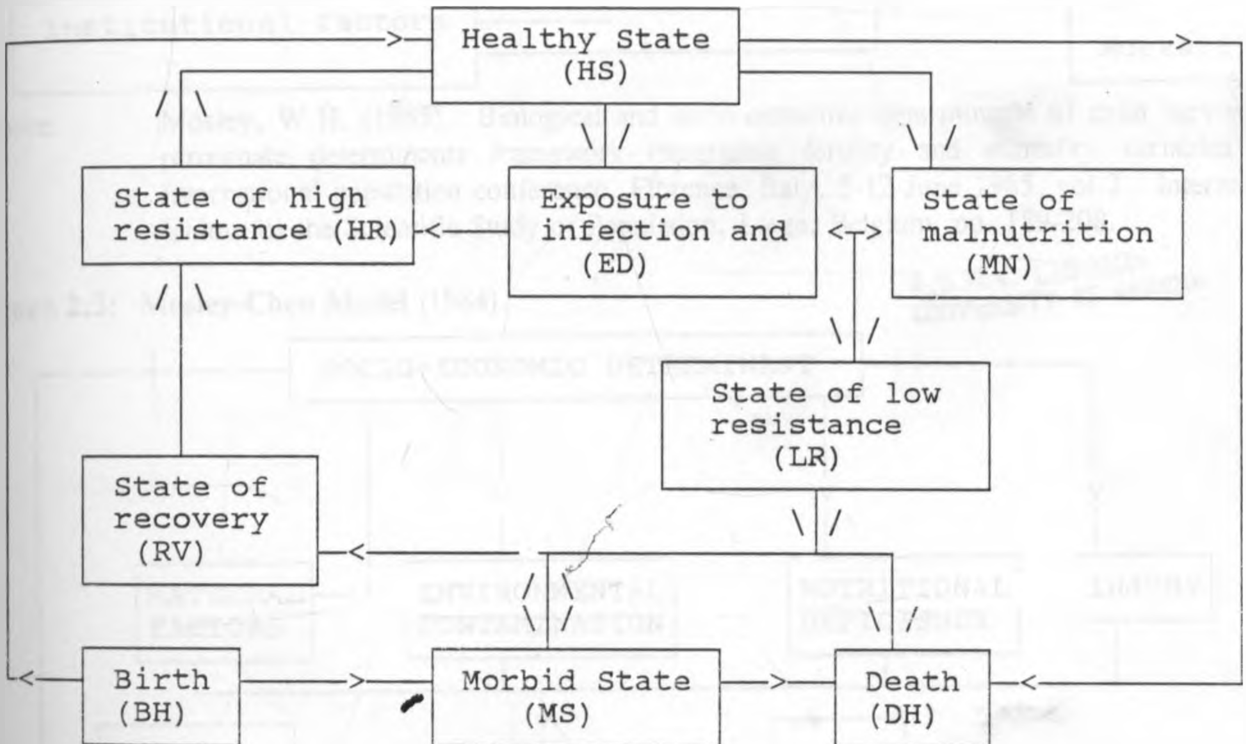
(i) individual level variables;

(ii) household level variables;

(iii) community level variables.

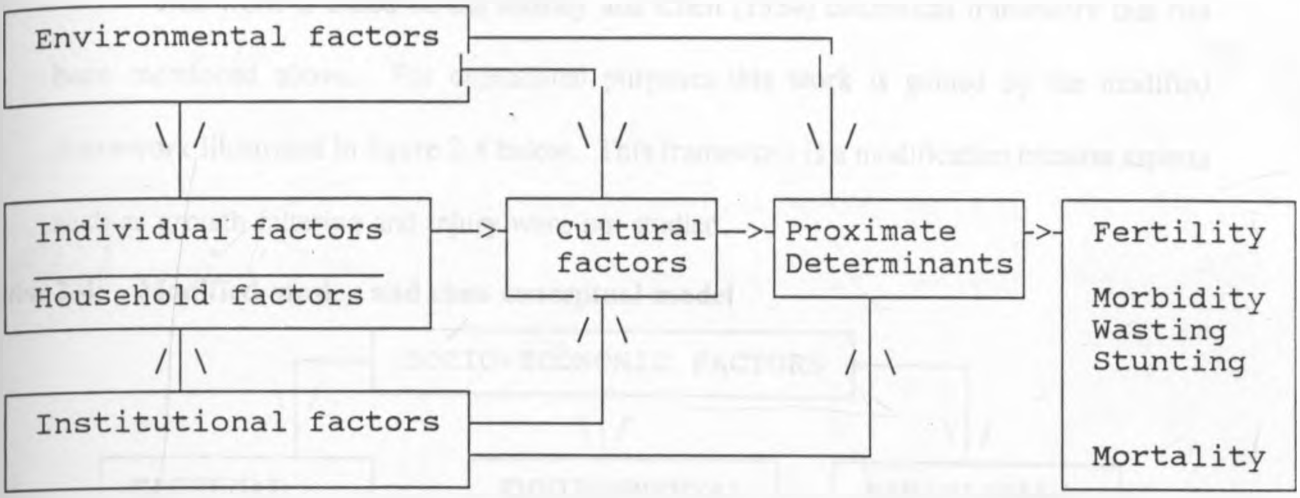
This model encompasses socio-economic as well as demographic, biological/behavioral and environmental variables. Because the intention is to find out the impact of behavioral/biological as well as demographic, socio-economic and environmental factors on infant and child mortality, this model has been used for the purposes of this study. The model is slightly modified because some of the factors such as personal injury are not considered in this study.

Figure 2.1: Process from birth to death among children (Venkatacharya 1985:239)



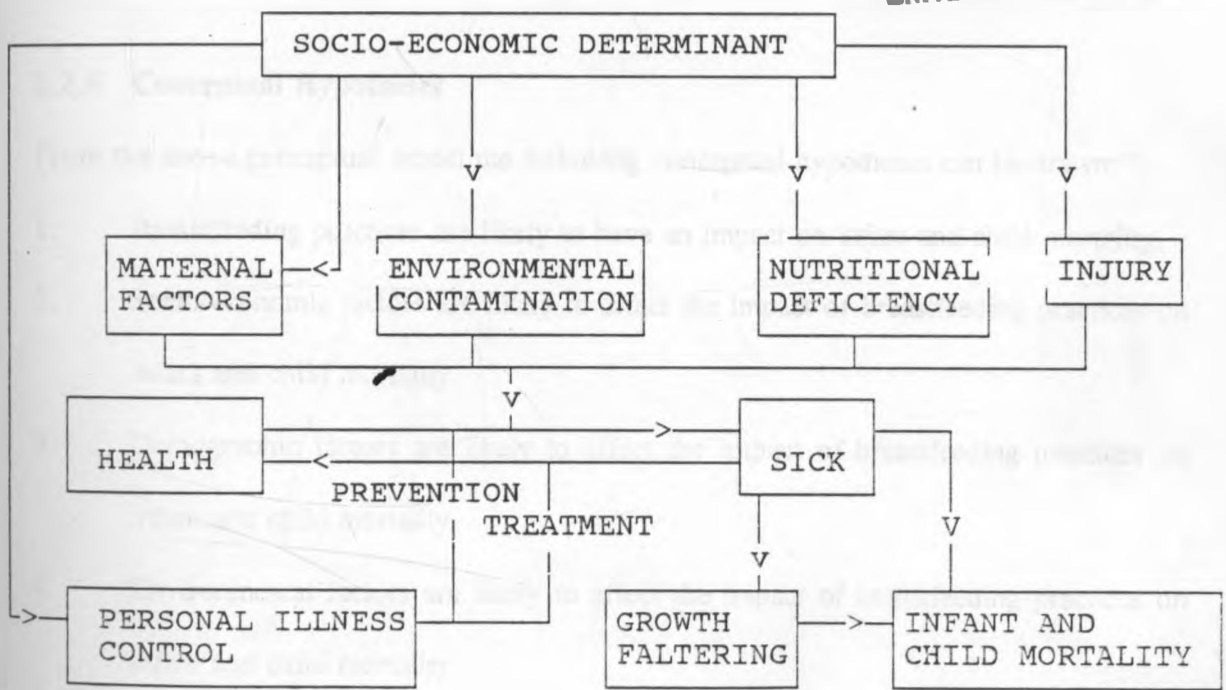
Source: Venkatacharya, K. (1985). an approach to the study of socio-biological determinants of infant and child morbidity and mortality. In International population conference, Florence, Italy, 5-12 June 1985, vol.2. International Union for the Scientific Study of Population, Liege, Belgium. pp. 237-253.

Figure 2.2: General model of the interrelationships of underlying and proximate determinants to fertility and child survival (Mosley 1985:197).



Source: Mosley, W.H. (1985). Biological and socio-economic determinants of child survival: a proximate determinants framework integrating fertility and mortality variables. In International population conference, Florence, Italy, 5-12 June 1985, vol.2. International Union for the Scientific Study of Population, Liege, Belgium. pp. 189-208.

Figure 2.3: Mosley-Chen Model (1984)

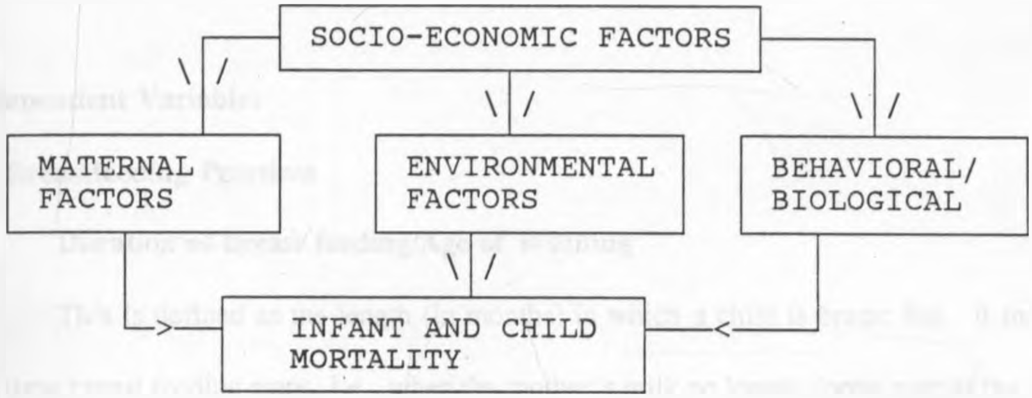


Source: Mosley W.H. & Chen L.C. (1984). Population and Development Review. A Supplement to Vol. 10:25-45.

2.2.5 Conceptual Framework For The Study

This work is based on the Mosley and Chen (1984) theoretical framework that has been mentioned above. For operational purposes this work is guided by the modified framework illustrated in figure 2.4 below. This framework is a modification because aspects such as growth faltering and injury were not studied.

Figure 2.4: Modified mosley and chen conceptual model



2.2.6 Conceptual Hypotheses

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

1. Breastfeeding practices are likely to have an impact on infant and child mortality.
2. Socio-economic factors are likely to affect the impact of breastfeeding practices on infant and child mortality.
3. Demographic factors are likely to affect the impact of breastfeeding practices on infant and child mortality.
4. Environmental factors are likely to affect the impact of breastfeeding practices on infant and child mortality.

2.2.7 Definition of Key Concepts

Dependent Variable:

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

Infant mortality: Deaths occurring to children between birth and age 1.

Child mortality: Deaths occurring to children between age 1 and age 5.

Independent Variables

1. Breastfeeding Practices

(a) Duration of breast feeding/Age of Weaning

This is defined as the length (in months) in which a child is breast fed. It indicates the time breast feeding stops, i.e., when the mother's milk no longer forms part of the child's food. The duration of breast feeding therefore coincides with the age of weaning. It is measured in terms of the following categories: 0-6 months; 7-12 months and 13-24 months and 25+ months. These categories are chosen according to the common breastfeeding durations that are reported by most women. This also makes it easy to see the impact of breastfeeding in the first half of the first year of life and how it may be influenced in the first year and second year of life and finally after the second year.

(b) Age at which supplementary feeding starts

This is defined as the age at which the infant was introduced to other milk or foods. It is measured in terms of the following age categories: 0-3 month; 4-6 months; 7+ months. These categories are chosen because many children today are given supplements quite early.

With increased formal education and off-farm activities for women, many do not have time to exclusively breastfeed for at least 4 or 6 months.

Intervening Variables

This are used to assess the impact of breast feeding practices on infant and child mortality. They include the following:

1. <u>**Environmental Factors**</u>

(a) Place of birth of the child

This is measured in terms of hospital/maternity unit and home births.

(b) Source of water

This is measured in terms of: river/stream/pond; andTap/borehole/well;. This gives two categories; exposed and not exposed to contamination. This is because river or stream, water is more likely to be contaminated if the surrounding has latrines nearby or poor faecal disposal facilities.

(c) Toilet Facility

This is used to refer to the method of faecal disposal. It is measured in terms of the following: bush and pit latrine/water borne toilets. This gives two categories: exposed and not exposed to environmental contamination.

2. <u>**Maternal Factors**</u>

(a) Age of mother

This is measured in terms of the following categories: 15-24; 25-34; 34+.

(b) Marital Status of the mother

This is measured in terms of the following categories: married; single; other.

(c) Parity

This measured in terms of the following categories: 1-2, 3-4 and 5+ children.

3. Socio-economic Factors

(a) Work status

This is measured in terms of the following two categories: Work away from home and work at home.

(b) Educational Level of the mother

It is measured in terms of the following categories: None; primary; and secondary+.

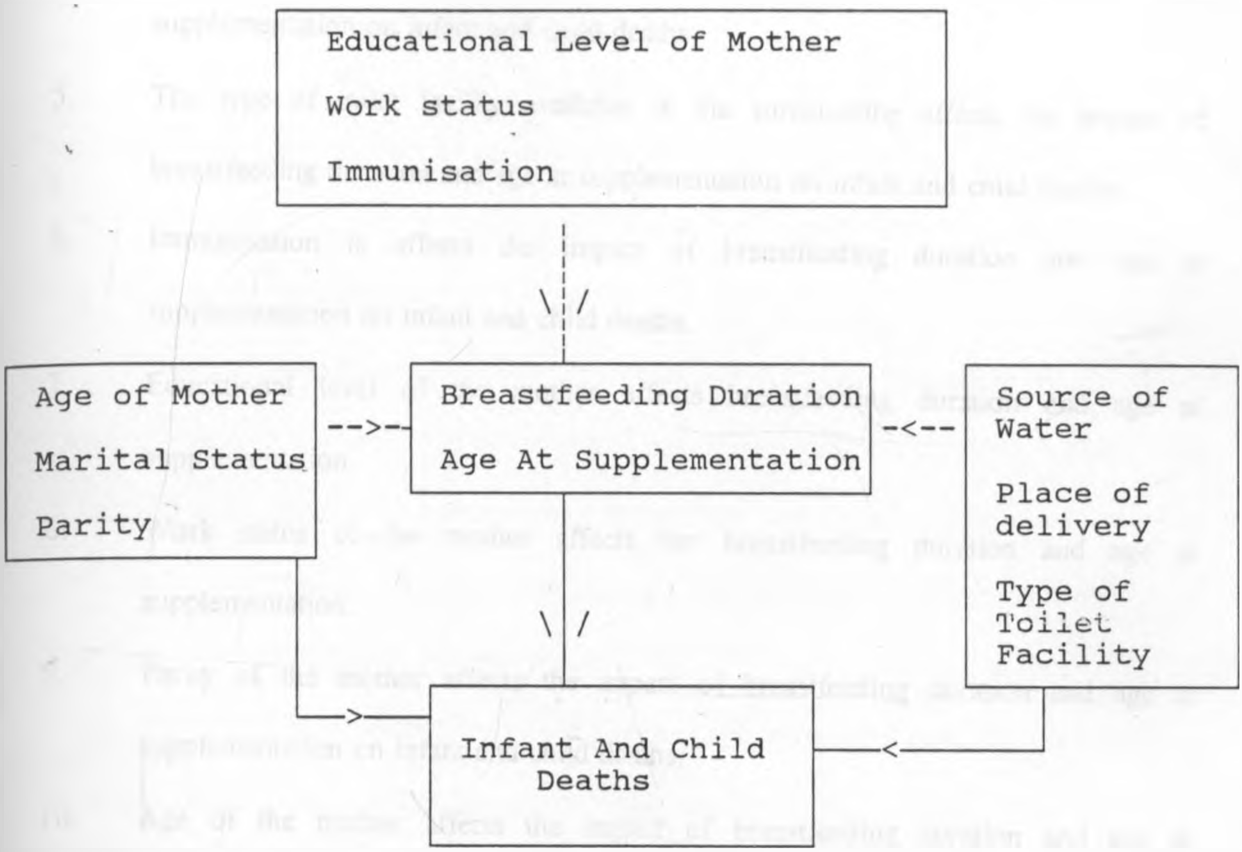
(c) Immunisation

This is measured in terms of the following: complete, incomplete and none.

2.3 OPERATIONAL MODEL

The operational model for the study is adapted from the Mosley and Chen (1984) model already mentioned above.

Figure 2.5: Operational Model



NB: The dotted lines indicate that those factors may affect the impact of breastfeeding practices on infant and child mortality.

2.3.1 Operational Hypotheses

From the above operational model, the following hypotheses can be drawn:

1. Duration of breastfeeding is inversely related to infant and child mortality. The shorter the duration the higher the chances of death.
2. Age at which supplementary food is introduced to the infant is inversely related to infant and child mortality. The earlier the age the higher the chances of death.
3. Place of delivery of the child affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

4. Source of water affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

5. The type of toilet facility available in the surrounding affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

6. Immunisation is affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

7. Educational level of the mother affects breastfeeding duration and age at supplementation.

8. Work status of the mother affects her breastfeeding duration and age at supplementation.

9. Parity of the mother affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

10. Age of the mother affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

11. Marital status of the mother affects the impact of breastfeeding duration and age at supplementation on infant and child deaths.

2.4 SUMMARY

This chapter has provided a review of literature, the conceptual framework and the the operational model. The literature review has covered the following:

- Breastfeeding and infant and child mortality
- Breastfeeding differentials by education, work status, age and parity of the mother.
- The influence of education, age and parity, marital status, work status, availability

of water, type of toilet facility, immunisation and place of delivery on infant and child mortality.

From the literature review, breastfeeding duration and age at supplementation have been found to have an impact on infant and child survival especially in the first year of life. However, as noted, some studies have also found that breastfeeding and supplementation have an impact even after the first year of life.

Breastfeeding differentials by maternal characteristics have been noted. Particularly, mothers' level of education highly influences breastfeeding durations. That women with higher levels of education tend to breastfeed less and this was found to be mainly due to their work status. Most of the educated women go to work after delivery and so have to shorten their breastfeeding durations and supplement the child's breast milk much earlier.

It has also been noted that age and parity of the mother influence the breastfeeding durations. Older women tend to breastfeed longer than the younger women. This was found to be because older women may have lower levels of education and this has been related to longer breastfeeding durations. Higher parity women have also been noted to breastfeed less because of shorter birth intervals.

Apart from breastfeeding and age at supplementation which have been found to influence infant and child survival, other factors such as education, age of the mother, parity, marital status, work status, availability of water, type of toilet facility, immunisation and place of delivery have an influence on infant and child mortality. Hence these factors may override the impact of breastfeeding on infant and child survival.

CHAPTER THREE

3.0 METHODOLOGY

3.0.1 Introduction

This section deals with the description of the data collection and analysis procedures utilised in this research. A total of 1030 women aged between 15 -49 who had at least had a live birth and also had at least a child under five years were interviewed.

3.1 THE DATA SOURCE

Information was gathered on mother's characteristics; heads of households and breastfeeding for the open interval (last child) and the closed interval (next to last child). Of these children, only those born between January 1988 and December 1992 (i.e under 5 years) were included in the interview.

The questions on breast feeding were confined to the last closed birth interval (i.e. the second last child) and to the open birth interval (i.e. the last child). Questions were also asked about the woman's birth history (i.e. children ever born and children dead).

Two aspects of breastfeeding practices were examined in the survey: Duration of breast feeding and the age at which supplementary feeding was introduced to the child, in addition to, or as a substitute for breast milk.

3.2 METHOD OF DATA COLLECTION

3.2.1 The Sample Design

The sampling procedure adopted was a modification of the multi-stage cluster sampling.

Despite the fact that mortality estimates from survey data require large sample sizes, the selection of the sample size is usually dictated by the size of the universe from which it is taken, the time and the financial resources at the disposal of the researcher. Time and financial resources for this research were quite limited. The selection of the sample for this study utilized the procedure outlined by Blalock et al (1968). He states that one can choose a sample size by using the standard error of the proportion 'P' of the population that he elects to choose.

To obtain the standard error the formula used is:

$$S.E\ (P) = SQRT\ (pq/n)$$

In this case SQRT denotes square root and n sample size. Note that $p+q = 1$.

In this study 'P' was set equal to 0.5 and a selected confidence interval of about 0.5. Thus the confidence interval is 95 per cent. This then gives a sample size with confidence limits around 0.45 and 0.55.

To find 'n' which is the unknown in the above formula, the formula $n = (2)^2 pq/2\ S.E.(p)^2$ is used. None the less, Blalock has noted a general formula for obtaining the sample size. This is given by $n = 1/K^2$. K is the desired interval about the proportion $'p' = 0.5$ at a desired confidence interval.

The sampling procedure adopted was a modification of the multi-stage cluster sampling.

The division was first divided into clusters using sub-locational boundaries. There were 7 sub-locations in total, hence 7 clusters. From these a total of 28 enumeration areas 4 per each cluster were selected at random. The 1989 Kenya Census enumeration area maps were used in the random selection. The next step was a census of all eligible women in each enumeration area. This was carried out with the help of sub-chiefs and village heads. This provided a sampling frame.

