TITLE

"ANALYSIS OF BIRTH INTERVALS IN KENYA"

BY

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A project submitted in partial fulfillment for the award of the degree of Master of Science in Population Studies at the Population Studies and Research Institute of the University of Nairobi.

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DECLARATION

This project 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 dear parents (Mary and Richard), brothers and sisters for being there for me.

ABSTRACT

The specific objective of this study was to analyse birth intervals in Kenya. Specifically, it sought to determine the trends of birth intervals, the influence of breastfeeding on birth intervals, the effect of contraceptive use or non-use on birth intervals and also the effect of socio-economic, cultural and demographic factors on birth interval lengths in Kenya.

To achieve the above objectives, several hypotheses to determine the magnitude of these effects were tested by applying survival (life) tables and hazard models. The data utilized was obtained from the Kenya Demographic and Health Survey conducted from February to July 1998.

The hypotheses were tested within a conceptual framework developed from Bongaaarts and Mosley and Chen frameworks for the analysis of fertility and infant and child mortality respectively. To operationalize this conceptual framework birth interval was taken as the dependent variable and also as a measure of fertility. Infant/child death was included to measure the effect of mortality. Several socio-economic, cultural and demographic variables were included in the framework as controls.

In chapter one, the problem of the study is stated, objectives outlined and justification of the study is made. The scope and limitations of the study are also stated. Chapter two reviews the relevant literature for the study, provides a theoretical framework and hypotheses for the study. It also undertakes a definition of the concepts used and the variables and their measurements are also given.

Data sources and methodology were discussed in chapter three. This involved explaining how the data relevant for this study was obtained and the most appropriate methods to analyse the said data. The selection of the most appropriate sub-sample for analysis and aspects of data quality relevant to the study were examined in chapter four. The results of this chapter indicated that data was of good quality and could hence be used for this study.

The results of the analysis are presented and discussed in chapter five and chapter six. The results of the survival (life) tables in chapter five showed that, the death of the index child was significantly related to the birth interval length. Birth intervals were shorter where an infant had died than where the infant had survived. The bivariate results indicated that, the death of a birth in the previous interval, the previous birth interval, and the use of contraception were significantly related to the birth interval at 5 % level. These results were also confirmed in the multivariate results.

The main policy implications, which can be drawn from this study is that infant, and child survival and family planning Programmes should be integrated as part of an overall strategy to lower fertility in Kenya. .

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My heart goes out to dear colleagues at PSRI for providing the right company and environment for academic endeavour. They formed such a real team .The assistance of Lamba in the acquisition and processing of the data cannot escape mention here.

Last but not the least, in conformity with the tradition, I remain solely responsible for any shortcomings in this work.

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CHAPTER ONE: INTRODUCTION AND STATEMENT OF THE PROBLEM

1.1: Introduction

Early fertility analyses were mainly concerned with the determinants of total fertility size (Rindfuss et al, 1987). Such studies concentrated primarily on aggregate measures of fertility such as total fertility rate (TFR)-(UN, 1997). TFR is the average number of births a woman would have if she were to live through the reproductive years (15-49) and bear children at each age at the rates observed in a particular year or period. TFR is familiar and easy to understand. However, it suffers from a variety of well-known weaknesses. It has been argued that, TFR is a hypothetical measure, which under certain circumstances can give distorted results. This distortion results from changes in the timing of childbearing, which can inflate or deflate the TFR (Bongaart's, 1999). Moreover, the TFR doesn't distinguish the various components of observed change in fertility. It doesn't reveal whether an increase or decrease in fertility is due to change in timing of the start of reproduction, in the spacing of births and /or in the proportion of women reaching higher parities. Hence, it has become increasingly clear that different factors are likely to be important at different stages of family formation: What determines the length of time between marriage and first birth might be quite different from the determinants of the length of the interval between, say fourth and fifth births (Rind fuss et al., 1987).

Consequently, due to the growing uneasiness with TFR population analysts have given increasing attention to the development of better measures of fertility. A major thrust in these attempts has been the focus on the progression in childbearing from one child to the next. Birth interval measures provide information on the tempo or spacing of births, which is useful for three purposes (Bertrand, Magnani and Knowles, 1994 cf. UN, 1997). Spacing of births is an essential part of any programme that gives priority to objectives related to maternal and child health. Secondly, in societies where much of the demand for family planning is for spacing rather than for limiting purposes, birth interval measures may indicate short run programme success in enabling women and couples to implement their reproductive preferences. Thirdly, it has been suggested that change in the length of the birth intervals may be a more sensitive signal of changing fertility behaviour than conventional summary fertility measures (Ryder, 1982,Srinivasan and Freymann, 1989,cf. UN, 1997). The pace of childbearing, as reflected in the length of closed birth intervals influences the rate of population growth independently of changes in levels of completed fertility. Longer birth intervals generally translate into lower completed fertility as well due to lost exposure time during the peak reproductive years.

The tempo of childbearing that is measured by parity progression ratios (PPRs') is an important measure of fertility. Parity refers to the number of children a woman has already borne alive. PPRs' indicate the proportion of women at each parity who proceed to the next birth. They are sensitive measures of the differences in fertility by parity within and among populations (lutz, 1989 cf. UN, 1997). PPRs'are less sensitive to period fluctuations in fertility than TFR. This study analyses birth intervals in Kenya. It specifically focuses on closed and open intervals. It intends to contribute to the understanding of the tempo and pace of childbearing in Kenya.

1.2 STATEMENT OF THE STUDY PROBLEM

This study seeks to analyse birth intervals among women in Kenya .It specifically focuses on both the open and closed birth intervals. Closed birth interval is the interval between successive live births of a woman. The open birth interval on the other hand is duration of time between the date of last live birth and the date of the survey. Birth intervals have been observed to influence the tempo and pace of childbearing and hence the resulting fertility level in a society.

Fertility level in Kenya has been declining as evidenced by the Kenya Demographic and Health Surveys conducted since 1989. NCPD (1998) (TFR) at 4.7 births per woman. However, while many analysts have been familiar with the general fertility trends they have often overlooked the fact that TFR is a hypothetical measure that under certain circumstances can give distorted results (Bongaarts, 1999). The most serious flaw of the TFR is the distortion that results from changes in the timing of childbearing, which can inflate or deflate the TFR.

Research has shown that family size preferences, as expressed in survey responses can be strong predictors of future fertility levels. However, studies linking family size preferences to subsequent fertility are limited in developing countries. Moreover, the measures of fertility preferences have long been controversial even though the data could have implications for social policy (Bogue, et al 1993). In Kenya, such studies have been relatively few (Nkanata, 1990;Ayehu, 1998).

This study is a contribution to the understanding of changing fertility behaviour in Kenya by examining changes in the spacing of births. The main research questions are:

1.Do birth intervals influence the tempo and pace of childbearing in Kenya?

2.what factors influence birth intervals in Kenya?

1.3 OBJECTIVES OF THE STUDY

The general objective of this study is to examine factors, which determine the length of birth intervals in Kenya. The specific objectives include:

1.To estimate the Parity Progression ratios and the median time for birth intervals in Kenya.

2.To determine the trends in birth intervals in Kenya.

3.To investigate the effect of breastfeeding on the length of birth intervals in Kenya.

4.To establish the effect of contraceptive use or non-use on the birth interval length in Kenya.

5.To determine some of the socio-economic, socio-cultural and demographic factors influencing the length of birth intervals in Kenya.

1.4 JUSTIFICATION OF THE STUDY

Demographic research has established evidence indicating that life-course events and transitions are cumulative with earlier events affecting subsequent outcomes in an individual's life course. Among women, there is a substantial relationship between the timing of the first birth and the number and the spacing of subsequent births. Thus, families can control their fertility by spacing children and also stopping after achieving the ideal family size.

Birth interval data can be analyzed to describe the fertility dynamics of the population, for the analysis of fertility differentials or for the estimation of certain parameters underlying the reproductive processes in the population.

A study of births interval in Kenya would therefore, be justified on the basis of the following reasons:

It provides a simple means of studying the patterns of reproduction of only those who continue to reproduce. It would also allow the study of the impact upon childbearing of a wide variety of additional variables, not possible in conventional fertility studies. This includes the introduction of sociological, economic and psychological variables for individual couples. It facilitates a subdivision of the total childbearing span into time segments or components that permit further study of each component. The major components include: the interval between successive live births and the open interval from last birth to the date of the interview.

The establishment of birth interval lengths also has implications for maternal and childcare and family planning programmes in Kenya. Birth interval measures may indicate short run programme success in enabling women and couples to implement their reproductive preferences. The length of birth intervals may be a more sensitive signal of changing fertility behaviour than conventional summary fertility measures.

1.5 SCOPE AND LIMITATION OF THE STUDY

This study focuses on factors influencing the length of birth intervals in Kenya. These factors are examined at a point in time, thus our analysis cannot give an indication of the possible changes with time. For instance, duration of breastfeeding is a biological process, which is expected to vary with time.

The restrictions imposed on the data utilized for analysis is due to a number of methodological considerations. Thus, for instance analysis is restricted to births occurring

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The restrictions imposed on the data utilized for analysis is due to a number of methodological considerations. Thus, for instance analysis is restricted to births occurring within 36 months from the time of the survey. This was done in order to capture the breastfeeding information. The study also considers births of women who are currently married. This means that premarital births are excluded.

This study focuses on all the districts covered by the Kenya Demographic and Health Survey (1998). The survey has a national coverage except districts in North Eastern Province, two districts in the Rift Valley province and two districts in Eastern province which account for 4% of the Kenya's population.

This study faces the problem of selection especially for birth interval data. The use of birth intervals, both closed and open has a number of biases. Such data demands that we include a number of incomplete intervals in the analyses, the experience of each woman being truncated at different points in time. For example, data on the length of post partum amenonorrhoea completed for the women after the last live birth are considered to be a censored set of data. The problem of censoring is handled through life table analysis but this doesn't solve the problem of truncation and selection.

The other problem has to do with premarital births. This study deals with married women aged 15-49 who are in their first union and those who had at least two closed birth intervals .The study considers intervals due births in the last three years prior to the survey.

CHAPTER TWO: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK.

2.1 Introduction

This section reviews the literature on studies, which have been undertaken on birth intervals in order to provide a basis for the study. We shall examine the works that have been done in the rest of the world and then those that have been carried out in Kenya.

2.2 THE REST OF THE WORLD.

Rindfuss et al., (1983) analyzed the determinants of birth intervals for five countries including the Philippines and Malaysia. They found significant differences in child spacing for the following variables: country and ethnicity, age at first birth, urban experience and for Korea, sex of the preceding birth. They established that education had relatively little effect on interval lengths except at the higher birth orders. This result may however, be due to the fact that much of the effect of education operates through age at first birth, a variable that Rindfuss et al., incorporated as an independent variable rather than as a dependent one.

Evidence obtained from historical data and world fertility surveys (WFS) show that, birth intervals are shorter when an infant dies than when it survives. In a cross-sectional study involving 22 countries with comparable data from the WFS, neonatal deaths were found to shorten the first birth interval by an average of 4.7 months in all the 22 countries and post-neonatal deaths by 2-4 months (Cochrane and Zachariah, 1983). Similar shortening were also obtained for the third and fifth intervals from the same study. It was further found that, this shortening also depended on the date of death of the child, being shorter if the infant died earlier.

Children in developing countries are much more likely to die if they were born less than two years after their mother's previous birth (Pebley et al., 1986). A study of 39 developing countries established that, if a surviving child was born less than two years before the index child's birth, then the risk of dying for the index child was 58 percent greater in the first month of life than if no previous child had been born in the two-year interval. The study further noted that, if the previous child died then the relative risk was even greater: 249 percent in the first month of life, 194 percent for the balance of first year and 91 percent for 1-2 years. The risk of mortality during the first month of life was noted to be 222 percent greater if there had been two previous births than if there had been no births in the two-year interval.

The reasons for the differences in length of birth intervals among countries are related not only to contraceptive practice but also to traditional birth spacing mechanisms, namely, breastfeeding and postpartum abstinence (Cleland et al., 1986). Their study observed that, majority of mothers who wanted another child didn't want to conceive for at least 18 months following child birth and that traditional birth spacing mechanisms didn't extend that long in most countries. In 17 Latin American and Caribbean countries, there was surprisingly little differential in levels of contraceptive use between women who said that, they had all the children they wanted and those who wanted to postpone the next birth -48 percent compared with 38 percent respectively. The study further observed that, contraceptive use had lengthened birth intervals in Latin America.

A study in China showed that, the factors which determined whether women had more than one child were: Government population policies related to mortality, rural residence, ethnic group, gender of the first born child and educational level (Choe et al., 1992). Among women who had a first birth during 1977-1987, the proportions in each province who had a second birth within ten years of the first ranged from 30 percent to 93 percent and the proportions who had a third birth within 10 years of their second ranged from 15 to 80 percent .The study established that, the death of a previous child was the most significant covariate predicting a second birth. Having a daughter also had a strong positive effect on the likelihood of having a second birth in some areas.

Marini and Hodsdon (1981) provided possible explanations for the impact of first birth timing on subsequent child spacing. Such explanations can be grouped into two broad categories i.e. a characteristics category and a causal category. In the characteristics category, the relationship between the timing of the first birth and later fertility is spurious and explained by selected background and socio-economic characteristics. Differences in educational attainment, for example may help explain why a rapid transition to parenthood is associated with more rapidly paced subsequent births. Women who receive less education are likely to develop stronger familial orientations than women with more education. These familial orientations may be translated to into a desire for a larger number of children, which in turn leads to more rapid childbearing.

Variations in fertility by educational attainment may also be related to differences in career orientation and the development of occupational resources. Additional characteristics that may distinguish women according to both first-birth timing and subsequent child spacing include: religiosity, and various family background variables. Since marriage cohorts differ with respect to numerous characteristics, it is important to control for these differences. Failure to recognize important compositional changes across marriage cohorts may lead to faulty conclusions about the changing impact of first birth timing. This is particularly important because prior research has shown that timing of first births has a significant impact on later spacing, net of the influence of compositional variation.

Under the causal category are several rationales for a significant influence of first-birth timing itself on subsequent fertility. First, women who experience a rapid pacing of first births are younger than their counterparts when exposure to the risk of second and higher order births occurs. This youthfulness may indicate greater fecundity and /or reduced risk of spontaneous abortion, which would in turn increase the likelihood of an additional birth in a given period following the initiation of parenthood. Younger women may lack the experience to foresee, evaluate and be concerned about the potential consequences of their fertility behaviour. Similarly, women who delay the transition to parenthood may acquire greater occupational or labour force capital, which may yield increasingly attractive alternatives to subsequent fertility.

The open interval is more sensitive to changes in the parity progression ratio, given mother's ages than the closed interval to changes in the fecundability (or by implication to changes in contraceptive usage)(Srinivasan, 1970). His study found that, the correlations of the closed and the open intervals with parity increase as mother's age increases. The open interval is more closely correlated with parity than the closed within each subgroup by mother's age. Further, the correlations of the closed and the open intervals with age tend to decrease as parity increases. Finally, the open interval is more highly correlated with mother's age than the closed across parities.

