FERTILITY AND MORTALITY ANALYSIS OF KWALE DISTRICT

BY

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THIS THESIS IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN POPULATION STUDIES AT THE POPULATION STUDIES AND RESEARCH INSTITUTE, UNIVERSITY OF NAIROBI

MAY, 1989

DECLARATION

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

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DEDICATION

This work is dedicated to my husband, Michael and sons, Ben and Dan.

PREFACE

Most of the researches at the Population Studies and Reasearch Institute (PSRI) have based their analysis on data from the Central Bureau of Statistics of Kenya. Few studies in the Institute have been done with data from other sources. This study is therefore a break from the common trend. In this study we investigate the relationship between fertility and mortality rather than looking at each as independent demographic phenomena.

I acknowledge the University of Nairobi for awarding me a scholarship to undertake a course in population studies. I am greatly indebted to the Director of Population Studies and Research Institute for offering me admission at the Institute.

I owe a great deal to my supervisors, Prof. J.O. Oucho, Dr.J.A.M.Otieno and Dr. C.Hammerslough, without whose untiring guidance this work would never have materialised. Special thanks go to Dr. Ties Boerma of Unicef, Kwale who willingly gave me access to the data he had painstakingly collected and offered me unlimited assistance whenever I needed it. I also acknowledge fellow students especially Monica Magadi and Florence Gachanja for their comforting company and constructive criticism during trying moments of the course.

I wish to thank my husband and the children for their understanding and support when I had to work for long hours away from home. Last but not least I extend my gratitude to my parents for their support throughout the study.

ABSTRACT

This study investigates the relationship between fertility and child mortality in Kwale district. Our first objective was to estimate the total fertility rate (TFR), the mean closed birth interval (MCBI) and child mortality q(2) using 1979 census data by division, education, marital status and residence differentials. Simple correlation analysis was then used to establish the relationship existing between birth interval and child mortality in the district. The results show that the length of average birth interval and child mortality (q2) are negatively related though weakly.

Further analysis using a sample of children from three locations in Kwale district included in the Child Survival and Development Baseline Survey (1987), show that the length of the previous birth interval and the subsequent birth interval have a significant impact on infant/child mortality whether duration of breastfeeding is taken into account or not. However, long previous birth intervals are favourable to survival at childhood while long subsequent intervals reduce the risk of mortality in infancy. Also, the age at which supplementation starts is an important determinant of child survival in Kwale District.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.0: INTRODUCTION

The relationship between mortality and fertility have for long been the subject of debate by demographers. It has been postulated that high fertility is a necessary biological and behavioural response to high mortality. This standpoint is manifested in the demographic transition theory which in its simplest form, states that mortality decline is a necessary precondition for fertility decline. This has led to the formulation of the "child replacement hypothesis" which states that parents try to replace children who die, and the "child survival hypothesis" which states that couples aim to produce enough children to ensure the survival of a desired number to adulthood and they will only reduce their fertility when they are convinced that infant and childhood mortality levels have dropped (Srimshaw, 1978; Johnson-Acsadi, 1986; El Deeb, 1988). However, these hypotheses do not hold consistently for many societies.

The other school of thought on the fertility/mortality equation is that high fertility may sometimes be a cause of high mortality. This revolves round both biological effects --effects of both close birth spacing and related factors-- and behavioural response to fertility such as sex preference that results in increased mortality (Wyon and Gordon, 1962; Wolfers and Scrimshaw, 1975; De Sweemer, 1984).

In most developed countries life expectancy at birth increased with rise in income per head and general socio-economic developement. In a number of developing countries such as Costa Rica, Kerala State in India, Sri Lanka and Cuba high life expectancy at birth, comparable to those achieved by the developed nations, have been reached but with low per capita income. For example, Sri Lanka has substantially reduced its infant mortality rate (IMR) to 37 per 1000, despite a per capita income of US$ 300, while Brazil, a relatively developed country of the third world nations, has an IMR of 76 per 1000 and an annual per capita income of US$ 2200 (Rosero-Bixby, 1986). This phenomenon has been found to be related to the population's awareness of the use of health facilities, especially through female literacy, and to the social structure of the communities (Ruzicka and Kane, 1985; Goldberg et al., 1984). This study examines the situation in three locations in Kwale district with respect to the fertility/mortality relationship, focussing mainly on the biological effects of fertility on infant/child mortality.

1.0.1: Background of the Study Area

Kwale District is one of the 41 districts in Kenya. It covers an area of 8 257 square kilometers and lies south of Mombasa district. The district is bordered by the Indian Ocean in the east, Kilifi district in the north, Taita-Taveta district in the west and Tanzania in the south. It is divided into four divisions, namely Kubo, Kinango (Hinterland), Matuga (Central Kwale) and Msambweni (Southern Kwale). These are further divided into a total of 21 locations. The locations of interest in this study are Mwaluphamba, Mkongani in Kubo division and Puma in Kinango division (figure. 1).

According to the 1979 census, the population growth rate in Kwale was estimated at 3.94% between 1980 and 1990. Population density is highest in Matunga (161 per square kilometer) and lowest in Kinango (29.7 per square kilometer). The district had a total fertility rate (TFR) of 7.1 and child mortality rate, q(2) of 188 per 1000 live births in 1979 (C.B.S., 1979). With these high fertility and child mortality rates it has been deemed necessary to find out the main causes of infant and child mortality in the district so that the appropriate policies can be formulated. The low socio-economic conditions in the district and the high fertility rate places a great strain on child survival.

The three locations --Mkongani, Puma and Mwaluphamba-- were selected as pilot locations, (figure 2) for the Child Survival and Development (CSD) programme in 1985 as they appeared to be fairly accessible to government officers based at the district headquaters (Boerma, 1989). The baseline survey was conducted on a sample of women from these locations, since the survey was conducted to evaluate the success of the CSD programme.

Fig. 1 KWALE DISTRICT : DIVISIONS AND LOCATIONS

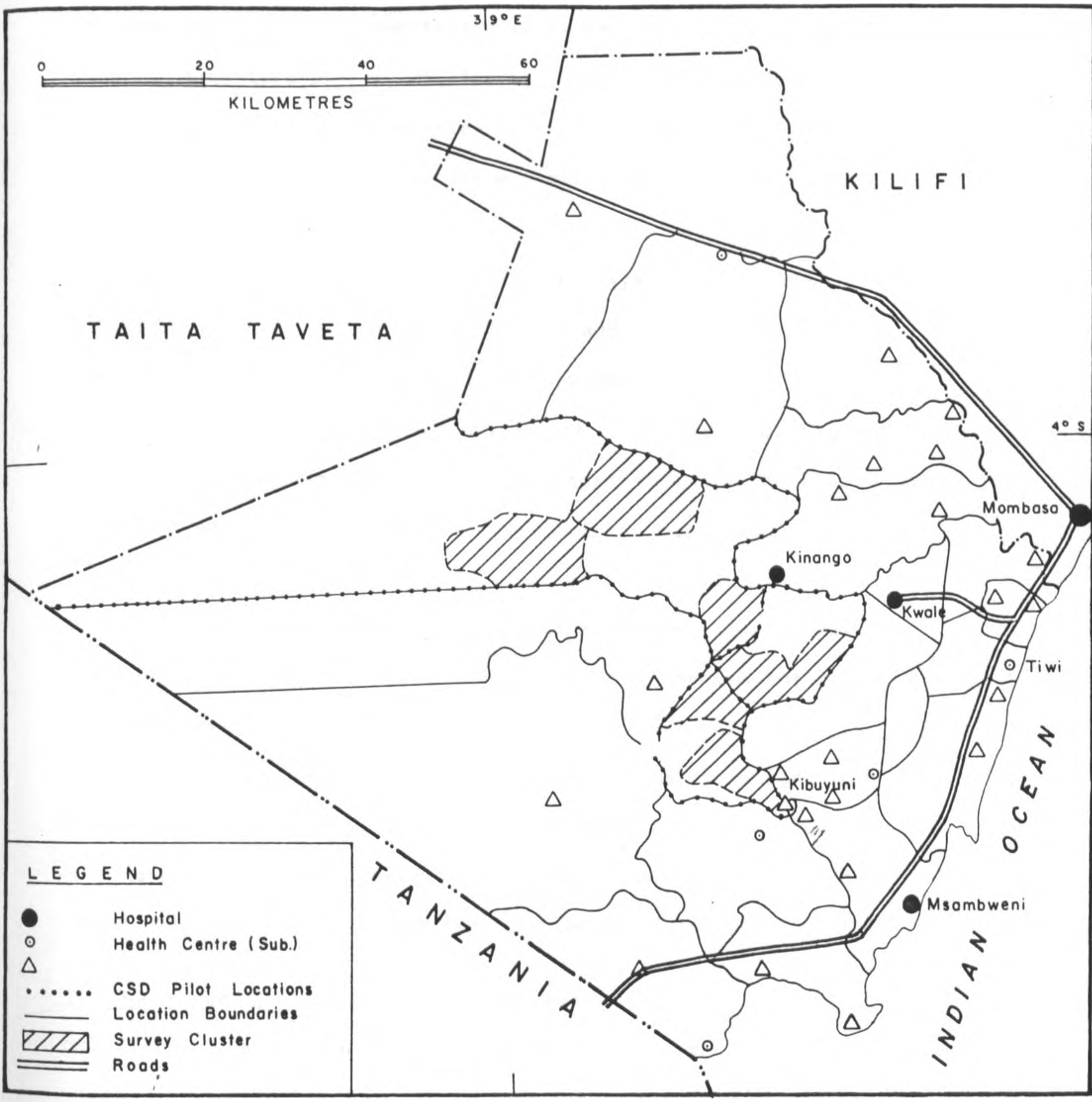

Fig. 2 KWALE DISTRICT : CSD PILOT LOCATIONS

1.1: STATEMENT OF THE PROBLEM

Previous research has shown that a fast pace of childbearing can lead to premature births, stillbirths, spontaneous abortion, low birth weight, sibling competition for resources such as maternal care, food, clothing, shelter and medical care (Wray, 1978; Gray, 1981; Winikoff, 1983; Palloni and Tienda, 1986; Millman and Cooksey, 1987; Hobcraft et al, 1983; Senanayake, 1982) which consequently lead to high mortality. In addition, if safe and adequate artificial and other food supplements are not readily available and affordable, then any impact on mother's ability to breastfeed will compound the disadvantages to child health. A short subsequent birth interval may lead to early and abrupt weaning of the child, resulting in high risks of morbidity and mortality, brought about by contaminated and nutritionally inadequate weaning foods and consequently chronic infection and malnutrition (Palloni and Tienda, 1986; Rosero-Bixby, 1986). In addition the physical burden of a new pregnancy causes some decline in the quality and quantity of maternal care provided, a problem which is more pronounced the younger the index child (the child under study) (Ruzicka and Kane, 1985).

In the three locations in Kwale, according to the Child Survival and Development (CSD) Baseline survey, even though the average breastfeeding duration is long (21.8 months), about 30% of the children have been weaned by the age of 18 months and by the age of 3 months about 45% of the infants are on regular supplementation. This proportion increases to 73% by the age of 4 months. A reduction in breastfeeding intensity may thus occur due to the early regular supplementation of infants leading to a decrease in the length of postpartum ammenorrhea and subsequent conception (Jain and Bongaarts, 1981; van de Walle, 1967).

The low socio-economic status of the Kwale population mentioned earlier, and the inadequate provision and utilisation of health facilities (Health information System, 1987), puts the infants at a higher risk of exposure to agents of infection and improper health care leading to high mortality. The situation is further aggrevated by high fertility which results in shorter birth intervals.

About 8% of the children in the sample have previous and subsequent intervals of 18 or less months and by the 24th month the percentage increases to 28% . This shows that in order to reduce infant/child mortality effectively the problem of short birth intervals within the three locations and the district as a whole has to be addressed. However, it should be noted that birth intervals do not affect mortality independently of socio-economic, socio-cultural and related reproductive variables. These factors must therefore be considered in the analysis.

The tradition of early age at marriage and first birth within this population is another aspect that would greatly endanger the survival of the index child. The population, being a predominantly Muslim society (87%), has a tendency to marry off girls at a very young age. (The mean age at first marriage according to the CSD survey and mean age at first birth is 17 years while the age at last birth is 47 years). In conjuntion with the reduction in the length of postpartum abstinence and the low acceptance of modern methods of contraception, chances of survival of the child are further reduced.

1.2: JUSTIFICATION OF THE PROBLEM

The District Focus for Rural Development, (DFRD) strategy was introduced by the government in 1984 as part of the 1984/88 development plan. This strategy necessitates analysis of data at sub-district level in order to plan effectively for each division and location. Kwale District, is one of the districts with high child mortality rates --q(2) 190 per 1000 live births; (Kibet, 1982). It should therefore be placed among the priority districts in the campaign against infant/child mortality, if the United Nations' goal of infant mortality rate of 50 per 1000 is to be achieved in Kenya by the year 2000 (United Nations, 1981).

It is therefore of paramount importance to draw attention to the issue of birth intervals in so far as they affect child survival It is also relevant to understand the mechanisms through which demographic, socio-economic, socio-cultural and enviromental factors work to affect child survival.

Pregnancies before age 18 and beyond age 35 years are quite frequent in Kwale, leading to high parities and relatively closely spaced births by the end of the reproductive span. Thus, could birth interval thus be a contributory factor to the persistent infant/child mortality in the district or are other factors more significant, and if so, to what extent?

This study will help project administrators in Kwale district in general, and in Puma, Mwaluphamba and Mkongani locations in particular, to improve on the methods of implementation of various programmes and/or change their approach to solving the problem of high child mortality. The findings will also act as guidelines to the planning and implementation of family planning, maternal and child health care and nutrition intervention programmes. The results could also be used by policy makers to formulate policies that are practically geared towards the enhancement of maternal and child health care with special reference to birth interval.