Table 3.1 below gives the distribution of eligible women for interview in the different clusters. Applying Blalock's formula above any sample size between 45% and 55% of the total number of eligible women can represent the Division at a 95% confidence interval. Thus, a total of 1050 women were randomly chosen.

Table 3.1 Distribution of Eligible Women For Interview Per Cluster

Cluster Name	Number of Eligible Women
Aboloi Sub-location	274
Angurai Sub-location	198
Kakapel Sub-location	191
Kamuriai sub-location	420
Kocholia Sub-location	450
Kolanya Sub-location	307
Moding sub-location	206
Total	2046

Source: Field Research

To find the total number of women to be interviewed in each cluster, a proportion of the total eligible women in the cluster was created by taking the total women in the sample and dividing by total eligible women in the division. For example in the cluster Aboloi, the proportion was 274/2046. This proportion was then multiplied by the target population of 1050 and the number to be interviewed was determined respectively.

Table 3.2 gives the number of women selected for interview in each cluster.

Table 3.2 Number of Women Selected for Interview in Each Cluster

Cluster Name	Number of selected women
Aboloi Sub-location	144
Angurai Sub-location	101
Kakapel Sub-location	98
Kamuriai Sub-location	215
Kocholia Sub-location	230
Kolanya Sub-location	157
Moding Sub-location	105
Total	1050

Source: Field Research

Each woman was assigned a unique number. Thus, in each cluster women interviewed were selected by simple random sampling. A list of all women eligible for interview was written on small pieces of paper and then wrapped up. The required number was then chosen after thorough mixing of the pieces of paper.

Pre-testing of the questionnaires was carefully done in order to have fairly representative results.

3.2.2 The Study Questionnaire

A pre-coded questionnaire was designed for the purposes of the study (See Appendix I). The questionnaire was divided into three parts. Part one was about the individual woman (i.e. the respondent). This was an important part as information was gathered regarding some of her socio-economic and demographic characteristics as well as household environmental factors. This was limited to only women between 15 - 49 years of age who had had at least a live birth in the preceding 60 months before the survey. The women were also asked about their birth history (i.e children ever born and children dead).

The second part of the questionnaire had questions about the head of the households.

This was somebody who was considered the major decision-maker in the household. This part sought to know the relation of the head to the respondent, education level, age and if working, type of work being done.

The third and final part of the questionnaire was on the last two births of the women. This part gathered the following information: the sex, age, survival status, place of delivery, breastfeeding durations, age at supplementation, type of other milk given, utensils used to give liquid food, morbidity in the last two weeks before the survey, type of sickness, action taken to cure the sickness and immunizations received by the child.

The questionnaire was first pre-tested. There was no major difficulty in interpreting and understanding the questions. It was therefore finally adopted for the interview.

3.2.3 Problems Encountered in the Field

A number of problems were encountered in the field that may affect results. Age misreporting and age heaping especially of children was quite pronounced. Where it could be helped, health cards were used to assess the age of the child.

Another major problem was on the reporting of durations of breastfeeding and age at supplementation. There was alot of heaping in multiples of 6 such as 6, 12 etc. This may have affected the results.

Death reporting in Africa is not very factual because of the stigma associated with death. As a result, the deaths may be under-reported. Apparently, many women seemed not to know the difference between a live birth and a still birth. Thorough training of the interviewers was done to ensure that this confusion was minimized. However, some of these errors could easily be detected especially where a woman reported more deaths than total live births. Such cases were corrected by probing about the nature of births they had.

Another problem encountered was that of non-response. This problem was partially solved by revisits and also by explanations to the concerned women about the importance of the research to them and their children. Ten of the sampled women were not found at home during the time of the interview. Most had travelled to towns where their husbands worked. The others were not available even after several re-visits. Five women blatantly refused to be interviewed and another five were refused interview by their husbands.

Lastly, there were cases of exaggeration of answers especially in terms of immunisation of children. Many respondents reported having taken their children for immunisation yet they could not produce the immunisation cards. Such cases, were all treated as not immunised except where a BCG scar was verified, such a child was assumed to have only received a BCG injection.

3.3 METHODS OF DATA ANALYSIS

3.3.0 Introduction

The SPSS (Statistical Package for Social Scientists) was used for data analysis. This section outlines the methods used in data analysis. They are frequencies, crosstabulations, estimation of infant and child mortality and logistic regression method.

3.4 FREQUENCY DISTRIBUTIONS

Frequencies are used to show the distribution of characteristics of mothers, heads of households, children and household environmental factors. This gives a first hand glance at the findings of the study.

3.5 CROSSTABULATION AND THE CHI-SQUARE

Cross tabulation has been used to interpret the relationship between two variables, namely duration of breastfeeding and age at supplementation and selected mothers' charateristics for both the last live birth (open interval) and next to last live birth (closed interval); proportion of children dead by selected mothers' characteristics and environmental factors.

The chi-square is used to measure the extent of association as well as the statistical test of hypotheses that a relationship does not exist.

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

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

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

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

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

The Pearson chi-square is a statistic which is more often used to test if the row and column variables are independent. This statistic is calculated by summing over all the cells of the squared residuals by expected frequencies.

$$X^2 = \sum \frac{(0ij - Eij)^2}{Eij}$$

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

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

In our study SPSS Computer Package has been used to calculate the observed significance level of the test. If the level of significance is small i.e less than 0.05 then the hypothesis that the variables are independent is rejected.

The application of chi-square is subject to the fulfillment of certain conditions. These are;

(i) experimental data should be independent of each other

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

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

(iv) that sample contains at least 50 observations.

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

3.6 CALCULATION OF INFANT AND CHILD MORTALITY RATES

3.6.1 Direct Methods

Infant mortality rate

This is a crude rate and is calculated from reported deaths of infants under one year to the total live births in a given year. The formula is as follows:

$$\text{Infant mortality rate} = \frac{\text{Deaths to infants under 1 year}}{\text{Total live births in a year}} \times 1000$$

There were a total of 382 infants and 23 of these were dead.
As a result the infant mortality rate was calculated as:

$$[23/382] \times 1000$$

$$= 60 \text{ deaths per 1000 live births}$$

Child mortality rate

This is also a crude rate and is calculated from the deaths of children between 1 year and under 5 years to the total number of children between 1 and under 5 years in a given year. The formula is as follows:

$$\text{Child mortality rate} = \frac{\text{Deaths of children 1 year to} < 5 \text{ years}}{\text{Total number of children 1 year to} < 5 \text{ years in a year}} \times 1000$$

There were a total of 1435 children aged between 1 and under 5 years. Out these 139 were dead. Thus childhood mortality rate was:

$$= [139/1435] \times 1000$$

$$= 97 \text{ deaths per 1000 live births.}$$

3.6.2 Indirect Methods

Brass Method

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

Brass was the pioneer of the procedure of converting proportions dead of children ever born reported by women in age groups 15-19, 20-24, ... 45-49 into estimates of the probability of a child dying before attaining a certain exact childhood age. The method utilizes information on children surviving among children ever born to women in reproductive ages 15-49. The use of the method according to Brass is based on a number of assumptions. These are:

1. By allowing for the effects of distribution of the births in time, the proportion of dead children can be converted into conventional measures of mortality expressing their average experience. This is to say that the proportions of children surviving and dead classified by the five year age group of the mothers or the duration of marriage can provide estimates of the probabilities of dying between birth and various childhood ages.
2. That fertility and mortality conditions have remained constant for quite a long time hence making it possible to estimate the proportions who survive to age 1, 2, 3, 5, 10, 15 ... 35, from the proportion reported as surviving among children ever born to mothers in different child bearing ages.
3. That the risk of death is a function only of the age of the child and not other factors such as child's birth order and mother's age which are equally important mortality determinants. This is a serious limitation for in practice it has been found that

mortality risks among infants and children are higher among young mothers which suggests that the age of the mother is a crucial child mortality determinant. This is why q(1) values of women aged 15-19 years are disregarded as they tend to be higher. The q(10) is also neglected because older women tend to forget long past experiences and hence their responses may distort the true mortality situation. In essence, q(1) and q(10) imply that the age of the mother is an important mortality determinant and if it is left to operate alone in any analysis of child mortality it will hide the importance of other equally important mortality determinants. For these reasons q(2), q(3) and q(5) values are preferred because they are considered more reliable. In this study only the q(2) value is considered.

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

Definition of Notations Used in this Method

FPOP(i) Refers to the female population in age group (i), where (i) is 15-19, 20-24 ..., 45-49.

CEB(i) This denotes the children ever born by women in age group (i).

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

P(i) This is the average parity per woman, where (i) refers to the age group of the woman.

D(i) This is the ratio of children dead to children ever born by women in age group (i).

q(x) This is the probability of dying at exact age (x).

p(x) This is the probability of surviving at exact age (x).

k(i) Coefficients used to adjust D(i) values into probability of dying.

Trussel Technique

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

In this study Coale-Trussel's method and multipliers for both the North and West Models have been used. The selection of these models is based on the fact that little is known about mortality conditions in Amagoro division and hence these models are recommended because of their generality. We use q(2), q(3) and q(5) infant mortality rate (IMR) and life expectancy at birth, (e_o) parameters, calculated only at the division level, to show the division's mortality condition.

Trussel technique utilizes the following information for child mortality estimation :

1) Children ever born classified by five year age group of the mothers (CEB)

2) Children dead classified by five year age group of the mothers (CD)

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

Computational Procedure

The following is the information that has been used to calculate the q(x) values for various ages in Amagoro division.

Table 3.3 Female Population by Age Group, Children Ever Born, Children Dead, Average Parity and Proportion of Children Dead

Age Group (i)	(i)	FPOP (i)	CEB (i)	CD (i)	P (i)	D (i)
15-19	1	82	86	31	1.0487804	0.3604651
20-24	2	267	551	48	2.0636704	0.0871143
25-29	3	258	842	51	3.2635658	0.0605700
30-34	4	214	1044	74	4.8785046	0.0708812
35-39	5	136	732	65	5.3823529	0.0887978
40-44	6	50	367	41	7.3400000	0.1117166
45-49	7	23	156	22	6.7826086	0.1410256

Step 1: Calculation of average parity per woman [P(i)]

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

P(i) = CEB(i)/FPOP(i)

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

For example P(1) = 86/82

= 1.0487804

Step 2: Calculation of proportion of children dead for each age group of the mother [D(i)]

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

Thus:

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

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

For example D(1) = 31/86

= 0.360465

Step 3: Calculation of multipliers [K(i)]

The North Model life table coefficients provided in Manual X, have been utilized.

In general:

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

a(i), b(i) and c(i) are coefficients.

Where P(1)/P(2) = 1.0487804/2.0636704

= 0.5082112

and P(2)/P(3) = 2.0636704/3.2635658

= 0.6323360

Table 3.4 Coefficients for estimation of child mortality multipliers, Trussell variant, when data are classified by age of mother, North Model

		Coefficients			
Age Group	(i)	a(i)	b(i)	c(i)	k(i)
15-19	1	1.1119	-2.9287	0.8507	0.1614300
20-24	2	1.2390	-0.6865	-0.2745	0.7165367
25-29	3	1.1884	0.0421	-0.5156	0.8837632
30-34	4	1.2046	0.3037	-0.5656	1.0012944
35-39	5	1.2586	0.4236	-0.5898	1.1009264
40-44	6	1.2240	0.4222	-0.5456	1.0935642
45-49	7	1.1772	0.3486	-0.4624	1.0619702

Source: Indirect Techniques for Demographic Analysis, Manual X, U.N. 1983, p.77.

For example, applying the above equation to data from Amagoro, k(1) = 1.1119 + [0.5082112 × -2.9287] + 0.632336 × 0.8507

= 0.161430

Step 4: Calculation of the probability of dying [q(x)]

q(x) = K(i) × D(i)

Note: q(x) takes the values 1, 2, 3, ..., 20 respectively, as it is related in broad terms to the average age of the children of women in age group (i).

For example q(1) = k(i) × D(1)

= 0.161430 × 0.3604651

= 0.0581899

Step 5 Calculation of the reference period [t(x)]

The reference period in a situation where mortality is changing smoothly is an estimate of the number of years before the survey date to which the child mortality estimates q(x) in step 4 refer to. t(x) is also estimated by means of an equation whose coefficients were estimated from simulated cases using linear regression. The coefficients are provided in table 3.5 below. The equation used in the estimation of t(x) is: t(x) = d(i) + e(i)[P(1)/P(2)] + f(i)[P(2)/P(3)]

Table 3.5 Coefficients for estimation of the reference period, t(x), to which the values q(x) estimates from data classified by age refer, North Model

Age Group	(i)	Coefficients d(i)	e(i)	f(i)	Reference Period t(x)
15-19	1	1.0921	5.4732	-1.9672	2.6297101
20-24	2	1.3207	5.3751	0.2133	4.1872632
25-29	3	1.5996	2.6268	4.3701	5.6979407
30-34	4	2.0779	-1.7908	9.4126	7.1197212
35-39	5	2.7705	-7.3403	14.9352	8.4841419
40-44	6	4.1520	-12.2448	19.2349	10.091975
45-49	7	6.9650	-13.9160	19.9542	12.510491

Source: Indirect Techniques for Demographic Analysis, Manual X, U.N. 1983, p.77.

For example, t(1) = d(1) + e(1)[P(1)/P(2)] + f(1)[P(2)/P(3)]

= 1.0921 + [0.5082112 × 5.4732] + [0.632336 × -1.9672].

= 2.6297101

This means that the q(1) value refers to April, 1990, since this data was collected in the months of December and January, 1993.

CALCULATION OF MORTALITY LEVELS AND CONSTRUCTION OF THE LIFE TABLE

With the values of q(2), q(3) and q(5) a life table for the division can be constructed.

Step 1: Calculation of p(x) Values

p(x) is the probability of surviving at a certain age. The formula is: p(x) = 1-q(x)

For example p(1) = 1 - q(1)

= 1 - 0.0581899

= 0.941810

P(x) values for all the age groups in the age range 15-49 are calculated using the formula above i.e. p(x) = 1 - q(x).

Table 3.6: Actual p(x) values for Amagoro Division

x	q(x)	p(x) [1 - q(x)]
2	0.06242	0.93758
3	0.05353	0.94647
5	0.07097	0.92903

Table 3.7: The Lower and Upper Values of p(x) used in calculating mean mortality level for Amagoro Division

(x)	Actual p(x)	Lower level	Upper level	Lower p(x)	Upper p(x)	Implied Level
2	0.93758	19	20	0.93682	0.94833	19.065975
3	0.94647	20	21	0.94304	0.95548	20.275755
5	0.92903	19	20	0.91987	0.93537	19.590775

The implied level is calculated by interpolation as shown below:

$$\text{Implied Level} = \text{lower level} + \frac{\text{Actual } p(x) - \text{lower } p(x)}{\text{upper } p(x) - \text{lower } p(x)}$$

For example for q(2), the implied level is thus:

$$19 + \frac{0.9375793 - 0.93682}{0.94833 - 0.93682}$$

$$= 19.065975$$

The mean mortality level is calculated by dividing the implied levels for q(2), q(3) and q(5) by 3 as follows:

$$\text{Mean Mortality Level} = \frac{19.065975 + 20.275755 + 19.590775}{3}$$

$$= 19.644168$$

Calculation of p(x)

The interpolated p(x) is got by obtaining levels from Coale & Demeny North model for five-year survivorship probabilities from Manual X, UN (1983).

The formula below is used:

$$\text{Interpolated } p(x) = \text{Lower } p(x) + \frac{[\text{Upper } p(x) - \text{Lower } p(x)]\,[\text{Average level} - \text{Lower level}]}{\text{Upper level} - \text{Lower level}}$$

For example, for Amagoro division, when x=2, interpolated p(x) is:

$$\frac{0.93682 + [0.94833 - 0.93682][19.065975 - 19]}{20-19}$$
$= 0.93758$

Table 3.8 below gives complete interpolated values of p(x).

Table 3.8: Interpolated p(x) Values for the Construction of the Life Table

Age (x)	p(x) Level 19	p(x) Level 20	Actual p(x)
0	1	1	1
1	0.94668	0.95555	0.95239
5	0.91987	0.93537	0.92985
10	0.90792	0.92612	0.91964
15	0.90061	0.92019	0.91322
20	0.89046	0.91142	0.90396
25	0.87664	0.89928	0.89122
30	0.86193	0.88638	0.87768
35	0.84605	0.87247	0.86307
40	0.82834	0.85690	0.84674
45	0.80681	0.83761	0.82665
50	0.78105	0.81411	0.80235
55	0.74575	0.78090	0.76839
60	0.70094	0.73840	0.72507
65	0.63722	0.67665	0.66262
70	0.54799	0.58939	0.57401
75+	0.42963	0.46877	0.45484

Step 3: Construction of life table

Using the actual p(x) values obtained in table 3.8 above, the other values of the life table are obtained:

(a) l_x: This is the number of survivors at exact age x. It is found by multiplying the number of survivors at the preceding age with p(x). Usually we begin by assuming that the number of survivors at age 0 are an arbitrary number such as 1,000; 10,000 or 100,000 etc. and then go ahead to derive the survivors in other ages. The formula is: $l_{x-n} \times p(x)$. Usually l_0 is the radix.

For example, suppose l_0 = 100,000, then $l_1 = l_0 \times p(1)$

= 100,000 × 0.9523937

= 95239.377

(b) $_nd_x$: It is the number of deaths at ages between x and x+n. The formula is: l_x $- l_{x+n}$

For example, $_1d_0$ = 100000 - 95239.377

= 4760.6229

(c) $_nL_x$: Is the person years lived between exact ages x and x+n. It is computed according to the various age groups as follows: for age group 0-1, $_1L_0 = 0.5 \times (l_0+l_1)$

For age group 1-4 up to 74 it is $_5L_x = 2.5 \times (l_x+l_{x+n})$

For age group 75+, $L_{75}+ = l_{75} \log_{10} l_{75}$

For example, $L_{75} = 45484.273 \times \log_{10} 45484.273$

= 211859.43

(d) T_x: Is the total person years lived after exact age x. It is found by summing up the person years lived above the age group.

For example, T_0 = 211859.43 + 257214.28 + . . . + 96667.56

= 6316889.3

(e) e_x: Is life expectancy at age x. It is obtained by the formula: $e_x = T_x/l_x$

For example life expectancy at birth (e_0) = T_x/l_x

= 6316889.3/100000

= 63.168893

Table 3.9 below gives the complete life table for Amagoro Division.

Table 3.9: Life Table for Amagoro Division - North Model

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x
0	0.0476062	0.9523938	100000	4760.623	96667.564	6316889.5	63.16889
1	0.0236658	0.9763342	95239.38	2253.917	374871.93	6220221.8	65.31145
5	0.0109810	0.9890190	92985.46	1021.076	462374.62	5845349.9	62.86305
10	0.0069821	0.9930179	91964.39	642.105	458216.67	5382975.3	58.53326
15	0.0101411	0.9898589	91322.28	926.105	454296.14	4924758.6	53.92724
20	0.0140911	0.9859089	90396.17	1273.780	448796.43	4470462.4	49.45411
25	0.0151971	0.9848029	89122.40	1354.407	442225.97	4021666.0	45.12520
30	0.0166473	0.9833527	87767.99	1461.099	435187.21	3579440.0	40.78298
35	0.0189226	0.9810774	86306.89	1633.148	427451.59	3144252.8	36.43107
40	0.0237229	0.9762771	84673.74	2008.706	418346.95	2716801.2	32.08552
45	0.0294008	0.9705992	82665.04	2430.418	407249.14	2298454.3	27.80443
50	0.0423180	0.9576820	80234.62	3395.369	392684.67	1891205.2	23.57094
55	0.0563800	0.9436200	76839.25	4332.197	373365.76	1498520.5	19.50202
60	0.0861309	0.9138691	72507.05	6245.099	346922.52	1125154.7	15.51787
65	0.1337195	0.8662805	66261.95	8860.516	309158.48	778232.2	11.74478
70	0.2076109	0.7923891	57401.44	11917.165	257214.28	469073.7	8.17181
75+	1	0	45484.27	45484.274	211859.44	211859.4	4.65786

3.7 LOGISTIC REGRESSION

3.7.1 Introduction

Logistic regression has been used to determine the probability of an event occuring (in this case, death) given certain conditions (i.e the independent variables).

The logistic regression model is the same as that of any model-building technique such as linear or multiple regression. The idea is to find the best fitting model to describe the relationship between an outcome (dependent or response variable) and a set of independent (predictor or explanatory) variables, often called covariates.

The difference between logistic regression model from linear regression model is that the outcome variable (dependent) in logistic regression is binary or dichotomous.

Basically logit analysis is a probability regression model which expresses the dichotomous variable, Y_i as a non-linear function of the explanatory variable X_i and can be interpreted as the probability that a child will survive or die given the variable in the model.

Two primary reasons for choosing logistic model are:

(1) from a mathematical point of view, it is an extremely flexible and easily used function; and

(2) it lends itself to a biologically meaningful interpretation (Hosmer & Lemeshow, 1989).

The specific form of the logistic model is as follows:

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}} \qquad 1.1$$

Where $\pi(x)$ = Probability of an event occuring.

e = the base of the natural logarithms, approximately 2.718.

β = Coefficients estimated.

x = Independent variables.

A transformation of $\pi(x)$ that is central in the study of logistic regression is the logit transformation. This is defined, in terms of $\pi(x)$, as follows:

$$g(x) = \ln\left[\frac{\pi(x)}{1 - \pi(x)}\right] \qquad 1.2$$

$$= \beta_0 + \beta_1 x$$

This transformation is important because it has many of the 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.

3.7.2 Multiple Logistic Regression Model

This deals with a logistic model of more than one independent variable, i.e. the "the multivariate case".