Women in Shaanxi province, China have their first birth soon after their first marriage, and that the interval between marriage and first birth is strongly correlated with the woman's age at first marriage (Ping Tu, 1991). The study further established that, the length of the second and third birth intervals and the likelihood of going on to have a second or third birth are strongly influenced by the sex composition of children already born, the survival time of the child initiating the interval, the duration of breastfeeding and the woman's occupation.

Breastfeeding has a considerably greater effect on preventing short interbirth intervals than contraceptive use (Vanzo, et al., 1991). Their research showed that, a woman's education is negatively related to the probability that she breastfeeds, positively related to the probability that she uses contraceptives and has no significant effect on the likelihood that the interpregnancy interval is less than fifteen months. This study observed that, having a family planning clinic near by is associated with less breastfeeding offsetting whatever positive effects clinics have on contraceptive use in terms of the percentage of birth intervals that are so short as to be detrimental to infant and child mortality.

A comparative study of fertility in Togo and Uganda showed that, women younger than 25 and those educated beyond the primary level were having their first birth later than older women and women with less education (Ahn et al., 1994). These differentials were more pronounced in Togo, where the women suggested the beginning of voluntary control of fertility, than in Uganda. The study observed that, in Togo, women's education has a large and increasingly negative effect on the tempo of progression to subsequent births beginning with the fourth year of schooling and accelerating sharply at the seventh year. In Uganda, women's education was noted to have no effect. Moreover, the death of the previous child was observed to have a large positive effect on the probability of a short birth interval and this effect was larger in Togo than in Uganda. Further more, the community level of infant mortality was noted to be positively associated with the probability of an early subsequent birth in Togo, while the opposite was true in Uganda.

Desired family size has decreased significantly in sub-Saharan Africa over a period of fifteen years (Kirk et al., 1998). The findings showed that Kenya and Zimbabwe experienced rapid fertility decline. Further, it was noted that, areas with higher education for women and lower child mortality experienced larger reductions in fertility and desired family size. This was attributed to contraceptive use more than any other proximate determinant. This study further, established that contraception is practiced for birth spacing. This study seeks to determine the contribution of contraception to the length of the birth intervals in Kenya.

Women's desired family sizes declined dramatically due to the use of family planning in Bangladesh (Kuenning-Arends, et al., 1999). The study established that, the proportion of women with two or more living children who indicated that they wanted to stop childbearing increased .For example, in 1985, 57% of women who had three living children wanted to stop childbearing. By 1990, 77% of women with three living children wanted to stop childbearing.

There are distinct differences between the actual lengths of birth intervals to women's reported preferred lengths. In a study based on data from twenty sub-Saharan countries, (Westoff et al., 2000) observed that in Kenya, Comoros, Ghana, Rwanda, and Zimbabwe women prefer much longer birth intervals than those they actually have, compared with women in the other fifteen countries studied. Consequently, spacing preferences had their greatest effect on level of fertility prevalence of short (less than twenty four months) birth intervals and malnutrition in the five countries noted above. The study established that, women who know, approve of, discuss and use family planning prefer longer birth intervals than do their counterparts.

The percentage of women who want no more children has risen slowly but steadily in sub-Saharan Africa since the late 1970s, having reached a level of 20-40 percent in many countries by the late 1990s (Westoff et al.2000). Yet, overall, levels remain far below those seen in Asia and North Africa, where the level of demand for limiting births clusters in the 40-60 percent range. The proportion of women wanting to stop childbearing is also high in Latin America. Unmet need for the means to limit births is increasing fairly uniformly for most women in sub-Saharan African countries. Evidence suggests that most women in Sub-Saharan Africa practice contraception to space rather than to limit births.

It has been observed that, from the late 1970s to the mid-1990s, fertility declined by 44 percent in Morocco and by 28 percent in Egypt, reflecting a drop in both level and pace of childbearing (Eltigani, 2000). The study noted that, the cumulative proportions of women progressing to each successive parity fell by at least 25 percent at each parity transition after the transition between a third and fourth birth in Egypt. However, the pattern was observed to be more mixed in Morocco, with declines fluctuating between 11percent and 27 percent, starting at the transition between a second and third birth. Moreover, the median length of time between births increased over the period, especially in the intervals between births at parities 2-4 in Morocco (increases of 4.2-4.7 months) and at parities 1-3 in Morocco (increases Of 3.0-3.6 months). The rise in the singulate mean age at marriage in both countries was noted to have contributed to fertility decline. The open interval is more sensitive as an index of marital fertility when marital duration and parity are controlled than when mother's age and parity are controlled (Hastings, et al., 1975).

The closed birth intervals are influenced mainly by the distribution of fecundability of women of non-zero fecundability while the open birth intervals are influenced mainly by parity progression ratios or the proportion of women becoming secondarily sterile after each parity as noted by Srinivasan, 1970. He further observed that the mean open intervals of women classified by parity can be used as indices of fertility and that such an index is comparable to the index of average age of women of given parity.

There is a strong correlation between breastfeeding and the duration of amenorrhoea and between breastfeeding and birth interval in developing countries (Smith, 1985). He noted that, in countries where the median durations of breastfeeding are relatively long or the rates of contraceptive use are relatively high, median birth intervals are longer than in countries where the median breastfeeding durations are shorter and contraceptive use is less widespread .His study further observed that in countries where fertility is moderate or high, the incidence of very short birth intervals is higher than when median breastfeeding durations are relatively short. The findings also suggested that contraception was inadequate as a substitute for breastfeeding.

The preference to balance the gender of children affects the timing of births, not a preference for either sons or daughters as noted by Teachman, et al., 1989. He noted that at parity two, women with children of the same sex time a third birth more rapidly than women with a boy and a girl .At parity one, women with a boy time second births more rapidly than women with a girl. The study further observed that, women with boys are more likely than women with girls to be married at any point in time and thus, less likely to have disrupted fertility careers.

A study among couples in Kerala, India found that higher educational attainment increased the likelihood that a couple will have used a method of contraception to delay or space births (Zavier et al., 2000). This likelihood was also found to be significant among respondents who experienced an abortion, among Christian women and among those who were older than 25 when either they or their partner were sterilized. The likelihood of using a temporary method before sterilization was found to be significantly reduced among women who preferred shorter birth intervals and among relatively older women (aged 31 and older). The median interval between the first and second children born to sterilized couples who had ever used a reversible method was longer than that among children born to couples who had relied only on sterilization (32 months vs. 26 months).

2.3 STUDIES IN KENYA.

The Kenya Fertility Survey (1977/78) data established that, the mean duration of breastfeeding for the whole country was 16.5 months, whereas women aged below 25 years breastfed for 20.6 months (Mosley, et al., 1982). He also noted that, the average birth interval increased with maternal age, that is, the birth interval for all the women 33.7 months, 28.6 and 35 months for women aged under 25 and 35 years respectively. The result showed that breastfeeding practice was on the decline. The current study will examine this aspect to try and find out the effect of breastfeeding durations on birth intervals.

More educated women and those who live in urban areas start childbearing later in life (Ferry and Page, 1984). They observed that, age at first birth occurred 4-5 years after menarche (about 19 years) and about 10 percent of the women had given birth to their first child by age 15.The birth intervals estimated using life tables ranged between 2 and 2.5 years. Their study also noted a tendency for women to stop childbearing earlier than physically obliged resulting to an average age at last birth to be around 40 years.

A study of birth spacing and timing using both the 1977/78 KFS and 1988/89 KDHS by Njogu and Martin (1991) using proportional hazards model showed that, birth intervals increased from those observed in the earlier data set and this was attributed to the increased contraceptive prevalence. Contraceptive use was predominant among women with four living children. In particular, changes in birth interval dynamics were not confined to the higher order births but fertility reduction was confined to the medium parities a finding which suggested existence of parity- specific birth control.

Differences in live birth interval and marital fertility rate in Kenya between regions still persist (Minyacha, 1989). He observed that live birth interval range from as low as 35 months among the Kalenjin community to as long as 41 months among the Mijikenda. Marital fertility was found to be as low as 267 per 1000 for Kisii and a high of 344 per 1000 for the Kalenjin. His study utilized the Kenya Contraceptive Prevalence Survey data of 1984.

In Siaya district, it was noted that on average women breastfed for 17.7 months and that breastfeeding duration increases with an increase in mother's age and parity (Otieno, 1988). Parent's education and educational attainments were negatively related to breastfeeding .The study further observed that Catholic women breastfed longer than protestant women. His regression analysis showed that survival status of the child was found to be inversely related to the breastfeeding practice and was the principal determinant of breastfeeding duration explaining 26.4 % of the total variation.

In Kawangware, an urban residential area in Nairobi birth interval ranged from 19.3 to 33.2 months for the age groups 15-19 and 60+ respectively whereas the total mean was 26.9 months (Sempebwa, 1982). Younger women tended to supplement breast milk with other foods much earlier and this made younger women to breastfeed for shorter durations as compared to relatively older ones. Age groups 15-19 and 40+ introduced supplementary foods when the babies were 3.2 and 7.2 months old on average respectively. Women in Kenya don't have longer breastfeeding preference for boys apart from uneducated rural women who have no access to income that still favour boys in terms of longer breastfeeding durations.

Short birth intervals were associated with infant and child deaths (Kimani, 1992). He found that birth intervals were shorter on the average by about 4-months for deaths of female births taking place in those intervals where the birth opening the interval was alive at the time of the survey .The study further observed that short birth intervals could be explained by the differences in coital frequency, contraceptive use and breastfeeding.

This study will examine some of these to find out their contribution to birth interval length using the current Kenyan data.

Marc and sear (1997) did a study on the Gabbra (a pastoral) community in Northern Kenya that is still less prone to modern changes. They noted that, the mean length of birth interval for the ever-married Gabbra women of all ages ranged from about 2.9 years to 3.2 years. The birth intervals after boys were longer. The hazard model analysis using data from only married women under 49 years old indicated that, a male child was followed by a longer birth interval for all first five birth intervals, but it was significant only for the second birth interval. Using the Kaplan-Meir plot of all birth intervals for women with children of both sexes daughters only and sons only showed that, women with children of both sexes had the longest birth intervals while women with only daughters had the shortest intervals.

2.4 Summary

This section has examined the relevant literature for this study. It is clear from this review that birth interval length is influenced by a number of factors. Thus, it's important to note some the issues raised by this review. Some the factors that influence birth interval length's are; country, ethnicity, age at first birth, urban experience and sex of the preceding child.

It's also evident from the literature that birth intervals are short when an infant dies according to data from the World fertility Surveys (WFS). Birth intervals of less than two years have been noted to increase the chances of infant death. On the other hand traditional birth spacing mechanisms such as breastfeeding and postpartum abstinence influence birth interval length.

The open interval has been noted to be very sensitive to changes in parity progression ratios while the closed intervals are influenced by the fecundability of the women. Government policies especially those related to mortality have also been noted to influence birth interval length. Other factors noted to be important include; urban residence, gender of first child, the prevalence to balance the gender of the children and education level. In Kenya studies have shown that the use of contraception is one the most important determinants of birth interval length.

From the literature review it's clear that, most of the studies on birth interval dynamics have been done outside Kenya. This implies that birth interval dynamics is still a fertile area of research in Kenya.

2.5 THEORETICAL FRAMEWORK.

This section conceptualises the study. Birth interval will be treated as the primary dependent variable while other factors will be treated as the independent variables. The framework for this study is based on the Bongaarts (1978) framework for the analysis of fertility and Mosley and Chen (1984) framework for the analysis of infant/child mortality. According to these frameworks, it is the socio-economic, cultural, environmental and demographic 'factors through which proximate operate to influence birth interval dynamics and also infant/child mortality.

The birth interval length between any two live births is determined by the length of its four components: post-partum amenorrhoea, waiting time to conception, periods of pregnancy and post partum amenorrhoea associated with abortion and still births and the gestation period associated with the live birth. Post partum amenorrhoea is the period following a birth when the woman cannot ovulate. This component is primarily a function of breastfeeding behaviour (Bonggaarts and Potter, 1983 cf. Kimani, 1992). During breastfeeding the receptors in the breast nipple are stimulated and this initiates a neutral signal to the hypothalamus, a nerve centre in the brain which in turn signals the pituitary gland which inhibits ovulation by reducing the release of gonadotrophic hormones needed for ovulation.

The waiting time to conception, also called the fecundable or ovulatory interval (Bongaarts and potter, 1983, cf. Kimani 1992) is largely determined by the frequency of intercourse and the use of contraception .It may also be influenced by the underlying fecundity of the woman, the monthly probability of conception, which although primarily determined by coital frequency and contraception may depend on the woman's characteristics. Thus, when coital frequency is high and contraception is not being practiced this component of the interval is expected to be short .The waiting time to conception is expected to lengthen with reduced coital frequency and particularly the use of contraception. The component due to foetal loss (induced or spontaneous) depends on the number of such losses, the gestation lengths associated with them and the periods of amenorrhoea associated with their termination .The duration of pregnancy associated with a live birth is the least variable component of the live birth (about 9 months) although the exact timing of delivery cannot be predicted with certainty.

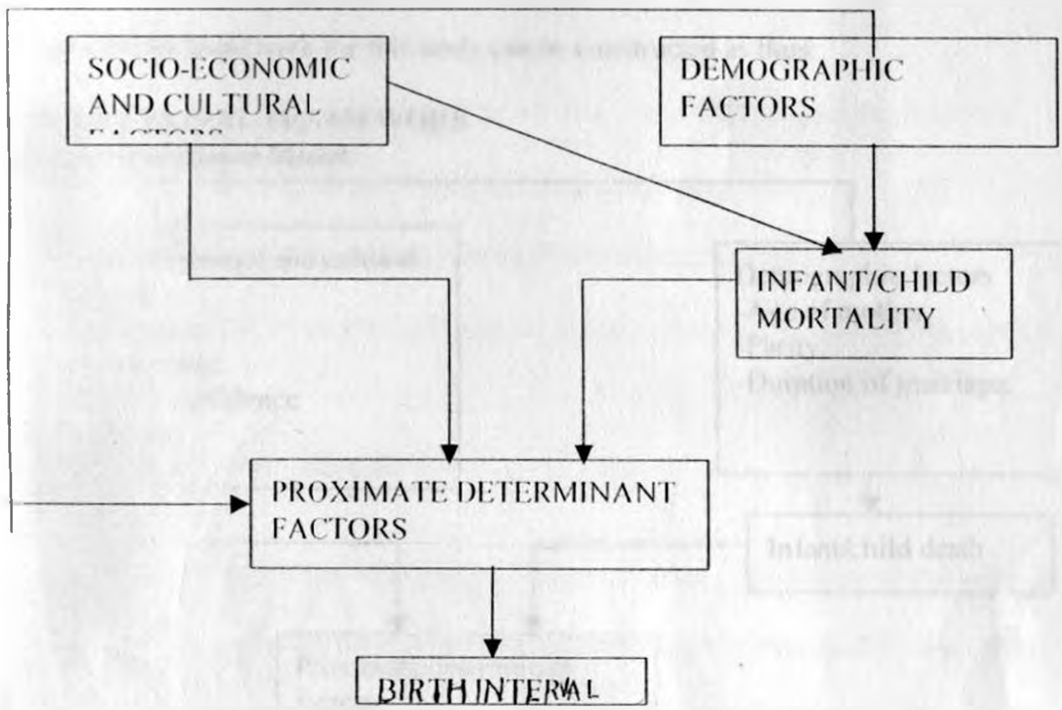
The factors above which determine the lengths of the various components of the birth intervals that is breastfeeding duration, contraception, coital frequency, fecundity and foetal losses are referred to as the proximate determinant factors of birth interval dynamics. As pointed out by Bongaarts (1983, cf. Kimani, 1992) all other factors must operate through these in order to affect fertility and /or birth interval dynamics.