The only study that has addressed the issue of birth intervals as they affect child survival in Kenya was carried out on a sample of 3019 women of childbearing age in Machakos district (Boerma and and van Vianen, 1984). The present study, located in a different district, will permit comparison with the Machakos study and reveal similarities and differences between the two contrasting districts. Thus, we may be able to make reasonable generalisation about the effects of the pace of childbearing on child survival in rural Kenya.

1.3: OBJECTIVES

The broad objective of the study will be to examine the effect of birth interval and other demographic, socio-economic and socio-cultural variables on infant/child mortality in Kwale district.

The specific objectives are:

(a) to estimate the total fertility rate (TFR), the child mortality rates and the mean closed birth interval and other demographic measures using 1979 census data set, by selected socio-economic and demographic variables.

(b) to determine the effect of the previous birth interval and breastfeeding duration on the survival chances of last born index children by age segments.

(c) to investigate the impact of the previous birth interval on the survival chances of all index children other than first born index children, regardless of information on breastfeeding duration by age segments.

(d) to determine the effect of the subsequent birth interval on the survival chances of all index children excluding the last born index children by age segments.

1.4: LITERATURE REVIEW

In this section five studies relevant to the area of study are reviewed. Particular attention is drawn to the objectives of the studies, the types of data used for analyses, the methodologies of data analyses and their findings. Mention is made of other related studies but not in as much detail.

Palloni and Tienda (1986), examining the effects of breastfeeding and interbirth intervals on the health or death risks of infants and children, used survey data from Encuesta Nacional de

Fecundidad conducted in Peru during 1977-78 as part of the WFS.

The survey contained births and pregnancy histories for a random sample of 5640 ever married women aged 15 to 49 at the time of the interview. They used a conditional logit model defining the logarithm of the odds of dying in each age segment to estimate the hypothesised effects.

The dependent variable was the probability of dying of the index child within a specified age segment, i.e. 1-2, 3-5, 6-11, 12-23, 24-59(months). The independent variables were the previous birth interval, the interval between birth and the following conception and breastfeeding duration. The survival status of the previous child, parity, age of mother at birth of the index child, birth cohort, education, occupation of spouse and residence (region) were used as control or background variables.

They also estimated the effect on mortality of policies that would affect the pace of reproduction and/or the normative patterns regulating breastfeeding by constructing an index η-the population attributable risk. The index measures the proportionate decrease in the conditional probabilities of dying within an age segment that would result if the attributes having the greatest negative impact on health were eliminated.

They found that: (a) mortality risk increases with rapid pace of reproduction within every age segment up to the 24th month of life; (b) cessation of breastfeeding increases mortality risks of children through the first year of life and thereafter it makes little difference; (c) the data did not strongly confirm the mediating role of breastfeeding but with respect to the previous birth interval they suspected that maternal deprivation played a more important role and had health on the infant consequences regardless of the patterns of breastfeeding. They explained that the attenuating effects of breastfeeding on the timing of the following conception came about because the estimation procedure was sensitive to errors in reports of breastfeeding duration. The elimination of short intervals (<1.5 years), and discontinuation of breastfeeding before the sixth month of life would reduce infant mortality by at least 13% and 17% respectively.

A study in Malaysia drew a stratified probability sample of 1262 ever married women less than 50 years of age from the Malaysian Family Life Survey (1976), from which a total of 5541 live births occuring in Peninsular Malaysia between 1946 and one month before the survey date were chosen (Millman and Cooksey, 1987). The study aimed at determining the magnitude and direction of the effects of breastfeeding on birth spacing and on infant mortality. The researchers used a logistic regression model to analyse the data in two parts. First, the estimation of the effects of independent variables on whether the index child was breastfed was performed. Second, the effects of breastfeeding and birth spacing, with other variables on mortality was estimated. The dependent variable was either the probability of surviving or of breastfeeding of the index child. The independent variables for the first analysis were: sex of the index child, residence, education, death of the previous child, multiplicity of births, foetal wastage, maternal age at birth of index child, birth order, previous birth interval and birth weight. The independent variables for the second analysis were: ever breastfed (index child), previous birth interval, birth weight, multiplicity of birth, foetal wastage, maternal age and parity.

They compared results obtained when using all births and those got when working with the last two births only and concluded that the results were quite similar. They observed that previous birth intervals of 18-35 months or more were advantageous to infant survival than those less than 18 months. They also found that longer breastfeeding durations are more beneficial in situations where conditions are unfavourable to child survival. In addition birth spacing acts through other mechanisms other than lactation to promote children's survival. Thus even when breastfeeding is not initiated, long birth intervals are still essential especially in populations with low socio-economic status.

Using data from the North-east Brazil Family Planning/Maternal Child Health Survey-1980, Goldberg *et al* (1984) examined the relationship between failure to breastfeed and infant mortality in north-eastern Brazil. The survey covered 7,852 women aged between 15 and 44 years, resulting in breastfeeding information for 5,190 children (dead and alive). They used cross-tabulation and life table survival rates to test for any apparent association between breastfeeding, infant mortality and other variables. A linear logistic model was used in describing the relationship between infant mortality and other variables. The dependent variable was infant mortality and the independent variables were: ever breastfed, residence (urban/rural), education, occupation, parity, age at last birth, attedance to ante-natal check-up and place of delivery of last birth.

They found that there was a strong positive relationship between breastfeeding and infant survival whether other factors were taken into account or not. Children who were not breastfed were twice as likely to die in infancy as breastfed children. The risk was 2.3 times greater in the rural than urban areas. Attendance to ante-natal check-up during pregnancy had a significant effect on infant mortality both in the urban and rural areas. It was one of the most important variables affecting infant mortality. Contrary to other studies, they found that education and residence were not significant independent variables; instead the use of health services, parity, employment status and age at last birth were more important in determining mortality. Last they observed that babies of working women were far more likely to die than those of non-working women. However, the study did not control for the health status at birth of the index child.

In investigating the strength of the influence of spacing on child survival, De Sweemer (1984) used data from a longitudinal pregnancy history survey conducted between 1969 and 1973 in 25 Punjabi villages. Pregnancy histories and survival of children of 5,018 women aged 15-45 years at any point between 1969 and 1973 were obtained. Almost all children in this population were breastfed up to 17 months of age.

De Sweemer used correlation and linear regression analyses to examine the relationship between the previous and subsequent birth intervals and their influence on infant-child survival respectively. The dependent variable was the age-specific probability of dying of the individual index children: (a) for whom the subsequent interval was not yet closed by a new conception (open interval); (b) for whom the subsequent interval had been closed by a new conception (closed interval); and (c) all index children irrespective of an open or closed interval. The independent variables were: survival status of previous child; sex of the index child; caste; interval between preceding birth; and the conception of the index child and interval between birth of the index child and the conception of the subsequent child. Breastfeeding status, parity, age of mother, residence, education and health status at birth were not controlled for.

She found that the previous and subsequent birth intervals were significantly but weakly correlated. The preceding birth interval was important to the survival of the index children irrespective of whether the previous sibling survived to the index children's conception or up to 3 years after the birth of the index child. The subsequent interval was also found to be an important factor in influencing the survival of index children only for intervals of less than 18 months and only upto the age of 18 months. This was postulated to be connected to the early cessation of breastfeeding of index children, a situation worsened by a short preceding interval.

Wolfers and Scrimshaw (1975), concluded that there is a downward trend in mortality with increasing birth interval lengths, in their analysis of pregnancy histories of 1,934 women in Guayaquil, Ecuador. They also found a consistent negative relationship of interval with postneonatal mortality which persisted over time even when a correction for prematurity was applied to the data.

Chowdhury, (1981) analysing 5,002 closed birth intervals in Bangladesh in 1966-70 found that neonatal and postneonatal mortality were generally higher at short intervals (<27 months) for all parities. He did not, however, control for age of mother. Fedrick and Adelstein (1973), using 8,356 interpregnancy intervals between 2 live births derived from interviews of mothers delivering all singleton pregnancies in Great Britain in the first week of March 1958, analysed deaths in the first 3 months of life only. They found that there were significant excess deaths for conceptions within 6 months of prior birth and there were no effects for longer interpregnancy intervals.

Wyon and Gordon (1962), analysed 1,244 birth intervals in Punjab, India between 1955-58 and concluded that there was generally a negative association between birth intervals and neonatal and postneonatal mortality with shortest intervals (0-11 months) and short intervals (24 months) respectively. There was no clear trend in mortality at childhood with interval lengths. They did not control for age, parity or for health status at birth. Pebley and Stupp (1987), added to the above findings that the pace of childbearing and the age at which it begins and ends together with the education of the mother are important determinants of child mortality in a population.

Cantrelle and Leridon (1971), showed that in Senegal, the probability of death was highest during or within the first 6 months of weaning, but this probability of dying decreases as weaning is delayed until later ages. One particular point of interest which emerges from this Senegalese study is that if weaning occurred after the mother had begun another pregnancy, the probability of death associated with weaning was markedly increased and almost double the probability of death associated with weaning if the mother was not pregnant. This showed that the occurrence of a subsequent pregnancy in itself introduced additional hazards either through more abrupt weaning or associated with shorter birth-to-conception interval.

Using correlation analysis and cross-tabulations in examining the effects of duration of breastfeeding on fertility and infant mortality, Knodel and Van de Walle (1967), found that fertility and infant mortality are negatively related.

Gray (1981), found that short birth intervals were detrimental to child survival and were associated with high risk of foetal wastage. He concluded that the decline in the practice of breastfeeding and postpartum sexual abstinence in many developing countries could have adverse health consequences for infants and children unless availability and use of contraceptives improved.

Potter, Mojarro and Nunez (1987), in studying the effect of Maternal Health Care on the prevalence and duration of breastfeeding in rural Mexico observed that there was a negative relationship between breastfeeding and the use of modern maternal care mainly due to the attitudes of medical staff and adoption of modern contraceptives.

Fortney and Higgins (1983), investigated the association between birth interval and perinatal mortality and low birth weight of women whose penultimate pregnancy ended in a live offspring who lived up to the time of birth of the index child. They found that there was a sharp decline in perinatal mortality (before hospital discharge) for the first 3 years interval. With intervals of more than 3 years perinatal mortality increased. Infants born after intervals of 2-4 years exhibited half the mortality risk of those born after very short (9-12) intervals. Low birth weight was also associated with short birth intervals. Maternal age and parity were found to be strongly related to infant mortality.

Lesthaeghe, Page and Adegbola (1981), showed that in Lagos the reductions in breastfeeding durations and birth intervals increased infant-child mortality risks especially among children born to less educated mothers, a view shared by: Kibet, 1981; Caldwell, 1979; Caldwell and McDonald, 1981; Hobcraft et al, 1984 and Cochrane, 1980.

Senanayak (1982), found that foetal deaths, health and growth impairment, early weaning, malnutrition and death in infancy were associated with high parities and short birth intervals. She also observed that breastfeeding provided a biological birth spacing method. Millard and Graham (1985), concluded that early and abrupt weaning, especially due to another pregnancy, is detrimental to child health in Central Mexico.

Rosero-Bixby (1986), singled out poverty, ignorance, isolation, lack of basic services and excessive fertility as the major determinants of child mortality. However, he contended that economic development alone is not necessarily a prerequisite to a decline in infant mortality rates.

Winikoff (1983) associated short birth intervals, high parity, and ages of women with high foetal losses and infant mortality. Trussell and Pebley (1984) argue similarly that childbearing should be confined to ages 20-34 years, limited to parity 3 and with intervals of at least two years if child and maternal mortality are to be reduced.

Boerma and van Vianen (1984) analysed births reported by a sample of 3019 women of childbearing age with at least one live birth between April 1974 and April 1981 in the Northern division of Machakos district, Kenya. They used a linear logistic model in the analysis of retrospective birth intervals and a life table type of analysis for prospective birth intervals. They found that there was no adverse effect on short retrospective birth intervals on the health status of the young children. The inclusion of birth order and maternal age in the analysis had no significant effect on the overall mortality rates. Very short prospective intervals (less than two years) increased the mortality risk in the second half of the first year of life and growth retardation between 11 and 15 months. However they were dealing with a very small sample of children with prospective birth intervals after excluding deaths which occured before the conception of the subsequent child, and thus their findings on this variable cannot be taken as conclusive. They thus concluded that birth interval was generelly not a significant factor in determining the mortality rates in this population with relatively favourable socio-economic conditions and low infant mortality rates (49 per 1000 live births). The socio-economic status of the family seemed to be a better explanatory variable.

Mosley and Chen (1984) developed a model for the study of child survival in developing countries. The dependent variable in this model is mortality in children. The social and economic variables are the independent variables but these operate through a set of proximate determinants that directly influence the risk of morbidity and mortality. The proximate determinants are grouped into five categories:

- Maternal factors: age, parity, birth interval.
- Enviromental contamination: air, food/water/fingers, skin/soil/inanimate objects, insect vectors.
- Nutrient deficiency: calories, protein, micronutrients (vitamins and minerals).
- Injury: accidental, intentional.
- Personal illness control: personal preventive measures, medical treatment.

The model (Mosley and Chen, 1984 pp. 29) singles out birth interval as one of the maternal factors through which the socio-economic variables influence child survival.

From the above literature review, it is logical to conclude that long birth intervals negatively affect infant/child health and survival. Whether duration of breastfeeding and health status at birth are included or not there is still a significant negative effect registered. Most of the researches reviewed utilised either the hazard or logistic regression models which are more suitable for analysis that involve the likelihood of an event occurring due to various interrelated factors. A number of studies analysed the effect of the previous and subsequent birth intervals separately because of the different influences they have on infant/child mortality.