If we have a collection of p independent variables denoted by $x' = (x_1, x_2, \ldots, x_p)$, then the conditional probability that the outcome is present is denoted by $P(Y=1|x) = \pi(x)$. Then the logit of the multiple regression model is given by equation:

$$g(X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_p X_p \qquad (1.3)$$

in which case:

$$\pi(X) = \frac{e^{g(X)}}{1 + e^{g(X)}} \qquad (1.4)$$

In this situation the method of choice is to use a collection of **design variables** or **dummy variables**.

In general if a variable has k possible values, then k-1 dummy variables will be needed. For example, suppose the j^{th} independent variable, x_j has k_j levels. Then k_j-1 dummy variables can be denoted as D_{ju} and the coefficients for the dummy variables can be denoted as B_{ju}, u=1, 2,..., K_{ju}-1. Thus, the logit for a model with p variables and the j^{th} variable being discrete would be:

$$g(X) = \beta_0 + \beta_1 X_1 + \ldots + \Sigma B_{ju} D_{ju} + B_p X_p.$$

3.7.3 Interpretation of the Coefficients of the Logistic Regression Model

In logistic regression the estimated coefficients for the independent variables represent the slope or rate of change of a function of the dependent variable per unit of change in the independent variable. Thus, interpretation involves two issues: Determining the functional relationship between the dependent variable and the independent variable, and appropriately defining the unit of change for the independent variable.

The first step is to determine what function of the dependent variable yields a linear function of the independent variables. This is called the **link function** [McCullagh and Nelder, 1983]. In

the case of a linear regression model it is the identity function since the dependent variable is linear in the parameters, i.e. it is the function y=y. In the logistic regression model the link function is the logit transformation: \

$g(x) = \ln \{\pi(x)/[1-\pi(x)]\} = \beta_0 + \beta_1 x.$

For a linear regression model the slope coefficient, β_1, is equal to the difference between the value of the dependent variable at x+1 and the value of the dependent variable at x, for any value of x. For example, let $y(x) = \beta_0 + \beta_1 x$ from which it follows that $\beta_1 = y(x+1) - y(x)$. In this case, the resulting coefficient expresses the resulting change in the measurement scale of the dependent variable for a unit of change in the independent variable. Such as, if in a regression weight on height of adolescent male children, we found the slope to be 5, then we would conclude that a change of 1 inch in height is associated with a change of 5 pounds in weight.

In the logistic regression model $\beta_1 = g(x+1) - g(x)$. That is, the slope coefficient represents the change in the logit for a change of one unit in the independent variable x.

Logit analysis is like a multivariate regression method for e stimating relative risk. The logit coefficients are the natural logarithms of the relative odds by which determinants of mortality are different for the risk of dying. An odd is the ratio of the frequency of being in one category to the frequency of not being in that category and is interpreted as the chance that an individual randomly selected will be observed to fall into the category of interest. The odds ratio here is marginal odds applying to the total frequencies while holding the effect of the other variables constant.

The logistic model can be re-written in terms of the odds of an event occuring. The *odds* of an event occuring are defined as the ratio of the probability that it will occur to the probability that it will not. It is easier to think of odds, rather than log odds, and the logistic equation can be written in terms of odds as:

$$\frac{\text{Prob(event)}}{\text{Prob(no event)}} = e^{B_0 + B_1X_1 \ldots B_PX_P}$$

$$= e^{B_0 + B_1X_1 \ldots B_PX_P}$$

Then e raised to the power β_1 is the factor by which the odds change when the ith independent variable increases by one unit. If β_1 is positive this factor will be greater than 1, which means that the odss are increased; if β_1 is negative the factor will be less than 1, which means that the odds are decreased. When β_1 is 0 the factor equals to 1, which leaves the odds unchanged.

To estimate the impact of breast feeding, age of supplementary feeding and other covariates on infant and child mortality, a logistic regression model was designed for the last births and next to last births.

The zero month of life was excluded because of the uncertainty of the survival status at birth and the child care status in that particular month (Da Vanzo et al., 1983; Palloni and Tienda, 1986).

The key independent variables in this analysis are durations of breast feeding and age at which supplementary feeding was introduced to the child. The breastfeeding duration variable was derived from the number of months for which the child was breast fed. For this purpose the variable was re-coded as a dummy and employed as a time varying explanatory factor. It took a value of 1 if the child was breast fed at least upto the beginning of the duration under consideration, otherwise 0. This approach was adopted to prevent bias that may result from possible cases of reverse causation whereby a child's death was the cause of breast feeding cessation.

The age of supplementary feeding variable was employed as a set of dummies with the following categories: 1-3 months; 4-6 months; 7+ months. It took a value of 1 if the child's feeding was supplemented at a specific age under consideration, otherwise 0.

Four models were estimated. One model estimated the effects of breast feeding duration and age of supplementary feeding on infant and child mortality. The second model expanded on the first one by introducing the environmental variables. This was used to see whether the estimates in model one changed when these control variables were included and which of these variables was a significant predictor of infant and child mortality. The third model thus expanded on the second one by introducing socio-economic variables. This was also used to see whether the estimates in model two changed. A fourth model introduced the demographic variables. This was to see the final change in the first three models. The models were estimated separately for the last births and next to last births.

3.7.4 Partial Correlation

As in the case of multiple regression, the contribution of individual variables in logistic regression is difficult to determine. The contribution of each variable depends on the other variables in the model. This is a problem particularly when independent variables are highly correlated.

A statistic that is used to look at the partial correlation between the dependent variable and each of the independent variables is the R statistic. r can range from -1 to +1. A positive value indicates that as the variable increases in value, so does the likelihood of the event occuring. If r is negative, the opposite is true. Small values for r indicate that the variable has a small partial contribution to the model.

The equation for the R statistic is:

$$r = \sqrt{\left[\frac{\text{WALD STATISTIC} - 2k}{-2LL_{(0)}}\right]}$$

The denominator is -2 times the log likelihood of a base model that contains only the intercept, or a model with no variables if there is no intercept.

We usually use two statistics for the multiple correlation analysis. The coefficient of partial correlation (r) represents an index measuring the strength of the relationship between the dependent variable and each of the independent variables included in the model.

But a more meaningful interpretation of r is got from the coefficient of determination, R^2. The coefficient of determination is the square of r. It shows the amount of variation in the dependent variable Y, that is explained by the independent variable.

3.8 SUMMARY

In this chapter a discussion of the method used in data collection and methods of analysis have been given. A modification of multi-stage sampling technique was adopted for data collection. The sample of women in this study may not represent the entire Amagoro population. However, the characteristics obtained for each category of women may be extended to that of the entire population if appropriate weighting to indicate the precise proportional size of each of these groups relative to the total population of Amagoro was available.

The methods used in data analysis that have been discussed include frequency distributions, crosstabulation and the chi-square, direct and indirect methods of calculating infant and child mortality, and the logistic regression method for estimating the relative risk of dying or surviving.

CHAPTER FOUR

4.0 CHARACTERISTICS OF THE STUDY POPULATION, CROSSTABULATION AND CHI-SQUARE RESULTS

4.0.1 Introduction

This chapter gives the frequency description, crosstabulation and chi-square results. These are important as they give the first hand glance/quick look at some of the significant factors affecting child survival in Amagoro Division. These factors were not controlled for in this section but looked at independently. Chapter Five gives the results with the socio-economic, environmental and demographic factors controlled for.

4.1 FREQUENCY DISTRIBUTION RESULTS

4.1.1 Introduction

Frequencies are used to show the distribution of characteristics of the mothers, heads of household, environmental factors and children, especially the last child (open interval) and next to last child (closed interval).

4.1.2 Characteristics of The Women

Age

Generally, majority of the women interiviewed were between ages 20-34 years. The highest number and percentage was in age group 20-24 (25.9%); followed by age groups 25-29 (25.0%) and 30-34 (20.8%). Only 2.2% were aged 45-49 years as shown in table 4.1 below. Older women generally may have had their desired family size earlier and hence there were a few who had children under 5 years.

Table 4.1 Age Distribution of the Women

Age Group	Number	%
15-19	82	8.0
20-24	267	25.9
25-29	258	25.0
30-34	214	20.8
35-39	136	13.2
40-44	50	4.9
45-49	23	2.2
Total	1030	100.0

Source: Field Data

Marital Status

Table 4.2 below shows that marriage as in many African societies, is almost universal in the division. Of the 1030 women 802 (77.9%) were currently married; 15.7% were single and 6.4% had been married but were either divorced, separated or widowed.

Table 4.2 Distribution of Women by Marital Status

Marital status	Number	%
Married	802	77.9
Single	162	15.7
Divorced	13	1.3
Separated	25	2.4
Widowed	28	2.7
Total	1030	100.0

Source: Field Data

Type Of Marriage

Most of the respondents reported being in monogamous unions (68.8%), whereas the rest were in polygnous unions (31.2%) as shown in table 4.3 below.

Table 4.3 Distribution of Women by Type of Marriage

Type of marriage	Number	%
Monogamous	548	68.8
Polygamous	254	31.2
Total	802	100.0

Source: Field Data

Age at First Marriage

Most women were married between the age of 18-20 years (48%). Age at first marriage for women is therefore, relatively low in the Division. Table 4.4 below shows that 48% married when they were between ages 18-20 and 24.% between ages 15-17. Only 3% married at age 24 or more.

Table 4.4 Distribution of Women by Age at First Marriage

Age	Number	%
<15	95	12.0
15-17	192	24.0
18-20	387	48.0
21-23	102	13.0
24+	26	3.0
Total	802	100.0

Source: Field Data

Religion

Table 4.5 below shows that the dominant religious group in the division is Protestant (64%); 35% reported being Catholics and only 1% were Muslims.

Table 4.5 Distribution of Women by Religion

Religion	Number	%
Catholic	361	35.0
Prostestant	659	64.0
Other (Muslim)	10	1.0
Total	1030	100.0

Source: Field Data

Education

Table 4.6 shows that most women interviewed had primary level of education (61.1%). However, a significant percent of 20.4% fell in the 'none education category'. Those who had secondary or more of formal education were only 18.5%. This shows that educational opportunities for women in Amagoro are still low especially for higher education.

Table 4.6 Distribution of Women by Educational Level

Educational level	Number	%
None	210	20.4
Primary	629	61.1
Secondary +	191	18.5
Total	1030	100.0

Source: Field Data

Work Status of the Mother

Table 4.7 gives the distribution of women who reported having employment outside the home. Most women in Amagoro were not employed away from home. Only 6.9% were employed away from home and 93.1% were not employed away from home.

Table 4.7 Distribution of Women by Work Status

Place of work	Number	%
Away from home	71	6.9
At home	959	93.1
Total	1030	100.0

Source: Field Data

Ever Use and Current Use of Contraceptives

Tables 4.8 and 4.9 show that contraceptive use is still low in the division. Only 33.5% of the women reported themselves as ever users whereas 31.9% as current users. For those currently using, 55.3% used modern methods and 44.7% used traditional methods (mostly breastfeeding and abstinence - see table 4.10 below).

Various reasons were given for non-use of contraceptives. The majority of non-users said they wanted more children (28.1%); 20% said their husbands did not approve and 11% of the respondents did not want to use. The other remaining percentage was distributed amongst other reasons as shown in table 4.11 below.

Table 4.8 Distribution of Women by Ever Use of Contraceptives

Ever use	Number	%
Yes	345	33.5
No	685	66.5
Total	1030	100.0

Source: Field Data

Table 4.9 Distribution of Women by Current Use of Contraceptives

Current use	Number	%
Yes	329	31.9
No	701	68.1
Total	1030	100.0

Source: Field Data

Table 4.10 Distribution of Women by Type of Current Contraceptive Method

Contraceptive method	Number	%
Modern	182	55.3
Traditional	147	44.7
Total	329	100.0

Source: Field Data

Table 4.11 Distribution of Women by Reasons for Non-use of Contraceptive Methods

Reasons	Number	%
Husband does not approve	142	20.0
Does not want	77	11.0
Sickness	15	2.0
Facilities unavailable	10	1.4
Religious beliefs	25	3.5
Pregnant	12	1.7
Has no knowledge of Family Planning	29	4.0
Medical complications	31	4.4
Friends Disapprove	66	9.4
Costs too much	10	1.4
Inconvinient to use	18	3.0
Infrequent sex	62	8.8
Wants children	197	28.1
Other	7	1.0
Total	701	100.0

Source: Field Data

4.1.3 Characteristics of the Male Heads of Households

Relation of the Male Heads of Households to the Respondents

Husbands formed the highest percentage of male heads of households (87.4%). Other relatives such as brothers, uncles, fathers etc. formed 12.6% as shown in table 4.12. below.

Table 4.12 Distribution of the Relationship between the Respondent and the Male Head of Household

Head of Households	Number	%
Husband	766	87.4
Others	110	12.6
Total	876	100.0

Source: Field Data

Age Distribution of Male Heads of Households

The highest percent of the male heads of households were in the age group 30-34 (26.0%) followed by age group 35-39 (20.8%); age group 25-29 (16.7%); and age group 40-44 (14.2%). Only 0.1% were of age group 15-19 (See table 4.13 below).

Table 4.13 Age Distribution of Male Heads of Households

Age	Number	%
15-19	1	0.1
20-24	31	3.5
25-29	146	16.7
30-34	228	26.0
35-39	182	20.8
40-44	124	14.2
45-49	81	9.2
50-54	34	3.9
55-59	20	2.3
60 +	29	3.3
Total	876	100.0

Source: Field Data

Work Status of Male Heads of Households

The majority of the male heads of households (68.8%) were not employed away from home. Those who were employed away from home constituted only 31.2%. But compared to the females more males were employed away from home than females (6.9%). This also shows that female opportunities outside the home are quite limited (Table 4.14).

Table 4.14 Distribution of Male Heads of Households by Work Status

Employed Away from Home	Number	%
Yes	273	31.2
No	603	68.8
Total	876	100.0

Source: Field Data

Education of Male Heads of Households

Just like the women, the majority of the heads of households were of primary level education (52.7%). But the percent with secondary+ education was higher than for the women (41.1%

compared to females) as shown in table 4.15.

Table 4.15 Distribution of Heads of Households by Educational level

Educational level	Number	%
None	54	6.2
Primary	462	52.7
Secondary+	360	41.1
Total	876	100.0

Source: Field Data

4.1.4 Environmental Characteristics of the Households

Source of Water

The highest percent (46.0%) of the households got their water from rivers. This also confirms the report in the Busia District Development Plan, that Amagoro division has the least water points in the district and hence many households draw their water from seasonal streams and rivers (Busia District Development Plan, 1989-1993). The percent of households using boreholes with pumps, boreholes with no pumps and pond was 18.3%, 19%, and 16% respectively. A mere 0.6% of households used tap water. These were mainly those which were near urban centres (table 4.16).

Table 4.16 Distribution of Households by Source of Water

Source	Number	%
Tap	6	0.6
River	474	46.0
Borehole/with pump	189	18.3
Bore hole/no pump	196	19.0
Pond	165	16.0
Total	1030	100.0

Source: Field Data

Type of Toilet Facility

Table 4.17 shows three distinct types of toilet facilities. Households using flush toilet constituted only 0.6%; those using pit latrines constituted 82.6% (forming the highest percent and typical of a rural setting) and 16.8% used the bush.

Table 4.17 Distribution of Households by Type of Toilet Facility

Toilet facility	Number	%
Flush	6	0.6
Pit	851	82.6
Bush	173	16.8
Total	1030	100.0

Source: Field Data

Place of Delivery

Tables 4.18A and 4.18B show that 60.7% of the last live births were born in hospital/maternity clinic and only 43.8% of the next to last births were born in such units. A higher percentage (56.2%) of the next to last births were born at home compared to 39.3%

of the last births. This shows an improvement of the awareness of mothers on the importance of the maternity clinic deliveries. This also confirms why there were more deaths for the next to last births compared to deaths of last births - probably many children died of post-delivery environmental contamination and lack of antenatal care.

Table 4.18A Distribution of the Last Live Birth by Place of Delivery

Place of Delivery	Number	%
Hospital/Maternity clinic Home	625 405	60.7 39.3
Total	1030	100.0

Source: Field Data

Table 4.18B Distribution of Next to Last Live Birth by Place of Delivery

Place of delivery	Number	%
Hospital/Maternity Clinic Home	287 369	43.8 56.2
Total	656	100.0

Source: Field Data

4.1.5 Characteristics of the Children

Children Ever Born and Dead

In total there were 3778 total live births from all the respondents. Out of the total live births 1864 (49%) were males and 1914 (51%) were females. Of these children 332 (8.8%) were dead and 3446 (91.2%) were alive. Table 4.19 shows the distribution of the total live births by sex and survival status of each sex.

Table 4.19 Distribution of all Children Ever Born by all Women by Sex and Survival Status

Sex	Survival Status		
	Alive	Dead	Total
Female	1743 (91.1%)	171 (8.9%)	1914 (50.7%)
Male	1703 (91.4%)	161 (8.6%)	1864 (49.3%)
Total	3446 (91.2%)	332 (8.8%)	3778 (100.0%)

Source: Field Data

Causes of Death

Table 4.20 shows the reported causes of death for all children that were dead. Most deaths were reported to be due to measles (31.5%) followed by malaria (22.5%); diarrhoea (15.3%); pneumonia (8.7%) and kwarshiorkor (6.6%). The remaining deaths were caused by other factors as shown in table 4.1.20 below. This confirms the report in the Busia District Development Plan (1989-1993) which says that the major causes of death in the District are measles, malaria and poor feeding habits.

Table 4.20 Causes of death

Cause	Number	%
Malaria	75	22.6
Diarrhoea	51	15.4
pneumonia	29	8.7
Measles	105	31.6
Tetanus	16	4.8
Whooping cough	15	4.5
Tuberculosis	3	0.9
Polio	3	0.9
Kwashiokor	22	6.6
Others	13	3.9
Total	332	100.0

Source: Field Data

Children Under Five

There were a total of 1832 children under five years of age. Of these 1670 (91.2%) were alive and 162 (8.8%) were dead. From these children some information was collected for the last and next to last births (open and closed intervals respectively).

In total, there were 1030 last live births and 656 next to last live births. Of these children 966 (93.8%) of the last live births were alive and 64 (6.2%) were dead; whereas for next to last live births 565 (86.9%) were alive and 91 (13.9%) were dead. Table 4.21 below shows the distribution of the last two births by their survival status.

Table 4.21 Distribution of the last two births by their survival status

Type of birth	Survival status		
	Alive	Dead	Total
Last birth Next to last birth	966 (93.8%) 565 (86.9%)	64 (6.2%) 91 (13.9%)	1030 (61.1%) 656 (39.9%)
Total	1531 (90.8%)	155 (9.2%)	1686 (100.0%)

Source: Field Data

Sex Distribution of the Last Two Births

Table 4.22 below shows the sex distribution of the last two births. Of the last live births 509 (49.4%) were females and 521 (50.6%) were males and for the next to last births 318 (48.5%) were females and 338 (51.5%) were males. So for both the last and next to last births there were 827 (49.1%) females and 859 (50.9%) males.

Table 4.22 Sex Distribution of the Last Two Births

Order of Birth	Females	Males	Total
Last Birth Next to Last Birth	509 (49.4%) 318 (48.5%)	521 (50.6%) 338 (51.5)	1030 (61.1%) 656 (38.9)
Total	827 (49.1%)	359 (50.9%)	1686 (100.0%0

Source: Field Data

Duration of Breastfeeding

Looking at the reported durations (classified into 6 month intervals), there is no significant change in durations of breastfeeding for the last births and next to last births. As shown in tables 4.23A and 4.23B a higher percentage of births were breastfed for a period of between 13-18 months and 19-24 months (10.2%) and (22.9%) and (16.3%) and (43.9%) for the last and next to last live births respectively. It is obvious that initiation of breastfeeding is almost universal except for minimal percentages of (0.5%) and (0.6%) for last and next to last births respectively. This confirms the 1989 KDHS Report which also found that (97%) of Kenyan women initiate breastfeeding and only (3%) do not.

Few respondents reported durations below 12 months and above 24 months. A total of 1.7% and 7.0% reported durations of only between 1-6 months and 7-12 months respectively for last live births. For the closed interval 3.8% and 14.0% reported durations of 1-6 months and 7-12 months respectively.

Table 4.23A Duration of Breastfeeding for the Last Births

Duration in Months	Number	%
0	5	0.5
1-6	18	1.7
7-12	72	7.0
13-18	105	10.2
19-24	168	16.3
25-30	52	5.0
31-36	22	2.1
Until death	15	1.5
Still breastfeeding	573	55.6
Total	1030	100.0

Source: Field Data

Table 4.23B Duration of Breastfeeding for Next to Last Births

Duration in months	Number	%
0	4	0.6
1-6	25	3.8
7-12	92	14.0
13-18	150	22.9
19-24	288	43.9
25-30	51	7.8
31-36	28	4.3
Until death	18	2.7
Total	656	100.0

Source: Field Data

Age at Supplementary Feeding

Tables 4.24A and 4.24B show the reported ages at which children were introduced to supplementary feeding. For both the last and next to last births, the majority reported supplementation at 3-4 months (43.5% and 49.4%) respectively; followed by 5-6 months. The only substantial difference is at 7 months where 12.3% in the open interval are supplemented at 7 months and above and 3.8% in the closed interval are supplemented at 7 months or above.