The death of an infant or child may result in the shortening of the birth interval. This shortening can be the result of either voluntary or involuntary mechanisms or a combination of both but can only be realised indirectly through the proximate determinant factors. The involuntary mechanism is known as the biological or physiological effect of infant/child death on fertility and occurs primarily as a result of cessation of breastfeeding following a child death. Thus, the death of an infant/child by interrupting breastfeeding shortens the period of post partum amenorrhoea hence increasing the probability of conceiving and consequently, leading to the shortening of the birth interval.

Figure 1 summarises the conceptual framework used for this study.

The framework shows that socio-economic, cultural and demographic factors influence birth intervals through proximate determinants. Birth intervals and infant/child mortality are also seen to be affected by the same socio-economic, cultural and demographic factors. Finally, the framework shows that, birth intervals may be affected by infant/child mortality.

Figure 1:conceptual framework for analysing birth interval dynamics.



Source: Adopted from Kimani, 1992.

From the diagram above conceptual hypotheses can be formulated as follows:

1.Socio-economic factors influence birth interval lengths through proximate determinants.

2.Socio-cutural factors influence birth intervals through proximate determinants.

3.Demographic factors influence birth intervals through proximate determinants.

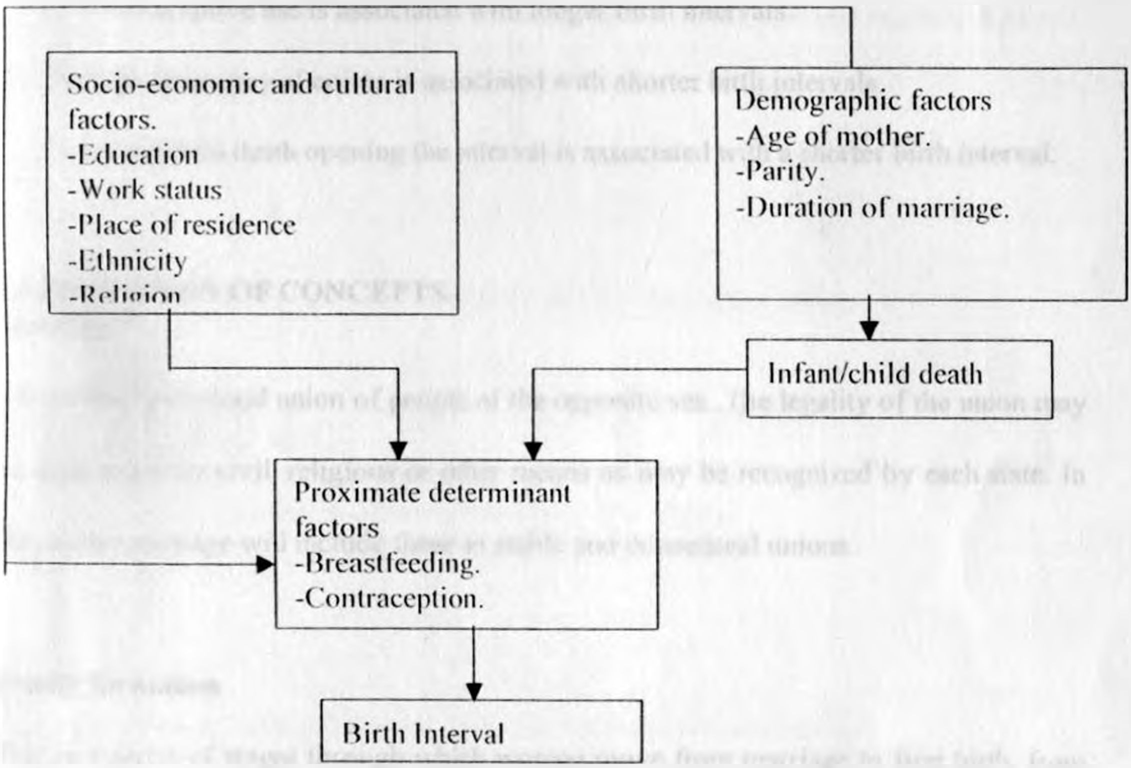
4.Proximate determinants influence birth intervals directly.

5.Infant/child mortality influence birth intervals through proximate determinants.

From the foregoing, the following theoretical statement can be formulated: that socio-economic, cultural and demographic factors act upon biological and behavioural factors which in turn influence the length of the birth interval hence the resultant total fertility. The operational framework for this study can be constructed as thus:

2.6 OPERATIONAL FRAMEWORK

Figure 2:Operational Model.



2.7 OPERATIONAL HYPOTHESES

1. Higher level of education is associated with shorter birth intervals.
2. Working women are more likely to have longer birth intervals.
3. Birth intervals are likely to be longer in rural than in urban areas.
4. The length of the birth interval is likely to vary by ethnicity.
5. Birth interval is likely to vary by religious group.
6. Polygynous unions are associated with longer birth intervals.

7. Birth intervals are likely to increase by the age of the women.

8. Birth intervals are likely to increase by the birth order of the women.

9. Birth intervals are likely to be longer for women who have been married for more than ten years.

10. Prolonged periods of breastfeeding are associated with longer birth intervals.

11. Contraceptive use is associated with longer birth intervals.

12. High frequency of coitus is associated with shorter birth intervals.

13. Infant/child death opening the interval is associated with a shorter birth interval.

2.8 DEFINITION OF CONCEPTS

Marriage

This refers to the legal union of people of the opposite sex .The legality of the union may be established by civil, religious or other means as may be recognized by each state. In this study, marriage will include those in stable and consensual unions.

Family formation

This is a series of stages through which women move from marriage to first birth, from first birth to second birth, and so on.

Total fertility rate

This is the average number of children born to women during their entire reproductive life span.

Fertility

This is defined as the actual performance rather than the capacity of a woman to produce a live birth.

Birth interval

This is the duration of time between two consecutive live births of one woman or over a group of women in a community.

Open birth interval

It is the interval between the date of last birth and the date of the survey.

Closed birth interval

This is the interval between successive live births of a woman.

Parity

This refers to the number of children a woman has already borne alive.

Parity Progression Ratios

These indicate the proportion of women at each parity who proceed to the next birth.

Event History

This is a record of when events of interest happened to a sample of individuals.

Survival analysis

This is a collection of statistical procedures for the analysis of data in which the outcome variable of interest is time until an event occurs such as death, birth, disease incidence etc.

Life Table

This is a statistical presentation of the life history of a cohort, commencing with the starting event, as the cohort is progressively thinned out over time by failures.

Censoring

This occurs when we have some information about individual survival time, but we don't know the survival time exactly.

2.9 VARIABLES AND THEIR MEASUREMENTS.

This study will examine two levels of variables namely: Background variables and the proximate determinant variables. The background variables are further classified into socio-economic, socio-cultural and demographic variables.

Socio-economic and Cultural variables include: Education, work status, place of residence, ethnicity, religion and type of marriage.

Education

This study classifies the levels of education into: no education, primary incomplete, primary complete, secondary incomplete, secondary incomplete, secondary complete and higher education.

Work status

This will be measured by whether the woman is working or not.

Place of Residence.

This is the area where the respondent was living at the time of the survey. In this study it's defined as either rural or urban.

Ethnicity

This refers to different tribal groups. The groups considered in this study are: Kikuyu, Luo, Luhya, Kamba, Kalenjin, Mijikenda, Meru/Embu, Kisii and others.

Religion

This refers to ones religious affiliation. In this study religious groups will include: Catholics, protestants/other Christians, Muslims, no religion and others.

Type of marriage

This study distinguishes two types of marriages i.e. monogamous and polygamous types of marriages. Monogamous marriage is where a man has one wife. Polygamous marriage is where the man has more than one wife.

DEMOGRAPHIC FACTORS.

The demographic factors considered in this study are: age of mother, parity and duration of marriage.

Age of mother

This will be taken to mean the number of completed years that have elapsed since birth. Age was categorized into; < 25 years and >=25 months.

Duration of marriage

This will be taken to mean the time or period completed since the beginning of married life to the date of other events such as survey, parturition, birth interval, breastfeeding, etc. In this study duration of marriage is coded into; < 10 years and >=10 years.

PROXIMATE DETERMINANTS

This proximate determinants considered in this study include: Breastfeeding duration, contraception and coital frequency.

Breastfeeding duration

This is the length of time elapsed since the woman began breastfeeding after birth to the time of the survey. Duration of breastfeeding is categorized into who are breastfeeding and those who are not.

Contraception

This is a deliberate attempt by the woman to avoid conception by use of natural or artificial methods. This is further divided into two other categories namely; ever use and current use. Ever use of contraception is categorized into; never used, used traditional and used modern. Current use is coded into; not using, using traditional and using modern.

Coital frequency

This is the number of times a woman engages in coitus during a specified time period.

The socio-economic cultural and demographic variables are the controls in this study. This variable is coded into; none, 1-3 times and >3 times.

CHAPTER THREE: DATA AND METHODOLOGY.

3.1 Introduction.

This chapter presents a description of the data and methods used for analysis in this study. Section 3.2 describes the design and the nature of the data that was collected while section 3.3 presents the methods utilized for data analysis. The quality of data is examined in the next chapter.

3.2 SOURCES OF DATA.

The source of data for this study is the Kenya demographic and health survey. This is a national survey, which was conducted from February to July in 1998.The main objective of the survey was to collect data on fertility, child mortality levels, nuptiality, fertility preferences, awareness and use of family planning methods, maternal and child health services and knowledge and behaviours that relate to HIV/AIDS and other sexually transmitted diseases. Data was collected among women aged 15-49 which included information about their birth histories. The sampling frame included all regions except the arid and semi-arid North Eastern province mainly occupied by the nomadic population, two districts in the Rift Valley province and two districts in Eastern province. The excluded region constitutes only 4% of the total national population.

The National Council For Population and Development (NCPD) conducted the survey in collaboration with the Central Bureau Of Statistics (CBS). Macro International Inc.of Calverton, Maryland (USA) provided technical assistance throughout all the stages of the survey. The United States Agency For International Development (USAID) and the Department for International Development (DFID/UK) provided financial assistance. The survey covered 7881 women aged 15-49 years. The purpose of the survey was to provide planners and policy makers with data useful in making informed programme decisions.

The sample for the KDHS was based on the National Sample Survey and Evaluation Programme (NASSEP-3) master sample maintained by the CBS.This master sample was updated on the basis of the 1989 census. NASSEP-3 consists of 1048 rural clusters in 65 rural districts and 325 clusters in 7 urban strata in 7 out of the 8 administrative provinces of Kenya. (excluded are the North Eastern province and four districts in Eastern and Rift valley provinces) and is designed to be representative of 95 % of the total population.

The KDHS utilized a two stage stratified sampling approach. The first involved selecting sample points or clusters while the second involved selecting households within sample points. From the master sample above a total of 444 rural clusters in addition to the 92 urban clusters and a total of 9465 households were selected for inclusion in the KDHS. However, in order to meet the specific objectives of the survey, the selection was undertaken so that there was over sampling in 15 out of the 65 rural districts so as to obtain reliable estimates for certain variables at the district level. These districts are: Bungoma, Kakamega, Kericho, Kilifi, Kisii, Machakos, Meru, Muranga, Nakuru, Nandi, Nyeri, Siaya, South Nyanza, Taita-Tavata, and Uasin Gishu.In addition Nairobi and Mombasa were targeted. Nonetheless, this over-sampling did not affect the representativeness of the survey. Due to the over sampling, the KDHS is not self-weighted.

According to the NCPD (1998) the implementation of the survey was successively undertaken. Of the eligible households, 8380 were successively interviewed, giving a response rate of 97 % .In the interviewed households, 8233 eligible women aged 15-49 were identified and 7881 were successively interviewed, yielding a response rate of 96 Percent.

A complete birth history covering all live births of each woman interviewed was obtained. For such births the survival status was ascertained and also the age at death for those infants /children who had died. Thus, it was possible to determine the spacing between any two live births and also the intervals in which the infant /child deaths occurred.

Breastfeeding information, which is also relevant to this study, was collected. Breastfeeding duration was obtained for a maximum of up to 6 children born in the 3 years from the time of the survey.

Finally, for each respondent, her background and demographic characteristics were obtained. Information on sexual behaviour and family planning practice, which is expected to affect directly a woman's reproductive performance was also collected .It should however, be noted that, whereas breastfeeding was obtained for each interval, the sexual and contraceptive behaviour information doesn't directly relate to any specific birth interval.

3.3 METHODS OF DATA ANALYSIS.

3.3.1 Introduction.

This section describes the methods of analysis utilized in this study. The study uses survival (life) tables and hazard models.

3.3.2 SURVIVAL (LIFE) TABLES.

Life tables were originally developed for mortality analysis but they have become the standard procedure for tracking the duration specific likelihood of experiencing an event. The basic idea underlying the survival table is to follow a group of people from an initial time until they experience the next event. In birth interval analysis, its the time from when they had a birth until they have their next birth. Those who reach the survey date before their next birth are the censored cases.

Several functions can be derived from the survival table but the key functions useful for describing and answering the basic questions of event histories are: the hazard (instantaneous) rate (function) which is the number of persons experiencing the next event per unit time and survival rate (function) which is the cumulative number of persons not experiencing the event within a certain duration from the initial time. The survival function enables the estimation of the average waiting time to the next event. There may be instances when the function of interest is the number of persons experiencing the event rather than those not experiencing the event. This is merely the compliment of the survival function called the distribution function.