The present study examines the age specific probability of dying of individual index children at three age segments, namely neonatal, postneonatal and childhood mortality. The previous and subsequent birth intervals are analysed separately because each has a different impact on child survival (De Sweemer, 1984). The study will employ a linear regression model, as done by De Sweemer (1984), to analyse the association between birth interval and infant/child mortality in Kwale District.

1.5: CONCEPTUAL FRAMEWORK

The influence of birth spacing on infant/child mortality will be studied using a model for the study of the relationship between socio-economic and socio-cultural differences in child mortality adopted from Mosley and Chen (1984). The framework is based on the assumption that socio-economic variables operate through biological mechanisms such as birth spacing, nutrition and the incidence of health impairment to affect infant/child mortality. In our study birth interval is the variable of interest. This has necessitated the modification of the Mosley and Chen (1984) model in order to highlight the importance of fertility in determining mortality. In our model the maternal factors have been changed to demographic factors and the nutrient deficiency to behavioural factors. For ease of analysis the enviromental, personal illness control and injury categories of proximate determinants are excluded from the model. The unit of analysis in this study is the individual child whom we have referred to as the index child.

Figure 3 is a schematic presentation of the mechanism through which a set of proximate determinants directly influence mortality. The framework consists of 6 proximate determinants grouped into two categories, namely demographic and behavioural factors. The behavioural and demographic factors influence the birth interval which in turn affect mortality. The demographic factors also affect the behavioural factors directly.

The proximate determinants categorised into two groups are as follows:

(I) Demographic factors: marital status, age of mother at the birth of the child, parity, sex of child and survival status of the previous sibling.

(II) Behavioural: breastfeeding, supplementation.

The socio-economic and socio-cultural variables are considered in two broad categories: individual and household level variables.

In this model the socio-economic variables used are education of the mother and spouse and the region of residence. These variables act as proxies for other socio-economic variables such as family income, ownership and productivity of land. Religion and ethnic origin are used as proxies for socio-cultural variables such as child care practices and marriage and reproductive patterns. Both socio-economic and socio-cultural

FIGURE 3: A SCHEMATIC MODEL OF THE RELATIONSHIP BETWEEN SOCIO-ECONOMIC AND SOCIO-CULTURAL DIFFERENCES IN CHILD MORTALITY

Socio-economic and socio-cultural factors
-education of mother
-education of spouse
-religion
-ethnicity
-location (region)

Demographic factors
-parity
-sex of child
-age of mother at birth of child
-marital status
-survival of previous sibling

Behavioural factors
-breastfeeding
-supplementaion

Birth interval
-previous interval
-subsequent interval

Infant/child mortality

characteristics of the family influence the two categories of proximate determinants directly which consequently birth interval and mortality. The birth interval variable is divided into two variables, the previous and subsequent birth intervals, as they have different effects on the survival of the index child. The variables analysed in this study include the age specific probability of dying of an index child between x and x+n (the dependent variable). The independent variables are: the previous interval and breastfeeding duration for last born index children; the previous interval for all index children regardless of the information on breastfeeding with the exception of first births; and the subsequent interval for all index children except for last births. The socio-economic, socio-cultural, behavioural and other demographic variables are used as background explanatory variables.

1.5.1a: Conceptual Hypothesis

A fast pace of childbearing, in conjuntion with certain socio-cultural norms and low socio-economic status, is detrimental to child health and survival.

1.5.1b: Operational Hypothesis

1. There is a negative relationship between child mortality q(2) and the mean closed birth interval.
2. The previous birth interval affects pregnancy outcome and the effects will peak very early in life and recede rapidly as the index child ages.
3. The effects of the previous birth interval are stronger under conditions of less resources, which increases the importance of breastfeeding and adequate medical services.

4. The effects of the subsequent birth interval are visible only after 3 months because relatively few index children are affected by the consequences of another conception within the first 3 months after their birth.

5. A lengthy subsequent birth interval is important to the development of the index child in early childhood due to the availability of other resources other than breastfeeding.

6. The effect of long subsequent birth intervals decrease as breastfeeding is prolonged.

7. The effects of breastfeeding is stronger the lower the socio-economic status of the family

1.6: DEFINITION OF BASIC CONCEPTS

In this section we define the technical terms as they have been used in the text.

Birth interval is the time elasped between either two live births, initiated or closed by live births and stillbirths.

Childspacing is the deliberate decision not to leave childbearing to chance.

Index child is the child who initiates or closes a birth interval and whose survival we study;

Preceding child is the sibling that immediately precedes the index child.

Subsequent child is the sibling born immediately after the index child.

Preceding birth interval is the time that elasped between the birth of the preceding child and the index child.

Subsequent birth interval is the time elasped from the birth of the index child to the birth of the subsequent child.

Previous child (see preceding child).

Previous birth interval (see preceding birth interval).

Retrospective birth interval (see preceding birth interval).

Prospective birth interval (see subsequent birth interval).

Weaning is the complete cessation of breastfeeding.

Supplementation is the introduction of other foods other than breastmilk to an infants diet.

Urban refers to townships with at least 2000 inhabitants.

The identification of variables used in the analyses and how they are measured is given in chapter 3.

1.7: METHODOLOGY

Two broadly based techniques were used in this study for both the data collection and data analysis. For the 1979 census data the enumeration method of data collection was used whereas for the Child Survival and Development (CDS) Baseline Survey (1987) the probability sampling technique was utilised.

The methods of data analysis include demographic and statistical techniques. The demographic techniques have been applied to the 1979 data set while the statistical techniques have been used to analyse the CSD Baseline Survey data (1987). Both techniques are described and discussed in chapters 2 and 3 respectively, however the techniques of data collection and the scope and limitation of this study are the major contents of this section.

1.7.1 Data source

The data used in this study were obtained from two sources. The first set was extracted from the Kenya population census (1979) data for Kwale District by division. The extent of coverage and the possible errors in these data have been discussed in detail by other researchers (Munala, 1987; Osiemo, 1986; Mwombobia, 1982; Pittchar, 1987; Adienge, 1987; C.B.S., 1979). However the extent of lack of coverage, misreporting and misallocation of events is expected to be quite high in Kwale District given poor infrastructure and low level of education, specifically the education of women.

The second data set was extracted from the CSD Baseline Survey, 1987 which was part of the Monitoring and Evaluation of Child Survival and Development in Kwale district: a subproject of the joint Government of Kenya/Unicef project of Child Survival and Development Programme initiated in Kwale district in 1985.

The main objective of the survey was to evaluate the health effects of the CSD programme after four years of operation in the selected pilot locations of Mkongani, Mwaluphamba and Puma. Seven field workers were involved in the collection of data from the seven clusters (one field worker per cluster) one field supervisor and the project leader who certified the interviews on the same day they were collected.

A sample of 3835 women between ages 15-44 were interviewed from seven sublocations (Table 1.1).

Table 1.1. Number of Respondents by location and sub-lacotion.

Location	Sub-location	Number	(per location)
Mkongani	Mkongani North	615	(1316)
	Mkongani South	701	
Mwaluphamba	Kizibe	779	(1170)
	Tserezani	391	
Puma	Kifyonzo	458	(1349)
	Vigurungani	419	
	Busa	472	
Total		3835	

The baseline survey included questions on charecteristics of the women, the household (including socio-economic status), children in the family born between 1980 and 1987, utilisation of health services, health knowledge and maternal mortality (Appendix 1.0).

1.7.2: Quality of Data

The data, once collected and certified by the field supervisor and the project leader, were keyed in using a D-Base III Plus package. During the survey there were 21 refusals (0.5%) and while most women did not know their exact ages, some had no idea at all. Therefore field workers estimated respondents' ages by using identity cards, a local calendar and relating the women's ages to the others who knew their ages. Analysis of age heaping by Boerma (1989) on the same data set using Myers' index showed preference for multiples of 10 and shortage of ages ending in digit 1. If parity conflicted strongly with age, the women's ages were adjusted during data editing. The most common error was high parity (7-10) at age 30 years or so, which is rather unlikely. Apropos, there appeared to be a tendency to underestimate ages among Kwale women.

The fertility of women between ages 15-19 tended to be rather high. This could have been due to the tendency of field workers to exclude young women without children in the sample. This age group of women is also more likely to be absent from home (schooling, work).

The respondents reported 3766 male and 3637 female births (including stillbirths) in the period between 1980 and 1987. The sex ratio at birth is thus 1.035, which is indicative of a good data quality. Ages of the children were often taken from the child health cards (80.5% produced a card during the interview) and corrected if necessary.

CHAPTER TWO

MORTALITY AND FERTILITY ESTIMATION IN KWALE BY DIVISION

2.0: INTRODUCTION

This chapter estimates the total fertility rate (TFR), the mean closed birth interval (MCBI), and child mortality [q(x)], by education, marital status and residence differentials in Kwale district at the divisional level using 1979 cencus data. These estimates will provide a basis and comparison over time, for examining the relationship between fertility and child mortality in 1979 and 1987 respectively.

The computational procedures and discussion of the results are an important aspect of this chapter. The techniques used are demographic, namely;

(a) the Coale-Trussell technique of estimating total fertility rate from information on children ever born (CEB), and children born in the last twelve months before the enumeration (BLM) i.e. cumulative and current fertility;

(b)Horne's method of computing the mean closed birth interval using the the adjusted TFR in (a); and

(c) the Brass-type method of estimating child mortality using Trussell's coefficients. A detailed dicussion of each technique and of the results obtained form the main content of this chapter.

2.1: THE COALE-TRUSSELL P/F RATIO METHOD

The P/F ratio method was first developed by Brass (1964). Coale and Trussell (1974) later estimated a new set of coefficients using the Coale-Trussell fertility model (Table 2.1). The strengths and weaknesses of this method have been well documented in earlier studies by Mwobobia (1982) and Osiemo (1986). Both of them have applied the method to census data but only Osiemo (1986) used the Brass-type method based on the Coale-Trussell coefficients.

Table 2.1: The Trussell Coeffecients for Estimating Child Mortality

Age Group	Index	a(i)	b(i)	c(i)
15-19	1	2.531	-.188	.0024
20-24	2	3.321	-.754	.0161
25-29	3	3.265	-.627	.0145
30-34	4	3.442	-.563	.0029
35-39	5	3.518	-.763	.0006
40-44	6	3.862	-2.481	-.0001
45-49	7	3.828	.016	-.0002

Source: United Nations, 1983, pp. 34

The method seeks to adjust the level of observed age specific fertility rates, f(i), which are assumed to represent average parities, P(i). Average parity equivalents, F(i) are then calculated by age group, and an average of the ratios P/F obtained for younger women used as an adjustment factor by which all the observed fertility rates are multiplied (United Nations, 1983, Chp.II).

2.1.1: Data Required

(a) The number of children ever born (CEB), classified by five-year age groups of mother.

(b) The number of children born in the last twelve months before the enumeration (BLM), classified by five-year age groups of mother.

(c) The total number of women (FPOP) in each five-year age group.

2.1.2: Computational Procedure

In computing the adjusted fertility schedule, the Kenya 1979 census data for Matuga division in Kwale district will be used to give a detailed example (Table 2.2).

Step 1: Calculation of reported average parities P(i)

The value of P(i),(where i refers to the ith five-year age group, that is when i=1 then it refers to age group 15-19 and i=7 refers to age group 45-49 and i=1,2,3,4,5,6,7) is obtained using the formula;

$$P(i) = CEB(i)/FPOP(i) \quad \ldots\ldots\{1\}$$

where CEB(i) is the number of children ever born to women in age group i; and FPOP(i) is the total number of women in age group i.

Table 2.2: Children Ever Born (CEB), Children Born in the Last Twelve Months (BLM), by Five-year Age Group of Mother-Matuga (1979).

Age Group	Index	FPOP	CEB	BLM
15-19	1	2121	1180	254
20-24	2	2178	4846	478
25-29	3	1858	7344	420
30-34	4	1468	7234	235
35-39	5	1140	6348	122
40-44	6	868	5075	38
45-49	7	736	4318	23

From Table 2.2 above, the value of P(2) is;

$$P(2) = CEB(2)/FPOP(2)$$

$$= 4846/2178$$

$$= 2.224977$$

The values of P(i) are fully shown in Table 2.3.

Step 2: Calculation of a preliminary fertility schedule, f(i)

The values of f(i) are computed by dividing BLM(i) with FPOP(i) i.e.,

$$f(i) = BLM(i)/FPOP(i) \ldots\ldots\ldots\ldots \{2\}$$

where BLM(i) is the number of children born in last twelve months before the enumiration.

Using Table 2.1, the value of f(2) is therefore:

$$f(2) = BLM(2)/FPOP(2)$$

$$= 478/2178$$

$$= 0.219467$$

The whole set of f(i) values based on table 2.1 are shown in table 2.3.

Table 2.3: Average parity, P(i), Period fertility schedule, f(i) and Cummulative fertility, Q(i) by age of mother - Matuga, 1979

Age Group	Index	P(i)	f(i)	Q(i)
15-19	1	.556341	.119754	.598774
20-24	2	2.224977	.219467	1.696111
25-29	3	3.952637	.226049	2.826358
30-34	4	4.927792	.160081	3.626767
35-39	5	5.568421	.107017	4.161855
40-44	6	5.846774	.043778	4.380749
45-49	7	5.866847	.03125	4.536999

Step 3: Calculation of observed fertility schedule

The fertility rates computed in step 2 are added up, beginning with f(1) and ending with f(i). The value of this sum multiplied by five is an estimate of cummulative fertility upto the upper limit of age group i. The formal definition of Q(i) is;

$$Q(i) = 5\sum_{i=1}^{j} f(j) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \{3\}$$

where j=1,2,3,4,5,6,7 and i=1,2,3,4,5,6,7.