Table 4.24A Age at Supplementary Feeding for Last Births

Age at supplementary feeding	Number	%
0-2	162	15.7
3-4	448	43.5
5-6	293	28.4
7+	127	12.3
Total	1030	100.0

Source: Field Data

Table 4.24B Age at Supplementary Feeding for Next to Last Births

Age at Supplementation	Number	%
0-2	120	18.3
3-4	324	49.4
5-6	187	28.5
7+	25	3.8
Total	656	100.0

Source: Field Data

Type of Other Milk Given

For both the open and closed intervals, the majority of respondents reported giving cow's milk - 94.6% for open interval and 95.1% for closed interval. This is because many rural residents keep cattle. Cow's milk is also cheaper than the commercial brands. Only 2.5% and 2.6% reported giving KCC milk for the open and closed intervals respectively. Baby formula was reported by 2.9% and 2.3% for open and closed intervals respectively (Tables 4.25A and 4.25B).

Table 4.25A Distribution of Last Births by Type of Other Milk Given

Type of milk	Number	%
Fresh cow's milk	974	94.6
KCC	26	2.5
Formula	30	2.9
Total	1030	100.0

Source: Field Data

Table 4.25B Distribution of Next to Last Births by Type of Other Milk Given

Type of milk	Number	%
Frsh cow's milk	624	95.1
KCC	17	2.6
Formula	15	2.3
	656	100.0

Source: Field Data

Utensils Used to Give Liquid Food

Cup/Bowl and Spoon feeding were reported to be the major modes of giving liquid food - 86.5% for the open interval and 82.9% for the closed interval. This is typical of a rural setting where bottle-feeding is not yet widespread. In both cases bottle feeding was low - 10.1% for open interval and 12.2% for the closed interval. In both cases only few mothers reported feeding by hands or other utensils - 3.4% for open interval and 4.9% for the closed interval (Tables 4.26A and 4.26B).

Table 4.26A Distribution of Last Births by Utensils Used to Give Liquid Food

Utensils Used	Number	%
Cup/Bowl/Spoon	891	86.5
Bottle	104	10.1
Hands	30	2.9
Other	5	0.5
Total	1030	100.0

Source: Field Data

Table 4.26B Distribution of Next to Last Births by Utensils Used to Give Liquid Food

Utensils used	Number	%
Cup/Bowl/Spoon	544	82.9
Bottle	80	12.2
Hands	28	4.3
Others	4	0.6
Total	656	100.0

Source: Field Data

Morbidity

A high percentage of children were reported as having been sick in the last two weeks before the interview. For the open interval and for those who were alive, 63% were reported having been sick. While for the closed interval 49.6% were reported to have been sick

(Tables 4.27A and 4.27B).

Table 4.27A Distribution of Last Births by Morbidity Status in the Last Two Weeks before the interview

Sick	Number	%
Yes No	609 357	63.0 37.0
Total	966	100.0

Source: Field Data

Table 4.27B Distribution of Next to Last Births by Morbidity Status in the Last Two Weeks before the interview

Sick	Number	%
Yes No	280 285	49.6 50.4
Total	564	100.0

Source: Field Data

Type of Sickness

Three major diseases were reported by majority of respondents in both the open and closed intervals. Tables 4.28A and 4.28B show that malaria is prevalent (40.9% and 35.4% for the open and closed intervals respectively). The other diseases are colds/coughs 25.5% and 25.0%; diarrhoea and vomiting 16.4% and 15.7%. Measles was reported by 12.2% and 14.3% respectively. This results confirm the report in the Busia Distric Development Plan, stating that malaria, malnutrition related ailments and measles are major reasons for hospital admissions in the district. Worm infection is higher (5.4%) for the next to last births than for last births (1.8%). This may point to the fact that there may be slight improvement in the children's playing environment and children's feeding diet as these are the major causes of worm infestation - (i.e because last births are relatively recent events than next to last births).

Table 4.28A Distribution of Last Births by Type of Sickness

Type of sickness	Number	%
Cold coughs	155	25.5
Malaria	249	40.9
Diarrhoea	100	16.4
Pneumonia	19	3.1
Measles	74	12.2
Worms	18	1.8
Others	1	0.1
Total	609	100.0

Source: Field Data

Table 4.28B Distribution of Next to Last Births by Type of Sickness

Type of sickness	Number	%
Cold coughs	70	25.0
Malaria	99	35.4
Diarrhoea	44	15.7
Pneumonia	8	2.9
Measles	40	14.3
Worms	15	5.4
Others	4	1.3
Total	280	100.0

Source: Field Data

Action Taken to Cure Sickness

Tables 4.29A and 4.29B show that a majority of women reported taking their children to hospital or a modern medical unit. In the open interval 63.2% children were reported to have been taken to hospital and in the closed interval 66.4% were taken to hospital. Many other children were reportedly given modern medicine at home (19.5% and 22.1% respectively). Others reported taking their children to private doctors (10.8% and 6.8%). These aspects of going to hospitals and use of modern medicines points to the awareness of the importance of modern medical care by these women.

Table 4.29A Distribution of Last Births By Action Taken to Cure Sickness

Action Taken	Number	%
Took to hospital	385	63.2
Took to private doctor	66	10.8
Took to traditional healer	13	2.1
Gave modern medicine at home	119	19.5
Gave herbs at home	23	3.8
Others	3	0.5
Total	609	100.0

Source: Field Data

Table 4.29B Distribution of Next to Last Births By Action Taken to Cure Sickness

Action Taken	Number	%
Took to hospital	186	66.4
Took to private doctor	19	6.8
Took to traditional healer	3	1.1
Gave modern medicine at home	62	22.1
Gave herbs at home	9	3.2
Others	1	0.4
Total	280	100.0

Source: Field Data

Immunizations Received

Tables 4.30A and 4.30B show immunization coverage for the last and next to last birth. Fourty nine per cent had received all immunizations whereas 18.6% had received none. Immunization schedules for most of the last births were not complete because most of the children were still young and hence not yet due for some immunizations.

Of all the next to last births 72.4% were reported to be fully immunized and 20.7% had not received any. This shows a higher percentage of children having been immunized than for the last births. This may be that there is a general improvement on the awareness of the importance of immunization as shown by these results. Whereas those not immunized among the next to last births have little or no chance of being immunized, the last births still stand a chance of being immunized because some were still young and had been born at home. Generally those born at home take time to have the first immunization (BCG) as opposed to those born in hospitals or maternity units; where the first immunization is given almost immediately after birth (Waweru, 1991).

Table 4.30A Distribution of Last Births by Immunizations Received

Type of Immunization	Number	%
None	192	18.6
BCG	74	7.2
DPT	9	0.9
Polio	20	1.9
BCG, DPT, Polio	233	22.6
Measles	2	0.2
All	500	48.5
Total	1030	100.0

Source: Field Data

Table 4.30B Distribution of Next to Last Births by Immunizations Received

Type of Immunization	Number	%
None	136	20.7
BCG	7	1.1
DPT	2	0.3
Polio	6	0.9
BCG, DPT, Polio	30	4.6
All	475	72.4
Total	656	100.0

Source: Field Data

4.2 CROSSTABULATION AND THE CHI-SQUARE RESULTS

4.2.0 Introduction

In this section the results of crosstabulations and the chi-square values are presented. Crosstabulations have been used to assess the association between the dependent and the independent variables. The chi-square technique has been used to test the null hypothesis that there is no relationship between the dependent and independent variables. The chi-square test has been set at $\alpha=0.05$ level for all the crosstabulations in this study. If the significance level is greater than 0.05 then we accept the null hypothesis but if it is less than 0.05 we reject the null hyothesis and accept the alternative hypothesis, that there is a relationship between the dependent and the independent variable.

4.2.1 Durations of breastfeeding

Age

Tables 4.31A and 4.31B show the duration of breastfeeding for last and next to last births by mothers age. For the last births it is evident that the majority of women breastfed for 19-24 months (36.8% of all women). With the exception of age group 25-29, all the other age groups had higher percentages for duration 19-24 months. The results also show that women in age group 15-19 breastfed least for duration 25+ months (7.4%); whereas 22.2% breastfed for less than 12 months in the same age group. The older women had more who breastfed for 25+ months (age group 30-34 had 24.3% breastfeeding for 25+ months). However, the results are not consistent especially for age groups 20-24 and 25-29. This may be a result of misreporting of durations by many women in this age groups. The chi-square value has a significance level of 0.1090. This shows that the age of the mother does not significantly explain breastfeeding durations at significance test of $\alpha=0.05$.

For the next to last birth, the results also show that majority of women breastfed for 19-24 months (43.9%). In each age group the highest percentage was registered in this category. However, duration decreases with an increase in age. Only 4.5% of women in age group 15-19 breastfed for 25 or more months, as compared to 26.5% of women in age group 40+. The chi-square value had a significance of 0.0062, showing that duration of breastfeeding is dependent of age of mother for the closed interval.

Table 4.31A Duration of Breastfeeding for Last Births by Mothers' Age

Duration in Months	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
< 12	6 (22.2)	19 (21.6)	30 (24.6)	27 (25.0)	15 (21.4)	13 (31.0)	110 (24.1)
13-18	5 (18.5)	20 (22.7)	38 (31.1)	19 (17.6)	18 (25.7)	5 (11.9)	105 (23.0)
19-24	14 (51.9)	32 (36.4)	36 (21.5)	49 (45.4)	20 (28.6)	17 (40.5)	168 (36.8)
25+	2 (7.4)	17 (19.3)	18 (14.8)	13 (12.0)	17 (24.3)	7 (16.7)	74 (16.2)
Total	27 (100.0)	88 (100.0)	122 (100.0)	108 100.0	70 100.0	42 100.0	457 100.0

Chi-Square	D.F.	Significance
21.95513	15	0.1090

Table 4.31B Duration of Breastfeeding for Next to Last Births by Mothers' Age

Duration in Months	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
< 12	4 (18.2)	18 (12.1)	32 (17.9)	27 (17.5)	21 (20.4)	15 (30.6)	117 (17.8)
13-18	1 (4.5)	32 (21.5)	49 (27.4)	37 (24.0)	23 (22.3)	8 (16.3)	150 (22.9)
19-24	16 (72.7)	80 (53.7)	71 (34.7)	67 (43.5)	41 (34.8)	13 (26.5)	288 (43.9)
25+	1 (4.5)	19 (12.8)	27 (15.1)	23 (14.9)	18 (17.5)	13 (26.5)	101 (15.4)
Total	22 100.0	149 100.0	179 100.0	154 100.0	103 100.0	49 100.0	656 100.0

Chi-Square	D.F.	Significance
32.14589	15	0.0062

Parity

Tables 4.32A and 4.32B show the duration of breastfeeding for the open and closed intervals by parity respectively. The results for the open interval show that by each parity, the majority of women breastfed for 19-24 months (36.8% of all women). The results show that more women of parity 5+ (29.4%) breastfeed for less than 12 months as compared to 21.3% and 21.5% of parity 1-2 and 3-4 respectively. However, the results are not significant. The chi-square had a significance level of 0.6776. This shows that parity is not significant in influencing duration of breastfeeding in the open interval.

For the closed interval, the majority (43.9%) of the women breastfed for 19-24 months. The results show that an increase in parity reduces breastfeeding duration. Only 11.9% of women with parity 1-2 breastfed for less than 12 months as compared to 23.7% of women of parity 5+. The chi-square results have a significance of 0.0026. This shows that parity influences breastfeeding duration for the closed interval. This may be due to close birth intervals which may have interrupted the breastfeeding of these children.

Table 4.32A Duration of Breastfeeding for Last Births by Mother's Parity

Duration in Months	Parity			Total
	1-2	3-4	5+	
< 12	37 (21.3)	28 (21.5)	45 (29.4)	110 (24.1)
13-18	42 (24.1)	31 (23.8)	32 (20.9)	105 (23.0)
19-24	68 (39.1)	50 (38.5)	50 (32.7)	168 (36.8)
25+	27 (15.5)	21 (16.2)	26 (17.0)	74 (16.2)
Total	174 (100.0)	130 (100.0)	153 (8.8)	457 (100.0)

Chi-Square	D.F.	Significance
3.99344	6	0.6776

Table 4.32B Duration of Breastfeeding for Next to Last Births by Mother's Parity

Duration in Months	Parity			Total
	1-2	3-4	5+	
< 12	21 (11.9)	36 (15.9)	60 (23.7)	117 (17.8)
13-18	36 (20.5)	63 (27.8)	51 (20.2)	150 (22.9)
19-24	96 (54.5)	94 (41.4)	98 (38.7)	288 (43.9)
25+	23 (13.1)	34 (15.0)	44 (17.4)	101 (15.4)
Total	176 (100.0)	227 (100.0)	253 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
20.17147	6	0.0026

Marital Status

Table 4.33A shows duration of breastfeeding by marital status for the open interval. The 'other' group represents the widowed, separated and divorced women. The results show that more of the women in the other category (32.5%) breastfed for less than 12 months compared to the married women (23.5%). Also only 10% of the 'other' category breastfed for 25 months or more compared to 17.6% of the married women. Generally, the results are not significantly different from each category. The chi-square value shows that marital status is not significant in influencing breastfeeding duration (significance level was 0.6726).

Table 4.33B shows the duration of breastfeeding for the closed interval by marital status. Again most women breastfed for 19-24 months (43.9%). Of the single women only 5.6% breastfed for 25 or more months as compared to 16.4% of the married women. Again 30.6% of the single women and 19.5% of the 'other' category breastfed for less than 12 months compared to 16.9% of the married women. The chi-square value was significant at 0.0400, showing a high association between breastfeeding and marital status in the closed interval.

Table 4.33A Duration of Breastfeeding for Last Births by Mother's Marital Status

Duration in Months	Marital Status			Total
	Married	Single	Others	
<12	79 (23.5)	18 (22.2)	13 (32.5)	110 (24.1)
13-18	78 (23.2)	20 (24.7)	7 (17.5)	105 (23.0)
19-24	120 (35.7)	32 (39.5)	16 (40.0)	168 (36.8)
25+	59 (17.6)	11 (13.6)	4 (10.0)	74 (16.2)
Total	336 (100.0)	81 (100.0)	40 (8.8)	457 (100.0)

Chi-Square	D.F.	Significance
4.03017	6	0.6726

Table 4.33B Duration of Breastfeeding for Next to Last Births by Mother's Marital Status

Duration in Months	Marital Status			Total
	Married	Single	Others	
< 12	98 (16.9)	11 (30.6)	8 (19.5)	117 (17.8)
13-18	134 (23.1)	3 (8.3)	13 (31.7)	150 (22.9)
19-24	252 (43.5)	20 (55.6)	16 (39.0)	288 (43.9)
25+	95 (16.4)	2 (5.6)	4 (9.8)	101 (15.4)
Total	559 (100.0)	36 (100.0)	41 (8.8)	656 (100.0)

Chi-Square	D.F.	Significance
13.19618	6	0.0400

Education

Table 4.34A shows the duration of breastfeeding for the open interval by education level of the mother. The results show that majority of women with no education breastfed for 19-24 months (40.9%) compared to 34.6% and 20.3% for the primary and secondary categories respectively. Only 8.1% of the secondary category breastfed for 25 or more months, compared to 11.3% and 20.5% of the none and primary categories respectively. The chi-square value had a significance level of 0.0000, showing that education highly influences breastfeeding duration.

For the closed interval, table 4.34B shows that more women of no education (23.4%) breastfed for less than 12 months than the primary group and secondary groups. However, 23.4% of the none education category breastfed for 25 or more months and only 9.7% of the secondary category breastfed for this duration. The chi-square value shows that education is once more highly associated with breastfeeding duration with a significance level of 0.0000.

Table 4.34A Duration of Breastfeeding for Last Births by Mother's Education

Duration in Months	Education Level			Total
	None	Primary	Secondary+	
<12	36 (31.3)	54 (20.1)	20 (27.0)	110 (24.1)
13-18	19 (16.5)	53 (19.8)	33 (44.6)	105 (23.0)
19-24	47 (40.9)	106 (34.6)	15 (20.3)	168 (36.8)
25+	13 (11.3)	55 (20.5)	6 (8.1)	74 (16.2)
Total	115 (100.0)	268 (100.0)	74 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
37.16987	6	0.0000

Table 4.34B Duration of Breastfeeding for Next to Last Births by Mother's Education

Duration in Months	Education Level			Total
	None	Primary	Secondary+	
<12	36 (23.4)	57 (14.7)	24 (21.2)	117 (17.8)
13-18	31 (20.1)	79 (20.3)	40 (35.4)	150 (22.9)
19-24	51 (33.1)	199 (51.2)	38 (33.6)	288 (43.9)
25+	36 (23.4)	54 (13.9)	11 (9.7)	101 (15.4)
Total	154 (100.0)	389 (100.0)	113 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
35.73540	6	0.0000

Work Status

From table 4.35A, duration of breastfeeding in the open interval seems to be influenced by work status of the mother. Whereas 34.4% of women working away from home breastfed for less than 12 months, only 23.3% of non-working women breastfed for this duration. Non-working women breastfed for longer durations than the working women. The majority of working women (37.5%) breastfed for 13-18 months, whereas 37.9% of non-working women breastfed for this duration. Only 6.3% of the working women breastfed for 25 or more months compared to 16.9% of non-working women. The chi-square was significant at 0.0313, showing the two variables to be highly associated.

Table 4.35B shows the duration of breastfeeding in the closed interval by work status of the mother. The results portray a similar pattern as of the open interval. Whereas 15.8% of non-working women breatfed for 25 or more months, only 9.5% of working women did the same. 31.1% of working women breastfed for less than 12 months, whereas only 16.9% of non-working women breastfed for this duration. Majority of non-working women breastfed for 19-24 months (45%). The chi-square was significant at 0.0290, showing that work status highly influences breastfeeding duration.

Table 4.35A Duration of Breastfeeding For Last Births by Mother's Work Status

Duration in Months	Work Status		Total
	Yes	No	
<12	11 (34.4)	99 (23.3)	110 (24.1)
13-18	12 (37.5)	93 (21.9)	105 (23.0)
19-24	7 (21.9)	161 (37.9)	168 (36.8)
25+	2 (6.3)	72 (16.9)	74 (16.2)
Total	32 (100.0)	425 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
8.85226	3	0.0313

Table 4.35B Duration of Breastfeeding For Next to Last Births by Mother's Work Status

Duration in Months	Work Status		Total
	Yes	No	
<12	13 (31.1)	104 (16.9)	117 (17.8)
13-18	13 (31.1)	137 (22.3)	150 (22.9)

19-24	12 (28.6)	276 (45.0)	288 (43.9)
25+	4 (9.5)	97 (15.8)	101 (15.4)
Total	42 (100.0)	614 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
9.01961	3	0.0290

4.2.2 Age at Supplementation

Age

Age does not seem to influence the age at supplementary feeding for the children in the open interval, as shown in table 4.36A below. Majority of the women, 187 (40.9%) supplement at 3-4 months, followed by 5-6 months, 148 (32.4%). Very few women 22 (4.8%) supplemented at 7 or more months. However, a large percentage (21.9%) supplement at 1-2 months. The results show that of the women aged 40 or more years, 33.3% supplement at months 1-2 compared to only 18.5% of women aged 15-19. The chi-square value had a significance level of 0.2811, showing that the relationship between age at supplementation and age of the mother is not very significant. The results did not show consistency and this may have resulted from age heaping and mis-reporting especially for the older women. This then could have affected the Chi-Square value and its significance.

Table 4.36B shows age at supplementation by mother's age in the closed interval. Very few women, 25 (3.8%) supplemented at 7 or more months. The majority, as in the open interval supplemented at 3-4 months and 5-6 months of age. But the younger and older women seemed to have different supplementation patterns, although they are not significant differences. Whereas 18.5% of the 15-19 age group supplemented at 1-2 months, 34.7% of the older women supplemented at 1-2 months. Again, no woman aged 15-19 supplemented at 7 or more months, whereas 2% of women aged 40+ supplemented at this age. There were no major variations in the middle ages. The chi-square value had a significance level of 0.0031, showing a high relationship between age at supplementation and age of the mother in the closed interval.

Table 4.36A Age at Supplementation for Last Births by Mothers' Age

Age in Months	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
1-2	5 (18.5)	18 (20.5)	27 (22.1)	24 (22.2)	12 (17.1)	14 (33.3)	100 (21.9)
3-4	10 (37.0)	37 (42.0)	59 (48.4)	37 (34.3)	35 (50.0)	9 (21.4)	187 (40.9)
5-6	11 (40.7)	30 (34.1)	30 (24.6)	40 (37.0)	20 (28.6)	17 (40.5)	148 (32.4)
7+	1 (3.7)	3 (3.4)	6 (4.9)	7 (6.5)	3 (4.3)	2 (4.8)	22 (4.8)
Total	27 (100)	88 (100)	122 (100)	108 (100)	70 (100)	42 (100)	457 (100)

Chi-Square	D.F.	Significance
17.65691	15	0.2811

Table 4.36B Age at Supplementation for Next to Last Births by Mothers' Age

Duration in Months	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
1-2	4 (18.2)	20 (13.4)	23 (12.8)	37 (24.0)	19 (18.4)	17 (34.7)	120 (18.3)
3-4	16 (72.7)	82 (55.0)	94 (52.5)	61 (39.6)	57 (55.3)	14 (28.6)	324 (49.4)
5-6	2 (9.1)	42 (28.2)	55 (30.7)	48 (31.2)	23 (22.3)	17 (34.7)	187 (28.5)
7+	0	5 (3.4)	7 (3.9)	8 (5.2)	4 (3.9)	1 (2.0)	25 (3.8)
Total	22 100.0	149 100.0	179 100.0	154 100.0	103 100.0	49 100.0	656 (100.0)

Chi-Square	D.F.	Significance
34.31198	15	0.0031

Parity

Table 4.37A, shows the age at supplementation by parity for the open interval. The majority of women supplemented at 3-4 months (40.9%). The chi-square value shows that the results are not very significant (significance level was 0.0969).

Table 4.37B shows age at supplementation in the closed interval by parity. Once again, majority of the women supplemented at ages 3-4 months (49.4%). However, the chi-square value with a significance of 0.0963 shows that the results are not very significant.