Using the survival function and /or the distribution function, summary measures can be obtained to describe the spacing patterns .The following summary measures are among the most useful: (1) The proportion of women of parity (p-1) who move on to the next parity p within 60-months from the (p-1) th birth, B60)), also referred to as the pseudo-parity progression ratio. This measure describes the quantum of fertility. Because of the high incidence of pre-marital conceptions in Kenya, B9 can be used in the first interval from marriage to examine the extent of premarital conceptions while B18 or B24 on the incidence of short birth intervals. (2) The average time taken from the (p-1) th birth to the p-th birth by women who ever reach the (p-1) th birth order will be used to measure the tempo or the speed of reproduction. The averages being the median time from the (p-1) th parity to the p-th parity and the associated normalized mean (trimean). These measures have been described by Hobcraft and Rodriguez (1982) as robust (Brass, 1993). The above measures are useful when analysing whether the tempo (speed) of the reproduction and the quantum of fertility have changed over time to check for period effects and by age of the women and duration of motherhood for cohort effects. It also forms the preliminary analysis for analysing the birth intervals as well as the factors affecting birth interval distribution and also to check the adequacy of performance of parametric distributions.

Some fixed covariates will be used to determine whether there exist differentials in the tempo of reproduction and factors, which affect the tempo. The covariates will include demographic variables of lagged duration dependence measured by length of previous interval, age at birth of the child opening the interval, in addition to the socio-economic variables.

One weakness of the survival tables when several covariates are to be included in the analysis is that the sample sizes quickly become small with several classifications ending up with numerous results and high standard errors. The alternative is then to shift to multivariate (life table) methods.

3.3.3 HAZARD MODELS

A hazard in ordinary use means risk. A hazard model is therefore, a model that defines the risk of instantaneous occurrence of a given event. Regression analysis for the open and closed intervals in this study are undertaken using the regression model for the life table, which was proposed by Cox in 1972. In this model, the dependent variable is taken as the probability of instantaneous occurrence of a given event at a given time t. This instantaneous rate which is referred to as the instantaneous failure rate or the force of mortality gives the risk of the occurrence of an event at time t, given that the event has not occurred earlier. In this study, this rate refers to the risk or hazard of having live birth t months since the last birth. If this risk is denoted by $\lambda(t)$ then,

$$\lambda(t)=f(t)/S(t)$$

Where $f(t)$ is failures at t, and $S(t)$ is the survival function (in this study is the number of women who gave birth t months earlier who have not had another birth). $S(t)$ is related to the cumulative density function of failures as follows:

$$S(t) = 1 - F(t)$$

Where $F(t)$ is the cumulative density function of failures and $f(t)$ is the associated density function.

Since,

$f(t) = \frac{d[F(t)]}{dt} = \frac{-d[S(t)]}{dt}$ then $S(t)$ and $\lambda(t)$ are related as follows:

$$S(t) = e^{-\int_0^t \lambda(u)du}$$

The model, which was proposed by Cox, assumes that the risk can be related to the independent variables in a log-linear manner i.e.

$$\lambda(t,x) = \lambda_0(t)e^{x^1\beta}$$

Where, $\lambda(t)$ is referred to as the baseline hazard

X is a set of variables, which the risk is assumed to depend on.

β is a vector of coefficients.

Thus,

$$\ln \lambda(t,x) = \ln \lambda_0(t) + X^1\beta$$

Several approaches have been adapted to operatinalize this model and hence obtain the estimates of the parameters. The maximum likelihood is used to obtain the estimates of the parameters. The likelihood function is maximized such that, the estimate are those which maximizes the probability of observing the outcome which was observed to occur.

Sometimes the baseline hazard is unspecified and arbitrary. But the log-logistic and Weibull distributions can be used to specify the baseline hazard. The estimates are hence obtained through the method of maximum likelihood.

Another approach that is used is to divide the time interval into duration categories and to assume that the baseline hazard is constant in each of such durations. This implies that in each of such durations the survival function is exponential. This study applies this approach. The variables used in this study are categorical. The maximum likelihood estimates is such that the expected number of failures (which are the number of births in this study) is equal to the observed number.

In general, the maximum likelihood estimates of the risk are given by f/T, where f is the number of failures and T is the total exposure. In this study for the months of exposure in the i-th duration, the risk will be given by Bi/Ti where Bi are the births given in this duration and Ti is the total exposure in the given duration. In order to obtain unique estimates of the parameters the log-linear will be used. This will be in cases where restriction is necessary.

CHAPTER FOUR: DATA QUALITY AND PRELIMINARY ANALYSIS.

4.1 Introduction

This section provides a description of the selection of the sub set of the cases employed in the analysis, quality of the data used and results of some of the preliminary analysis, which include frequencies and cross tabulations.

4.2. Selection of Birth Intervals and sub-sample for analysis.

The analysis of birth intervals is faced with two major problems. One is the selectivity problem, which involves determining the most appropriate subset of intervals for analysis. The second problem is the censoring effect. This problem is methodological in nature and has already been discussed in the methodology section. This section focuses on the first problem.

Bumpass et al., (1982) observed the need to select a subset of intervals for analysis arguing that analysing all the intervals can bias the results. This occurs because of over-representation among maternity histories for women aged 15-49 of intervals begun at younger ages. Consider, for example women in the KDHS whose second birth interval begun when they were aged 15 years. Such intervals include those intervals begun in 1998 for women aged 15 years in 1998 and those begun in 1964 for women aged 49 years at the time of the survey. In other words, all intervals begun between 1964 and 1998 are eligible for inclusion in the analysis. According to Bumpass et al., (1982), such over representation can bias the results because of the relationship between the age and the length of the birth interval and also if there is a trend in any of the independent variables. In addition, intervals begun many years before the survey raise two other problems i.e. the quality of the data for such intervals and the fact that a considerable number of intervals are missed for those women who had died. One of the approaches adopted to minimise the above problem is to restrict the analysis to intervals that were initiated in the recent past say, 5 or 10 years before the survey and at the same time ensure that a sufficiently large sample is maintained to obtain stable estimates. In order to ensure this, the analysis in this study was restricted to intervals began in the three years before the survey, since this is also the time up to which breastfeeding information is available. Thus, the largest possible intervals considered will be 36 months.

The other approach, which is adopted to minimise this bias, is to exclude from the analysis, birth intervals of higher birth orders. Bumpass et al., (1982) noted that, restriction of the sample to only women who are aged less than 50 years at the time of the survey excludes from the analysis, intervals which were begun during the period in question, in this case the 3 years before the survey, but cannot be included because the women were aged 50 years and over at the time of survey. Thus, in this case interval begun between 1993 and 1998 by women aged 45 and 49 are omitted because some of these women were aged over 49 years at the time of the survey. Bias due to such omission is minimised by restricting the analysis to intervals of lower birth orders. The intervals that were considered in the analysis are those started by births of orders 8 or less. Also, since the previous birth interval is one of the independent variables in the analysis, only women who had at least two closed intervals (excluding the interval from marriage to first birth) are included in the analysis. Trussel et al., (1985) observed that the interval from marriage to first birth is often poorly defined. Finally, only women who were continuously married, i.e. those who indicated to be married and in first union, were included in the analysis. There were 3620 intervals for the last three years preceding the survey. Out of this only 3507 contained breastfeeding information and were thus used for the survival (life) table analysis. When restrictions were imposed on those women who had at least two closed intervals and whose births were closed by birth order 8 or less there were 1717 intervals left which were utilized for the regression analysis.

4.3: Quality of the study data.

Bumpass et al., (1982) noted that, the analysis of birth intervals on child spacing demands high quality data. Data utilized for analysis in this study were examined through several approaches to determine its suitability. This assessment was undertaken at various levels. First, the overall quality in terms of reporting was examined. Secondly, the quality of reporting for the births and deaths were examined. The assessment of the quality of data for the independent variables of duration of marriage and breastfeeding which are more likely to be affected by the quality of reporting were the next to be examined. Finally, the assessment focussed on the quality of the data on the birth intervals, the dependent variable of this study.

4.3.1:Age Distribution of women.

To obtain a general picture of the nature in the reporting of events, we begin this analysis by examining the quality in the reporting of the respondents' ages. In figure 4.3(a) the percent of women is plotted against the reported ages in single years (Appendix g) .The plot is expected to decline smoothly with age. Thus, peaks suggest preferences against the corresponding digits.

The distributions show that, reported ages are falsely concentrated at points: 19,22,25,28,30,32,35,38,41,and 45.This indicates a preference for digits 5 and digits ending in even numbers of: 2, and 8.The preference for digits ending in odd numbers is less pronounced. In order to quantify the extent of digit preference for "0" and "5" noted above the Whipples index is calculated. This index is given by:

$$W_i = \frac{\sum P_a}{\frac{1}{5}\sum_{15}^{49} P_i} * 100$$

a=15,20,25,30,35,40,45.

The index varies between 100, representing no preference for 0 and 5 and 500 indicating that only 0 and 5 were reported. For this study, this index was 107 indicating that the extent of preference for the two digits in the reporting of age was not serious. However, when calculated for each of the three levels of education it confirms that preference for the two digits was less for the more educated women. For women with secondary and above level of education, this index was 104 compared with 109 for those with no education.

4.3.2: Assessment of omission and misplacement in the reporting of births and deaths.

Birth history data can be affected by the omission of births or their misplacement over time. In this study, the omission in the reporting of live births was determined through the approach by Miguel (1980). Using this approach, sex ratios at birth by some socio-economic characteristics of rural/urban and educational levels were calculated. Omission was determined by examining the extent to which the calculated sex ratios differed from the expected ratio of 1.05.Asex ratio smaller than the above was interpreted to mean that, the male births were omitted while a larger one implied the omission of female births.

Table 4.1 reports the sex ratios, which are provided by age, level of education and residence. The calculation of the ratios was based on all the live births in the study sample. The sex ratio of 1.02 obtained for the study sample as reported in this table is lower than the expected ratio of 1.05.This suggests the possibility of the omission of male births. Such omissions if they exist would be expected to more pronounced for rural women and those with low levels of education. However, examining these ratios which are reported in the same table suggest that births are omitted more among women with no education and those with secondary education and above level of education. Sex ratios are observed to be low among women aged 20-24 30-39 and 45-49.This may suggest the omission of some births by those mothers with no education. On the other hand, for those mothers with secondary and above level of education this may suggest the unwillingness on the part of these enlightened mothers' to report births of their children who had died, in particular the males.

Table 4.1: Sex ratios of births by some socio-economic and demographic characteristics of the mother.

Characteristic	sex ratio
All	1.02
Age (yrs.)	
15-19	1.19
20-24	0.96
25-29	1.05
30-34	0.96
35-39	0.98
40-44	1.29
45-49	0.80
Residence	
Urban	1.02
Rural	1.02
Education	
No education	0.98
Primary education	1.02
Secondary education	0.99

Accurate reporting in the ages at deaths of infants and children is desirable for this study so as determine the intervals in which such deaths took place. An indication of the accuracy in this reporting is provided in figure 4.3(b) in which the percent distribution of deaths of infant and children is provided by the month of death (Appendix h). Because of the manner in which the coding of age at death in KDHS was done, this figure was drawn up to 29 months. The figure reveals a strong tendency for reporting infant and child deaths with whole numbers and half years. The figure shows a high degree of heaping at months 3 and 12 and to a lesser and to a lesser extent at months 6, 8,14 and 18.

4.4.3: Assessment of nuptiality data

In order to detect whether there was misreporting in the dates of marriage, two approaches were used. The first was to examine the extent of heaping by plotting the percent married versus age in single years. The proportions ever married for each current age were also examined from the expected trend of increase in this proportion with age. Figure 4.3(c) shows the percent married plotted against the duration since first marriage in single years (Appendix I). Heaping is noted at durations 1.5,2,5,8,12,15,17,22 and27.

Figure 4.3(d) shows a plot of the cumulative proportion married at each age versus current age in years (Appendix j). These proportions are expected to increase with age. This figure reveals this to be generally the case although some irregularities are noted particularly at ages above 30. This figure therefore, confirms that extent of heaping is minor.

4.3.4: Assessment of the quality of breastfeeding data.

In order to determine the quality of the breastfeeding data, the extent of heaping was determined by examining the plot of the percent of women versus duration of breastfeeding. This plot is shown in figure 4.3(e). Heaping was found to be particularly extensive for months 12,18 and 24(Appendix k).

4.3.5: Checking the quality of the data on open intervals.

Data on birth intervals were analyzed to determine whether there were serious preference for certain digits. This analysis is shown in figure 4.4(f) in which percent distributions of the open intervals in the last three years preceding the survey (Appendix L). Heaping for the open intervals is noted in durations 1,3,6,12,14,16,18,24,29,31,and 34.This shows a tendency for preference of durations ending in even numbers.

4.3.6: Summary.

The assessment of the quality of data undertaken in this sub-section in general shows no major errors in the data. The misreporting in the dates of marriage detected in the data is not unusual and is not expected to affect the analysis undertaken much. The misstatement of the dates of death of infants and children as revealed by heaping, the possible omission of male children who may have died and misstatement in durations of breastfeeding needs to be borne in mind in subsequent analyses.

Another point that needs to be noted relates to the manner in which the age at death was coded in the KDHS. As noted earlier, deaths were coded to then nearest year. This implies that for such deaths accurate identification of the intervals in which the deaths occurred was not possible. However, the bias arising from this is not expected to be large. Data on contraceptive use and coital frequency as already noted was not available for each of the birth intervals included in the analysis. The limitations in the assessment of the effects of infant and child deaths in birth intervals arising from this and the strategies adopted to resolve it would be addressed in the analysis part. Finally, the quality of the data for the open intervals as reflected by the extent of digit preferences was found to be good.

CHAPTER FIVE: SURVIVAL TABLE ANALYSES OF BIRTH INTERVALS IN KENYA.

5.1 Introduction

This chapter examines the results of the survival life tables. It specifically looks at the patterns of birth spacing.

5.2 Patterns of birth spacing.

5.2.1 Introduction

Cross-sectional data collected in surveys is usually faced with the problem of censoring. Birth intervals which are measured by the intervals between successive births (closed birth intervals) are often biased. This is due to the fact that some women have completed childbearing while others are still engaged or have not yet started. It follows that; observations from such women are often censored by the date of the survey. Event history methods can be used to analyse such data by way of constructing life (survival) tables for each birth hence avoiding the biases towards shorter durations when only closed birth intervals are estimated. Life table methods are however limited in that massive data sets are generated which are not readily comparable thus appropriate summary measures are required in order to describe the patterns and to compare the experiences of different sub-groups of the population.

5.2.2 Summary Measures.

A common and robust measure used in constructing life (survival) tables is the median duration of the birth interval, which measures the tempo of childbearing. The other commonly used measure is the cumulative proportion at each birth order who eventually move to the next within 60 months (B60) to describe the intensity of fertility (also called quintum). According to Brass et al., 1995 c.f.Otieno (1999) this measure closely approximates to parity progression ratio in high fertility populations. Finally, among those who ever progress to the next birth within 60 months a conditional mean called the trimean is used to provide a more refined measure of the speed of reproduction. This is due to the fact that the life table median is influenced both by the set of the women who progress to the next birth as well as by those who will never experience the event .The proportions of those who experience the next event within 18 months has been included as an indicator of the prevalence of short birth intervals. Short birth intervals measure the influence of infant deaths due to the reduction in the period of postpartum amenorrhoea usually prolonged by breastfeeding and also extent of mistimed births.