The results of Q(i) are shown in table 2.3. As an example Q(3) is computed as;

$$Q(3) = 5\sum_{i=1}^{3} f(3)$$

$$= 5(0.119754 + 0.219467 + 0.226049)$$

$$= 2.826358$$

Step 4: Estimation of current average parity equivalents, F(i)

The coefficients in Table 2.1 are used in the estimation of F(i) which is estimated using the formula:

$$F(i)= Q(i-1)+ a(i)f(i) + b(i)f(i+1) + c(i)Q(7) \ldots\ldots\ldots \{4\}$$

where a(i), b(i) and c(i) are the coefficients for interpolating between age specific fertility rates to estimate current parity equivalents.

Using the values of f(i) and Q(i) in Table 2.1 an example of the computation of F(4) is given below;

$$F(4) = Q(3)+ a(4)f(4) + b(4)f(5) + c(4)Q(7)$$

Table 2.4: Estimated Parity Equivalent, P/F Ratios, Fertility rates for Conventional age groups, Adjusted fertility and Number of births by age of mother, Matuga - 1979.

Age Group	Index	F(i)	P(i)/F(i)	w(i)	f+(i)	f*(i)	b(i)
15-19	1	.272728	2.039909	.094374	.140467	.222562	472.055
20-24	2	1.230229	1.808586	.105053	.222502	.352543	767.8394
25-29	3	2.399578	1.647221	.106057	.21928	.347437	645.5389
30-34	4	3.330266	1.479699	.106168	.154465	.244742	359.2825
35-39	5	3.972543	1.401716	.118291	.100834	.159766	185.1338
40-44	6	4.252943	1.374759	.095897	.041596	.065908	57.20825
45-49	7	4.380749	1.339233		.028253	.044765	32.94753
		MEAN P/F=1.584446			TFR =	7.188633	

= 2.826358+(3.442)(0.160081)+(-0.563)(0.107017)+(0.0029)(4.536999)

= 3.330266

It should be noted that in the computation of F(7) equation 4 is reduced to;

$$F(7) = Q(6) + a(7)f(7) + b(7)f(6) + c(7)Q(7).$$

The results of F(i) are shown in Table 2.4.

Step 5: Calculation of a fertility schedule, f+(i), for conventional five-year age groups.

In order to estimate rates for conventional age groups the rates referring to the unorthodox age groups are weighted according to formulae 6 and 7 below;

$$f+(i) = [1-w(i-1)]f(i) + w(i)f(i+1) \quad \{6\}$$

where f(i) and f+(i) are the unweighted and weighted age specific fertility rates respectively and w(i) is calculated as

$$w(i) = x(i) + y(i)f(i)/Q(7) + z(i)f(i+1)/Q(7) \quad \{7\}$$

where x(i), y(i) and z(i) are the coefficients for the weighting factors, w.

The values of x(i), y(i) and z(i) are given in Table 2.5.

Table 2.5: Coefficients of Calculating the Weighting Factor, w.

Age Group	Index	x(i)	y(i)	z(i)
15-19	1	.031	2.287	.114
20-24	2	.068	.999	-.233
25-29	3	.094	1.219	-.977
30-34	4	.12	1.139	-1.531
35-39	5	.162	1.739	-3.592
40-44	6	.27	3.454	-21.497
45-49	7	-	-	-

Source: United Nations, (1983), pp. 34

An example on the computation of w(3) and f(3) is shown below;

$$w(3) = x(3) + y(3)f(3)/Q(7) + z(3)f(4)/Q(7)$$

$$= 0.094+(1.219)(0.226049)/4.536999 +(-0.977)(0.160081)/4.536999$$

$$= 0.106057$$

$$f+(3) = [1-w(2)]f(3) + w(3)f(4)$$

$$= (1-0.105053)(0.226049) + (0.106057)(0.160081)$$

$$= 0.219280$$

age groups. As a result a mean of all the P/F ratios is used as the adjustment factor, K. Thus K is computed using the equation;

$$K = [\sum_{i=1}^{7} P(i)/F(i)]/7$$

$$= (2.039909+1.808586+1.647221+1.479699+1.401716+1.374759+1.339233)/7$$

$$= 1.534446$$

The K factor is then used to adjust f+(i) to f* as follows;

$$f^*(i) = Kf+(i)$$

where f*(i) is the adjusted age specific fertility rate of women in age group i.

Thus,

$$f^*(3) = Kf^+(3)$$
$$= (1.534446)(0.219280)$$
$$= 0.347437$$

The values of all $f^*(i)$ are shown in Table 2.4. These values can be multiplied by the FPOP to get adjusted births to women of each age group. The total fertility rate (TFR) is obtained by summing the values of $f^*(i)$ and multiplying by 5 as shown below;

$$TFR = 5\sum_{i=1}^{7} f^*(i)$$

$$= 5(0.222562+0.352543+0.347437+0.244742+0.159766+0.065908+0.044765)$$

$$= 7.188633$$

Thus the TFR for Matuga division of Kwale district is 7.2 children per woman.

2.1.3: <u>Discussion of Results</u>

Table 2.5 shows the TFR in Kwale District by division. According to the results, TFR is highest in Kubo (8.0) followed by Kinango's TFR and Msambweni has the lowest TFR (6.9). The high TFR in Kubo could be due to the fact that the division had no urban influence by 1979, the population was basically rural. Msambweni seems to have the lowest TFR. This may be because of under-reporting of children ever born and children born in the last twelve months before the enumeration or survey. As expected, the TFR of the rural women is higher than that of their urban counterparts in all the divisions (Table 2.6). However, the TFR for urban in Kinango (7.4) is higher compared to those of Matuga and Msambweni (6.5 and 6.2 respectively). This is largely due to the small proportion of the Kinango urban women. We should note that the average TFR by division is the same as the TFR for rural populations, probably because the population of Kwale district is largely rural. When TFR is considered according to the marital status of the women, the never married women have the lowest TFR in all the divisions.

Table 2.6: TFR by Residence, Marital Status, and Education Differentials and division in Kwale District

	Matuga	Kubo	Kinango	Msambweni
Average	7.2	8.0	7.7	6.9
Residence:				
Urban	6.5	N/A	7.4	6.2
Rural	7.2	8.0	7.7	6.9
Marital Status:				
Single	4.3	5.8	5.0	4.5
Married	7.4	7.9	7.6	7.3
Widowed	5.8	9.3	7.3	5.2
Div./Sep.	5.6	5.8	6.0	5.0
Education:				
None	7.5	8.1	7.7	6.9
Primary	8.0	8.1	7.4	7.8
Secondary and above	3.2	6.9	7.1	2.8

(Div./Sep. stands for divorced and separated and N/A for not applicable).

Married women have generally the highest TFR in all the divisions except in Kubo where the widowed take the lead (Table 2.6). This may be as a result of the very small proportion (about 3%) of the widowed and severe under-reporting of CEB and children born in the last one year, resulting in an over-estimation of TFR. The divorced and separated have a fairly similar TFR (between 5.0 and 6.0) in all the divisions. Their fertility follows a trend similar to the single mothers whose TFR ranges from about 4.0 to 6.0. We can therefore conclude that fertility of married women is higher followed by the widowed, then divorced and separated, and lastly single.

The TFR of women who have at least primary education is generally higher than for women with other levels of education considered (Table 2.6). This conforms with the findings of other researchers, who have found that TFR falls drastically with higher educational levels (Henin, 1979; Osiemo, 1986). The TFR of those with no education and those with primary level of education seem to be equal but this is caused by rounding up of figures, otherwise there is a slight difference conforming with our expectations. The very small TFR exhibited by women educated up to secondary level and above in Matuga and Msambweni can be attributed to the under-reporting of CEB and the small proportion of women with secondary education. Kubo and Kinango seem to have a fair picture of what is expected, taking into account the low level of education of women in Kwale district as a whole

2.2: ESTIMATION OF THE MEAN CLOSED BIRTH INTERVAL

The adjusted TFR calculated in section 2.1 is used in this section to estimate the mean closed birth interval (MCBI). The formulations of age at first birth and age at last birth were recently derived by Horne and Suchindran (1984). For the mean age at first birth (MAFB) we have;

$$MAFB = \frac{15-50\exp(-TFR) + 5\sum_{i=1}^{7}\exp[-TFR(Xi)]}{1-\exp(-TFR)} \qquad \ldots\ldots\ldots\ldots(1)$$

where Xi is the mid-point of the ith age interval, and TFR(Xi) is the cumulative fertility from age 15 upto age Xi.

In terms of age specific fertility rates;

$$TFR(17.5) = 0 + 2.5m1$$

$$TFR(22.5) = 5m1 + 2.5m2$$

$$TFR(27.5) = 5(m1+m2) + 2.5m3$$

$$\vdots$$

$$TFR(47.5) = 5(m1+m2+m3+.....+m6) + 2.5m7$$

where mi (i=1,2,3,4.5,6,7) is the age specific fertility rate for the ith age interval and is constant within that interval.

In general

$$TFR(Xi) = 5 \sum_{i=1}^{Xi} mi + 2.5mi$$

The formula used in the calculation of the mean age at last birth is;

$$MALB = \frac{50 - 15\exp(-TFR) - 5 \sum_{i=1}^{7} \exp -[TFR-TFR(Xi)]}{1 - \exp(-TFR)} \quad ....\{2\}$$

where TFR-TFR(Xi) is the cumulative age specific fertility rate from age Xi onwards to the last age for which childbearing is possible.

To calculate the mean closed birth interval (MCBI), the following formula is used:

$$MCBI = \frac{MALB - MAFB}{TFR-1}$$

where MALB is the mean age at last birth and, MAFB is the mean age at first birth.

The data required by the above method are the age specific fertility rates of the female population by five-year age groups.

2.2.1: Computational Procedure

The main features of formulae 1 and 2 to be calculated are TFR(Xi) and exponent of its negative ; TFR-TFR(Xi) and the exponent of its negative and the exponent of negative TFR. For the illustration of the estimation of MCBI the 1979 data set for Kinango division in Kwale district in Table 2.7 is be used.

Step 1: Estimation of cumulative fertility rate upto age Xi [TFR(Xi)]

TFR(Xi) is estimated by cumulating the adjusted age specific fertility rates [f*(i)], upto the age group immediately below the age group to which Xi belongs, multiplying by 5 and adding 2.5 multiplied by the f*(i) in the age group to which Xi belongs. That is;

$$TFR(X_i) = \left[5\sum_{i=1}^{i-1} m_i \right] + 2.5m_i$$

For example in the age group 30-34, i=4:

$$TFR(X_4) = 5\sum_{i-1}^{3} m_i + 2.5m_4$$

$$= 5(0.198992 + 0.36517 + 0.344198) + 2.5(0.258925)$$

$$= 5.189112$$

The TFR(Xi) values are fully shown in Table 2.7.

Step 2: *Estimation of the exponent of negative TFR(Xi)*

The exponents of the values obtained in step 1 are estimated in this step. For age group 30-34, exp[-TFR(Xi)] will be:

$$\exp[-TFR(X4)] = \exp(-5.189112)$$

$$= 0.005576$$

Values of exp[-TFR(Xi)] are shown in Table 2.7.

Step 3: <u>Estimation of the cumulative age specific fertility rates from age Xi to X7</u>

To obtain TFR-TFR(Xi), the difference between TFR and TFR(Xi) is calculated. For age group 30-34, TFR-TFR(Xi) is:

TFR-TFR(X4) = 7.65441 - 5.189112

= 2.465298

Values of TFR-TFR(Xi) are shown in Table 2.8.

Step 4:<u>Estimation of the exponent of negative TFR-TFR(Xi)</u>

The exponent of negative TFR-TFR(Xi) is estimated here. Thus for age group 30-34:

exp -[TFR-TFR(X4)] = exp(-2.465297)

= 0.084983

The values of exp -[TFR-TFR(Xi)] are shown in Table 2.8.

Table 2.7: Age Specific Fertility Rate [f*(i)], TFR(Xi), and exp[-TFR(Xi)]

Age Group	Index	Xi	f*(i)	TFR(Xi)	exp [-TFR(Xi)]
15-19	1	17.5	.198992	.49748	.608061
20-24	2	22.5	.36517	1.907885	.148393
25-29	3	27.5	.344198	3.681305	.02519
30-34	4	32.5	.258925	5.189112	.005576
35-39	5	37.5	.198968	6.333845	.001775
40-44	6	42.5	.103527	7.090082	.000833
45-49	7	47.5	.061102	7.501655	.000552
SUM			7.65441		.79038

Table 2.8: Age Specific Fertility Rate [f*(i)], TFR-TFR(Xi) and exp-[TFR-TFR(Xi)]

Age Group	Index	Xi	f*(i)	TFR-TFR(Xi)	exp-[TFR-TFR(Xi)
15-19	1	17.5	.198992	7.15693	.000779
20-24	2	22.5	.36517	5.746525	.003193
25-29	3	27.5	.344198	3.973105	.018814
30-34	4	32.5	.258925	2.465297	.084983
35-39	5	37.5	.198968	1.320565	.266984
40-44	6	42.5	.103527	.564327	.568742
45-49	7	47.5	.061102	.152755	.858339
SUM			7.65441		1.801838

Step 5: <u>Calculation of MAFB and MALB</u>

Substituting for TFR, exp[-TFR(Xi) and exp-[TFR-TFR(Xi) in formulae 1 and 2 the values of MAFB and MALB are estimated as follows:

$$MAFB = \frac{15-50[\exp(-7.65441)] + 5(0.79038)}{1 - \exp(-7.65441)}$$

$$= \frac{15-50\ (0.000474) + 3.951913}{1 - 0.000474}$$

$$= 17.95678$$

$$MALB = \frac{50-15\ (0.000474) - 5(1.801838)}{1 - 0.000474}$$

$$= 40.98653$$

Step 6: <u>Calculation of the mean closed birth interval (MCBI)</u>

Using formula 3 the MCBI for Kinango can be computed as:

$$MCBI = \frac{40.98653 - 17.95678}{7.65441 - 1}$$

$$= 3.47343$$

The MCBI of women in Kinango in Kwale district is 3.5.