Table 4.37A Age at Supplementation For Last Births by Mother's Parity

Age in Months	Parity			Total
	1-2	3-4	5+	
1-2	32 (18.4)	29 (22.3)	39 (35.5)	100 (21.9)
3-4	72 (41.4)	58 (44.6)	57 (37.3)	187 (40.9)
5-6	66 (37.9)	37 (28.5)	45 (29.4)	148 (32.4)
7+	4 (2.3)	6 (4.6)	12 (7.8)	22 (4.8)
Total	174 (100.0)	130 (100.0)	153 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
10.73692	6	0.0969

Table 4.37B Age at Supplementation For Next to Last Births by Mother's Parity

Age in Months	Parity			Total
	1-2	3-4	5+	
1-2	23 (13.1)	43 (18.9)	54 (21.3)	120 (18.3)
3-4	96 (54.5)	118 (52.0)	110 (43.5)	324 (49.4)
5-6	52 (29.5)	60 (26.4)	75 (29.6)	187 (28.5)
7+	5 (2.8)	6(2.6)	14 (5.5)	25 (3.8)
Total	176 (100.0)	227 (100.0)	253 (38.6)	656 (100.0)

Chi-Square	D.F.	Significance
10.75369	6	0.0963

Marital Status

Tables 4.38A and 4.38B show age at supplementation by marital status for the open and closed intervals respectively. For the open interval, most women supplemented at ages 3-4 months (40.9%). Married women had more supplementing at age 7+ months (6.3%) than all other groups of women. The 'other' category had a reasonable percent (32.5%) of the children were supplemented at 1-2 months than any other group. The chi-square value was significant at 0.1471 which shows that the relationship between age at supplementation and marital status is not very significant.

The same patterns observed for the open interval also pertained as far as the the closed interval is concerned. The chi-square value had a significance level of 0.1810, showing that the relationships is not very significant.

Table 4.38A Age at Supplementation For Last Births by Mother's Marital Status

Age in Months	Marital Status			Total
	Married	Single	Other	
1-2	73 (21.7)	14 (17.3)	13 (32.5)	100 (21.9)
3-4	134 (39.9)	37 (45.7)	16 (40.0)	187 (40.9)
5-6	108 (32.1)	29 (35.8)	11 (27.5)	148 (32.4)
7+	21 (6.3)	1 (1.2)	0 (0.0)	22 (4.8)
Total	336 (100.0)	81 (100.0)	40 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
9.50611	6	0.1471

Table 4.38B Age at Supplementation For Next to Last Births by Mother's Marital Status

Age in Months	Marital Status			Total
	Married	Single	Other	
1-2	100 (17.3)	7 (19.4)	13 (31.7)	120 (18.3)
3-4	284 (49.1)	21 (58.3)	19 (46.3)	324 (49.4)
5-6	173 (29.9)	6 (16.7)	8 (19.5)	187 (28.5)
7+	22 (3.8)	2 (5.6)	1 (2.4)	25 (3.8)
Total	579 (100.0)	36 (100.0)	41 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
8.87017	6	0.1810

Education

Table 4.39A shows age at supplementation by mother's education level in the open interval. The results show that women of secondary+ education supplemented earlier than those in other categories. For those with secondary+ education, 33.8% supplement at 1-2 months compared to 16.3% and 26.1% of the primary and none education categories respectively. Whereas 7.8% of no education women supplemented at 7+ months, only 1.4% of those with secondary+ education supplemented at this age. The chi-square value shows a very high association between age at supplementation and education level. The results were significant at 0.0011.

The same pattern is also found in the closed interval. Table 4.39B shows that a reasonable percent of women with secondary education supplemented at 1-2 months (26.5%). However, a majority supplemented at age 3-4 months (60.2%). Only 4.8% supplemented at 7+ months. Those with no education and primary level education breastfed the longest. About 8% of those with no education and 4.5% of those with primary level of education breastfed for 7+ months as compared to 1.4% of those with secondary+ level of education. The chi-square results also confirm that education level is highly related to age at supplementation with a significance level of 0.0000.

Table 4.39A Age at Supplementation For Last Births by Mother's Education

Age in Months	Education Level			Total
	None	Primary	Secondary+	
1-2	30 (26.1)	45 (16.8)	25 (33.8)	100 (21.9)
3-4	37 (32.2)	115 (42.9)	35 (47.3)	187 (40.9)
5-6	39 (33.9)	96 (35.8)	13 (17.6)	148 (32.4)
7+	9 (7.8)	12 (4.5)	1 (1.4)	22 (4.8)
Total	115 (100.0)	268 (100.0)	74 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
22.18888	6	0.0011

Table 4.39B Age at Supplementation For Next to Last Births by Mother's Education

Age in Months	Education Level			Total
	None	Primary	Secondary+	
1-2	33 (21.4)	57 (14.7)	30 (26.5)	120 (18.3)
3-4	57 (37.0)	199 (51.2)	68 (60.2)	324 (49.4)
5-6	52 (33.8)	121 (31.1)	14 (12.4)	187 (28.5)
7+	12 (7.8)	12 (3.1)	1 (0.9)	25 (3.8)
Total	154 (100.0)	389 (100.0)	113 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
37.73534	6	0.0000

Work Status

Table 4.40A shows age at supplementation by mother's work status for the open interval. Whereas 37.5% of the children of working women are supplemented at 1-2 months, 20.7% of non-working women supplement at the same age. Of the children of non-working women, 34.1% are supplemented at 5-6 months, as compared to only 9.4% for working women. The chi-square is significant at 0.0194, showing that the relationship between supplementation and work status is significant.

For the closed interval, table 4.40B below shows a similar pattern of results. Majority of working women supplemented before 4 months (95.2%) as compared to only 65.8% of non-working women. No working women supplemented at 7+ months. The chi-square was significant at 0.0014, once again showing that age at supplementation and work status are highly associated.

Table 4.40A Age at Supplementation For Last Births By Mother's Work Status

Age in Months	Work Status		Total
	Yes	No	
1-2	12 (37.5)	88 (20.7)	100 (21.9)
3-4	15 (46.9)	172 (40.5)	187 (40.9)
5-6	3 (9.4)	145 (34.1)	148 (32.4)
7+	2 (6.3)	20 (4.7)	22 (4.8)
Total	32 (100.0)	425 (100.0)	457 (100.0)

Chi-Square	D.F.	Significance
9.90708	3	0.0194

Table 4.40B Age at Supplementation For Next to Last Births By Mother's Work Status

Age in Months	Work Status		Total
	Yes	No	
1-2	11 (26.2)	109 (17.8)	120 (18.3)
3-4	29 (69.0)	295 (48.0)	324 (49.4)
5-6	2 (4.8)	185 (30.0)	187 (28.5)
7+	0	25 (4.1)	25 (3.8)
Total	42 (100.0)	614 (100.0)	656 (100.0)

Chi-Square	D.F.	Significance
15.62577	3	0.0014

4.2.3 Survival Status of Last and Next to Last Births

In this section only those children who died after being stopped to breastfeed are included in the crosstabulations. This is because the intention is to assess the survival status of the children in relation to breastfeeding duration and age at supplementation.

Duration of Breastfeeding

Tables 4.41A and 4.41B show the survival status of last and next to last births by duration of breastfeeding. Table 4.2.15A shows that 47.9% of those children who were breastfed for less than 12 months were dead compared to only 1.9% and 0.6% for those who were breastfed for 13-18 and 19-24 months respectively. Of those who were breastfed for 25 or more months, none was dead. The chi-square value had a significance level of 0.0000, showing that duration of breastfeeding is significant in influencing child survival.

For the next to last births, survival was also related to duration of breastfeeding. For those who were breastfed for less than 12 months, 52.9% of them were dead and only 47.1% were alive; and for those who were breastfed for 25 or more months, 100% were alive. The chi-square value showed a very high significance level of 0.0000, hence survival of the child is highly determined by breastfeeding duration. As pointed out from other studies elsewhere, breastmilk helps the child build immunity against diseases, reduces germ causing diseases and is very nutritious (Buchanan, 1975; Wray 1978; Kleinman, 1984).

Table 4.41A Survival Status of Last Births By Duration of Breastfeeding

Survival Status	Duration in Months				Total
	< 12	13-18	19-24	25+	
Alive	50 (52.1)	102 (98.1)	167 (99.4)	74 (100.0)	393 (88.9)
Dead	46 (47.9)	2 (1.9)	1 (0.6)	0 (0.0)	49 (11.1)
Total	96 (100.0)	104 (100)	168 (100)	74 (100)	442 (100)

Chi-Square	D.F.	Significance
168.95586	3	0.0000

Table 4.41B Survival Status of Next to Last Births By Duration of Breastfeeding

Survival Status	Duration in Months				Total
	< 12	13-18	19-24	25+	
Alive	57 (47.1)	143 (95.3)	286 (99.3)	79 (100.0)	565 (88.6)
Dead	64 (52.9)	7 (4.7)	2 (0.7)	0 (0.0)	73 (11.4)
Total	121 (100.0)	150 (100.0)	288 (100.0)	79 (100.0)	638 (100.0)

Chi-Square	D.F.	Significance
255.00456	3	0.0000

Age at Supplementation

Table 4.42A shows the survival status in the open interval by age at supplementation. Majority of the children who were supplemented quite early or late died. Of all the children supplemented at 1-2 months, 37.4% were dead as compared to 1.4% of those who were supplemented at 5-6 months. Of those supplemented at 7 or more months, 10% were dead. The chi-square value had a significance level of 0.0000, showing that age at supplementation is significant to child survival.

Table 4.42B shows the survival status in the closed interval by age at supplementation. It is evident that children who were supplemented at earlier or later ages had less survival chances than those who were supplemented at ages 3-4 and 5-6 months. Of those who were supplemented at 1-2 months, 46.2% were dead; and for those who were supplemented at 7 or more months, 16.7% were dead. For those who were supplemented at 5-6 months, only 0.5% were dead. The chi-square was very significant with a significance level of 0.0000. This again shows that age at supplementation influences the survival of children. This results confirm other findings in the world (WHO, 1979; Surjono et al, 1980). Many children who are supplemented earlier may be bottle-fed. This may result in serious health problems, especially where living conditions are unsanitary and where the milk formulas are diluted with water to the extent that it inhibits the food value, leading to impaired physical growth and malnutrition of the infant.

Table 4.42A Survival Status of Last Births By Age at Supplementation

Survival Status	Age in Months				Total
	1-2	3-4	5-6	7+	
Alive	57 (62.6)	172 (94.0)	146 (98.6)	18 (90.0)	393 (88.9)
Dead	34 (37.4)	11 (6.0)	2 (1.4)	2 (10.0)	49 (11.1)
Total	91 (100.0)	183 (100.0)	148 (100 0)	20 (100.0)	442 (100.0)

Chi-Square	D.F.	Significance
82.77785	3	0.0000

Table 4.42B Survival Status of Next to Last Births By Age at Supplementation

Survival Status	Age in Months				Total
	1-2	3-4	5-6	7+	
Alive	62 (57.4)	297 (93.1)	186 (99.5)	20 (83.3)	565 (88.6)
Dead	46 (42.6)	22 (6.9)	1 (0.5)	4 (16.7)	73 (11.4)
Total	108 (100.0)	319 (100.0)	187 (100.0)	24 (100.0)	638 (100.0)

Chi-Square	D.F.	Significance
132.53166	3	0.0000

Source of Water

Table 4.43A below shows that the survival chances of last births is related to the source of water of the household. Survival chances are higher for those children whose source of water is not exposed to contamination than for those with exposed sources. Of all those with tap water or boreholes with pumps, 100% were alive in each case compared to only 56.4% of those with ponds as a source of water. The chi-square value shows a significance level of 0.0000; thus source of water is significant in determining child survival.

Table 4.43B also shows a similar pattern of survival in the closed interval. Of those children whose households had ponds as sources of water, 42.7% were dead compared to only 1.7% and 1.6% for those with boreholes/with pump and boreholes/without pump respectively. The chi-square value had a significance level of 0.0000, showing that source of water is significant for child survival. This is expected because in rural areas pond or river water is often exposed to disease causing organisms from the surrounding environment. Often this water is used untreated resulting in gastrointestinal diseases, one of the major causes of death in infants in developing countries.

Table 4.43A Survival Status of Last Births By Source of Water

Survival Status	Water Source					Total
	Tap	River	Borehole/With Pump	Borehole/No Pump	Pond	
Alive	3 (100.)	188 (92.2)	65 (100)	80 (98.8)	57 (56.4)	393 (88.9)
Dead	0 (0.0)	16 (7.8)	0 (0.0)	1 (1.2)	32 (36.0)	49 (11.1)
Total	3 (100)	204 (100)	65 (100)	81 (100)	89 (100)	442 (100)

Chi-Square	D.F.	Significance
74.47246	4	0.0000

Table 4.43B Survival Status of Next to Last Births By Source of Water

Survival Status	Source of Water					Total
	Tap	River	Borehole/with Pump	Borehole/No Pump	Pond	
Alive	1 (100)	256 (92.1)	119 (98.3)	126 (98.4)	63 (57.3)	565 (88.6)
Dead	0 (0.0)	22 (8.9)	2 (1.7)	2 (1.6)	47 (42.7)	73 (11.4)
Total	1 (100)	278 (100)	121 (100)	128 (100)	124 (100)	638 (100)

Chi-Square	D.F.	Significance
133.57073	4	0.0000

Type of Toilet Facility

Table 4.44A below shows the survival status of last births by type of toilet facility. The results show that type of toilet facility is related to child survival. Of those children whose households used bushes, 41.1% were dead compared to 3.4% of those with pit latrines. The chi-square value shows a significance level of 0.0000; thus type of toilet facility is highly related to child survival. This may be because lack of proper toilet facilities in the division (note that a substantial percent of 16.8% of households used the bush for faecal disposal). Usually lack of proper toilet facilities may lead to the prevalence of insect vectors such as flies which may cause food contamination. Poor sewage disposal also encourages the spread of parasites such as hookworm (Meegama (1980). All these factors may have affected child survival in the division.

Table 4.44B shows the survival status in the closed interval by type of toilet facility. Just like the children in the open interval, the results also indicate that survival for children with bush is lower than for those with pit latrines or waterborne toilets. Of those with pit latrines, only 4.5% were dead compared to 44.0% of those whose households used bushes.

Table 4.44A Survival Status of Last Births by Type of Toilet Facility

Survival Status	Type of Toilet Facility			Total
	Flush	Pit Latrine	Bush	
Alive	2 (100)	338 (96.6)	53 (58.9)	393 (88.9)
Dead	0 (0.0)	12 (3.4)	37 (41.1)	49 (11.1)
Total	2 (100)	350 (100)	90 (100)	442 (100)

Chi-Square	D.F.	Significance
103.38265	2	0.0000

Table 4.44B Survival Status of Next to Last Births by Type of Toilet Facility

Survival Status	Type of Toilet Facility			Total
	Flush	Pit Latrine	Bush	
Alive	7 (100)	483 (95.5)	75 (60.0)	565 (88.6)
Dead	0 (0.0)	23 (4.5)	50 (40.0)	73 (11.4)
Total	7 (100)	506 (100)	125 (100)	638 (100)

Chi-Square	D.F.	Significance
125.26426	2	0.0000

Place of Delivery

Table 4.45A shows the survival status in the open interval by place of delivery. The results show that survival chances are related to the place where the child was born. Those children born at home have less survival chances than those born in hospital/maternity clinics. Of those born at home, 24.6% were dead as compared to only 1.5% of those born in hospital/maternity clinics. The chi-square value shows that place of delivery is significant for child survival, with 0.0000 significance level.

Table 4.45B shows that survival status in the closed interval by place of delivery. Of those born at home, 20.1% were dead as compared to only 0.7% of those born in hospital/clinic. The chi-square value shows that place of delivery is significant at 0.0000 level.

These results confirm other findings elsewhere because delivery at home may often be by an untrained midwife who may use unsterilized instruments to cut the umbilical cord thus leading to death by neonatal tetanus.

Table 4.45A Survival Status of Last Births by Place of Delivery

Survival Status	Place of Delivery		Total
	Hospital/Clinic	Home	
Alive	225 (98.5)	138 (75.4)	393 (88.9)
Dead	4 (1.5)	45 (24.6)	49 (11.1)
Total	259 (100)	183 (100)	442 (100)

Chi-Square	D.F.	Significance
55.46419	1	0.0000

Table 4.45B Survival Status of Next to Last Births by Place of Delivery

Survival Status	Place of Delivery		Total
	Hospital/Clinic	Home	
Alive	283 (99.3)	282 (79.9)	565 (88.6)
Dead	2 (0.7)	71 (20.1)	73 (11.4)
Total	285 (100.0)	353 (100.0)	638 (100.0)

Chi-Square	D.F.	Significance
56.73937	1	0.0000

Education

Tables 4.46A and 4.46B show the survival status in the open and closed intervals by education respectively. Education is inversely related to child survival. Of those children with mothers with no education, 22% were dead as compared to 8.0% of those with mothers with primary education and 4.1% with mothers with secondary or more education level. The significance level shows that mothers' education is significant in child survival. The lower the education level, the higher the chances of dying.

For those in the closed interval, similar results are portrayed. Again of those with mothers with no education, 19.1% were dead as compared to 10.3% for those in the primary category and 4.5% for the secondary category. The significance level was 0.0007, showing that mother's education level is significant in influencing infant and child mortality.

This results contend with other findings in the world as higher levels of maternal education have been known to increase the woman's awareness of the importance of health care, proper nutrition and hygienic surroundings (Caldwell, 1979, 1983; Mott, 1982; Anker and Knowles, 1983). Such factors will obviously put a child in an advantageous position than one with an illiterate or semi-illiterate mother.

Table 4.46A Survival Status of Last Births by Mother's Education

Survival Status	Education Level			Total
	None	Primary	Secondary+	
Alive	92 (78.0)	231 (92.0)	70 (95.9)	393 (88.9)
Dead	26 (22.0)	20 (8.0)	3 (4.1)	49 (11.1)
Total	118 (100)	251 (100)	73 (100)	442 (100)

Chi-Square	D.F.	Significance
20.42815	2	0.0000

Table 4.46B Survival Status of Next to Last Births by Mother's Education

Survival Status	Education Level			Total
	None	Primary	Secondary+	
Alive	128 (81.0)	332 (89.7)	105 (95.5)	565 (88.6)
Dead	30 (19.0)	38 (10.3)	5 (4.5)	73 (11.4)
Total	158 (100)	370 (100)	110 (100)	638 (100)

Chi-Square	D.F.	Significance
14.54200	2	0.0007

Work Status

Tables 4.47A and 4.47B show that work status is not significant in influencing child survival. There is very little difference in survival for those whose mothers work and for those whose mothers do not work. For the open interval, 11.2% of those with non-working mothers were dead compared to 9.7% of those with working mothers. The significance level of 0.7956 shows that work status is not significant in influencing child survival.

For the closed interval, 11.9% of those with non-working mothers were dead as compared to 4.8% of those with working mothers. However, the significance level of 0.2475 shows that work status is not significant for child survival.

Table 4.47A Survival Status of Last Births by Mother's Work Status

Survival Status	Work Status		Total
	Yes	No	
Alive	28 (90.3)	365 (88.8)	393 (88.9)
Dead	3 (9.7)	46 (11.2)	49 (11.1)
Total	31 (100)	411 (100)	442 (100)

Chi-Square	D.F.	Significance
0.06710	1	0.7956

Table 4.47B Survival Status of Next to Last Births by Mother's Work Status

Survival Status	Work Status		Total
	Yes	No	
Alive	40 (95.2)	525 (88.1)	565 (88.6)
Dead	2 (4.8)	71 (11.9)	73 (11.4)
Total	42 (100)	596 (100)	638 (100)

Chi-Square	D.F.	Significance
1.33715	1	0.2475

Immunization

Tables 4.48A and 4.48B show the survival status in the open and closed interval respectively, by type of immunizations received by the child. For the last births, 48.0% of those who had not received any immunization were dead as compared to only 0.4% of those who had received all the immunizations. The chi-square value had a significance level of 0.0000, showing that immunization is a significant factor in determining child survival.

For the next to last births, similar results are shown in table 4.2.18B below. Again only 0.2% of children who had received all the immunizations had died compared to those who had received none (58.8%). The chi-square had a significance level of 0.0000, showing that immunization is significant for child survival.

Table 4.48A Survival Status of Last Births by Immunizations Received

Survi-val Status	Immunizations Received						Total
	None	BCG	Polio	BCG/DPT/Polio	Measles	All	
Alive	50 (51.0)	7 (100)	3 (100)	48 (100)	1 (100)	284 (99.6)	393 (88.9)
Dead	48 (49.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)	49 (11.1)
Total	113 (100)	7 (100)	3 (100)	48 (100)	1 (100)	285 (100)	442 (100)

Chi-Square	D.F.	Significance
183.43932	5	0.0000

Table 4.48B Survival Status of Next to Last Births by Immunizations Received

Survival Status	Immunizations Received						Total
	None	BCG	DPT	Polio	BCG/DPT/Polio	All	
Alive	49 (41.2)	6 (100)	1 (50.0)	6 (100)	29 (96.7)	474 (99.8)	565 (88.6)
Dead	70 (58.8)	0 (0.0)	1 (50.0)	0 (0.0)	1 (3.3)	1 (0.2)	73 (11.4)
Total	119 (100)	6 (100)	2 (100)	6 (100)	30 (100)	475 (100)	638 (100)

Chi-Square	D.F.	Significance
329.22001	5	0.0000

Age

Table 4.49A shows the survival status of last births by mothers' age. The results show that mothers' age is not significant in determining infant and child mortality in the open interval. There are little differences between the various age categories of the mothers. But the highest percent of deaths were recorded in the age groups 15-19 (18.5%) and 40+ (15%). The chi-square had a significance of 0.8323, showing that age is not a significant factor for child survival in Amagoro division.