A picture of fertility levels and differentials is obtained by considering the median and B60 together. But unlike the median, normalized trimean may be considered fairly close to the true average birth interval thus more useful for sub-group comparisons in inter-birth spacing. Large median coupled with a high B60 implies long birth spacing that may not necessarily lead to lower fertility. In contrast a small median and high B60 suggest higher fertility but large median and small B60 may imply that, a non-negligible proportion of respondents have a next birth more than five years from previous birth. When several birth orders are put together than only one birth then the trimeans and the medians are per birth rather than per woman. The set of these summary measures will collectively be referred to as the birth functions.

5.2.3 Overall Trends in birth spacing patterns.

Table 5.1 shows the estimated birth functions for the period 1995-1998. In the estimation of the progression from marriage to first birth the negative intervals are all set to zero. B3 and B9 are used as indicators of premarital births and/or premarital conceptions. They are the cumulative proportions of having a birth within 3 and 9 months of marriage respectively.

Table 5.1: Trends in birth spacing patterns

Period at the start of the interval		
Birth order transition	Summary measure	1995-1998
Marriage to 1st birth	B3	0.3800(0.021)
	B9	0.5600(0.019)
	B60	0.8952(0.019)
	M	6.98
	N	890
1ST TO 2ND	B18	0.0895(0.023)
	B60	0.8360(0.026)
	M	31.08
	T	28.80
	N	734
2ND TO 3RD	B18	0.0725(0.012)
	B60	0.7893(0.027)
	M	31.72
	T	29.27
	N	497
3RD TO 4TH	B18	0.075(0.014)
	B60	0.8371(0.026)
	M	32.71
	T	30.20
	N	400
4TH TO 5TH	B18	0.0573(0.013)
	B60	0.8250(0.030)
	M	32.82
	T	30.47
	N	321
5TH to 6TH	B18	0.0693(0.014)
	B60	0.7500(0.036)
	M	32.99
	T	28.92
	N	255
6TH TO 7TH	B18	0.0595(0.019)
	B60	0.7216(0.037)
	M	34.40
	T	28.81
	N	188
7TH TO 8TH	B18	0.0584(0.0187)
	B60	0.7141(0.039)

	M	33.88
	T	29.02
	N	126
8TH TO 9TH	B18	0.0595(0.017)
	B60	0.6801(0.028)
	M	38.14
	T	29.02
	N	111
9TH TO 10TH	B18	0.0487(0.024)
	B60	0.6206(0.075)
	M	43.42
	T	30.35
	N	58
10TH and above	B18	0.0585(0.023)
	B60	0.5408(0.023)
	M	-
	T	28.60
	N	40

KEY
B3-Proportion having the next birth within 3-months.
B9-Proportion having the next birth within 9-months.
B18-Proportion having the next birth within 18-months.
B60-Proportion having the next birth within 60-months.
M-Median birth interval.
T- Trimean.
N-Number initially at risk.
Standard errors in parentheses.

Results from table 5.1 show that 38 % of the women had a birth within 3-months of marriage while 56 % of them had a birth within 9-months of marriage. The median birth interval for the progression from marriage to first birth was lowest across all birth orders. The progression proportion of women having short birth intervals (i.e. of less than 18-months) decreased from 9 % in birth order one to 6 % in birth order five. At higher birth orders this proportion ranged between 5 % to 6 %. The proportion of those going to have the next birth within the next 60-months ranged between 79 % to 84 % for women of birth order 1-5 and between 54 % to 78 % for women of birth order 6 and above. The average birth interval from birth order one to the highest was about 29 months.

5.2.4 Demographic controls.

Table 5.2: Birth spacing patterns controlling for relative age 1995-1998.

		Age at the start of the interval			
Birth order Transition	Summary Measure	<16	16-18	19-20	>20
1ST TO 2ND	B18	0.0498	0.08999	0.1173	0.1185
	B60	0.7893	0.8347	0.8674	0.8172
	M	32.85	30.96	30.19	28.75
	T	29.95	28.46	27.95	26.53
	N	8	180	342	990
2ND TO 3RD		<19	19-21	22-23	>23
	B18	0.0797	0.1096	0.0765	0.1161
	B60	0.8572	0.8626	0.8273	0.7654
	M	28.67	29.51	31.92	32.58
	T	28.52	28.83	27.89	25.62
	N	188	543	480	682
3RD TO 4TH		<21	21-23	24-25	>25
	B18	0.0875	0.1086	0.0849	0.0857
	B60	0.8588	0.8752	0.8154	0.7496
	M	29.60	28.50	31.55	33.61
	T	28.85	29.05	28.72	29.61
	N	380	451	462	621
4TH TO 5TH		<23	23-25	26-27	>27
	B18	0.0851	0.0855	0.0899	0.0795
	B60	0.8458	0.8621	0.8252	0.6950
	M	31.43	28.32	29.05	35.62
	T	29.40	28.90	28.56	29.46
	N	1335	346	362	591
5TH TO 6TH		<25	25-27	28-30	>30
	B18	0.1093	0.1034	0.0698	0.0591
	B60	0.8452	0.8151	0.7757	0.6489
	M	28.54	28.81	31.12	39.06
	T	26.81	27.85	27.72	29.03
	N	234	289	362	398
6TH and over		<29	30-31	32-33	>33
	B18	0.1051	0.1018	0.0654	0.0571
	B60	0.8502	0.8152	0.7757	0.6492
	M	29.05	30.57	35.83	40.05
	T	27.15	28.92	28.65	28.36
	N	486	437	461	1635

KEY

B18-Proportion having the next birth within 18 months.

B60- Proportion having the next birth within 60 months.

M-Median birth interval.

T-Trimean.
N-Number initially at risk.

The results in table 5.2 show that, 79 % of women who had their first birth before age 16 had their next birth within 60-months. The average birth intervals are shown to decline with the increase in age at first birth across all the birth orders. This could possibly be attributed to the effect of premarital births.

It's further observed that, there are differentials in the occurrence of short birth intervals across the birth intervals for the different ages. For birth order 1-2, the prevalence of short birth intervals range from 4 % for those aged less than 16 to 12 % for those aged 19-20 and over 20 years. For women in birth orders 2-3, the occurrence of short birth intervals range from 8 % to 12 %. It was also observed that, the prevalence of short birth intervals is averaged at 8 % for women in birth order 4-5. For those women of birth orders 6 and above, the prevalence of short birth intervals ranged between 6 % and 11 % across the different age segments.

Table 5.3: Birth spacing patterns controlling for length of preceding interval 1995-1998.

		Length of preceding interval			
Birth order Transition	Summary Measure	<18	18-24	24-34	>35
2^{ND} TO 3^{RD}	B18	0.1256	0.0890	0.0790	0.0852
	B60	0.8754	0.8258	0.8576	0.7484
	M	28.54	28.83	29.51	34.26
	T	26.77	28.28	28.63	29.59
	N	431	113	133	218
3^{RD} TO 4^{TH}	B18	0.1651	0.0712	0.0780	0.0851
	B60	0.8384	0.8458	0.8453	0.7450
	M	30.50	28.83	30.96	34.90
	T	27.86	28.58	29.23	29.67
	N	31	63	114	192
4^{TH} TO 5^{TH}	B18	0.1291	0.0693	0.0696	0.0788
	B60	0.8087	0.7853	0.8543	0.7052
	M	32.61	29.62	30.72	34.81
	T	28.51	28.67	28.47	28.57
	N	20	60	85	156
5^{TH} TO 6^{TH}	B18	0.1379	0.0651	0.0650	0.0677
	B60	0.7761	0.7168	0.7881	0.7059
	M	27.61	30.95	30.86	33.69
	T	25.78	25.64	28.73	28.62
	N	25	43	60	127
6^{TH} TO 9^{TH}	B18	0.1681	0.0806	0.0657	0.0739
	B60	0.7194	0.7569	0.7491	0.5965
	M	31.63	30.73	32.51	40.31
	T	25.76	28.00	28.41	28.81
	N	37	69	116	205
9^{TH} and over	B18	0.1668	0.0532	0.0565	0.0309
	B60	0.6571	0.6052	0.6178	0.3650
	M	32.64	39.51	36.76	-
	T	23.97	28.92	28.66	28.54
	N	138	19	22	48

KEY

B18-Proportion having the next birth within 18 months.

B60-Proportion having the next birth within 60 months.

M-Median birth interval.

T-Trimean

N-Number initially at risk.

Length of the previous interval is considered as one of the most important factors influencing the subsequent interval (Otieno, 1999). The results presented in table 5.3 show a general decline in the prevalence of short birth intervals across all the birth orders. Notable changes were for those women of birth order 9 and above where the prevalence of short birth intervals fell from 17 % for those with a preceding birth interval of less than 18 months to 3 % for those with a preceding birth interval of more than 35 months. This was also observed for women of birth order 6-9 and those of birth order 5-6 where the change in the prevalence of short birth intervals was 10 % and 7 % respectively.

The results further show that, there was a general decline in those progressing to the next birth within 60 months across all the birth orders. For those women of birth order 9 and above this change ranged from 66 % for those women with a previous birth interval of less than 18 months to 3 % for those women with a previous birth interval of more than 35 months. For women of birth order 6-9, 59 % with a previous birth interval of more than 35 months progressed to the next birth within 60 months compared to 72 % of women who had a previous birth interval of less than 18 months who progressed to the next birth within 60 months.

The median birth interval was noted to increase across all the birth orders and for all the lengths of the previous birth intervals. This increase was highest for birth order 6 and over where it ranged between 32-40 months. On the other hand, the average birth interval was 29 months across all the birth orders.

Table 5.4: Birth spacing patterns controlling for the death of index child at infancy.

Period at the start of interval			
		1995-1998	
Birth order Transition	Summary Measure	Index child Dead	Index child Alive
1ST TO 2ND	B18	0.2396	0.0876
	B60	0.8476	0.8276
	M	24.68	30.85
	T	22.87	28.43
	N	107	1517
2ND TO 3RD	B18	0.3364	0.0768
	B60	0.8903	0.8172
	M	23.59	30.79
	T	21.96	28.51
	N	29	468
3RD TO 4TH	B18	0.2732	0.0821
	B60	0.8745	0.813
	M	25.52	31.45
	T	23.36	29.59
	N	25	375
4TH TO 5TH	B18	0.2409	0.0743
	B60	0.8845	0.7821
	M	25.42	32.12
	T	24.15	28.39
	N	24	297
5TH TO 6TH	B18	0.2232	0.0742
	B60	0.8433	0.7402
	M	24.20	32.27
	T	22.12	28.57
	N	25	230
6TH and over	B18	0.2459	0.0709
	B60	0.7742	0.6001
	M	26.53	34.62
	T	22.68	28.66
	N	53	470

KEY
B18-Proportion having the next birth within 18 months.
B60-Proportion having the next birth within 60 months.
M-Median birth interval.
T-Trimean.
N-Number initially at risk.

Results of the analysis indicate that, where an index child died, the cumulative proportion having the next child in 60 months is higher than where the child survived across all the birth orders. Consequently, the prevalence of short birth intervals is higher in cases where the index child died than where the child survived. This implies that those who lost a child were more likely to have the next birth than those whose children survived.

The results further reveal that, the differences in birth functions are more pronounced in the cumulative proportion having the next birth within 18 months and the average birth intervals. Where a child died more women were more likely to have a short birth interval throughout all the intervals. Thus, it can be observed that the effect of an infant death can be said to be more pronounced on the tempo of child bearing than on the quantum.

Table 5.5: Birth spacing patterns by age cohort and period.

Period at the start of the interval				
			1995-1998	
Birth order Transition	Summary Measure	<=24	25-34	35+
1ST TO 2ND	B18	0.0705	0.1353	0.0658
	B60	0.7942	0.8632	0.7254
	M	32.09	27.52	28.68
	T	29.05	26.17	26.72
	N	1480	428	16
2ND TO 3RD	B18	0.0695	0.1012	0.1392
	B60	0.8353	0.8242	0.7205
	M	31.05	29.85	34.32
	T	29.82	27.86	28.63
	N	181	301	15
3RD TO 4RD	B18	0.0346	0.1026	0.1254
	B60	0.8227	0.8256	0.7865
	M	31.55	31.05	34.51
	T	29.33	28.63	29.52
	N	49	313	37
4TH TO 5TH	B18	0.0158	0.0765	0.1043
	B60	0.8074	0.8271	0.7681
	M	30.91	31.49	32.43
	T	28.68	29.72	26.90

	N	15	247	59
5^{th} TO 6^{th}	B18		0.0824	0.0669
	B60		0.7905	0.7122
	M		30.44	32.67
	T		28.32	27.64
	N		165	90
6^{th} and higher	B18		0.0775	0.0901
	B60		0.7659	0.6845
	M		31.82	34.64
	T		29.05	27.65
	N		142	379

KEY
B18-Proportion having the next birth within 18 months.
B60-Proportion having the birth within 60 months.
M-Median birth interval.
T-Trimean.
N-Number initially at risk.

Birth intervals differ by period as well as by the age of the women. Table 5.5 shows major differences in the proportions experiencing the next event within 18 months especially for the younger cohorts. For those aged less than 23 years, the proportions experiencing the birth within 18 months decline from 7 % from birth order one to 2 % in birth order 5. For women in the middle cohort (25-34) the proportion experiencing the next birth within 18 months decline from 14 % in birth order 1 to 8 % for birth order 6 and above. The proportion experiencing the next birth within 18 months for those over 35 years fluctuates between 7 % and 14 % with variations observed across the birth orders.

The proportion having the next birth within 60 months for those aged 25-34 declines from 86 % to 77 % across all birth orders. For those aged less than 24 years and those over 35 years the pattern is not consistent. The median birth intervals fluctuate between 31 and 32 for those aged less than 24 years for birth orders 1-5. For the age cohort 25-34, median birth intervals increase across the birth orders except for birth order 5-6. For women aged 35 years and above the median birth intervals increase from 29 to 35 months between birth order 1-4 and decline to 32 for birth order 4-5 after which they increase again up to 35 months for birth orders 6 and above. The average birth intervals show increased but minor changes across all the birth orders.

5.3 Summary

This chapter explored the use of survival (life) tables in the analysis of birth intervals. The trends show remarkable increase in premarital births as indicated by the cumulative proportions having a first birth within 3 and 9 months. The median birth intervals for nearly all birth orders are between 28 and 29 months.

The most significant observation is the decrease in the prevalence of short birth intervals. The average birth intervals are higher where the index child died than where the child survived. However, it's important to note that, whereas life tables are useful instruments to examine birth spacing patterns, they are nonetheless inadequate. One major weakness of the life tables is that the numbers quickly become small when several controls are introduced. Thus, in order to account for differentials as well as being able to determine the set of factors which explain the determinants of birth intervals it would be in order to use multivariate life tables where controls can be introduced. This is considered in the next chapter.