2.2.2:Discussion of Results

In general, women in Kwale experience long mean closed birth intervals with the shortest being 3.3 years and the longest being 3.7 years. Birth intervals range from 2.4 for widowed women in Kubo and 4.8 for single women in Kinango. When birth interval is analysed according to the education differential, it is found that there is no major difference in birth interval by educational attainment (Table 2.9). With the exception of Matuga, urban women seem to experience long birth intervals. However, this conclusion could be biased because of the small number of urban women in all the divisions and Kwale district as a whole (about 6%, CBS (1979).

Table 2.9: The Mean Closed Birth Interval (MCBI) in years by Marital Status, Education, Residence and Division in Kwale, 1979

	Matuga	Kubo	Kinango	Msambweni
Average	3.5	3.3	3.5	3.7
Marital Status:				
Single	4.6	4.0	4.8	4.3
Married	3.6	3.5	3.6	3.6
Widowed	4.0	2.4	3.3	4.3
Div./Sep.	4.1	4.2	4.1	4.1
Education:				
None	3.5	3.4	3.5	3.7
Primary	3.5	3.0	3.4	3.6
Secondary and above	2.7	2.8	2.9	4.0
Residence:				
Urban	3.5	3.3	3.5	3.7
Rural	2.8	N/A	3.6	3.9

(N/A stands for not applicable).

2.3: BRASS TECHNIQUE OF ESTIMATING CHILD MORTALITY RATES

This method was developed by Brass (1964). It involves converting proportions dead of children ever born reported by women in age intervals 15-19, 20-24 and 25-29 into estimates of the probability of dying before attaining certain exact childhood ages, q(x), which is the probability of dying between birth and exact age x. The equation for estimating q(x) takes the form:

$$q(x) = K(i)D(i) \qquad (1)$$

where K(i) is the multiplier that adjusts for non-mortality factors determining the value of D(i), and D(i) is the proportion of children dead to women in age group i.

This method is based on the fact that there exists a relationship between the proportin of children dead, D(i) and a life table mortality measure, q(x). This relationship is influenced by the age pattern of fertility as the pattern determines the distribution of the children of a group of women by length of exposure to the risk of dying. Trussell (1975) developed a set of multipliers using data generated from the model fertility schedules developed by Coale and Trussell (1974). Trussell's variant is thus used in this study as it is based on a wider range of cases, the most important assumption in using this method being that fertility and mortality have remained constant in the recent past (United Nations, 1983, ch. 3 pp).

2.3.1: Data Required

(a) The number of children ever born (CEB), classified by five-year age group of mother.

(b) The number of children dead or surviving (CD), classified by five- year age-group of mother.

(c) The total number of women in each five-year age group (FPOP).

2.3.2: Computational Procedure

Step 1: Calculation of average parities [P(1), P(2), P(3)] and proportions of children dead, D(i).

The average parities P(i) in this section are calculated in the same way as in section 2.1.2, step 1. the proportion of children dead, D(i) is the ratio of reported children dead to reported CEB, and is represented mathematically as;

$$D(i) = CD(i)/CEB(i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\{2\}$$

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

Table 2.10: Children Ever Born, CEB and Children Dead, CD by Five -year Age Group of Mother for Kubo Division in Kwale District-1979

Age Group	Index	FPOP	CEB	CD
15-19	1	2121	1180	119
20-24	2	2178	4846	520
25-29	3	1858	7344	912
30-34	4	1468	7234	1048
35-39	5	1140	6348	1063
40-44	6	868	5075	581
45-49	7	736	4318	950

Using data obtained from 1979 cencus for Kubo division in Kwale district in Table 2.10 the proportion of children dead to women in age group 25-29, D(3) will be;

$$D(3) = CD(3)/CEB(3)$$
$$= 912/4240$$
$$= 0.215094$$

The other values of P(i) and D(i) are fully shown in Table 2.11.

Table 2.11: Average Parity, P(i) Proportion dead, D(i) Multipliers, K(i) and q(x)

Age Group	Index	P(i)	D(i)	K(i)	q(x)	Parameter Estimated
15-19	1	.411728	.176557	.605528	.10691	q(1)
20-24	2	2.079494	.18578	1.007883	.187245	q(2)
25-29	3	3.865086	.215094	.960368	.206569	q(3)
30-34	4	5.511848	.225279	.942157	.212248	q(5)
35-39	5	6.494905	.238233	.946973	.225601	q(10)
40-44	6	7.134099	.156015	.9305	.145172	q(15)
45-49	7	7.634615	.265883	.925288	.246018	q(20)

Step 2:<u>Calculation of the multipliers, K(i)</u>

Using the Coale and Demeny `West' model life table set of Trussell's coefficients in table 2.12, the multipliers K(i) that are used to adjust the observed proportions dead, D(i) for the effects of the age pattern of childbearing are calculated from the ratios P(1)/P(2) and P(2)/P(3), by applying the following equation;

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

where a(i), b(i) and c(i) are the Trussell's coefficients for each age group, i.

K(2) would thus be;

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

$$= 1.2563 + (-0.5381)\ 0.411728/2.079494 + (-0.2637)\ 2.079494/3.865086$$

$$= 1.007883$$

Other values of K(i) are shown in Table 2.11.

Table 2.12: Coefficients for Estimation of Child Mortality Multipliers, Trussell's Variant - West Mortality Model

Age Group	Index	a(i)	b(i)	c(i)
15-19	1	1.1415	-2.707	.7663
20-24	2	1.2563	-.5381	-.2637
25-29	3	1.1851	.0633	-.4177
30-34	4	1.172	.2341	-.4272
35-39	5	1.1865	.308	-.4452
40-44	6	1.1746	.3314	-.4537
45-49	7	1.1639	.319	-.4435

Source: United Nations, 1983, pp. 77

<u>Step 3: Calculation of q(x)</u>

The probability of dying between birth and exact age x, q(x), is the product of an observed proportion of children dead among the children ever born, D(i) and the corresponding multiplier K(i) as represented by equation 1. Thus q(5) is calculated as;

$$q(5) = K(4)D(4)$$

$$= (0.942157)(0.225279)$$

$$= 0.212248$$

The values of q(1), q(2), q(3), q(5), q(10), q(15) and q(20) are shown in Table 2.11.

2.3.3: Discussion of Results

Generally, in the divisions mortality tends to be increasing by age, Table 2.13. For example, in Matuga q(2) is 148; q(3) 179 and q(5) 201 per 1000. On the whole, Kinango has the highest q(2), q(3) and q(5) values among all the divisions (204, 213 and 231 per 1000 respectively). Kubo and Msambweni have almost the same levels of q(2), q(3) and q(5) whereas Matuga has the lowest values of q(x).

Table 2.13: Mortality Rates for Kwale by Residence and Division - 1979.

Division		q(2)	q(3)	q(5)
Matuga				
	Average	148	179	201
	Urban	79	103	161
	Rural	151	182	202
Kubo				
	Rural only	187	206	212
Kinango				
	Average	204	213	231
	Urban	106	143	186
	Rural	207	215	232
Msambweni				
	Average	187	198	211
	Urban	149	180	166
	Rural	189	199	214

Child mortality rates in the rural areas exceed by a large margin that of the urban population. For example, q(2) among the rural population in Matuga is 151 per 1000 whereas that of the urban population is about half this figure (Table 2.13). The same pattern persists for Kinango and Msambweni. However, in the case of Msambweni the q(5) of the urban population is less than their q(3). This could be due to the gross under-reporting of CEB, CD and again the small proportion of women living in the urban areas.

Increase in the level of education of women has a negative effect on child mortality at all ages in Kwale district. This observation is in line with the findings of various researchers (Kibet, 1981; Kichamu, 1986; Mosley et al, 1982). The zero value of q(5) in Kubo may also be attributed to under-reporting and misplacement of deaths. However, the increase of mortality with age is not consistent, for example, q(2) for children of women with primary education in Matuga is higher than q(3) of the same; 139 and 127 per 1000 respectively (Table 2.14).

Table 2.14: Mortality Rates for Kwale by Education and Division - 1979

Division		q(2)	q(3)	q(5)
Matuga				
	None	150	190	204
	Primary	139	127	157
	Secondary and above	70	50	37
Kubo				
	None	197	217	227
	Primary	139	148	88
	Secondary and above	62	102	0
Kinango				
	None	270	218	235
	Primary	149	143	109
	Secondary and above	57	73	88
Msambweni				
	None	196	208	212
	Primary	150	149	159
	Secondary and above	73	75	92

There is no discernible pattern of child mortality that emerges when analyses are done according to the marital status differential (Table 2.15). In Matuga and Kubo the married women experience the highest child mortality rates, q(2), followed by the divorced and separated in Matuga and the single in Kubo. The widowed experience the least q(2) of 35 and 91 per 1000 in Matuga and Kubo respectively. The pattern is completely different in Kinango and Msambweni. The single experience the lowest q(2) in Kinango, followed by the married, the widowed and the divorced and separated. On the other hand, in Msambweni q(2) is lowest among children of the married women, the single, the divorced and separated and lastly the widowed with q(2) of 216 per 1000.

Table 2.15: Mortality Rates by Marital Status and Division in Kwale, 1979.

Division		q(2)	q(3)	q(5)
Matuga				
	Single	78	198	311
	Married	134	173	190
	Widowed	35	357	227
	Div./Sep.	119	173	175
Kubo				
	Single	125	188	166
	Married	172	200	201
	Widowed	91	237	226
	Div./Sep.	116	201	291
Kinango				
	Single	113	217	229
	Married	189	211	228
	Widowed	202	243	251
	Div./Sep.	213	205	208
Msambweni				
	Single	156	173	193
	Married	111	194	209
	Widowed	216	183	260
	Div./Sep.	168	222	175

TFR in Kwale is quite high, coupled with relatively long average birth intervals one would expect that child mortality would be relatively low, however this is not the case as can be seen in appendix 1.1a and 1.1b. For example in Msambweni, the rural women with a birth interval of 3.7 experience very high q(2) values of 189 per 1000. Simple correlation analysis of the MCBI and q(2) values show that there is a weak negative (-0.358,significant at 0.05) relationship exists between these variables even from the scanty data. It is therefore necessary to find out if there are other factors other than birth interval that affect infant/child mortality in Kwale and specifically Mkongani, Mwaluphamba and Puma locations for which data is available. This is thus the objective of chapter III.

CHAPTER THREE

THE EFFECT OF BIRTH INTERVAL ON CHILD SURVIVAL

3.0: INTRODUCTION

In chapter two we established that even when using the indirect methods of estimating birth interval and child mortality, there is a negative relationship between the two variables. As birth interval increases, child mortality [q(2)] decreases. This chapter investigates further the relationship between mortality and fertility using the Child Survival and Development (CSD) Baseline Survey (1987).

This chapter are the operational definition of variables, a description of the method of analysis and the discussion of results. Ordinary least square (OLS) regression is used to examine the hypothesized relationship.

3.1: METHODOLOGY OF DATA ANALYSIS

The CSD Baseline Survey (1987) data enable us to make a detailed analysis of the sequence of births, deaths and conceptions of different siblings and to identify for each child individually such characteristics as the length of previous and subsequent birth intervals, sex, age of mother at birth, survival status of the previous sibling, socio-economic and enviromental conditions. Only closed intervals (intervals that began and ended in a live birth) are included in the analysis.

The original data base file contained information on 3835 women of childbearing age with at least one live birth, occurring after 1979. After the exclusion of stillbirths and children born less than one month before the date of interview, 7198 children remained in the sample for analysis. For neo-natal mortality analysis, 7198 index children were included, 6334 for the post-neonatal and 3201 for childhood mortality analysis. In comparision with the 1979 census data there is a marked reduction in child mortality, q(2) from 198 to 124 per 1000 live births, using the indirect estimation techniques for the pilot locations.

3.1.1. : Methodological Problems in the Estimation of the Effect of Birth Interval on Infant and Child Mortality

The verification of the hypotheses we have formulated requires the resolution and assumption of a host of methodological difficulties. These problems include:

(a) Spurious relations. Spuriousness between birth interval and other variables such as age of mother at birth of the child, birth order, breastfeeding duration and socio-economic variables have been shown to distort the effect of birth interval on mortality if left uncontrolled (Palloni and Tienda, 1986, Gray, 1981; Federeci and Terrento, 1980). The variables are related to the length of birth interval and simultaneously exert independent effects on death risks of children (Palloni and Tienda, 1986).

(b) Reverse causality. (i) In the assessment of the length of the previous birth interval on the death risks of the index child, it is important to identify the factors affecting both the death risks of the child initiating the interval and its rapid closure by the index child. Only then can one be able to recognise the underlying causal mechanisms. For example, short birth intervals might be the result of voluntary termination of breastfeeding along with non-use of contraception, or early death of full-term births, or the high incidence of premature births with increased risks of neonatal mortality. For a population with short intervals caused by voluntary cessation of breastfeeding with non-use of contraception one might assume an increased risk to the preceding child of a pair (Winikoff, 1983). In the sample, the early onset of regular supplementation resulting in reduction of the intensity of breastfeeding and the introduction of nutritionally inadequate and contaminated foods may be the cause of short birth intervals. The introduction of supplements reduce breastfeeding intensity and consequently the length of post-partum ammenorrhea. In addition, the intake of unhygienically prepared foods, low in nutrients, exposes the first child of a pair to higher risks of mortality. However, due to maternal depletion, the second child of a pair is also at the risk of mortality (Pebley and Stupp, 1987).