However, table 4.49B shows some contrasting results for the children in the closed interval. The results show that age is a significant for child survival. Of those children of women in age group 15-19, 19.0% were dead and for those in age group 40+, 28.9% were dead. So survival chances for children is lower in these two age groups. The chi-square value, with a significance level of 0.0001 shows that age is highly associated with chances of survival in the closed interval.

Table 4.49A Survival Status of Last Births by Mother's Age

Survival Status	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
Alive	22 (81.5)	75 (90.4)	105 (87.5)	95 (91.3)	62 (91.2)	34 (85.0)	393 (88.9)
Dead	5 (18.5)	8 (9.6)	15 (12.5)	9 (8.7)	6 (8.8)	6 (15.0)	49 (11.1)
Total	27 (100)	83 (100)	120 (100)	104 (100)	68 (100)	40 (100)	442 (100)

Chi-Square	D.F.	Significance
3.53193	5	0.6186

Table 4.49B Survival Status of Next to Last Births by Mother's Age

Survival Status	Age Group						Total
	15-19	20-24	25-29	30-34	35-39	40+	
Alive	17 (81.0)	138 (94.5)	160 (90.4)	133 (90.5)	85 (83.3)	32 (71.1)	565 (88.6)
Dead	4 (19.0)	8 (5.5)	17 (9.6)	14 (9.5)	17 (16.7)	13 (28.9)	73 (11.4)
Total	21 (100)	146 (100)	177 (100)	147 (100)	102 (100)	45 (100)	638 (100)

Chi-Square	D.F.	Significance
23.71096	5	0.0002

Marital Status

Tables 4.50A and 4.50B show the survival status in the open and closed intervals respectively, by mothers' marital status. The results for the last births show that marital status is significant for child survival. Of those children in the 'other' category, 25% were dead as compared to only 7.7% for the married category. Note that the 'other' category represents the widowed, separated and divorced. The single women had also more children dead (17.7%) than the married women. The chi-square value with a significance level of

0.0005 shows that marital status is a significant factor for child survival.

However, the results for the closed interval show that marital status is not significant for child survival. But once more, the single and the 'other' category women had more children dead than the married (14.3% and 19.5% respectively compared to 10.7% for the married). The chi-square significance level of 0.1979 shows that marital status is not a significant factor in the closed interval.

Table 4.50A Survival Status of Last Births by Mother's Marital Status

Survival Status	Marital Status			Total
	Married	Single	Other	
Alive	298 (92.3)	65 (82.3)	30 (75.0)	393 (88.9)
Dead	25 (7.7)	14 (17.7)	10 (25.0)	49 (11.1)
Total	323 (100)	79 (100)	40 (100)	442 (100)

Chi-Square	D.F.	Significance
15.05400	2	0.0005

Table 4.50B Survival Status of Next to Last Births by Mother's Marital Status

Survival Status	Marital Status			Total
	Married	Single	Other	
Alive	502 (89.3)	30 (85.7)	33 (80.5)	565 (88.6)
Dead	60 (10.7)	5 (14.3)	8 (19.5)	73 (11.4)
Total	562 (100)	35 (100)	41 (100)	638 (100)

Chi-Square	D.F.	Significance
3.23988	2	0.1979

Parity

Tables 4.51A and 4.51B show the survival status for the last and next to last births by parity respectively. For the last births, the results of the chi-square show that parity is not significant in determining child survival. The significance level was 0.9075, showing that parity is not significant for child survival. This may be because many mothers interviewed did not have many children and if they did the last borns are usually advantaged because of their position. A last child often enjoys many benefits from the mother, such as being breastfed longer, being fed first, etc.

For the closed interval, the results, however, show that parity is significant for child survival. Of those children with mothers of high parity i.e 5+, 16.9% were dead compared to 6.4% and 9.4% for parity 1-2 and 3-4 respectively. The chi-square significance level of 0.0019 confirms that parity is significant for child survival.

Table 4.51A Survival Status of Last Births by Mother's Parity

Survival Status	Parity			Total
	1-2	3-4	5+	
Alive	149 (88.2)	113 (89.0)	131 (89.7)	393 (88.9)
Dead	20 (11.8)	14 (11.0)	15 (10.3)	49 (11.1)
Total	169 (100)	127 (100)	146 (100)	442 (100)

Chi-Square	D.F.	Significance
0.19418	2	0.9075

Table 4.51B Survival Status of Next to Last Births by Mother's Parity

Survival Status	Parity			Total
	1-2	3-4	5+	
Alive	162 (93.6)	202 (90.6)	201 (83.1)	565 (88.6)
Dead	11 (6.4)	21 (9.4)	41 (16.9)	73 (11.4)
Total	173 (100)	223 (100)	242 (100)	638 (100)

Chi-Square	D.F.	Significance
12.53963	2	0.0019

4.3 SUMMARY

In chapter four, results of the frequency distribution, crosstabulations and the chi-square test have been presented.

In these results, majority of children were found to be breastfed for durations between 13-24 months. Age at supplementation was also found to be between 3-6 months. These two factors are highly influenced by mother's education, work status and marital status.

The results also show that breastfeeding duration and age at supplementation are inversely related to child survival. For example, the higher the duration of breastfeeding, the lower the of probability of dying.

Other factors that are highly significant in child survival are education, immunisation, source of water, type of toilet facility, and place of delivery, both in the open and closed intervals. Mother's age and parity were significant for the closed interval whereas marital status was significant for the open interval.

CHAPTER FIVE

5.0 ESTIMATES OF INFANT AND CHILD MORTALITY AND LOGISTIC REGRESSION RESULTS

5.0.1 Introduction

This chapter gives the estimates of infant and childhood mortality rates, calculated using the procedures outlined earlier in chapter three. Logistic regression is used to estimate the likelihood of survival for last and next to last births according to breastfeeding duration and age at supplementation under prevailing socio-economic, demographic and environmental factors.

5.1 CHILDHOOD MORTALITY RATES USING THE NORTH MODEL

The following indices are often used as indicators of the level of infant and child mortality in the area of study.

- q(1), q(2), q(3), q(5), q(10), q(15) and q(20): These are the probabilities of dying at age 1, 2, 3, 5, 10, 15 and 20 respectively.
- ${}_1q_0$: The probability of dying between age 0 and 1.
- ${}_4q_1$: The probability of dying between age 1 and 4.
- e_0: The life expectancy at birth.

However, it is important to note that only q(2) and q(5) are considered to be more reliable. The estimate of q(1) or infant mortality rate derived from women aged 15-19 frequently shows higher mortality than that for older women. As a result the estimate of q(1) is usually disregarded because of the low numbers of children ever born and dead in this category of women.

The ${}_1q_0$ and ${}_4q_1$ estimates are obtained from the life table directly and they are probabilities of dying between ages 0-1 and 1-5. This study will thus utilize the q(2) and q(5) estimates that have been found to be reliable (Manual X, 1983). Using the North Model, q(2) was calculated as 62 deaths per 1000 live births and q(5) to be 71 deaths per 1000 live births. The life expectancy at birth, (e_0), was estimated to be 63 years in the study area.

5.2 CHILDHOOD MORTALITY RATES USING THE WEST MODEL

The results using the West Model were not significantly different from those of the North Model. The q(2) was estimated at 71 deaths per 1000 live births and q(5) at 72 deaths per 1000 live births. The life expectancy at birth (e_0) was 62 years.

Table 5.1 below gives a summary of the child mortality estimates for Amagoro division using both the North and West Models.

Table 5.1 Childhood Mortality Rates and Life Expectancy at Birth For Amagoro Division, North and West Models

Model	Mortality Estimates		e_0
	q(2)	q(5)	
North	62	70	63
West	71	72	62

Source: Calculated From Field Data

5.3 LOGISTIC REGRESSION RESULTS

5.3.0 Introduction

This section gives the results obtained from multivariate logistic regression. The stepwise regression method was used to analyze the data. Four models were designed for both the last births and next to last births. Each additional variable was brought into the equation at different stages depending on its significance. It was not possible to sub-divide the children into age groups because of the number of children in each category (i.e. Last births and Next to last births). Results by age of the children would have resulted in estimates of the impact of breastfeeding practices in each age group of children. However, below are tables 5.1 and 5.2 showing the age at death for those who had died among the last births and next to last births respectively. The frequencies show that majority of the last births died between ages 1 year and 2 years (38.8%) and also for the next to last births (31.5%). But the reported ages at death could have been affected by age heaping and misreporting. However, they are pointers to the time when most children die in the division. This may also point to the fact that many children die of environmental factors than breastfeeding practices because by age 1 and above, the children become more exposed to infection through the food they eat, the household sanitary conditions and the environment in which they play.

The tables also show that a substantial number die between the first and sixth months of life (30.6% for last births and 24.7% for the next to last births). This may indicate the effect of breastfeeding practices. It may mean that many children who died had been supplemented much earlier. As a result the supplementary foods given to them may have been contaminated due to environmental factors and preparation habits.

Table 5.2 Age at Death for the Last Births

Age	Number	%
< 1 Month	3	6.1
1 Month - 6 Months	15	30.6
7 Months - < 1 Year	7	14.3
1 Year - < 2 Years	19	38.8
2+ Years	5	10.2
Total	49	100.0

Source: Field Research

Table 5.3 Age at Death for the Next to Last Births

Age	Number	%
< 1 Month	7	9.6
1 Month - 6 Months	18	24.7
7 Months - < 1 Year	13	17.8
1 Year - < 2 Years	23	31.5
2+ Years	12	16.4
Total	73	100.0

Source: Field Research

5.3.1 Description of Variables Used in the Multivariate Regression

A. Breastfeeding Practices

1. Breastfeeding Duration

Dur1 - Indicates breastfeeding duration of 0-12 months. It forms the reference category.

Dur2 - Indicates breastfeeding duration of 13-18 months (coded 1 if the case, 0 otherwise).

Dur3 - Indicates breastfeeding duration of 19-25 months (coded 1 if the case, 0 otherwise).

Dur4 - Indicates breastfeeding duration of 25+ months (coded 1 if the case.

0 otherwise).

2. Age at Supplementation

Sup1 - Indicates children who were supplemented at ages 0-3 months. It forms the reference category.

Sup2 - Indicates children who were supplemented at ages 4-6 months (1 if the case, 0 otherwise).

Sup3 - Indicates children who were supplemented at ages 7+ months (1 if the case, 0 otherwise).

B. Environmental Factors

3. Source of Water

Well - Indicates if the source of household water was borehole with pump/without pump/tap/well. It forms the reference category.

River - Indicates the source of household water as being river or pond or roof catchment (1 if the case, 0 otherwise).

4. Type of Toilet Facility

Pit - Shows the household with pit latrines. It forms the reference category.

Bush - Indicates the households which use bush as a form of faecal disposal (1 if the case, 0 otherwise).

5. Place of Delivery

Hos - Indicates if the child was born in a hospital or maternity clinic. It forms the reference category.

Home - Indicates if the child was born at home (1 if the case, 0 otherwise).

C. Socio-economic Factors

6. **Level of Education**

None - Indicates women with no education or adult literacy only. It forms the reference category.

Pri - Indicates women with incomplete or complete primary education (1 if the case, 0 otherwise).

Sec - Indicates women with secondary plus education (1 if the case, 0 otherwise).

7. **Work Status**

Yes - Indicates women who were working away from home. It forms the reference category.

No - Indicates women not working away from home (1 if the case, 0 otherwise).

8. **Immunisation**

Nil - Indicates children who had not received any form of immunisation. It forms the reference category.

Some - Indicates children who had received only some of the immunizations (1 if the case, 0 otherwise).

Comp - Indicates children who had completed immunization (1 if the case, 0 otherwise).

D. Maternal Factors

9. **Age of Mother**

Age1 - Women aged 15-24 years. This formed the reference category.

Age2 - Women aged 25-34 years (1 if the case, 0 otherwise).

Age3 - Women aged 35+ years (1 if the case, 0 otherwise).

10. Marital Status

Married - Indicates women who were currently married. This formed the reference category.

Single - Indicates women who were single, widowed, separated or divorced at the time of the interview (1 if the case, 0 otherwise).

11. Parity

Par1 - Indicates women of parity 1-2. This formed the reference category.

Par2 - Indicates women of parity 3-4 (1 if the case, 0 otherwise).

Par3 - Indicates women of parity 5+. (1 if the case, 0 otherwise).

5.3.2 LOGISTIC REGRESSION ESTIMATES FOR THE LAST BIRTHS

Model One

Logistic Regression Estimates on the Impact of Breastfeeding Duration and Age at Supplementation on Infant and Child Mortality

This model included only the key independent variables as mentioned above. The regression results are shown in table 5.4 below. The table gives four major equations for this model. In the first equation only one variable was included, i.e. Sup2 (age at supplementation 4-6 months). Equations two onwards contain variables in the previous equation and an additional variable. The equation that was finally obtained is summarized below:

Probability of infant or child death = 0.0689 - 1.2429(Sup2) - 3.6378(Dur2) - 4.3451(Dur3) - 9.1220(Dur4).

From the equation above it is evident that age at supplementation and breastfeeding duration are significant in child survival. Supplementing the child at age 4-6 months had an effect of increasing child survival. This was found to be the most significant determinant in this model. Supplementing the child's breastmilk at 4-6 months reduces the odds of dying by 0.2886 in reference to supplementing at ages 0-3 months. Supplementing at age 7+ was found not to be significant at $\propto = 0.05$. Supplementing the child's food at the right age may reduce the risk of infection through contaminated food.

Breastfeeding duration was also found to be negatively related to mortality. Breastfeeding duration of 13-18 months reduced the odds of dying by 0.0263 compared to a duration of 0-12 months; whereas breastfeeding durations of 19-24 and 25+ months reduced the odds of dying by 0.0130 and 0.0001 respectively (See equation 4).

Despite breastfeeding duration of 25+ months having been in the equation, it was not statistically significant. This may be because at age 25+ months, a child's health is mostly determined by the type of foods given and the surrounding in which the child lives.

Table 5.4 **Logistic Regression Estimates on the Impact of Breastfeeding and Age at Supplementation on Infant and Child Mortality - Last Births**

Variables	Equations			
	1	2	3	4
Sup2				
B	-3.1021	-3.4643	-2.9460	-1.2429
Significance	0.0000	0.0000	0.0000	0.0435
Exp(B)	0.0450	0.0313	0.0526	0.2886
Dur2				
B		-2.8503	-3.3739	-3.6378
Significance		0.0001	0.0000	0.0000
Exp(B)		0.0578	0.0343	0.0263
Dur3				
B			-3.5975	-4.3451
Significance			0.0005	0.0000
Exp(B)			0.0274	0.0130
Dur4				
B				-9.1220
Significance				0.6476
Exp(B)				0.0001
Constant				
B	-1.0761	-0.5412	-0.0336	0.0689
Significance	0.0000	0.0047	0.8754	0.7511
-2 LL	65.7210	96.3670	130.2800	147.5280

Source: Calculated From Field Data

Model Two

Logistic Regression Estimates on the Impact of Breastfeeding Practices and Environmental Factors on Infant and Child Mortality

This model introduced the environmental factors into the first model. The regression results are shown in table 5.5. The idea was to see whether the earlier estimates would change when these other factors were included in the model.

Table 5.5 gives five equations that were obtained from this model. The final equation obtained is summarized below:

Probability of infant or child death = 0.8774 + 1.4732(Bush)- 0.7535(Sup2) - 3.3860(Dur2) - 3.9665(Dur3) -8.6174(Dur4).

In model two an attempt was made to control for three environmental factors that may confound the effect of breastfeeding practices on infant and child mortality. These were type of toilet facility, source of household water and placy of delivery of the child. The results show that when these factors are controlled the most significant determinant of child survival in the model is type of toilet facility. Those children whose households used bush for faecal disposal had the highest risk of dying in relation to those who used pit or flush toilets. The odds of dying for those who used bush were 4.3648 times to those who used pit/flush toilets. When fitted alone, the odds of dying for those using bush were 19.7791 times to those using pit latrines. However, there was a significant change in the odds when the breastfeeding variables were fitted in the equation; though it remained the most significant determinant of child survival.

Although supplementing at ages 4-6 months forms part of the second equation, it became less significant at the last equation when all the important variables were fitted into the equation. The odds of dying for those supplemented at these ages were 0.4707 times to those of a child supplemented at 0-3 months (higher than in the first model though not significant). Supplementing at age 7+ months was still not significant.

Breastfeeding duration was still significant. The odds of breastfeeding durations of 13-18 months were 0.0338 times for those of children breastfed for 0-12 months; whereas for breastfeeding durations of 19-25 months and 25+ months, the odds were 0.0189 and 0.0002 times respectively. However, the odds of breastfeeding durations were all higher than in the first model.

Whether the child was born at home or in hospital/maternity clinic and the source of household water did not appear to be significant determinants of infant and child mortality in this model.

Table 5.5 Logistic Regression Estimates on the Impact of Breastfeeding Practices and Environmental Factors on Infant and Child Mortality - Last Births

Variables	Equations				
	1	2	3	4	5
Bush					
B	2.9846	2.1553	2.1045	1.7913	1.4732
Significance	0.0000	0.0000	0.0000	0.0001	0.0008
Exp(B)	19.7791	8.6306	8.2030	5.9974	4.3638
Sup2					
B		-2.1815	-2.4883	-2.0024	-0.7535
Significance		0.0001	0.0000	0.0010	0.2507
Exp(B)		0.1129	0.0831	0.1350	0.4707
Dur2					
B			-2.7577	-3.1535	-3.3860
Significance			0.0003	0.0000	0.0000
Exp(B)			0.0634	0.0427	0.0338
Dur3					
B				-3.2381	-3.9665
Significance				0.0019	0.0002
Exp(B)				0.0392	0.0189
Dur4					
B					-8.6173
Significance					0.6672
Exp(B)					0.0002
Constant					
B	-3.3440	-2.2939	-1.7591	-1.1640	-0.8774
Significance	0.0000	0.0000	0.0000	0.0020	0.0179
-2LL	81.3230	101.3380	125.8060	147.8850	159.509

Source: Calculated From Field Data

Model Three

Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental and Socio-economic Factors on Infant and Child Mortality

This model added socio-economic variables to the second model. The socio-economic factors included were level of maternal education, work status and immunisation received by the child.

Only three equations were obtained from this model. The final equation obtained is given below (See Table 5.6).

Probability of infant or child death = 0.17660 + 1.0216(Bush) - 5.03833(Comp) - 9.6835 (Some).

Table 5.6 shows the results of a further attempt to identify the real impact of breastfeeding duration and age at supplementation on infant and child mortality with both environmental and socio-economic factors controlled. The question which was to be answered was: Will the introduction of socio-economic factors affect the results earlier obtained? In effect, the impact of breastfeeding practices were completely altered as none of them remained in the equation. The only factor that remained unchanged was bush as a type of toilet facility. Only that the pattern and strength of the relationship following the inclusion of socio-economic factors reduces the odds from 4.3638 to 2.7777 (See equations 4 in Models Two and Three). The odds of dying for those with bush is 2.7777 times the odds of those with pit/flush toilets.

Only one of the socio-economic factors is found to be strongly related to infant and child mortality, i.e immunisation. The results suggest that there is a negative relationship between the immunization of the child and child death. Children who had completed immunizations are significantly less likely to die than those who had received none. The odds of dying for those who had completed immunizations are only 0.0065 times the odds for those who had not received any.

Receiving some immunization reduced the likelihood of dying but it was not statistically significant. The odds of dying were 0.0001 times the odds for those who had not received any.

These patterns of results suggest that the most important determinant of infant and child survival in the division is the health care factors, which usually go hand-in-hand with the level of education. Despite the results showing that maternal education and work status are not important factors, they point to the fact that children who are well cared for, are more likely to survive than those who are not, i.e in terms of health care through immunization). Many studies have shown that maternal education increases the mother's awareness of proper nutrition and health care for the children (Caldwell, 1979, 1983; Mott, 1982). Therefore the influence of education may have been overshadowed by the effect of immunization.

Table 5.6 Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental and Socio-economic Factors on Infant and Child Mortality - Last Births

Variables	Equations		
	1	2	3
Bush			
B	2.9846	1.9125	1.0216
Significance	0.0000	0.0000	0.0198
Exp(B)	19.7791	6.7699	2.7777
Comp			
B		-4.0814	-5.0383
Significance		0.0001	0.0000
Exp(B)		0.0169	0.0065
Some			
B			-9.6835
Significance			0.6476
Exp(B)			0.0001
Constant			
B	-3.3440	-1.8742	-0.7166
Significance	0.0000	0.0000	0.0478
-2LL	81.3230	128.7180	164.422

Source: Calculated From Field Data

Model Four

Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental, Socio-Economic and Demographic Factors on Infant and Child Mortality

This last model added demographic factors to the third model above. It was aimed at seeing the final effect of the inclusion of all other variables on the impact of breastfeeding practices. The demographic factors included were age of mother, parity and marital status of the mother.

Table 5.7 gives the three equations obtained from this model. The final equation is given below:

Table 5.6 **Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental and Socio-economic Factors on Infant and Child Mortality - Last Births**

Variables	Equations		
	1	2	3
Bush			
B	2.9846	1.9125	1.0216
Significance	0.0000	0.0000	0.0198
Exp(B)	19.7791	6.7699	2.7777
Comp			
B		-4.0814	-5.0383
Significance		0.0001	0.0000
Exp(B)		0.0169	0.0065
Some			
B			-9.6835
Significance			0.6476
Exp(B)			0.0001
Constant			
B	-3.3440	-1.8742	-0.7166
Significance	0.0000	0.0000	0.0478
-2LL	81.3230	128.7180	164.422

Source: Calculated From Field Data

<u>**Model Four**</u>

<u>**Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental, Socio-Economic and Demographic Factors on Infant and Child Mortality**</u>

This last model added demographic factors to the third model above. It was aimed at seeing the final effect of the inclusion of all other variables on the impact of breastfeeding practices. The demographic factors included were age of mother, parity and marital status of the mother.