CHAPTER SIX: RESULTS OF THE MULTIVARIATE ANALYSIS

6.1 Introduction

In the previous chapter, we examined birth interval lengths using survival (life) table technique. The limitation of this technique was explained therein. This chapter extends this analysis using multivariate hazard methods. The definitions of the variables utilized for analysis are discussed in section 6.2. Section 6.3 examines the nature of the relationship between the dependent variable and each of the independent variables.

6.2 Categorization and definition of the variables.

This section presents the definition of the variables utilized in fitting the models. Most of these variables .are categorical in nature.

6.2.1 Categorization of the variables.

Education was initially defined in five categories namely; none, primary incomplete, primary complete, secondary incomplete and secondary and above level of education. The bivariate analysis undertaken for this variable indicated that, the secondary incomplete category was not significantly related with the dependent variable. But, when this was combined with secondary and above level of education it turned out to be significantly related with the dependent variable.

Ethnicity was categorized into; Mijikenda, Luhya, Kalenjin, Luo, and other ethnic groups. This was based on earlier studies which showed that the Mijikenda group from the Coast province of Kenya should be expected to have the longest birth intervals while the Luhya in Western part of the country have the shortest birth intervals (Mosley et.al, 1982). The other ethnic groups should lie in between.

The demographic variables utilized in this study were continuous in nature but were categorized into appropriate groups. Various grouping of age revealed that this variable was most appropriately defined in two categories i.e. <25 years and >=25 years. The previous birth interval was also appropriately grouped into: <2 years, 2-3 years and >3years. The analysis for the duration of marriage showed that, the variable was most strongly related to the dependent variable when categorized onto <10 years and >=10 years. The other variables were used as shown in table 6.1.

Table 6.1 Means and proportions of the variables used in the analysis.

Variable name	Open intervals n=1513	Closed intervals n=204	closed and open n=1717
Dependent variable			
Birth interval length		19.0	
Independent variables			
Death of birth opening interval			
Child alive (ref)	56.0	38.0	64.0
Child died	44.0	62.0	36.0
Length of previous birth interval			
<2 years(ref.)	23.0	25.0	23.0
2-3 years	35.0	42.0	36.0
>3 years	42.0	33.0	41.0
Length of previous birth interval mean			
<2 years	20.0	18.0	17.0
2-3 years	30.0	29.0	30.0
>3 years	50.0	53.0	57.0
Education			
No education	13.4	8.8	12.9
Primary incomplete	41.8	47.1	42.4
Primary complete	24.0	25.5	24.2
Secondary+	20.8	18.6	20.5
Place of residence			
Urban(ref.)	11.5	7.4	11.0
Rural	88.5	92.6	89.0
Region of residence			
Western(ref.)	13.3	20.1	14.1
Nairobi	2.1	1.0	2.0
Central	6.6	3.4	6.2
Coast	14.9	9.8	14.3
Eastern	13.9	12.3	13.7
Nyanza	17.9	19.1	18.1
Rift Valley	31.3	34.3	31.7
Religion			
Catholic(ref.)	25.8	25.6	25.8
Protestant	65.0	67.5	65.3
Muslim	5.1	3.4	4.9
Other	4.0	3.4	4.0
Ethnicity			
Mijikenda(ref.)	9.3	5.4	8.9
Luhya	15.5	21.6	16.2
Kalenjin	22.2	25.0	22.5
Luo	13.5	18.6	14.1

Kikuyu	10.6	7.4	10.3
Other	28.9	22.1	28.1
Marital status			
Others(ref.)	7.7	2.9	7.2
Married	92.3	97.1	92.8
Age of mother			
<25 years(ref.)	18.9	22.1	19.3
>=25 years	81.1	77.9	80.7
Birth order			
<3(ref.)	28.2	23.5	27.7
4-5	39.7	43.6	40.2
6-8	32.1	32.8	32.1
Ever use of contraception			
Never used(ref.)	40.4	45.6	41.1
Used traditional	11.6	12.3	11.6
Used modern	48.0	42.2	47.3
Current use of contraception			
Not using (ref.)	69.7	79.9	70.9
Using traditional	29.5	20.1	29.1
Using modern	11.8	11.1	17.1
Breastfeeding duration			
Not breastfeeding	2.5	4.4	2.7
Breastfeeding	97.5	95.6	97.3
Duration of marriage			
Never married	1.7	0.5	1.5
<5 years	6.7	5.9	6.6
5-14 years62.7	62.7	73.7	62.8
>15 years	29.0	29.9	29.1
Work status			
Not working	43.7	47.1	44.1
Working	56.3	52.9	55.9

a) Dependent variable

The mean of the closed intervals as presented in table 6.1 is 19 months. It's lower than expected because of several reasons. One is the selection procedure in which only intervals started and completed in the last three years preceding the survey were included. This kind of selection of procedure removes longer intervals.

b) Variable for the assessment of the effect of infant/child mortality on birth intervals.

According to the table, 44 percent of deaths occurred to children born in the open intervals while the corresponding number for the closed intervals was 62 percent. On the overall, 36 percent of deaths opening the interval died.

c) Socio-economic, cultural and demographic.

About 44 percent of the births were contributed by women with primary incomplete level of education. Those with secondary and above level of education contributed 21 percent of the birth intervals. About 89 percent of the intervals were due to women living in the rural areas while the rest were due to women reported to be in urban areas. The table further shows that, over 32 percent of the intervals were reported from women in the Rift Valley while women from Nyanza contributed 18 percent of the intervals. Over 14 percent of these intervals were each contributed by women from Western, Coast and Eastern provinces. Only 2 percent of the intervals were reported due to women from Nairobi region.

Slightly over 81 percent of the intervals were reported by women aged over 25 years with the rest being reported due to women aged less than 25 years. Most of the intervals (60 percent) were preceded by intervals of more than 3 years. Nearly 93 percent of the intervals were attributed to the continuously married women. Sixty three percent of the intervals were initiated by women who had been married for between 5-14 years while 29 percent of the intervals were attributed to women married for over 15 years. About 56 percent of the intervals were due to working women.

Over 23 percent of the intervals were initiated by the Kalenjin ethnic group. The Mijikenda initiated about 9 percent of the intervals .The Luhya, Luo and Kikuyu ethnic groups put together initiated over 28 percent of the intervals. The Protestants and other Christians initiated about 65 percent of the intervals with 26 percent of the intervals due to the Catholics. The Muslims and other religions initiated about 9 percent of the intervals. Over 40 percent of the intervals were attributed to women in birth order 4-5 while 32 percent of the intervals were due to women of birth orders 6-8.

D) proximate determinants

According to the table, 47 percent of the intervals were due to women who had ever used a modern method of contraception while 41 percent of the intervals were initiated by women who had never used any contraception. About 60 percent of the intervals were initiated by women who were not using any current method of contraception while 17.1 percent were due to women using a current method of contraception. It's however important to note that, data on contraception was not related to any specific intervals in this study. About 97 percent of the intervals were attributed to women who were breastfeeding.

6.2.2 Fitting of the models

The first step was to undertake a bivariate analysis. This involved fitting a model for each of the variables. Under this criterion all variables were considered to be theoretically important to the study and hence all of them were entered into the model. The next step involved fitting the sub-models. There were two sub-models viz; socio-economic and cultural and the proximate determinants sub-model. The socio-economic and cultural factors which were significant at the bivariate level were entered into model first followed by others. The proximate determinants sum-model was fitted in more or less the same way. The significant variables in the bivariate analysis were the first to be inserted in the model followed by the others, which were not significant. In each of the above models the socio-economic, cultural and proximate determinant factors, which were not significant, were determined through the Wald test.

A variable was only considered not significant if none of its categories was significant. Thus, the variable with the lowest level of significance was determined and the above models re-fitted by excluding this variable. If the changes above weren't substantial this implied that the variable, which was removed from the model, didn't confound the relationship. The above procedure was repeated to determine the demographic variables to be included in the final model. In order to determine the effect of removing the variables which weren't from the model as a group and the changes in the effects were determined by comparing the model containing all the variables with the above model.

6.3 Results of the bivariate analysis.

Table 6.2 Results of the bivariate Analysis

Variable	β	S.E.	Exp(β)
Education			
None(ref.)			
Primary incomplete	-0.2839	0.3239	0.7529*
Primary complete	-0.6177	0.3469	0.3994
Secondary+	-0.9765	0.3097	0.2525
Marital status			
Other(ref.)			
Married	0.5955	0.3704	1.4424*
Age of mother			
<25 years(ref.)			
>=25 years	0.7041	0.2817	2.0221**
Marital duration			
<10 years(ref.)			
>=10 years	0.6907	0.2895	1.8988*
Death of birth in previous interval			
Alive(ref.)			
Dead	0.7067	0.2835	4.8028*
Previous birth interval			
<2 years(ref.)			
2-3 years	-0.8138	0.3056	0.2201**
>3 years	-0.7865	0.3802	0.0799**
Ever use of contraception			
Never used(ref.)			
	-0.9857	.05702	0.9105

Used traditional Used modern	-0.5906	0.3256	0.1207**
Current us of contraception Not using(ref.) Using contraception	-0.7506	0.3489	0.1493*
Breastfeeding Not breastfed(ref.) Breastfed	-0.9171	0.3965	0.0363*

* Means $p<0.05$ ** means $p<0.01$

The results of the bivariate analysis showed that, the risk of having a birth for those with secondary and above level of education was 0.25 times lower compared to those with no education. On the other hand, the risk of having a birth for those with primary complete level of education was 0.40 times lower compared to those with no education. For those in marital unions, the risk of having a birth was 1.4 times higher than those who had been widowed, divorced or separated.

The age of the mother at the beginning of the interval was also found to be significantly related to the dependent variable at 0.1 percent level of significance. The risk of having a birth for mothers aged over 25 years was 2.02 times higher compared to those aged less than 25 years. A marital duration of more ten years was found to increase the risk of having a birth by 1.9 times compared to those who had marital duration of less than 10 years.

The risk of having a birth for those who had experienced the death of a birth in the previous interval was 4.8 times higher compared to those whose births were alive. The previous birth interval was also significantly related to the probability of moving to the next birth. The risk of having a birth was 0.08 times lower for those with a previous birth interval of more than 3 years compared to those who had a previous birth interval of less than two years. Those with a previous birth interval of between 2-3 years had a risk of 0.22 times lower of having a birth compared to those who had a previous birth interval of less than two years.

Ever use of contraception had a significant relationship with the dependent variable. The risk of having a birth was 0.12 times lower for those who had ever used any modern form of contraception compared with those who had never used any form of contraception. Having used any traditional form of contraception reduced the chances of having a birth by 0.91 times compared to those who had never used any form of contraception. The risk of having a birth was 0.15 times lower for those who were using a current method of contraception compared to those who were not using. Breastfeeding was found to reduce to be significantly related with the dependent variable. The risk of having a birth was 0.04 times lower for those who were breastfeeding compared to those who were not breastfeeding.

This study further examined the effect of various groups of variables on the dependent variable. These variables were categorized into socio-economic and cultural and the proximate determinants. Each group of variables was considered as a sub model. We examine each sub model in turn.

6.3.1 The Socio-economic and cultural sub-model.

Table 6.3 Results of the socio-economic and cultural sub-model.

Variable	β	S.E	Exp(β)
Marital status			
Other(ref.)			
Married	0.7004	0.2963	2.4605**
Education			
None(ref.)			
Primary incomplete	-0.9249	0.6653	0.7916
Primary complete	-0.7089	0.3367	0.4922**
Secondary+	-0.8595	0.3740	0.1409**
Religion			
Catholic(ref.)			
Protestant	-0.7349	0.3503	0.4796**
Muslim	-0.4937	0.4709	0.6104
other	-0.5716	0.3654	1.7710

** Means $p<0.01$

According table 6.3, marital status was found to be significantly related to the dependent variable. The risk of having a birth was 2.5 times higher for women in marital unions compared to those who were widowed, divorced or separated. This is understandable given the fact that in African societies marriage is the only sanctioned institution for having children. On the overall, educational attainment was found to be significantly related to the dependent variable. Having secondary and above level of education was found to reduce the risk of having a birth by 0.14 times compared to those with no education. The risk of having a birth was 0.49 times lower for those with primary complete level of education compared to those with no education. The risk of having a birth was 0.5 times lower for the Protestants compared to the Catholics.

6.3.2 Proximate determinants sub-model.

Table 6.4: Results of the proximate determinants model.

Variable	β	S.E	EXP(β)
Death of birth in the previous interval Alive(ref.) Dead	 0.9648	 0.3832	 4.3266**
Previous birth interval <2 years(ref.) 2-3 years >3 years	 -0.8815 -0.8906	 0.3407 0.3605	 0.2776* 0.1174
Ever use of contraception Never used(ref.) Used traditional Used modern	 -0.9486 -0.6305	 0.3850 0.3903	 0.0015 0.1958

*Means $P<0.05$ ** Means $P<0.01$

The results of the proximate determinants model show that, the death of a birth in the previous interval was significantly related to the dependent variable. The risk of having a birth was 4.3 times higher for those who had lost a birth in the previous interval compared to those who had not lost a birth. Having a previous birth interval of between 2-3 years was found to reduce the risk of having a birth by 0.28 times compared to those who had a previous birth interval of less than two years. The risk of having a birth was 0.12 times lower for those who had a previous birth interval of more than three years compared to those who had a previous birth interval of less than two years. The risk of having a birth for those who had ever used any modern contraception was 0.20 times lower compared to those who had never used any contraception.

6.3.3: Multivariate Results

Table 6.5 Results of the multivariate analysis

Variable	β	S.E	EXP(β)
Education			
None(ref.)			
Primary incomplete	-0.5842	0.5362	0.7725
Primary complete	-0.6577	0.3091	0.3854
Secondary+	-0.7865	0.3125	0.2462*
Marital status			
Other(ref.)			
Married	0.6854	0.3507	1.5764
Marital duration			
<10 years(ref.)			
>=10 years	0.7205	0.2985	1.6978
Age of mother			
<25 years(ref.)			
≥25 years	0.6507	0.2864	1.8795**
Death of birth in the previous interval			
Alive (ref.)			
Dead	0.7362	0.2973	3.7024**
Previous birth interval			
<2 years (ref.)			
2-3 years	-0.7906	0.3052	0.2010**
>3 years	-0.3547	0.3547	0.0689**
Ever use of contraception			
Never used (ref.)			
Used traditional	-0.9876	0.5902	0.9105
Used modern	-0.6943	0.3523	0.1109**

*Means $p<0.05$ ** means $p<0.01$

The results of the multivariate analysis are shown table 6.5. According to this table, The risk of having a birth was 0.25 times lower for those with secondary and above level of education compared to those with no education. For those with primary complete level of education the risk of having a birth was 0.39 times lower compared to those with no education. Marital status was found to be an important determinant of the risk of progressing to the next birth. The risk of having a birth was 1.7 times higher for women in marital unions compared to those who were never married, divorced, separated or widowed.