The higher incidence of foetal loss (both reported and unreported) and temporary involuntary sterilisation may be the cause of exceptionally long birth intervals with a high risk of death to the child whose birth closes such an interval. Such a feature distorts the effect of long previous birth intervals on mortality downwards.

(ii) In certain instances short birth interval is the result of the death of an index child and not the reverse. If the index children to be considered for analysis at any age segment are not properly defined, simultaneity baises are introduced in the results, exaggerating the effects of the subsequent birth interval. The death of the index child may also be the cause of cessation of lactation and not otherwise. To this end, conditions in the utero that precipitate death immediately after birth, foetal growth deficiencies and immaturity can inhibit the initiation of breastfeeding to any degree. Because of the extra risk of death to these index children, the relationship between breastfeeding and mortality can be heavily distorted.

3.1.2 Limitations

i) Our data do not include information on the ages at death of previous children. It is therefore difficult to ascertain whether the index child was born before or after the death of the previous sibling and whether it occurred in infancy or after. Thus, we assume that the death of the previous sibling, regardless of the age at which it occurred, reduces the survival chances of the index child.

ii) Breastfeeding duration information is available for last born children only. In order to avoid having a very small proportion of the sample in the models including breastfeeding information, we have included those last born children who were still breastfeeding at the time of the interview so long as they had breastfed to the lower bound of an age segment.

iii) The length of the previous and subsequent birth intervals is not defined for certain children. In our data the previous birth interval is not defined for first borns and for children whose previous siblings were born before 1980. The subsequent birth interval is not closed for most children and for some it will never be closed.

iv) Lack of facilities and time have prevented us from exploring the hypothesized relationship using other methods such as the logit or the hazard regression models.

3.1.3: Ordinary Least Square Regression

A linear regression model is used in the estimation of the individual contributions of both the previous and subsequent intervals to the age specific probability of dying of the index children. The model is of the form:

$$Y_i = B_0 + B_1 X_{i1} + B_2 X_{i2} + \ldots + B_k X_{ik} + E_i \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $i=1, 2, 3, \ldots\ldots n$; $B_0, B_1 \ldots B_k$ are the unknown coefficients or parameters; and $X_{i1}, X_{i2} \ldots X_{ik}$ are the K characteristics of the ith individual. The unknown coefficients are estimated using the least square method. The testing of their significance is based on the T-test and the analysis of variance. The regression equations from this linear model gives more conservative estimates of significance than a logit model would.

Three series of regressions are carried out for the post-neonatal (1-11 months) and childhood (12-47 months) mortality analysis. For neonatal period, only two regressions are done because breastfeeding is assumed to be universal at this age segment, for this population, therefore analysis including duration of breastfeeding is excluded. The first and the second series have as their dependent variable the age-specific probability of dying of all index children for whom the previous interval is closed. The difference between the two regressions is that breastfeeding information is included in the first but omitted in the second. In the third series of regressions the dependent variable is the age-specific probability of dying of all index children for whom the subsequent interval is closed, information on breastfeeding duration is also excluded. Table 3.1 shows the definition and distribution of the variables used in the analyses. All variables are operationalized as dummy variables. The spurious relation between the length of the previous interval and the death of the index child, if the prior interval is shortened by the previous child's death and if the chances of dying for all children in a family are correlated, is dealt with by taking into account the survival status of the previous sibling. The effects of the death of a previous sibling on the mortality risk of the index child cannot be defined clearly from our data set because there is no information on the age at death of the former.

Table 3.1: Definitions and Distribution of Variables Used in the Analysis By Type.

Variable Type and Name	Operational Definition	Mean or Percentage	Explanation
Dependent Mortality	Dummy variable coded 1 if index child died during a specified age segment, 0 otherwise	9.4 Months	The specific age segments in months are 0, 1-11 and 12-47
Independent Variables 1. Previous Interval	A set of two dummy variables capturing the following categories P-interval 1=0-18 Months P-interval 2= 19-24 P-interval 3= 25+ Months	 9 21 70	P-interval is the omitted category.
2. Subsequent Interval	A set of two dummy variables capturing the following categories S-interval 1=0-18 Months S-interval 2=19-25 Mths S-interval 3=25+ Months	 9 20 71	S-intervall is the omitted category.
Controls a) Behavioural 1. Breast-feeding	Dummy variables coded 1 if child was breastfed upto lower bound of age segment, x, 0 otherwise	21.8 months	Available for last born children.
2. Age at start of supple-mentation	A set of two dummy variables capturing the following categories Suppl-1 =1-3 months Suppl-2 =4-6 months Suppl-3 =6+ months	 45 48 7	Available for 95% of the children. Suppl-1 is the omitted category. Monitors the effects of breast-feeding intensity on mortality.
b) Demographic 1. Previous sibling mortality	Dummy variable coded 1 if previous sibling died, 0 otherwise		The variable serves as a control for

Table 3.1 (continued)

	Alive Dead	84 17	influences on mortality due sibling deaths.
2.Sex of child	A set of dummy variables capturing the two sex categories Male Female	 51 49	The variable serves as a control for sex differences in mortality. Male is the omitted category.
3. Parity	A set of two dummy variables capturing the following categories Parity-1 = first births Parity-2 = 2nd- 4th births Parity-3 = 5th or higher births	 19 43 39	The variable reduces the distortion on P-interval due to first births and serves as a control for influences on mortality control for due to birth order. Parity-1 is the omitted cotegory.
4. Marital Status	A set of 2 dummy variables capturing the following categories Marital-1 = single, Divorced, Separated and Widowed Marital-2 = Married (monogamous) Maritual-3 = Married (polygamous)	 10 55 35	Serves as a control for effects of marital status on mortality. Marital-1 is the omitted category.
5.Age of mother at birth of child	A set of 2 dummy variables capturing the following categories Mage1= 19 or less years Mage2= 20-29 years Mage3= 30+ years	 15 56 29	Monitors selection problem age resulting from age bounds of of mothers in the survey and the association

Table 3.1 (continued)

			of age at birth with breast-feeding and mortality. Magel is the omitted category.
c) <u>Socio-Economic</u> Education of Mother	A set of dummy variables capturing the following categories Educf1= No education Educf2= Madrasa / Adult literacy Educf3= Some formal education	 73 12 16	Act as a proxy for mother's knowledge of health and child care practices. Educf1 is the omitted category.
2. Education Spouse	A set of dummy variables capturing the same categories as above Educm1 Educm2 Educm3	 48 18 26	Acts as a proxy for the socio-economic status of the family. Educm1 is the omitted category.
3. Religion	A set of dummy variables capturing the following categories Relig1= Islam Relig2= Christian Relig3= Other or	 75 15	Proxy for religious differences in child-bearing practices and beliefs is the omitted category.
4. Ethnicity	A set of dummy variable capturing the following categories Tribe1= Duruma Tribe2= Digo Tribe3= Kamba / Massai / others	 63 26 11	Proxy for the socio-cultural differences in child care practices as they affect mortality. Tribe1 is

Table 3.1 (continued)

			the ommited category.
5. Location of residence	A set of dummy variables capturing the following categories Loc1= Mkongani Loc2= Mwaluphamba Loc3= Puma	 31 33 36	Proxy to access to community resources and agricultural productivity of land. Locl is the omitted category.

A short subsequent interval, as a result of the death of the index child, is controlled for by excluding all children who were not exposed to the risk of death at least up to the lower bound of an age segment, x. To avoid problems of reverse causality for the length of the subsequent birth interval, the subsequent birth must occur before the beginning of the age interval in question in order to be counted. For an index child to contribute to the risk of dying in age interval, it must have survived to the beginning of that interval.

The duration of breastfeeding for post-neonatal is included in the analysis for last borns as it plays a crucial role in child survival, especially when sanitary conditions are poor. Any child who has been breastfed to the beginning of an age segment is included in the analysis involving the last borns for that age interval. During the interviews, mothers were asked the method of feeding they were using for their last children. (see Appendix 1.0). Their response made it possible to determine the intensity of breastfeeding among the population. About 10% of the women fed the children on breastmilk only at the time of the interview, compared to 58% who breastfed with supplementation. We have thus included the age at the start of regular supplementation in the analysis to measure the degree of breast-feeding and to serve as a proxy for the exposure to risk of infection and its influence on child mortality.

Maternal age at birth of the index child, birth order and marital status have a direct and indirect impact on the length of birth intervals. These variables are included in the analysis as explanatory variables. In some communities the sex of a child is directly linked to its survival (Scrimshaw, 1975; Ruzicka and Kane, 1985). In addition, male children experience higher mortality rates, particularly during the neonatal period, than females because of physiological differences. To account for these differences, we have included the sex variable in the analysis with the male as the omitted category.

Maternal education in this study is used as an indicator of a mother's ability to utilise effectively the resources at her disposal to improve her children's survival chances. The education of the spouse acts as a proxy for the level of family income which determines to a great extent availability of and accessibility to resources.

We include three other variables that may affect the association between birth interval and child mortality. Religion and ethnicity are proxies for the socio-cultural differences in child care practices which also influence child survival. The location of residence variable is included to act as proxy for differences in the enviroment, climate, land productivity and provision of health services. Mkongani and Mwaluphamba locations are basically the same as both are situated in the most fertile region of Kwale Distict, Shimba Hills. Puma, on the other hand, is situated on the Hinterland which is dry, agriculturally unproductive, sparsely populated and with no health facilities. The location of residence is thus expected to contribute to the risk of mortality among the children.

3.2: RESULTS AND DISCUSSION

The results of the analysis are presented in this section in three parts. The first part examines the effect of birth interval on neonatal mortality; the second part is dedicated to the investigation of the impact of birth interval on post-neonatal mortality; and in the last part synthesis of the relationship between birth interval and childhood mortality.

3.2.1: The Effect of Birth Interval on Neonatal Mortality

Table 3.2 shows the coefficients of the variables entered for analysis with respect to neonatal mortality for the previous and subsequent birth intervals. Out of 23 variables entered in each case, four variables stood out as important predictors of neonatal mortality when examining the effects of the preceding birth interval. In the case of the subsequent birth interval, eight variables were significant.

The age of mother at birth of the child appears to be a very important predictor of neonatal mortality whether analysis are done for the previous or subsequent intervals. Children born to mothers who are aged 20 or more years experience less risk of mortality during the neonatal period in comparison to those of mothers aged 19 or less years. This risk is further reduced if the previous or subsequent birth interval length is above 18 months.

Being born to a mother who is married in a monogamous union reduces the risk of mortality during the neonatal period,

Table 3.2: Relationship between Neonatal Mortality and Birth Interval

Independent Variable	Coefficients For previous interval		Coefficients For subsequent interval	
Previous Interval				
P-interval2	-0.002	(0.211)	-	-
P-interval3	-0.009	(1.047)	-	-
Subsequent Interval				
S-interval2	-	-	-0.105***	(6.446)
S-interval3	-	-	-0.139***	(9.775)
Age at start of supplement				
Suppl-2	0.005	(1.206)	0.012	(1.400)
Suppl-3	0.014	(1.492)	0.032*	(1.814)
Survival of previous sib.				
PS	0.006	(0.950)	0.021*	(1.945)
Sex of child				
Female	-0.005	(1.138)	-0.010	(1.221)
Birth order				
Parity-2	0.037	(1.415)	0.074*	(1.743)
Parity-3	0.033	(1.25)	0.067	(1.559)
Marital status				
Marital-2	-0.026**	(2.084)	-0.058**	(2.309)
Marital-3	-0.019	(1.509)	-0.038	(1.464)
Maternal age at birth				
Mage-2	-0.369***	(3.535)	-0.060***	(3.217)
Mage-3	-0.383***	(3.205)	-0.064***	(3.023)
Education of mother				
Educf-2	0.003	(0.424)	0.009	(0.727)
Educf-3	-0.003	(0.371)	-0.020	(1.405)
Education of spouse				
Educm-2	0.024*	(1.749)	0.022	(0.795)
Educm-3	0.023	(1.633)	0.026	(0.959)
Religion				
Relig-2	0.004	(0.522)	0.014	(1.055)
Relig-3	0.001	(0.089)	0.001	(0.034)
Ethnicity				

Table 3.2: (continued)

Tribe-2	0.007	(1.252)	0.007	(0.642)
Tribe-3	0.007	(0.853)	0.005	(0.350)
Location of residence				
Loc-2	-0.003	(0.567)	-0.011	(0.988)
Loc-3	-0.010	(1.502)	-0.018	(1.518)
Constant	0.026	(0.894)	0.165 ***	(3.286)

Note: t-statistics shown in parentheses
* significant at < 0.10 level; ** significant at < 0.05 level;
*** significant at < 0.01 level.

relative to those of the single, divorced, separated or widowed mothers for analysis with the previous and subsequent intervals. This finding in part confirms our third hypothesis because single, separated, divorced and widowed mothers have less resources at their disposal than the married mothers whether in a monogamous or polygamous unions and consequently their children have a higher risk of mortality. This risk is more pronounced during the neonatal period.

If the education of a father is limited to the informal type (Madrasa and adult literacy) or some kind of formal education (primary and above) there seems to be an added risk of mortality in relation to children whose fathers have no education at all in both the analysis involving the previous or subsequent birth. However, this factor is not a significant factor except in the case of informal education for the analysis involving previous birth interval.

Previous birth interval length greater than 18 months is favourable to child survival at the neonatal period though not significantly. This lends support to our second hypothesis. The effect of subsequent birth interval seem to be very strong at the neonatal period, a finding which fails to support our fourth hypothesis. This may be as a result of effects of rapid childbearing on the mother (maternal depletion syndrome) adding higher mortality risk to the index child and not through cessation of breastfeeding and competition for resources as had been postulated.