Table 5.7 gives the three equations obtained from this model. The final equation is given below:

Probability of infant or child deaths = -0.7166 + 1.0216(Bush) - 5.0383(Comp) - 9.6835(Some).

Interestingly, the inclusion of demographic factors did not alter the results obtained in Model Three (See Table 5.6 and 5.7). The pattern and strength of association found in Model Three remained unchanged. This shows that age, parity and marital status of the mother have no significant effect on child survival. It also points to the fact that environmental and health care factors are the most important for child survival in the division. Thus whether a child is breastfed or not is not the issue but what is significant is the immunization received which tends to guard against certain communicable diseases e.g measles, whooping cough, tuberculosis etc. (Waweru, 1991).

In general, Models One to Four showed the decrease in importance of breastfeeding among the last births. It is surprising that although breastfeeding stands out as very significant its significance is completely modified by the socio-economic factors. A number of reasons may account for these findings in the division. One of these is the problem of heaping in the reported breastfeeding durations, age at supplementation and age at death. The possibility that this problem may have affected the estimated effects of breastfeeding on infant and child mortality has been noted elsewhere (Akin et al., 1981; Palloni and Millman, 1987).

Another possible reason for the breastfeeding results in this study may relate to factors that may diminish the advantages of breastfeeding over supplementary feeding. As Knodel (1977:1113) points out, "the impact of breastfeeding on infant and child mortality risk depends on the nutritional quality of substitute foods, the sanitary conditions surrounding artificial feeding, and the overall health conditions of the infant's environment". The issue of supplementary feeding is very important since the breastfeeding referred to in this study is largely supplemented breastfeeding. In Kenya, as elsewhere in African communities today, the long duration of breastfeeding is punctuated by early introduction of supplementary foods to the child. For instance, about 20% of the children in the present study were already introduced to supplementary feeding by the 2nd month of life. By the 4th month, this number had increased to about 60%. The quality of the foods given to the child, may therefore, boost or diminish the survival chances of a breastfed child. Also the degree of sanitation involved in food preparation and feeding especially the type of toilet facilities around the house and a host of other environmental factors interplay to influence the health and mortality status of the child.

The quality of supplementary food as well as the sanitation of the environment under which the babies were given supplementary food may in part be the immediate reasons for the high relationship found between age at supplementation and infant and child mortality.

Table 5.7 Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental, Socio-economic and Demographic Factors on Infant and Child Mortality - Last Births

Variables	Equations		
	1	2	3
Bush			
B	2.9846	1.9125	1.0216
Significance	0.0000	0.0000	0.0198
Exp(B)	19.7791	6.7699	2.7777
Comp			
B		-4.0814	-5.0383
Significance		0.0001	0.0000
Exp(B)		0.0169	0.0065
Some			
B			-9.6835
Significance			0.6476
Exp(B)			0.0001
Constant			
B	-3.3440	-1.8742	-0.7166
Significance	0.0000	0.0000	0.0478
-2LL	81.3230	128.7180	164.422

Source: Calculated From Field Data

5.3.3 Logistic Regression Estimates For Next To Last Births

Model One

Logistic Regression Estimates on the Impact of Breastfeeding Duration and Age at Supplementation on Infant and Child Mortality

This model included only the key independent variables as mentioned earlier. The regression results are shown in table 5.8. This table gives four equations obtained from the model. The equation that was finally obtained is given below:

Probability of infant or child death = 0.3878 - 2.1496(Sup2) - 4.1311(Dur3) - 2.8243(Dur2) - 3.3387(Dur4).

Just like the results for the last births, the results for the next to last births (i.e closed intervals) for Model One show similar patterns and association. When breastfeeding duration and age at supplementation were fitted alone, the most significant variable was Sup2 (i.e supplementation at 4-6 months). Supplementing the child at this age reduced the likelihood of dying for the child. The odds of dying in equation one are 0.0265 times for those who are supplemented at ages 0-3 months. However, with the inclusion of breastfeeding duration the odds finally changed to 0.1165 in equation 4, but still remained the most significant predictor of child death.

Once more, despite breastfeeding for a period of 25+ months being in the equation, it is not statistically significant (See Table 5.8). The odds of dying are only 0.0001 times for those who are breastfed for 0-12 months (Dur1). This may be because the child has built some immunity as it grows. Also, it may be because at an age of 2+ years, the child is prone to environmental health risks such as accidents or parasites within the surrounding in which he lives. Hence, breastfeeding is less important at this age.

Table 5.8 Logistic Regression Estimates on the Impact of Breastfeeding Practices and Age at Supplementation on Infant and Child Mortality - Next to Last Births

Variables	Equations			
	1	2	3	4
Sup2				
B	-3.6325	-3.1708	-3.4045	-2.1496
Significance	0.0000	0.0000	0.0000	0.0001
Exp(B)	0.0265	0.0420	0.0332	0.1165
Dur3				
B		-2.9350	-3.6994	-4.1311
Significance		0.0001	0.0000	0.0000
Exp(B)		0.0531	0.0247	0.0161
Dur2				
B			-2.5726	-2.8243
Significance			0.0000	0.0000
Exp(B)			0.0763	0.0594
Dur4				
B				-8.8387
Significance				0.6255
Exp(B)				0.0001
Constant				
B	-0.9420	-0.5761	0.2197	0.3878
Significance	0.0000	0.0002	0.2510	0.0501
-2 LL	117.2210	154.2310	205.5820	226.3100

Source: Calculated from Field Data

Model Two

Logistic Regression Estimates on the Impact of Breastfeeding Practices and Environmental Factors on Infant and Child Mortality

Just like for last births this model introduced the environmental factors into the first model. The regression results are shown in table 5.9 below.

Five equations were obtained from this model. The final equation obtained is summarized below:

Probability of infant or child death = -0.2824 + 1.1288(Bush) - 1.8501(Sup2) - 3.8448(Dur3) - 2.6546(Dur2) - 8.5528(Dur4).

The introduction of environmental factors into the model did not alter the results much. Only the type of toilet facility became the most significant predictor of child death, just as was the case with Model Two for last births. When alone in the equation (equation 1), using bush increases the likelihood of dying in relation to using pit/flush toilets. The odds of dying in equation one are as high as 14.2029 times for those whose households used pit/flush toilets. However, this odds decreased to 3.0919 in equation 4 when age at supplementation and breastfeeding duration were fitted into the equations.

Once more the likelihood of dying when a child is supplemented at ages 4-6 months (Sup2) was decreased by a factor of 0.1572 (equation 4), an increase from equation 2. Again breastfeeding for 25+ months (Dur4) was found to reduce the likelihood of dying by a factor of 0.0002; although this duration is not statistically significant.

Table 5.9 Logistic Regression Estimates on the Impact of Breastfeeding Practices and Environmental Factors on Infant and Child Mortality - Next to Last Births

Variables	Equations				
	1	2	3	4	5
Bush					
B	2.6534	1.6791	1.4986	1.2891	1.1288
Significance	0.0000	0.0000	0.0000	0.0002	0.0013
Exp(B)	14.2029	5.3606	4.4755	3.6295	3.0919
Sup2					
B		-2.9615	-2.5094	-2.8053	-1.8501
Significance		0.0000	0.0000	0.0000	0.0015
Exp(B)		0.0517	0.0813	0.0605	0.1572
Dur3					
B			-2.7179	-3.4322	-3.8448
Significance			0.0002	0.0000	0.0000
Exp(B)			0.0660	0.0323	0.0214
Dur2					
B				-2.4331	-2.6546
Significance				0.0000	0.0000
Exp(B)				0.0878	0.0703
Dur4					
B					-8.5528
Significance					0.6337
Exp(B)					0.0002
Constant					
B	-3.0589	-1.8076	-1.3919	-0.5314	-0.2824
Significance	0.0000	0.0000	0.0000	0.0616	0.3301
-2LL	97.7940	150.721	178.2600	219.7150	236.7340

Source: Calculated From Field Data

Model Three

Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental and Socio-economic Factors on Infant and Child Mortality

This third model incorporated socio-economic factors in addition to those in model two. The regression estimates are shown in table 5.10 below.

Seven equations were obtained from this model. The final equation is given below: Probability of infant or child death = -0.4787 - 5.6792(Comp) - 2.9081(Some) - 2.9901(Dur2) - 2.7749(Dur3) - 2.0605(Sup2) + 2.4664(No) - 1.8220(Sup3).

A notable aspect of this model was that type of toilet facility was no longer a significant predictor of child death, when socio-economic factors were controlled for. Furthermore, immunization (Complete and Some) became the most significant predictors of infant and child deaths. Complete immunization decreased the likelihood of dying by a factor of 0.0034 when all the other variables were fitted, in reference to having received none. Receiving some immunizations also reduced the likelihood of dying. The odds for this in equation four were 0.0546 times for those who had received none.

Another interesting aspect was that supplementing at ages 4-6 months (Sup2) became less important in comparison to breastfeeding duration which were then more significant. Breastfeeding for 25+ (Dur4) months became insignificant and was eliminated from the Model. Breastfeeding for 13-18 months (Dur3) and 19-24 months (Dur3) remained significant. The odds of dying for these durations were 0.0503 and 0.0624 respectively, times for those who had been breastfed for only 0-12 months (Dur1).

Supplementing at age 7+ months also became important in predicting child deaths. The odds of dying were even higher than for age at supplementation 4-6 months (0.1617).

Lastly, not working (No) increased the likelihood of child deaths by a high factor of 11.7802. This was indeed the highest of all in the last equation. Although level of education was not important once more, it is a known fact that work status is generally related to level of education. Generally, children born to more disadvantaged women, for instance in terms of education and health care are more susceptible to the risk of mortality. But such children tend to breastfeed longer than those born to more advantaged mothers (higher levels of education). It may, therefore, be the case that the effects of maternal socio-economic status far out-weigh the advantage of long breastfeeding durations with respect to survival chances among the children. As noted earlier in the literature review, educated women tend to breastfeed less and are likely to introduce supplementary feeding earlier than those with little or no education. Nevertheless, their educational advantage may enable them to maintain more hygienic child feeding practices and to afford better and high quality supplementary foods than those with little or no education. Thus, the combined advantages of improved sanitary conditions and high quality of supplementary feeds may override the advantages of breastfeeding, even though these women may be working away from home due to their higher levels of education.

Table 5.10 Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental and Socio-economic Factors on Infant and Child Mortality - Next to Last Births

Variables	Equations						
	1	2	3	4	5	6	7
Comp							
B	-5.9223	-6.5132	-6.7792	-6.1261	-5.4635	-5.5220	-5.67[illegible]
Significance	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00[illegible]
Exp(B)	0.0027	0.0015	0.0011	0.0022	0.0042	0.0040	0.00[illegible]
Some							
B		-3.4012	-3.6938	-2.9941	-2.5119	-2.6939	-1.908[illegible]
Significance		0.0000	0.0000	0.0002	0.0024	0.0013	0.00[illegible]
Exp(B)		0.0333	0.0249	0.0501	0.0811	0.0676	0.054[illegible]
Dur2							
B			-2.0188	-2.4440	-2.5438	-2.7620	-2.990[illegible]
Significance			0.0000	0.0000	0.0000	0.0000	0.000[illegible]
Exp(B)			0.1328	0.0868	0.0786	0.0632	0.056[illegible]
Dur3							
B				-2.9693	-2.6759	-2.8620	-2.7749
Significance				0.0002	0.0011	0.0006	0.0011
Exp(B)				0.0513	0.0688	0.0572	0.0624
Sup2							
B					-1.8225	-1.8359	-2.060[illegible]
Significance					0.0057	0.0066	0.0030
Exp(B)					0.1616	0.1595	0.1274
No							
B						2.1982	2.4664
Significance						0.0191	0.0101
Exp(B)						9.0091	11.780[illegible]
Sup3							
B							-1.8220
Significance							0.0224
Exp(B)							0.1617
Constant							
B	-0.2342	0.3567	0.8531	1.2588	1.4794	-0.4943	-0.4787
Significance	0.1376	0.0555	0.0002	0.0000	0.0000	0.5773	0.5910
-2LL	215.749	261.9790	282.4660	303.4840	312.0110	317.8750	323.030

Source: Calculated From Field Data

Model Four

Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental, Socio-Economic and Demographic Factors on Infant and Child Mortality

This is the last model and it had demographic factors added to it in addition to those that were in model three. The regression estimates are given in table 5.11 below. This model also produced seven equations. The last of these equations is given below:

Probability of infant or child deaths = -0.4787 - 5.6792(Comp) - 2.9081(Some) - 2.9901(Dur2) - 2.7749(Dur3) - 2.0605(Sup2) + 2.4664 (No) - 1.8220(Sup3).

In this final Model for the next to last births, we again noted that the inclusion of demographic factors did not alter the results at all. The results remained unchanged and so were exactly the same as those obtained in Model Three.

Once more, we can conclude that demographic factors are not significant predictors of child mortality status in this Division. The most important factors that can be noted are socio-economic and breastfeeding practices.

To be noted also was that in this last model for next to last births, breastfeeding duration and age at supplementation remained significant even with the inclusion of all factors into the models. These factors even gained in importance. But for the last births the inclusion of these factors removed breastfeeding duration and age at supplementation from the equations.

The reason for these may be because of the change in the times - i.e last births were fairly recent events compared to next to last births. So it is possible that the conditions/practices that prevailed at the time of birth for the next to last births were not the same for the last births. Modernization may have changed the importance of breastfeeding practices in the Division, such that many women of recent births were now more educated and hence more careful in child care and feeding practices than before. As a result environmental and socio-economic factors have then become more significant in child survival.

Table 5.11 Logistic Regression Estimates on the Impact of Breastfeeding Practices, Environmental, Socio-economic and Demographic Factors on Infant and Child Mortality - Next to Last Births

Variables	Equations						
	1	2	3	4	5	6	7
Comp							
B	-5.9223	-6.5132	-6.7792	-6.1261	-5.4635	-5.5220	-5.6792
Significance	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Exp(B)	0.0027	0.0015	0.0011	0.0022	0.0042	0.0040	0.0034
Some							
B		-3.4012	-3.6938	-2.9941	-2.5119	-2.6939	-1.9081
Significance		0.0000	0.0000	0.0002	0.0024	0.0013	0.0007
Exp(B)		0.0333	0.0249	0.0501	0.0811	0.0676	0.0546
Dur2							
B			-2.0188	-2.4440	-2.5438	-2.7620	-2.9901
Significance			0.0000	0.0000	0.0000	0.0000	0.0000
Exp(B)			0.1328	0.0868	0.0786	0.0632	0.0563
Dur3							
B				-2.9693	-2.6759	-2.8620	-2.7749
Significance				0.0002	0.0011	0.0006	0.0011
Exp(B)				0.0513	0.0688	0.0572	0.0624
Sup2							
B					-1.8225	-1.8359	-2.0605
Significance					0.0057	0.0066	0.0030
Exp(B)					0.1616	0.1595	0.1274
No							
B						2.1982	2.4664
Significance						0.0191	0.0101
Exp(B)						9.0091	11.7802
Sup3							
B							-1.8220
Significance							0.0224
Exp(B)							0.1617
Constant							
B	-0.2342	0.3567	0.8531	1.2588	1.4794	-0.4943	-0.4787
Significance	0.1376	0.0555	0.0002	0.0000	0.0000	0.5773	0.5910
-2LL	215.749	261.9790	282.4660	303.4840	312.0110	317.8750	323.030

Source: Calculated From Field Data

5.4 SUMMARY

This chapter has presented the results of infant and child mortality estimates using indirect methods and also logistic regression. The North and West Models were both used to calculate the childhood mortality rates. The results were very similar and so any of the Models can be recommended for future use. The q(2) values for the North and West Models were found to be 62 and 71 per 1000 live births and life expectancy at birth to be 62 and 63 respectively.

The Logistic Regression estimates for the probability of infant and child deaths was done using a total of 8 Models - 4 for each category of births, i.e last births and next to last births. Each model controlled for specific factors - namely environmental, socio-economic and demographic factors. The first and second model results obtained found a highly significant relationship between breastfeeding and age at supplementation on infant and child mortality. However, the introduction of environmental factors altered the patterns because the type of toilet facility for the household became most significant. These results were further altered when socio-economic factors were introduced into the models. For the last births, immunisation reduced the significance of breastfeeding and age at supplementation. In the end only immunization and type of toilet facility became significant predictors of infant and child deaths.

For the next to last births, the introduction of socio-economic factors did not override the influence of breastfeeding and age at supplementation on infant and child deaths. Instead these factors became more important in respect to immunization. Work status also became quite significant.

Lastly, for both the last and next to last births, demographic factors did not show any significance. These factors may have been overshadowed by other household and individual factors of the child (e.g immunization). The results of levels of education showed inconsistencies with other findings in the literature, since education was not significant in any case. The importance of education may have been overshadowed by immunization and work status which are highly correlated with levels of education of the mother.

CHAPTER SIX

6.0 SUMMARY. CONCLUSION AND RECOMMENDATIONS

6.0.1 Introduction

This Chapter gives the summary, conclusions and recommendations as derived from the study. The major aim of the study was to assess the impact of breastfeeding practices (i.e breastfeeding duration and age at supplementation for the child) on infant and child mortality, under prevailing environmental, socio-economic and demographic factors.

Cross-tabulation and the Chi-Square technique were used to measure the association between the variables. Logistic regression was used to assess the impact of breastfeeding practices on infant and child mortality. Childhood mortality estimates and life expectancy at birth were also calculated using both the North and West Models.

6.1 SUMMARY

The childhood mortality estimates q(2) and q(5) were derived from both the North and West Models. The q(2) value for the North was estimated at 62 deaths per 1000 live births and the the q(5) at 71 deaths per 1000 live births, whereas life expectancy at birth was 63 years. From the West Model, these were estimated at 71 and 72 deaths per 1000 live births respectively and life expectancy at birth to be 62 years.

The regression results have shown that breastfeeding duration is inversely related to infant and child mortality. The shorter the duration the higher the chances of death. For both the last and next to last births, breastfeeding for a period of 13-18 months reduced the odds of dying in relation to a duration of 0-12 months, and was more significant as compared to durations of 19-24 and 25+ months. This may be because at these age the mother's breast milk no longer forms the major part of the child's diet. Many studies have found out that the strong effects of breast feeding on mortality in the early months of life gradually wears out as the child grows older (Palloni and Tienda, 1986). Most of the food is prepared and therefore may be prone to environmental contamination. Also other household factors, such as the socio-economic status, will greatly influence the child's health. The Chi-Square test had also shown that breastfeeding duration is significant in child survival.

However, it should be noted that for the last births, breastfeeding became insignificant with the introduction of other factors into the models (i.e. environmental, socio-economic and demographic factors). For the closed interval breastfeeding remained significant even with these control variables in the models.

As was hypothesized the age at supplementation was found to be related to infant and child mortality. The earlier the age the higher the chances of death. In may developing countries, several mothers initiate breastfeeding, but breast milk substitutes are introduced early, with most children receiving some form of supplementation by the fourth month. Very often, these children are in turn fed from the bottle. Bottle feeding can then result in serious health problems. In this study, majority of the women were either illiterate or had incomplete primary education. Usually among the rural and illiterate families, living in unsanitary conditions, mothers who rely on formulas or other milk often dilute it with water to the extent that it inhibits the food value which leads to impaired physical growth and malnutrition of the infant. Also, many of these women lack proper facilities to sterilize bottles and nipples or to refrigerate mixed formula or milk. The water often used to dilute formulas may be unclean and this often results in gastrointestinal diseases, one of the major causes of death in infants in developing countries. The regression results for both the last and next to last births showed that being supplemented at ages 4-6 months reduced the child's mortality risk as compared to supplementation at ages 0-3 months. The Chi-Square test had also confirmed this hypothesis.

The logistic regression results showed that place of delivery of the child was not significant in predicting infant and child deaths. The significance of this variable as earlier seen from the Chi-Square results may have been confounded by the other environmental factors included in the model.

Once more the logistic regression results showed that source of household water was not significant in infant and child mortality. The Chi-Square results had earlier shown that it was very significant. Again, this factor may have been overshadowed by the environmental factors such as type of toilet facility.

The type of toilet facility used by the household was found to be a very significant predictor of infant and child mortality and hence affected the impact of breastfeeding practices on infant and child mortality. When this variable was introduced into the first models, it became the most significant. Therefore, the results confirmed the Chi-Square results which had shown type of toilet facility to be very significant in child survival. Thus exposed faecal disposal (bush) is a health risk to the people living in that surrounding.

Immunization was found to be a very significant factor in infant and child mortality as was confirmed by both the Chi-Square and logistic regression results. The results showed that completed immunization significantly reduced the risk of death for the children. For both the last and next to last births, immunization ended up being the most significant variable when all of them were fitted into the models. Immunisation has been found to reduce the risk of infection or lessen the effect especially for communicable diseases such as tuberculosis, whooping cough, measles, etc. (Waweru, 1991). This may have accounted for the significance of immunization in this study.

The regression results showed that level of education of the mother was not a significant predictor of infant and child mortality for both the last and next to last births and hence had no effect on the impact of breastfeeding practices. This then did not confirm the generally held view that education is an important factor in child survival. However, the Chi-Square results had shown that this variable was very significant. The regression results may have been affected by the inclusion of work status and immunisation in the models of which are highly correlated with maternal education.