The duration of marriage tuned out to be an important factor influencing the risk of having a birth. The risk of having a birth was 1.7 times higher for women who had been married for more than 10 years compared to those who had been married for less than 10 years. The study established that, the risk of having a birth was 1.9 times higher for mothers who were aged more than 25 years increased compared to those who were aged less than 25 years.

The study further observed that, the risk of having a birth was 3.7 times higher for those who had experienced the death of a birth in the previous interval compared to those who had not lost any birth in the previous interval. On the other hand, the length of the previous birth interval of between 2-3 years reduced the risk of having a birth by 0.20 times compared to those who had a previous birth interval of less than two years. The risk of having a birth was 0.07 times lower for those who had a previous birth interval of more than three years compared to those who had a previous birth interval of less than two years.

Ever use of contraception was also significantly associated with the length of the birth interval. Women who had ever used any modern contraception reduced their risk of having a birth by 0.11 times compared to those who had never used any contraception. Having ever used any traditional form of contraception was not found to be significantly related to the length of the birth interval. But, as already noted, information on the ever use of contraception was not obtained for any specific interval.

6.4 Summary

This chapter set out to examine the relationship between the dependent variable and the independent variables. The first part examined the results of the bivariate analysis. This was followed by the results of the sub-models and finally the multivariate results.

The results of the bivariate analysis showed that some variables were related to the to the dependent variable at 1 % level. These variables were; the death of birth in the previous interval, the previous birth interval, age of the mother at the beginning of the interval and ever use of modern contraception. Secondary and above level of education, marital duration of more than ten years, being in marital union, using current contraception and breastfeeding were all significant at 5 % level.

The socio-economic and cultural sub-model showed that; marital status, education and religion had a significant relationship with the risk of moving to the next birth .The proximate determinants sub-model indicated that; the death of a birth in the previous interval, the previous birth interval and ever use of contraception were significantly related to the dependent variable. The results of the multivariate analysis showed that; education, marital status, marital duration, age of the mother, death of a birth in the previous interval, previous birth interval and ever use of contraception to be significantly related to the dependent variable.

CHAPTER SEVEN: FINDINGS, CONLUSIONS AN D RECOMMENDATIONS

7.1 Introduction

This chapter summaries the research findings, makes conclusions and recommendations. Recommendations are made for policy makers and future researchers. These are based on the research findings.

7.2 Summary

This study set out to analyse birth intervals in Kenya. It was concerned with the determinants of birth intervals in Kenya. Specifically, it sought to determine the trends of birth intervals, the effects of breastfeeding on birth intervals, the influence of contraceptive use or non-use on birth intervals and also the effect of socio-economic, cultural and demographic factors on birth interval lengths in Kenya.

To achieve the above objectives several hypotheses to determine the magnitude of these effects were tested by applying survival (life) tables and hazard models. The data utilized was obtained from the Kenya Demographic and Health Survey conducted from February to July, 1989.

The hypotheses were tested within a conceptual framework developed from Bongaarts and Mosley and Chen frameworks for the analysis of fertility and infant and child mortality respectively. To operatinalize this framework birth interval was taken as the dependent variable and also as a measure of fertility. Infant /child death was included to measure the effect of mortality. Several socio-economic, cultural and demographic variables were included in the framework as controls.

In chapter one, the problem of the study is stated, objectives outlined and the justification of the study is made .The scope and limitations of the study is also made. Chapter two reviews the relevant study for the study. It also provides the theoretical framework and a statement of the hypotheses. The concepts are also defined plus the variables and their measurements.

The data sources and methodology was discussed in chapter three. This involved explaining how the data relevant for the study was obtained and the most appropriate methods to analyse the said data. The selection of the sub-sample for analysis and aspects of data quality relevant to the study were examined in chapter four. The results of this chapter indicated that the data was of good quality and could hence be used for this analysis.

The results of the analysis are presented and discussed in chapter five (for survival life tables) and chapter six (for bivariate and multivariate analysis). The results of the survival (life) tables showed that the death of the index child was significantly related to the birth interval length. Birth intervals were shorter where an infant had died than where the infant had survived.

The results of the bivariate analysis indicated that the death of birth in the previous interval, the previous birth interval and ever use of contraception were significant at 5 % level. These results were confirmed in the multivariate analysis.

7.3 Conclusions

With respect to the first objective of this study, the average birth intervals for nearly all birth orders ranged between 28 and 29 months. A decrease in the prevalence of short birth intervals was also observed. However, the average birth intervals were higher where the index child died than where the child survived.

The study established a remarkable increase in premarital births as indicated by the cumulative proportions having the first birth within 3 and 9 months respectively. The average birth intervals were noted to decline with the increase in age at first birth and this could possibly be attributed to the effect of premarital births. The length of the previous birth interval was observed to be an important determinant of the length of the subsequent event. The median birth intervals increased across all the birth orders and also across all the lengths of the previous intervals. The study further noted that, birth intervals varied by the age of the women. The proportion of younger women experiencing short birth intervals was noted to decline across the birth orders.

The results of the bivariate analysis showed that, breastfeeding was a significant determinant of birth interval length. Those women who had breastfed were found to reduce the risk of moving to the next birth compared to those who were not breastfeeding. Both ever use and current use of contraception were found to be significantly related to the dependent variable according to the results of the bivariate analysis. Those who were using a current method of contraception increased the risk of moving to the next birth than those who were not using. On the other hand, ever use of modern contraception reduced the risk of moving to the next birth compared to those who had never used any method.

The death of a birth in the previous interval increased the chances of moving to the next birth more rapidly than in the intervals where the child survived. The study also noted that the length of the previous interval was significantly related to the risk of moving to the next birth. Secondary and above level of education was also significantly related to the dependent variable at 5 % level. Women who had been married increased their chances of moving to the birth than their counterparts who were never married, widowed, divorced or separated. A marital duration of more than ten years was found to increase the chances of moving into the next birth more than one of less than 10 years.

The age of the mother at the beginning of the interval increased the risk of moving to the next birth for mothers who were aged more than 25 years.

7.4 Recommendations for policy and research

In view of the above findings, this study recommends that, Policies should be put up which integrate child programmes that reduce mortality, increase coverage of contraceptive programmes and also increase educational opportunities for girls. These programmes should be integrated as part of the overall strategy for increased acceptance and use of family planning in areas where infant and child mortality is high. There should be renewed emphasis on the role of breastfeeding as a strategy for birth spacing.

Further research is also needed in this area. Future research should focus on analysis of preferred birth intervals and how they are likely to impact on the process of childbearing. Research is also needed on the link between birth intervals and completed family size. Future research should also focus on the parental perception of child survival risks and how these perceptions relate to behavioural decisions in reproduction.

It is important to note that the study of birth interval is useful in understanding fertility patterns of a population. Such a study can be used to gauge the success of programmes such as infant and child survival and also family planning programmes.

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APPENDICES

Appendix (a)Percent distribution of women in single years.

Age of women	percent
15	0.2
16	0.4
17	1.4
18	3.2
19	4.7
20	4.8
21	5.6
22	6.9
23	6.4
24	6.0
25	6.5
26	5.1
27	4.6
28	6.1
29	5.0
30	4.4
31	2.9
32	3.1
33	3.1
34	3.2
35	3.6
36	2.3
37	2.1
38	2.1
39	1.5
40	1.3
41	1.2
42	0.7
43	0.5
44	0.3
45	0.5
46	0.2
47	0.1
48	0.1
49	0.1

Appendix (b)Percent distribution of deaths of infants and children by month of death.

Month	percent
0	38.4
1	3.8
2	4.9
3	8.0
4	5.7
5	3.4
6	5.3
7	4.6
8	4.9
9	3.4
10	1.1
11	1.5
12	7.2
13	0.8
14	1.9
15	0.8
17	0.4
18	2.7
23	0.4
24	0.4
29	0.4
Total	100.0

Appendix (c) Percent in first marriage

Age	Percent
0	3.3
1	5.2
2	8.8
3	8.5
4	7.2
5	7.0
6	5.6
7	4.9
8	5.5
9	4.1
10	3.9
11	3.7
12	3.8
13	3.3
14	3.0
15	3.3
16	2.6
17	2.8
18	2.1
19	2.0
20	1.8
21	1.5
22	1.6
23	1.2
24	1.0
25	0.7
26	0.6
27	0.6
28	0.2
29	0.2
30	0.1
31	0.0
32	0.0
34	0.0

Appendix(d) cumulative proportion married.

Age	cumulative percent
0	3.3
1	8.5
2	17.3
3	25.8
4	32.9
5	40.0
6	45.6
7	50.5
8	56.0
9	60.1
10	64.0
11	67.7
12	71.5
13	74.7
14	77.7
15	81.0
16	83.5
17	86.3
18	88.4
19	90.4
20	92.2
21	93.7
22	95.3
23	96.5
24	97.5
25	98.2
26	98.8
27	99.4
28	99.6
29	99.8
30	99.9
31	99.9
32	100.0
34	100.0

Appendix(e) Percent breastfeeding.

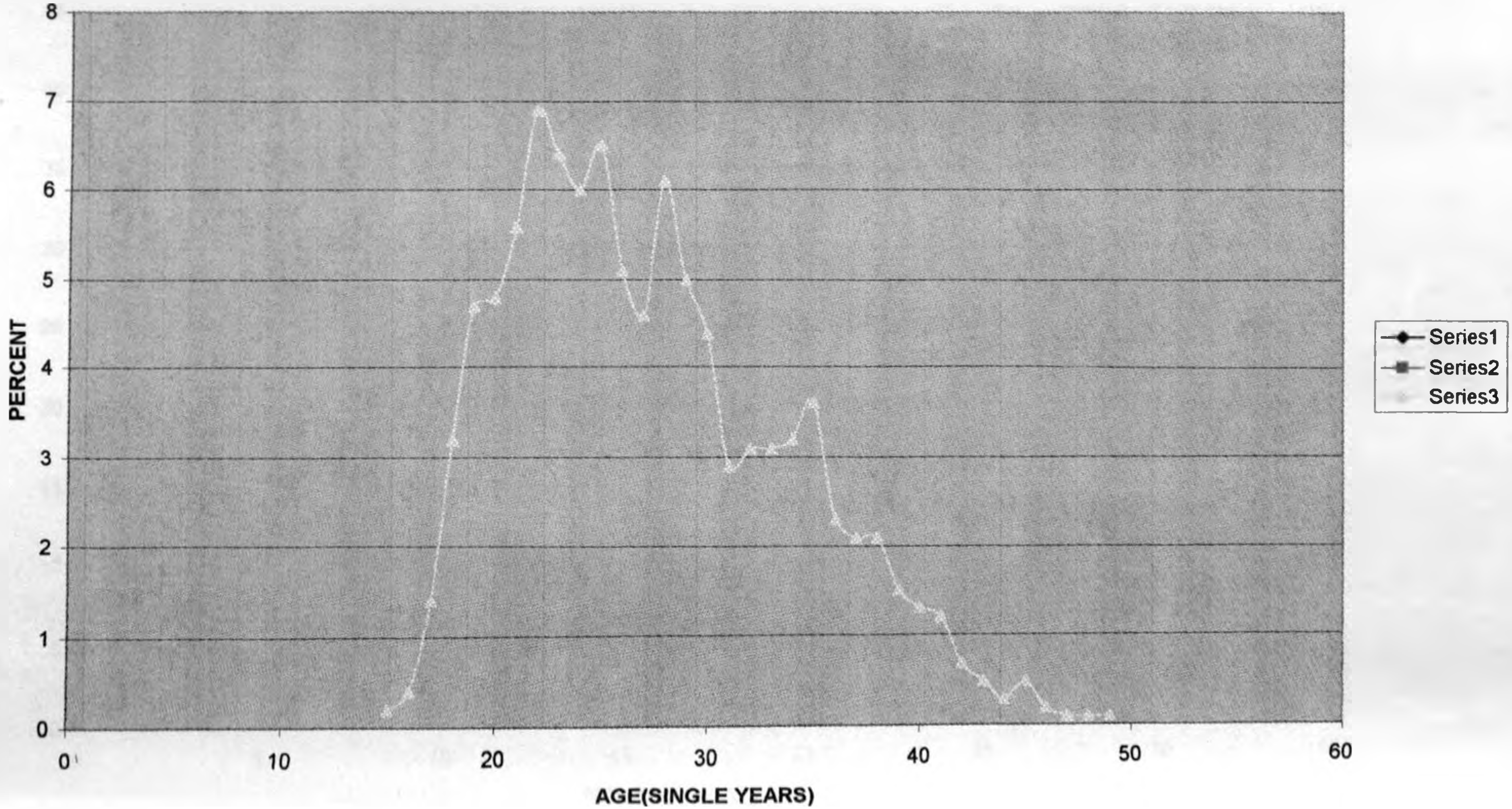
Duration	Percent
0	1.3
1	0.5
2	0.7
3	0.8
4	0.8
5	0.7
6	1.1
7	0.9
8	1.2
9	1.8
10	0.6
11	0.6
12	4.6
13	1.4
14	2.4
15	1.8
16	1.4
17	1.0
18	4.2
19	0.6
20	1.9
21	0.6
22	0.5
23	0.5
24	4.4
25	0.2
26	0.4
27	0.2
28	0.3
29	0.1
30	0.3
32	0.1
34	0.0
36	0.0
48	0.0

Appendix(f) percent distribution of the open interval.