Birth order 2-4 with subsequent birth interval of 19 months and above increase the likehood of death during the neonatal period in relation to first births. This is contrary to the findings of other researchers (Goldberg et al, 1984; Palloni and Tienda, 1986; Pebley and Stupp, 1987) who have shown that first and higher order births are at greater risk of death. This result further confirms that maternal depletion syndrome and general ill health of mothers in the population results in increased mortality among children of parity greater than one. However bivariant analysis carried out on the same data set (Boerma, 1989) reveals that neonatal mortality is quite high for first births, declines for second to sixth births and increases again for birth order seven or high. The female index has a higher chance of survival during the neonatal period than the male. In general, the subsequent birth interval has a very significant effect on neonatal mortality than previous birth interval which is not significantly related to neonatal mortality.

3.2.2: <u>Post-neonatal Mortality and Birth Interval</u>

Generally there is a lower risk of death to children born after previous intervals of 19 and above months in relation to those born after shorter intervals during the post-neonatal period,

Table 3.3: Relationship between the Post-neonatal and Birth Interval

Independent Variable	Coefficients: For previous interval with Bf		without Bf		Subsequent Birth interval	
Previous Birth Interval						
P-interval2	-0.023	(1.048)	-0.016	(0.991)	-	-
P-interval3	-0.022	(1.093)	-0.002	(0.138)	-	-
Subsequent Interval						
S-interval2	-	-	-	-	-0.127***	(5.622)
S-interval3	-	-	-	-	-0.168***	(8.558)
Age at start of supplement						
Suppl-2	-0.020*	(1.949)	-0.16*	(1.891)	-0.008	(0.633)
Suppl-3	-0.040**	(2.092)	-0.017	(0.973)	-0.011	(0.427)
Survival of previous sib.						
PS	0.004	(0.253)	0.013	(1.133)	0.037**	(2.501)
Sex of child						
Female	0.005	(0.499)	0.010	(1.197)	0.149	(1.226)
Birth order						
Parity-2	0.037	(0.617)	0.010	(0.235)	0.045	(0.768)
Parity-3	0.038	(0.618)	0.003	(0.074)	0.074	(1.236)
Marital status						
Marital-2	0.025	(0.995)	0.005	(0.237)	-0.031	(0.895)
Marital-3	0.033	(1.283)	0.190	(0.819)	-0.005	(0.139)
Maternal age at birth						
Mage-2	0.018	(0.762)	-0.014	(0.713)	-0.004	(0.181)
Mage-3	0.030	(1.098)	-0.020	(0.912)	-0.019	(0.650)
Education of mother						
Educf-2	-0.028	(1.861)	-0.019	(1.472)	0.018	(1.043)
Educf-3	-0.020	(1.256)	-0.015	(1.103)	-0.004	(0.212)
Education of spouse						
Educm-2	-0.046	(1.615)	-0.028	(1.098)	-0.027	(0.721)
Educm-3	-0.032	(1.144)	-0.015	(0.585)	-0.007	(0.176)
Religion						
Relig-2	0.016	(1.047)	0.025	(1.898)	0.025	(1.349)
Relig-3	0.005	(0.268	0.006	(0.390)	0.018	(0.845)

Table 3.3: (continued)

Ethnicity						
Tribe-2	0.022	(1.771)	-0.001	(0.065)	0.0004	(0.028)
Tribe-3	0.014	(0.770)	0.005	(0.293)	-0.008	(0.359)
Location of residence						
Loc-2	-0.003	(0.217)	0.005	(0.462)	-0.006	(0.397)
Loc-3	-0.006	(0.447)	-0.015	(1.298)	-0.016	(0.938)
Constant	0.014	(0.207)	0.091	(1.788)	0.191***	(2.762)

Note: t-statistics shown in parentheses
* significant at < 0.10 level; ** significant at < 0.05 level;
*** significant at < 0.01 level.

even though this relationship is not statistically significant (Table 3.3).

The removal of the breastfeeding variable from the second series analyses of post-neonatal mortality has an overall attenuating effect on the other variables including the previous interval variables. The age at which a child starts on regular supplementation seems to be a crucial factor at this age segment. Children who start on regular supplementation at the age of 4-6 months are less likely to die during infancy than those who start at 3 or less months. Those who start on regular supplementation at ages beyond six months are less likely to die in infancy. These results also support the hypothesis that the effect of breastfeeding is stronger at older ages, the lower the socio-economics status. Any form of education of the mother or father is favourable to child survival in this age segment as indicated by the direction of the coefficients. The sex of the index child does not favours female survival in comparision to male during the post-neonatal period. In the analysis involving the previous birth interval female children are more likely to survive than male, as has already been confirmed by other researchers (De Sweemer, 1984). The subsequent birth interval in the case of post-neonatal mortality is a very important predictor even in the absence of information on breastfeeding duration. Children whose subsequent interval were closed after 19-23 have a greater chance of surviving than those whose subsequent intervals were closed in less than 19 months. The death of the previous sibling regardless of the time it took place, increases the risk of dying of the index child.

In all the analyses of post-neonatal mortality the education of both father and mother increase the survival chances of the index child (statistically not significant). Maternal age of the birth of the index child is not strongly related to post-neonatal mortality.

In comparison to a child born to a mother of the Duruma tribe, a child born to a mother belonging to a Digo, Kamba, Maasai or any of the other tribes within the three location has a general positive effect on post-neonatal mortality.

3.2.3: Childspacing and Childhood Mortality

Table 3.4 shows the coefficients for the regression of childhood mortality and previous birth interval. The regressions with the subsequent birth interval for childhood mortality did not yield any significant relation between the dependent variable and any of the independent variables. This is due to the fitting of a linear model to a relationship which may not basically be linear. As was the case with post-neonatal mortality, the removal of

Table 3.4: Relationship between Childhood Mortality and Birth Interval

Independent Variable	Coefficients of regression with previous interval: With breastfeeding	Without breastfeeding
Previous Interval		
P-interval2	-0.752* (1.718)	-0.051 (1.492)
P-interval3	-0.742* (1.699)	-0.014 (0.424)
Breastfeeding		
Breastch	0.214 (0.575)	- -
Age at start of supplement		
Suppl-2	-0.220** (2.507)	-0.046** (2.258)
Suppl-3	-0.351** (2.563)	-0.080* (1.975)
Survival of previous sib.		
PS	-0.092 (1.029)	0.031 (1.314)
Sex of child		
Female	-0.119 (1.553)	-0.021 (1.585)
Birth order		
Parity-2	0.623 (1.098)	0.010 (0.114)
Parity-3	0.555 (0.984)	-0.017 (1.196)
Marital status		
Marital-2	0.041 (0.271)	-0.021 (0.410)
Marital-3	0.032 (0.205)	-0.048 (0.924)
Maternal age at birth		
Mage-2	0.241 (0.915)	0.015 (0.350)
Mage-3	0.107 (0.385)	0.013 (0.257)
Education of mother		
Educf-2	-0.096 (0.845)	0.020 (0.740)
Educf-3	0.341* (1.958)	-0.005 (0.153)
Education of spouse		
Educm-2	-0.120 (0.637)	0.004 (0.078)
Educm-3	0.097 (0.482)	0.011 (0.199)
Religion		
Relig-2	-0.257* (1.789)	-0.006 (0.181)
Relig-3	-0.044 (0.280)	0.001 (0.020)

Table 3.4 (continued)

Ethnicity		
Tribe-2	0.015 (0.165)	-0.009 (0.348)
Tribe-3	0.329* (1,969)	0.006 (0.150)
Location of residence		
Loc-2	-0.104 (1.047)	-0.051** (2.000)
Loc-3	-0.078 (0.672)	-0.035 (1.256)
Constant	0.193 (0.334)	0.149 (1.410)

Note: t-statistics shown in parentheses
* significant at < 0.10 level; ** significant at < 0.05 level;
*** significant at < 0.01 level.

breastfeeding duration from the analysis has an attenuating effect on all the variables including the constant.

Previous birth interval is an important predictor of childhood mortality when information on breastfeeding duration is included. Whether information on lactation is included or not the age at which supplementation commences is significantly related to childhood mortality. An inclusion of information on breastfeeding reduces the risk of mortality to the index child if the age at supplementation is greater than 4 months. One interesting observation is that relative to Islam, Christianity significantly reduces childhood mortality (religion was quite insignificant as a predictor in the other age segments). Belonging to the Kamba, Maasai or any other tribe increases significantly the risk of childhood mortality.

In general, previous birth interval greater than 18 months is a more important predictor of childhood mortality than at any other age segment, whereas the subsequent birth interval is an important predictor at the neonatal and post-neonatal periods and totally insignificant for childhood mortality. This finding contradicts, in part, the hypothesis that the previous birth interval affects pregnancy outcome and the effects peak early in life and recede as the index child ages. According to our results the previous birth intervals seems to be more important at older ages of the index child. his could be as a result of competion for resources, maternal care and other resources such as shelter and food

Even though the effects of the subsequent birth interval are expected to show only after three months of the birth of the index child, our results show that the subsequent birth interval also affects the index child during the neonatal period. This could be due to the effects of maternal depletion syndrome rather than of another close following conception.

CHAPTER IV

SUMMARY AND CONCLUSION

4.0: INTRODUCTION

The relationship between rapid childbearing and infant/child survival has been established in this study. The main aspects of this chapter are a summary of the research findings, conclusion and recommendations to policy makers and for further research.

4.1: SUMMARY

The main objective of this study was to examine the effect of the closed previous and subsequent birth interval on infant and child mortality of the index child. In order to realise this objective the study drew from two sources of data: the 1979 census data set for Kwale District and the Child Survival and Development (CSD) Baseline survey-1987 for Mkongani, Mwaluphamba and Puma locations in Kwale District. The 1979 data set was analysed using the Coale-Trussell technique of estimating total fertility rate, TFR; Horne's method of computing mean closed birth interval from adjusted TFRs; and the Brass-type method of estimating child mortality using Trussell's coeffients. The relationship between the q(2) and mean closed birth interval values were then investigated using correlation analysis.

The survey data were analysed using Ordinary Least Square (OLS) regression method to examine further the relationship between birth interval and infant/child mortality. The following are in brief the findings of the study.

Despite the weak correlation between the mean closed birth interval and child mortality, q(2), there is every reason to believe that birth intervals affect child mortality negatively. This has been confirmed by further analysis on the CSD Baseline Survey (1987) which has shown that birth interval affects infant/child mortality at the neonatal, post-neonatal or childhood periods.

The effect of the previous birth interval is strengthened when information on breastfeeding duration is included in the analysis. Long previous birth intervals (>18 months) are favourable to child survival, at least for this population, whether breastfeeding information is included or not, possibly because of maternal depletion, competition for maternal care and scarcity of other resources (De Sweemer, 1984; Millman and Cooksey, 1987; Palloni and Tienda, 1986). According to our findings, long previous birth intervals (> 18 months) are more favourable to survival of children during the childhood period (12-47 months). During the neonatal and post-neonatal periods long previous intervals have negative impact on infant mortality though these results were not statistically significant.

Interestingly, the subsequent interval is a significant predictor of neonatal and post-neonatal mortality yet, not significant for childhood mortality. This points to the fact that a long subsequent interval is an important aspect of child survival whether through maternal care or benefits of breastfeeding and its effects are reduced as the index child ages.

The effects of both the previous and subsequent intervals are felt more in conditions of scarce resources which also increaase the importance and the age at which supplementation commences.

4.2: CONCLUSION

From the findings we conclude, first, that birth interval is an important factor in determining infant/child mortality not only in Mkongani, Mwaluphamba and Puma locations but in the whole of Kwale District. Long previous birth intervals are favourable to survival at childhood while long subsequent intervals reduce the risk of mortality at infancy.

Second, the study has shown that when breastfeeding is removed from the analysis there is a reduction in the effect of all the independent variables (in the same direction) on the dependent variable.

Third, the age at which supplementation starts is a crucial determinant of child survival, at least in the three locations. Early age at start of supplementation is detrimental to child health and survival. In addition, maternal age at the birth of the child is an important factor to child survival especially during the neonatal period. Children born to mothers aged 19 and under are more likely to die as neonates in comparison to those born to older mothers.

In all the regressions involving previous birth interval, sex of the child and birth order were not significant at any age segment. Education of mother and of spouse, religion, ethnicity and location were also not significant in the regressions with subsequent interval. This is could be because the model fitted to the data, otherwise they may prove to be very important predictors of infant/child mortality if a better model is used.

4.3: RECOMMENDATIONS

Since birth interval, maternal age at birth of child and the age at which supplementation starts are important determinants of infant/child survival, we make the following recommendations for policy makers and further research. The findings are also useful to other organisations involved in family planning activities.

4.3.1: Recommendations for Policy Makers

Policies need to be formulated that would help to increase the length of intervals between births, the age at which supplementation begins and the age at first birth of mothers. Those entrusted with the responsibility of disseminating information on the advantages of child spacing need to be people who are well trained and are seen to practise family planning by having reasonable lengths of the birth interval between the children and small family sizes. The number of acceptors of modern methods of contraception in Kwale District is very low and with the rapid dissappearance of traditional norms governing child spacing and child care practices, there is need to intensify the campaign for family planning through education of parents and easy access to service delivery points.

Other than being well trained, people in close contact with mothers should always give coherent advice to avoid confusing mothers, especially in matters concerning child care. Given the low socio-economic status of the population, the age at which supplementation starts should be about 5 to 6 months other than the conventionally recommended 3 months. A delay in the age at supplementation would also imply a delay in the onset of malnutrition and exposure to agents of infection through contaminated foods which is to the advantage of child survival. If supplementation is inevitable, mothers should be shown how to hygienically prepare nutritionally balanced weaning foods. This involves conducting demonstrations to women at their homes, as most mothers hardly take their infants for regular monthly growth monitoring or for immunization at the available health facilities.