Work status was found to affect the impact of breastfeeding practices on child deaths. The Chi-Square results confirmed this for both the last and next to last births. For the regression results, work status was very significant in the case of next to last births. Those children whose mothers worked had lower chances of dying as compared to those whose mothers did not work. This variable was not significant in the case of last births.

Logistic regression results showed that demographic factors, i.e. parity, marital status and age of the mother, which were all hypothesized to have an effect on the impact of breastfeeding practices on infant and child mortality were not significant in the division. Their effect may have been confounded by the presence of environmental and socio-economic factors.

The Chi-Square results showed that parity, age and marital status are important in determining breastfeeding duration in the closed interval. In the same interval, age was found to be significant in determining age at supplementation for the child, whereas age and parity were found to be more significant in child survival. For the open interval none of these variables was found to influence breastfeeding duration or age at supplementation using the Chi-Square test. Only marital status was found to be significant in child mortality.

6.2 CONCLUSION

As noted above for both last and next to last births, both breastfeeding duration and age at supplementation were very significant in influencing infant and child mortality. However, when other factors were fitted into the models these results siginificantly changed. For the last births, immunization and type of toilet facility ended up being the most significant of all determinants of infant and child mortality.

For the next to last births, it was found that the most significant determinants were immunization, followed by breastfeeding duration, age at supplementation and work status in that order.

Finally it should be pointed out that the data might have suffered from problems of heaping and misreporting which could mostly have affected the results. However, the results show a diminishing importance of breastfeeding practices as determinants of infant and child mortality in the Division as shown by the results for the last births, which are also the most recent births. This points to the fact that other factors are becoming more important in child survival in the Division. As already seen from the results it is evident that environmental and socio-economic factors are more important than just the breastfeeding practices.

6.3 RECOMMENDATIONS

Because child health programmes have been prioritized in many developing countries, every country needs policies upon which child health interventions can be carried out.

Recommendations For Policy

1. The study found that breastfeeding duration significantly influenced child mortality.

As a result we therefore recommend that:

a) The government should train the health personnel especially those in the Maternal and Child Health (MCH) clinics to impart to the mothers the knowledge about the advantages of breastfeeding as far as child survival strategies are concerned.

b) Public awareness on the importance of breastfeeding should be created in the whole country through the mass media.

c) The government, non-governmental organisations and health workers should encourage the promotion and protection of breastfeeding during the second year of life. These efforts should include the development of positive societal attitudes toward longer breastfeeding duration.

2. It was also found that age at which supplementary feeding was introduced to the child influenced child mortality. Here we recommend that more public education should be given through the appropriate media that supplementation should start at ages 4-6 months. This may reduce infant and child deaths related to poor child nutrition and feeding habits.

3. Environmental factors especially type of toilet facility available was found to be very significant in infant and child mortality. The study found that proper faecal disposal reduces the likelihood of dying for the children. We recommend that national public health education be intensified to educate the people on the importance of hygyiene and proper sanitation.

4. Immunization was also found to significantly influence infant and child mortality. Here we recommend the government to expand immunization centres so that they can be within walking distance for many mothers. Also public knowledge on the

importance of immunization should be intensified by the government.

5. Since work status of the mother was found to influence child mortality, we recommend that the government should increase female employment opportunities which in turn increases female incomes. When women are in active income generating activities they are likely to have a fair share of the decision-making in the household, i.e. in terms of expenditure on food, health, etc. Also special attention should be directed toward women whose work, paid or unpaid, takes them away from their children. Legislation should be developed and enforced to provide for increased maternity leave and for women who wish to breastfeed in the workplace.

6. National data on breastfeeding practices should be routinely collected, and national objectives set for breastfeeding duration.

Recommendations For Further Research

Earlier on it was stated that the study was limited due to finance and time constraints. The study therefore covered only a sample of the whole eligible population.

1. We recommend that more investigations be made on how breastfeeding and age at supplementation influence infant and child mortality, especially in terms of frequency of breastfeeding; type of food given and frequency at which children are fed with these foods.

2. Researchers should focus more attention to micro-level data such as from divisions as these may identify distinct problems to particular areas which may easily be solved within that scope.

3. Similar studies should be carried out while applying different models to enhance insights into the impact of breastfeeding practices on infant and child mortality.

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APPENDIX I

RESEARCH QUESTIONNAIRE ON BREASTFEEDING AND CHILD HEALTH

IDENTIFICATION-----------------

SUB-LOCATION-----------------

HOUSEHOLD NUMBER---------------

RESPONDENT'S INFORMATION

1. Age of mother
2. Marital Status
   1 = Married
   2 = Single
   3 = Divorced
   4 = Separated
   5 = Widowed
3. If married, at what age did you first get married?
   99 = N/A
4. For how long have you been married?
   99 = N/A
5. In which type of marriage are you?
   1 = Monogamous
   2 = Polygynous
6. What is your religion?
   1 = Catholic
   2 = Protestant
   3 = Other (specify)------
7. What is the educational level of the mother?
   1 = None
   2 = Adult literacy only
   3 = Primary 1-6
   4 = Primary 7-8
   5 = Secondary-No. of years: 1,2,3,4,5,6.
   6 = Post-secondary (specify)_______________
8. Is the mother employed away from home?
   1 = Yes
   2 = No
9. Where does your household get most of its water for drinking, hand washing and cooking most of the year?
   1 = Tap water (piped)
   2 = River/stream
   3 = Borehole/well with pump
   4 = Borehole/well without pump
   5 = Pond
   6 = Rain water
   7 = Others (specify)
10. What kind of toilet facility does your household have?
   1 = Flush toilet
   2 = Pit latrine
   3 = Bucket
   4 = Bush
   5 = Other (specify)----------
11. How long has this kind of toilet facility been available?

Month	Year

12. Have you ever heard of family planning?
   1 = Yes
   2 = No
13. If yes, have you ever used any method of family planning?

1=Yes
2=No

14. Are you currently using any contraceptive method with your partner to delay pregnancy?
1=Yes
2=No

15. If yes, when did you start using family planning method?
Month------------- Year-----------

16. If yes, which one?
1=Pill
2=Coil
3=Tubal ligation
4=Injection
5=Natural/safe period/abstinence
6=Breast feeding
7=Others (specify)------------------------

17. If you have never practised family planning give reasons:[Record all those mentioned].
1=Husband refuses
2-Mother refuses
3=Mother sick
4=Facilities not available
5=Religious belief
6=Mother pregnant
7=Has not heard of family planning
8=Medical complications
9=Friends disapprove
10=Costs too much
11=Inconvenient to use
12=Infrequent sex
13=Wants children
14=Other [specify]-----------

Now I would like to ask you about all of your births, starting with the first one, whether still alive or not. (SURVIVAL STATUS OF EACH BIRTH)

18 NAME	19 SEX 1=Male 2=Female	20 DATE OF BIRTH [Record Month and Year]		21 STILL ALIVE 1=Yes 2=No	22 IF DEAD: How old when he/ she died? [record days if less than 1 month, months if less than 2 years, or years]			23 CAUSE OF DEATH	24 TICK IF CHILD WAS BORN AFTER NOV. 198
		Year	Mon		Days	Mons	Years		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

KEY TO CODING:

25. CAUSE OF DEATH:
1=Malaria 2=diarrhoea 3=pneumonia 4=measles
5=tetanus 6=whooping cough 7=tuberculosis

8=polio 9=kwarshiorkor 10=Others specify

SUMMARY:

26. (B) Total Live Births: Males----Females------Total------

26. (C) Total No. of Dead Children: Males----- Females----Total---

HEAD OF HOUSEHOLD INFORMATION [IF MARRIED ASK ABOUT THE HUSBAND]

27. Age of male/Female head of household

28. What educational level does he/she have?
 1=None
 2=Adult literacy only
 3=Primary 1-6
 4=Primary 7-8
 5=Secondary-No. of years: 1,2,3,4,5,6.
 6=Post-secondary (specify)

29. (a) Is the head employed away from home?
 1=Yes
 2=No

30. (b) If yes, specify type of work
 1= salaried/home
 2=salaries/town
 3=farmer
 4=manual labourer
 5=casual labourer

31. What is the relationship of the head to the respondents?

CHILD'S HEALTH AND BREASTFEEDING INFORMATION

32. Name of the child____________________
 (Indicate whether last live birth (LLB) or next to last live birth (NLLB).
 1=LLB 2=NLLB

33. Sex of the child
 1=male
 2=female

34. Date of birth:

35. Alive or Dead
 1=Alive
 2=Dead
 3=N/A

36. Where was the child born?
 1=Hospital/clinic
 2=home
 3=Other (specify)

37. Did you ever breastfeed (NAME)?
 1=Yes
 2=No

38. If no, why did you never feed (NAME) at the breast?
 1=inconvenient
 2=Had to work
 3=Insufficient milk
 4=Baby refused
 5=Child died
 6=Child sick
 7=Other (specify)

39. Are you still breastfeeding your last born child?
 1=Yes
 2=No
 3=Dead
 99=NA

40. How many months old was (NAME) when you stopped breastfeeding?
 (record in months only)

96 = Never breastfed
97 = Until death
98 = Still breastfeeding
99 = N/A

41. If still breastfeeding, at what age do you intend to stop breastfeeding (NAME) completely?
99 = N/A

42. Why did you stop breastfeeding (NAME)?
1 = Inconvenient
2 = Had to work
3 = Insufficient milk
4 = Baby refused
5 = Child died
6 = Child sick
7 = Child had diarrhoea
8 = Child's weaning age
9 = Became pregnant
10 = Other (specify)

43. How long did you exclusively breastfeed (NAME) or intend to exclusively breastfeed (NAME)? [Record in months]
0 = Not breastfeeding
97 = Never breastfed
98 = Until death
99 = N/A

44. Do you give (NAME) anything to drink or eat other than breast milk? Or did you give (NAME) anything to drink or to eat other than breast milk?
1 = Yes
2 = No

45. How many months old was (NAME) when you first gave him/her anything to drink or eat other than breast milk? Or at what months old do you intend to give (NAME) anything to drink or eat? (record in months)
97 = Died before other food/drink given
98 = Still full breastfeeding
99 = N/A

46. At what age did you give or intend to give the child other milk? (record in months)
99 = N/A

47. What type of milk did you give or intend to give to your child?
1 = Fresh cow's milk
2 = KCC
3 = Formula
4 = Others (specify)
99 = N/A

48. At what age did you give or intend to give your baby the first semi-solid food? (Record in months)
99 = N/A

49. What utensils do you use to give liquid food to your child?
1 = Cup/bowl/spoon
2 = Bottle
3 = Hands
4 = others (specify)-----------

50. Has the child been sick in the last two weeks?
1 = Yes
2 = No

51. If yes, what was the problem?
1 = Colds/coughs
2 = Malaria
3 = Diarrhoea and vomiting
4 = Pneumonia 5 = Measles 6 = Worms 7 = Skin rashes 8 = Others 99 = N/A

52. What was the duration of the last sickness?
99 = N/A

53. What action did you take to cure the sickness?
1 = Took to hospital
2 = Took to private doctor
3 = Took to traditional healer
4 = Gave modern medicine at home
5 = Gave herbs at home

6 = Others [specify]———

54. Is the child health card available?
1 = Yes
2 = No

55. (a) What immunization has this child had?

BCG	DPT		POLIO		MEASLES
Date & Scar	Dose	Date	Dose	Date	Date
	1st		1st		
	2nd		2nd		
	3rd		3rd		

1 = BCG 2 = DPT 3 = POLIO 4 = BCG.DPT.POLIO 5 = MEASLES 6 = ALL 99 = N/A

56. (b) If immunization schedule is incomplete, why so?
1 = Child sick
2 = Mother sick
3 = Lack of time
4 = Clinic too far
5 = Impolite staff/sent away from the health unit
6 = Previous immunization produced bad effects
7 = Vaccine out of stock
8 = Child less than one year
9 = Others (specify)

APPENDIX II

THE CALCULATED ESTIMATES OF CHILDHOOD MORTALITY RATES - WEST MODEL

Coefficients for estimation of child mortality multipliers, Trussell Variant, when data are classified by age of mother - West Model.

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

Source: Manual X, 1983 p.77,

Estimations equation:

$$k(i) = a(i) + b(i)[P(1)/P(2)] + c(i)[P(2)/P(3)].$$

$$q(x) = k(i) \times D(i).$$

Coefficients for estimation of the reference period, t(x), to which the values q(x) estimates from data classified by age refer to - West Model.

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

Source: Manual X, 1983 p.77

Estimation equation:

$$t(x) = d(i) + e(i)[P(1)/P(2)] + f(i)[P(2)/P(3)].$$

Female Population by age group, children ever born, children dead, average parity, proportion of children dead, and child mortality multipliers, Amagoro Division - West Model.

Age Group	i	FPOP(i)	CEB(i)	CD(i)	P(i)	D(i)	K(i)
15-19	1	82	86	31	1.0487804	0.360465	0.250331
20-24	2	267	551	48	2.0636704	0.087114	0.816084
25-29	3	258	842	51	3.2635658	0.060570	0.953143
30-34	4	214	1042	74	4.8785046	0.070881	1.020838
35-39	5	136	732	65	5.3823529	0.088797	1.061513
40-44	6	50	367	41	7.34	0.111716	1.056130
45-49	7	23	156	22	6.7826086	0.141025	1.045578

P(1)/P(2) = 0.5082112

P(2)/P(3) = 0.6323360

Calculated q(x) and p(x) Values - West Model

Age Group	i	q(x)	Lower p(x)	Upper l(x)	Lower Mortality level		Interpolated Level
15-19	1	0.0902357	0.909764				
20-24	2	0.0710926	0.928907	0.92058	0.93453	18	18.59694
25-29	3	0.0577319	0.942268	0.9301	0.94462	19	19.83802
30-34	5	0.0723582	0.927641	0.92454	0.94065	19	19.19253
35-39	10	0.0942600	0.905739				
40-44	15	0.1179873	0.882012				
45-49	20	0.1474533	0.852546				

Mean Mortality level = 19.20916

Interpolated p(x) Values - West Model

Age x	Level 19 l(x)	Level 20 l(x)	Actual
0	1	1	1
1	0.94343	0.95372	0.945582
5	0.92454	0.94065	0.927909
10	0.91763	0.93531	0.921327
15	0.91234	0.93117	0.916278
20	0.90395	0.92429	0.908204
25	0.89243	0.91476	0.897100
30	0.87989	0.90439	0.885014
35	0.86569	0.89261	0.871320
40	0.84864	0.87814	0.854810
45	0.82693	0.85913	0.833664
50	0.79777	0.83247	0.805027
55	0.75720	0.79440	0.764980
60	0.70117	0.74027	0.709348
65	0.62337	0.66377	0.631820
70	0.51969	0.55922	0.527958
75+	0.38870	0.42407	0.396097

Life Table for Amagoro Division - West Model

Age	nqx	npx	l(x)	ndx	nLx	Tx	e(x)
0	0.054417	0.9455822	100000		5441.774	96190.757	62.46200
1	0.018689	0.9813102	94558.22	1767.268	373461.27	6150009	65.03939
5	0.007092	0.9929070	92790.95	658.162	462309.37	5776548	62.25335
10	0.005480	0.9945193	92132.79	504.947	459401.60	5314238	57.68020
15	0.008811	0.9911880	91627.84	807.417	456120.69	4854837	52.98429
20	0.012226	0.9877739	90820.43	1110.377	451326.21	4398716	48.43311
25	0.013472	0.9865275	89710.05	1208.612	445528.74	3947390	44.00164
30	0.015473	0.9845269	88501.44	1369.383	439083.75	3501861	39.56841
35	0.018948	0.9810513	87132.05	1651.036	431532.70	3062777	35.15098
40	0.024736	0.9752632	85481.02	2114.526	422118.79	2631245	30.78162
45	0.034350	0.9656491	83366.49	2863.710	409673.20	2209126	26.49896
50	0.049746	0.9502537	80502.78	4004.710	392502.15	1799453	22.35268
55	0.072724	0.9272758	76498.07	5563.259	368582.22	1406950	18.39197
60	0.109294	0.8907051	70934.81	7752.809	335292.05	1038368	14.63834
65	0.164385	0.8356146	63182.00	10386.19	289944.53	703076.2	11.12779
70	0.249754	0.7502451	52795.80	13186.01	231014.02	413132.0	7.825091
75+	1	0	39609.79	39609.79	182118.03	182118.0	4.597802

NORTH MODEL

Coefficients for estimation of child mortality multipliers, Trussell variant, when data are classified by age of mother - North Model

Age Group	(i)	Coefficients a(i)	b(i)	c(i)	k(i)
15-19	1	1.1119	-2.9287	0.8507	0.1614300
20-24	2	1.2390	-0.6865	-0.2745	0.7165367
25-29	3	1.1884	0.0421	-0.5156	0.8837632
30-34	4	1.2046	0.3037	-0.5656	1.0012944
35-39	5	1.2586	0.4236	-0.5898	1.1009264
40-44	6	1.2240	0.4222	-0.5456	1.0935642
45-49	7	1.1772	0.3486	-0.4624	1.0619702

Source: Manual X, Un 1983, p.77.

Coefficients for estimation of the reference period, t(x), to which the values q(x) estimates from data classified by age refer - North Model

Age Group	(i)	Coefficients d(i)	e(i)	f(i)	Reference Period t(x)
15-19	1	1.0921	5.4732	-1.9672	2.6297101
20-24	2	1.3207	5.3751	0.2133	4.1872632
25-29	3	1.5996	2.6268	4.3701	5.6979407
30-34	4	2.0779	-1.7908	9.4126	7.1197212
35-39	5	2.7705	-7.3403	14.9352	8.4841419
40-44	6	4.1520	-12.2448	19.2349	10.091975
45-49	7	6.9650	-13.9160	19.9542	12.510491

Source: Manual X, UN 1983

t(x) = d(i) + e(i)[P(1)/P(2)] + f(i)[P(2)/P(3)

Female Population by age group, children ever born, children dead, average parity, proportion of children dead, and child mortality multipliers, Amagoro Division - North Model.

Age Group	i	FPOP(i)	CEB(i)	CD(i)	P(i)	D(i)	K(i)
15-19	1	82	86	31	1.0487804	0.360465	0.1614300
20-24	2	267	551	48	2.0636704	0.087114	0.7165367
25-29	3	258	842	51	3.2635658	0.060570	0.8837632
30-34	4	214	1042	74	4.8785046	0.070881	1.0012944
35-39	5	136	732	65	5.3823529	0.088797	1.1009264
40-44	6	50	367	41	7.34	0.111716	1.0935642
45-49	7	23	156	22	6.7826086	0.141025	1.0619702

P(1)/P(2) = 0.5082112
P(2)/P(3) = 0.6323360

Calculated q(x) and p(x) Values - North Model

Age Group	i	q(x)	p(x)	Lower l(x)	Upper l(x)	Lower Mortality level	Interpolated Level
15-19	1	0.0581899	0.941810				
20-24	2	0.0624206	0.937579	0.93682	0.94833	19	19.065975
25-29	3	0.0535296	0.946470	0.94304	0.95548	20	20.275755
30-34	5	0.0709729	0.929027	0.91987	0.93537	19	19.590775
35-39	10	0.0977598	0.902240				
40-44	15	0.1221693	0.877831				
45-49	20	0.1497650	0.850235				

Mean mortality level = 19.644168

Interpolated p(x) Values - North Model

Age (x)	p(x) Level 19	p(x) Level 20	Actual p(x)
0	1	1	1
1	0.94668	0.95555	0.95239
5	0.91987	0.93537	0.92985
10	0.90792	0.92612	0.91964
15	0.90061	0.92019	0.91322
20	0.89046	0.91142	0.90396
25	0.87664	0.89928	0.89122
30	0.86193	0.88638	0.87768
35	0.84605	0.87247	0.86307
40	0.82834	0.85690	0.84674
45	0.80681	0.83761	0.82665
50	0.78105	0.81411	0.80235
55	0.74575	0.78090	0.76839
60	0.70094	0.73840	0.72507
65	0.63722	0.67665	0.66262
	0.54799	0.58939	0.57401
75+	0.42963	0.46877	0.45484

Life Table for Amagoro Division - North model

Age x	nqx	npx	l(x)	ndx	nLx	Tx	e(x
0	0.0476062	0.9523938	100000	4760.623	96667.564	6316889.5	63.16889
1	0.0236658	0.9763342	95239.38	2253.917	374871.93	6220221.8	65.31145
5	0.0109810	0.9890190	92985.46	1021.076	462374.62	5845349.9	62.86305
10	0.0069821	0.9930179	91964.39	642.105	458216.67	5382975.3	58.53326
15	0.0101411	0.9898589	91322.28	926.105	454296.14	4924758.6	53.92724
20	0.0140911	0.9859089	90396.17	1273.780	448796.43	4470462.4	49.45411
25	0.0151971	0.9848029	89122.40	1354.407	442225.97	4021666.0	45.12520
30	0.0166473	0.9833527	87767.99	1461.099	435187.21	3579440.0	40.78298
35	0.0189226	0.9810774	86306.89	1633.148	427451.59	3144252.8	36.43107
40	0.0237229	0.9762771	84673.74	2008.706	418346.95	2716801.2	32.08552
45	0.0294008	0.9705992	82665.04	2430.418	407249.14	2298454.3	27.80443
50	0.0423180	0.9576820	80234.62	3395.369	392684.67	1891205.2	23.57094
55	0.0563800	0.9436200	76839.25	4332.197	373365.76	1498520.5	19.50202
60	0.0861309	0.9138691	72507.05	6245.099	346922.52	1125154.7	15.51787
65	0.1337195	0.8662805	66261.95	8860.516	309158.48	778232.2	11.74478
70	0.2076109	0.7923891	57401.44	11917.165	257214.28	469073.7	8.17181
75+	1	0	45484.27	45484.274	211859.44	211859.4	4.65786