The district needs more health facilities especially in Puma Location and in other equally less developed locations within the district. Other than providing curative treatment to the community, preventive measures should be advocated through the Community Health Workers and a directive should come from the District Commissioner in connection with the construction of pit latrines (81 per cent of the sampled women had no pit latrines in their homes). The provision of clean water and increase in the number of health facilities should be given first priority by the District Development Committee (DDC).

The policy of free and compulsory education for all children up to the primary level, especially for girls, would give the new generation basic hygienic principles that would help alleviate the problem of infection as a result of living in an unhealthy environment. If funds allow, however, female education up to secondary level is highly recommended, as this might lead to the desire for small families.

Finally, if infant and child mortality rates are to be reduced to manageable levels in Kwale District, intersectoral approach between the various ministries concerned, non-governmental organisations, the DDC and self help groups would be of paramount importance. This kind of approach will provide a forum for exchange of ideas, co-operation and pooling together of resources for the achievement of one goal.

4.3.2: Recommendations for Further Research

There are various gaps of kwowledge that have not been explored by this study. These include:

(i) Investigating whether better results can be obtained if a an appropriate model is fitted to the data. A logit or a hazards model would be more appropriate methods of analysis for the same data set.

(ii) Determining the effects of the inclusion of environmental factors and the age at death of the previous sibling in the analysis.

(iii) Comparing results obtained when using reproductive variables (birth interval, birth order, parity and maternal age at birth) as the idependent variables and when reproductive, bio-demographic, enviromental and socio-economic variables are analysed together.

(iv) Examination of the effect of birth interval on the growth and mortality rates of children by including anthropometric measurements in the analysis.

(v) A similar kind of study is needed for those districts with high infant/child mortality in Kenya to provide a clear picture of the mechanisms through which factors that influence child survival work. This will also provide a basis for comparisons on the determinants of infant/child mortality between the districts so that appropriate approaches can be employed in solving this problem for each district.

APPENDIX 1.0

CSD BASELINE SURVEY - QUESTIONNAIRE

PART A: IDENTIFICATION

SUBLOCATION	
VILLAGE	
HOUSEHOLD NUMBER	
PERSON NUMBER	
DATE	8 7

CONFIDENTIAL

KWALE CHILD SURVIVAL
AND DEVELOPMENT
PROJECT 1987

Interviewer:
Checked: yes / no

PART B: RESPONDENT PARTICULARS (WOMEN AGED 15-44 YEARS)

NAME HEAD OF HOUSEHOLD:	
NAME RESPONDENT:	
RELATIONSHIP TO HEAD OF HOUSEHOLD	Head =1 Wife =2 Daughter =3 Other =4 None =5
AGE OF RESPONDENT (in completed years)	
RELIGION	Islam =1 Christian =2 Tradition.=3 Other =4
TRIBE	Duruma =1 Digo =2 Kamba =3 Other =4
MARITAL STATUS	Never married =1 Married monogamous=2 Married polygamous=3 Divorced/separated=4 Widowed =5
AGE AT FIRST MARRIAGE (years)	not married =00
NUMBER OF TIMES MARRIED	
HIGHEST LEVEL OF EDUCATION ATTENDED — RESPONDENT	None =1 Madrassa =2 Adult literacy =3 Standard 1-4 =4 Standard 5-8 =5 Form 1-4 =6 Higher =7 Don't know =8
HUSBAND	No husband =0
RESPONDENT STILL SCHOOLING	Yes =1 No =2

APPENDIX 1.0 (Cont.)

IF CHILD DIED (born 1980 or later)

AGE AT DEATH	DAYS	MONTHS	YEARS	
CAUSE OF DEATH	MOTHER:........................			
SYMPTOMS	Yes, less than few hours =1 Yes, 1-2 days =2 Yes, longer =3 No =4	Fever		
		Diarrhoea& vomiting		
		Cough		
		Skin rash		
		Chirwa		
		Mwadzulu		
		Short of breath		
		Convulsions		
		Small at birth		
	DIAGNOSIS			

AGE AT DEATH	DAYS	MONTHS	YEARS	
CAUSE OF DEATH	MOTHER:........................			
SYMPTOMS	Yes, less than few hours =1 Yes, 1-2 days =2 Yes, longer =3 No =4	Fever		
		Diarrhoea& vomiting		
		Cough		
		Skin rash		
		Chirwa		
		Mwadzulu		
		Short of breath		
		Convulsions		
		Small at birth		
	DIAGNOSIS			

AGE AT DEATH	DAYS	MONTHS	YEARS	
CAUSE OF DEATH	MOTHER:........................			
SYMPTOMS	Yes, less than few hours =1 Yes, 1-2 days =2 Yes, longer =3 No =4	Fever		
		Diarrhoea& vomiting		
		Cough		
		Skin rash		
		Chirwa		
		Mwadzulu		
		Short of breath		
		Convulsions		
		Small at birth		
	DIAGNOSIS			

APPENDIX 1.0 (Cont.)

LASTBORN CHILD (1982 or later)

PLACE OF BIRTH		Health facility=1 Home =2 TBA Home =3 Elsewhere =4	
BIRTH ATTENDANT		Health worker =1 TBA =2 Relative =3 Neighbour =4 Self =5 Other =6	
CHILD HEALTH CARD PRESENT		Yes =1 No =2	
IMMUNIZATION STATUS	Yes =1 No =2	BCG scar	
		DPT 1	
		DPT 2	
		DPT 3	
		Polio 1	
		Polio 2	
		Polio 3	
		Measles	
DISEASE SYMPTOMS YESTERDAY	Yes, 1 day =1 Yes, 2-3 days =2 Yes, 4-6 days =3 Yes, 1-2 weeks =4 Yes, 3-4 weeks =5 Yes, 1-2 months =6 Yes, 3 mo. or more=7 No =8 Not applicable =9	Diarrhea	
		Fever	
		Cough	
		Running nose	
		Skin problem	
		Worms	
		Blood urine	
		No appetite	
METHOD OF FEEDING		Breastfeeding only=1 Breastfeeding with liquids and solid foods =2 Bottle feeding =3 Breast and bottle =4 No breast or bottle=5	
IF NOT BREASTFEEDING NOW AT WHAT AGE OF THE CHILD WAS IT STOPPED (IN MONTHS)			
AGE OF CHILD AT WHICH REGULAR SUPPLEMENTATION WITH LIQUID OR SOLID FOODS APART FROM BREASTMILK STARTED (MONTHS)			

APPENDIX 1.0 (Cont.)

PART C HOUSEHOLD PARTICULARS

NUMBER OF PEOPLE IN HOUSEHOLD			
WATER SOURCE	DRY SEASON	Dam/pond =1 Spring =2 Well =3 Stream =4 Roof =5 Swamp =6 Borehole/pump =7 Tap =8 Other =9	
	WET SEASON		
DISTANCE TO WATER SOURCE (oneway, in minutes)	DRY SEASON	Less than 10 =1 10-29 =2 30-59 =3 60-89 =4 90 or more =5	
	WET SEASON		
LATRINE IN USE ON COMPOUND		Yes =1 No =2	
DISTANCE TO NEAREST HEALTH FACILITY (IN KM)			
OFF-FARM ACTIVITIES IN HOUSEHOLD		None =1 Casual labour =2 Self-employed =3 Temporary empl.=4 Employed =5	
NUMBER OF PEOPLE EMPLOYED BY HOUSEHOLD LAST YEAR		None =1 Irregular,few =2 Regular, few =3 Irregular,many =4 Regular, many =5	
WORKING RADIO PRESENT IN HOUSEHOLD		Yes =1 No =2	

PART D: BIRTH HISTORY AND CHILD HEALTH

NUMBER OF CHILDREN EVER BORN TO RESPONDENT	
NUMBER OF CHILDREN EVER DIED	

DETAILS OF MOST RECENT BIRTHS (1980 OR LATER)

NAME OF CHILD	SEX Boy =1 Girl=2	BIRTH DATE Month Year	SURVIVAL Alive=1 Dead=2	WEIGHT

APPENDIX 1.0 (Cont.)

PART E: MATERNAL HEALTH

PREGANT NOW	Yes =1 No =2
IF YES	
NUMBER OF MONTHS	
ATTENDS ANTENATAL CLINICS NOW	Yes =1 No =2
RECEIVED DRUGS DURING PREGNANCY	Yes, iron =1 Yes,chloroquin=2 Yes, other =3 Yes, don't know which =4 No =5
RECEIVED INJECTIONS AGAINST TETANUS	Yes, one =1 Yes, 2 or more=2 No =3
ANY ILLNESS DURING THIS PREGNANCY:	
IF NOT PREGNANT NOW	
FOR THE LAST COMPLETED PREGNANCY:DID YOU ATTEND ANTENATAL CLINICS	Yes =1 No =2
RECEIVE DRUGS DURING PREGNANCY	Yes, iron =1 Yes chloroquin=2 Yes, other =3 Yes, don't know which =4 No =5
RECEIVE INJECTIONS AGAINST TETANUS	Yes, one =1 Yes, 2 or more=2 No =3
MALARIA DURING LAST PREGNANCY	Yes =1 No =2
HEIGHT (in CM)	

APPENDIX 1.0 (Cont.)

PART F: KNOWLEDGE, ATTITUDE AND PRACTICES

DURING LAST ATTACK OF DIARRHEA OF YOUR CHILDREN	Increase fluids=1 Decrease fluids=2 Same fluids =3 Don't know =4 No diarrhea =5	
REASONS FOR IMMUNIZATION OF CHILDREN	Don't know why =1 Protect againts polio =2 Protect against measles =3 Protect against other dis.=4 Protect against polio and measles =5 Protect against polio and others =6 Protect against measles and others =7 Protect against measles, polio and others =8	
CAUSES OF BAD GROWTH OF CHILDREN	Don't know =1 Feeding =2 Diseases =3 Feeding and diseases =4 Spiritual or social only =5 Feeding and spiritual or social =6	
HOW TO SPACE BIRTHS	Don't know =1 Breastfeeding =2 Sexual abstinence =3 Breastfeeding and abstinence=4 Traditional FP methods =5 Modern FP methods =6 Modern FP methods and breast feeding,abstinence or other=7	
REASON FOR GROWTH MONITORING	Don't know =1 Ensure good growth =2 Other =3	
CAUSES OF ANEMIA Yes =1 No =2	Malaria	
	Worms	
	Bilharzia	
	Inadequate nutrition	
	Blood loss	

TAKE THE WEIGHTS OF THE CHILDREN BORN 1984 OR LATER

APPENDIX 1.0 (Cont.)

PART G: MATERNAL MORTALITY

DO YOU KNOW OF ANY WOMAN IN YOUR VILLAGE OR SURROUNDINGS WHO DIED DURING PREGNANCY, CHILDBIRTH OR WITHIN SIX WEEKS AFTER CHILDBIRTH ?

IF YES

NAME OF THE DECEASED
VILLAGE
YEAR OF DEATH
PLACE OF DEATH
CAUSE OR SYMPTOMS OF DEATH

NAME OF DECEASED
VILLAGE
YEAR OF DEATH
PLACE OF DEATH
CAUSE OR SYMPTOMS OF DEATH

NAME OF DECEASED
VILLAGE
YEAR OF DEATH
PLACE OF DEATH
CAUSE OR SYMPTOMS OF DEATH

(IF MORE CONTINUE).

THANK YOU VERY MUCH FOR YOUR COOPERATION.

Appendix 1.1a.

TFR, Mean Closed Birth Interval (MCBI) and q(2) by Residence, Marital Status and Division in Kwale - 1979

Division		Number of cases	TFR	MCBI	q(2)
Matuga					
	Average	10369	7.2	3.5	151
	Urban	459	6.5	2.8	79
	Rural	9910	7.2	3.5	148
Kubo					
	Rural only	6601	8.0	3.3	187
Kinango					
	Average	23028	7.7	3.5	207
	Urban	650	7.4	3.6	106
	Rural	22378	7.7	3.5	204
Msambweni					
	Average	26244	6.9	3.7	189
	Urban	1530	6.2	3.9	149
	Rural	24714	6.9	3.7	187
Matuga					
	None	8021	7.5	3.5	150
	Primary	1779	8.0	3.5	139
	Secondary and above	540	3.2	2.7	70
Kubo					
	None	4908	8.1	3.4	197
	Primary	1287	8.1	3.0	139
	Secondary and above	397	6.9	2.8	62
Kinango					
	None	21264	7.7	3.5	270
	Primary	1384	7.4	3.4	149
	Secondary and above	339	7.1	2.9	57
Msambweni					
	None	21153	6.9	3.7	196
	Primary	4192	7.8	3.6	150
	Secondary and above	864	2.8	4.0	73

Appendix 1.1b.

TFR, Mean Closed Birth Interval (MCBI) and q(2) by Education and Division in Kwale - 1979

Division		Number of cases	TFR	MCBI	q(2)
Matuga					
	Single	1623	4.3	4.6	78
	Married	7161	7.4	3.6	134
	Widowed	316	5.8	4.0	35
	Div./Sep.	1263	5.6	4.1	119
Kubo					
	Single	1290	5.8	4.0	125
	Married	4686	7.9	3.5	172
	Widowed	210	9.3	2.4	91
	Div./Sep.	409	5.8	4.2	116
Kinango					
	Single	2884	5.0	4.8	113
	Married	18137	7.6	3.6	189
	Widowed	1065	7.3	3.3	202
	Div./Sep.	928	6.0	4.1	213
Msambweni					
	Single	3814	4.5	4.3	156
	Married	619091	7.3	3.6	111
	Widowed	1047	5.2	4.3	216
	Div./Sep.	2557	5.0	4.1	168

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