Interval	percent
0	2.3
1	3.7
2	3.6
3	3.7
4	3.6
5	3.5
6	4.0
7	3.8
8	3.9
9	3.4
10	3.3
11	3.6
12	4.1
13	3.0
14	3.1
15	2.9
16	3.7
17	2.4
18	2.9
19	2.5
20	2.7
21	2.7
22	2.5
23	2.7
24	2.8
25	2.3
26	2.1
27	2.0
28	1.4
29	1.7
30	1.5
31	2.1
32	1.5
33	1.2
34	1.5
35	1.2
36	1.0
Total	100.0

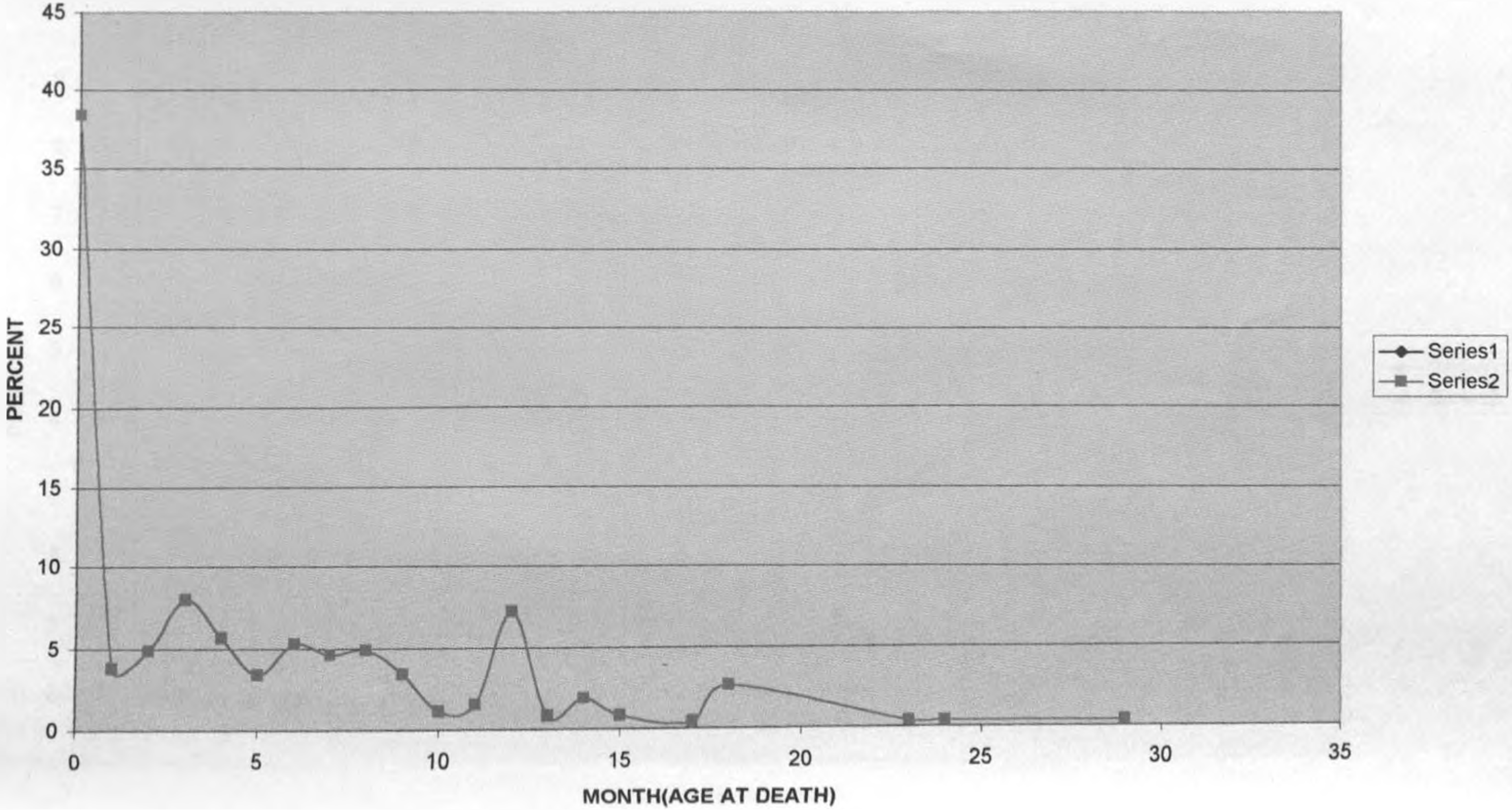
Appendix (9)

FIG.4.3(A)PERCENT DISTRIBUTION OF WOMEN IN SINGLE YEARS



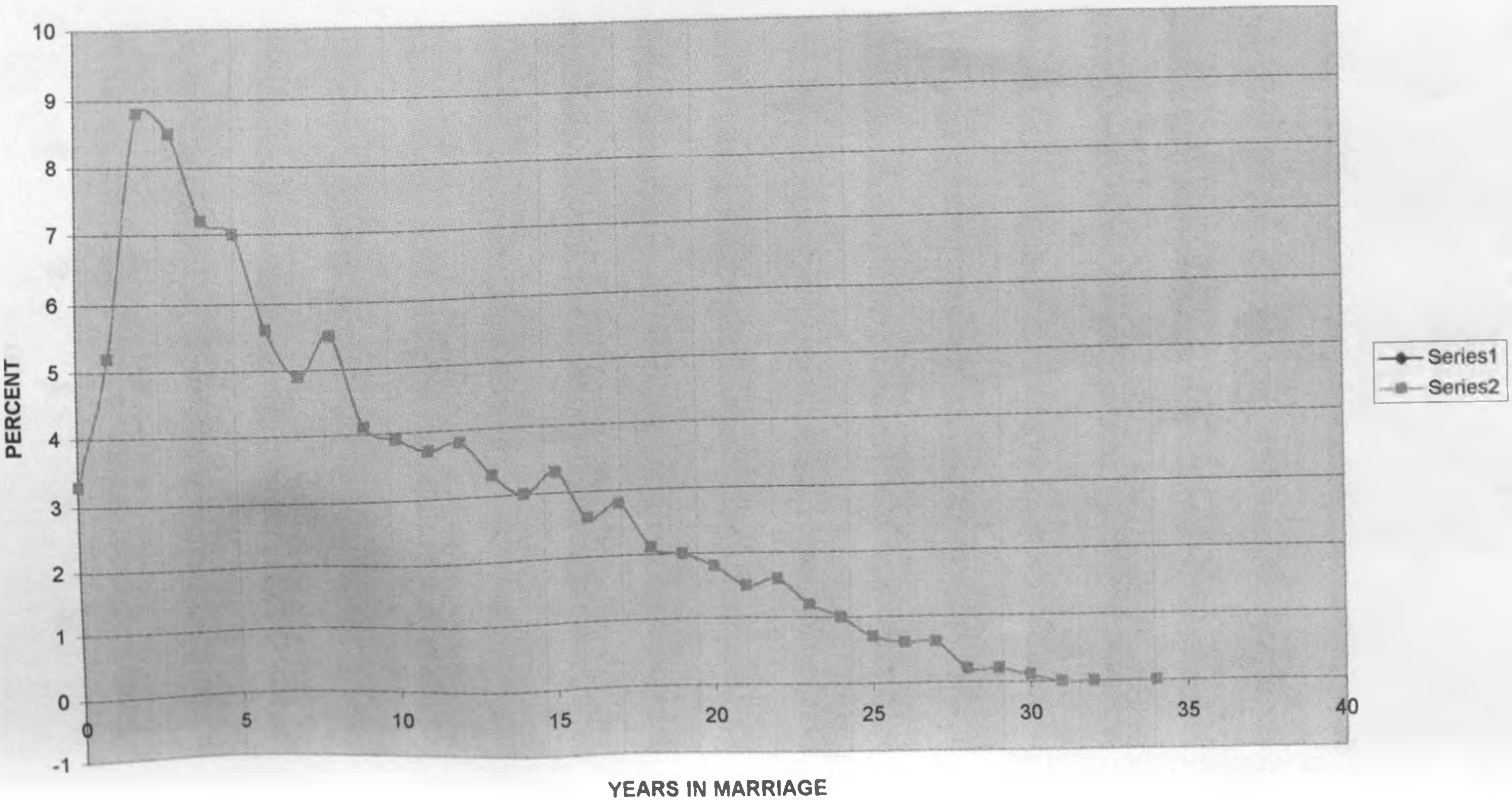
Appendix(h)

FIG.4.3(B)PERCENT DISTRIBUTION OF INFANTS AND CHILDREN BY MONTH OF DEATH



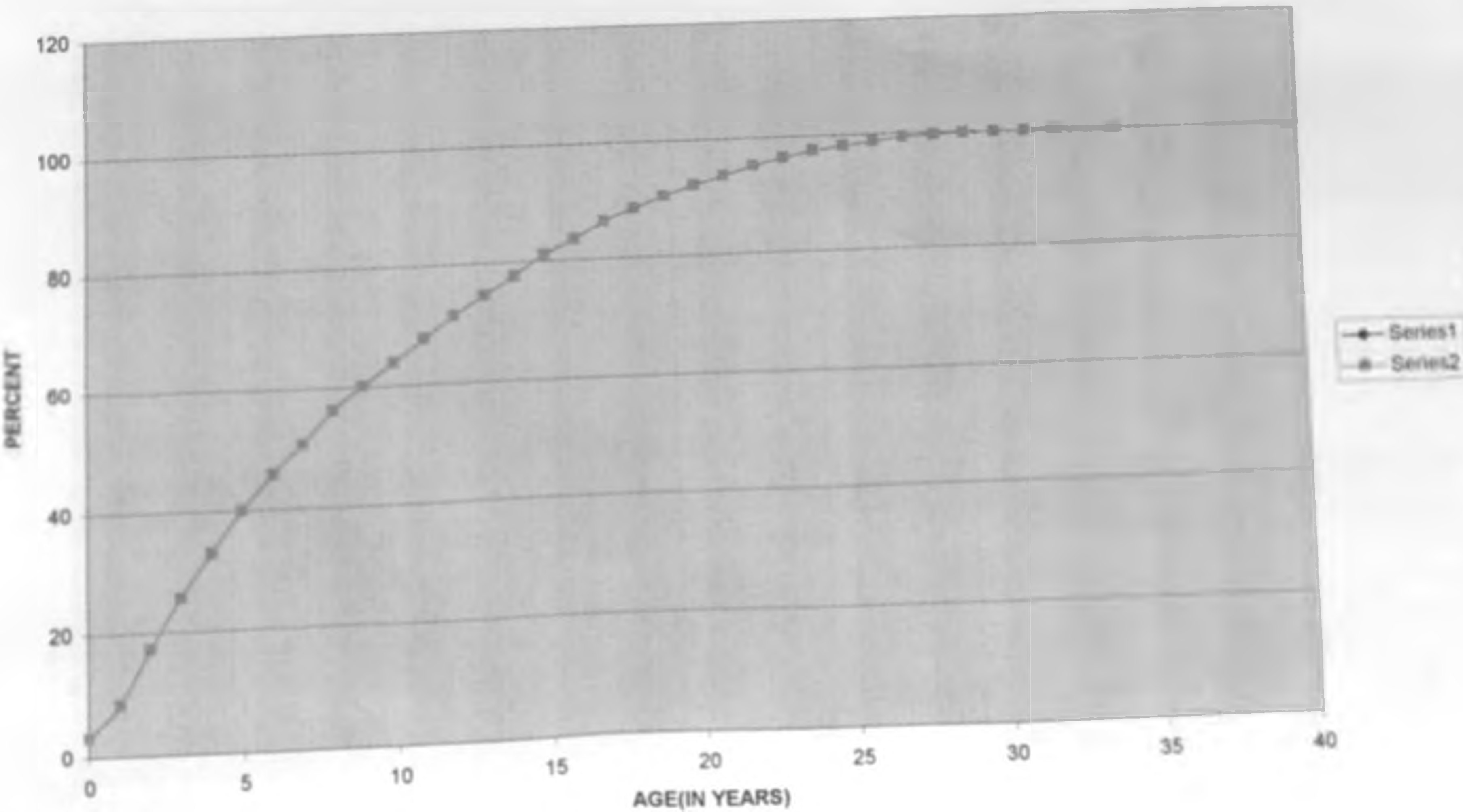
Appendix(i)

FIG.4.3(C)PERCENT IN FIRST MARRIAGE



Appendix(j)

FIG.4.3(D)CUMULATIVE PROPORTION MARRIED



Appendix (K)

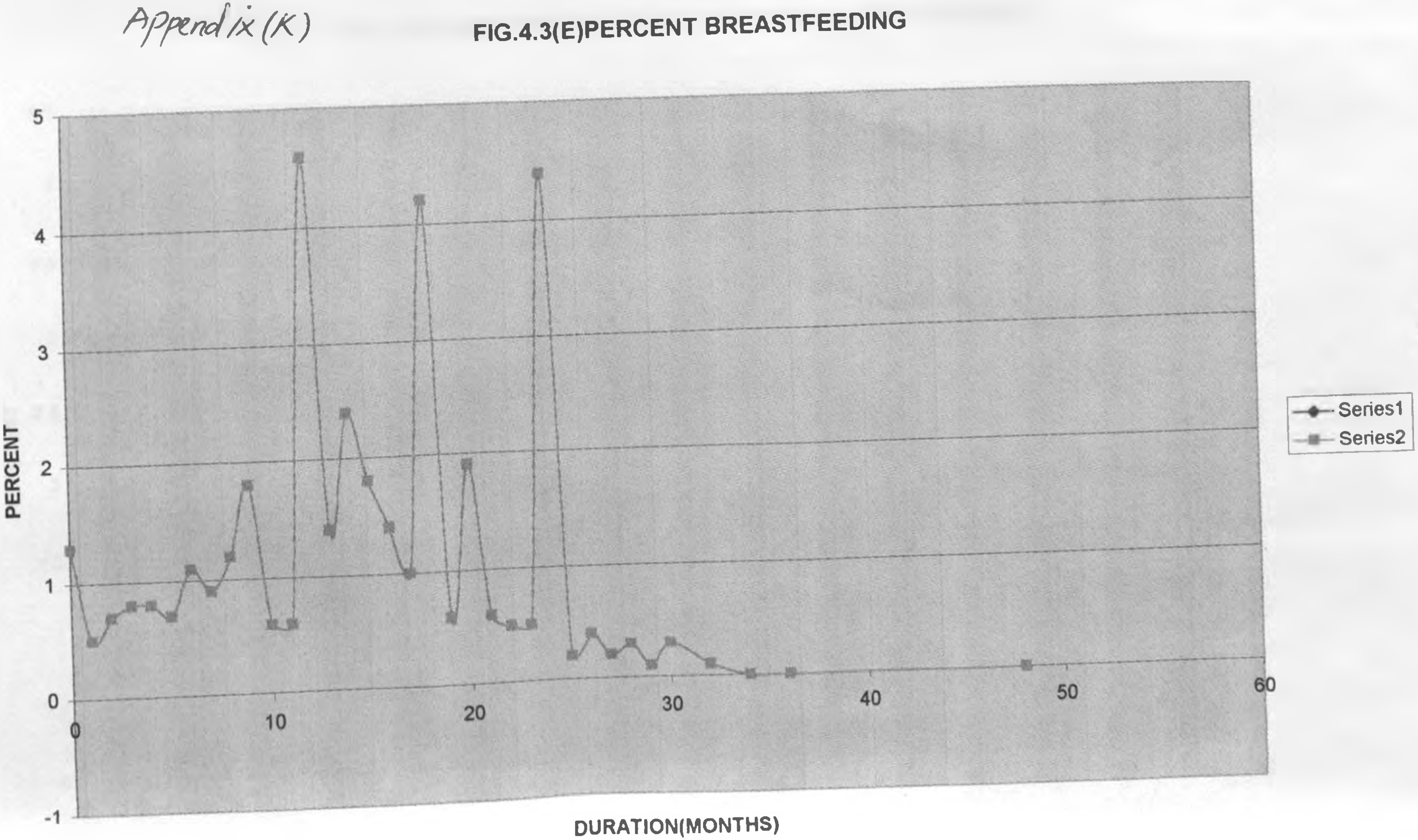
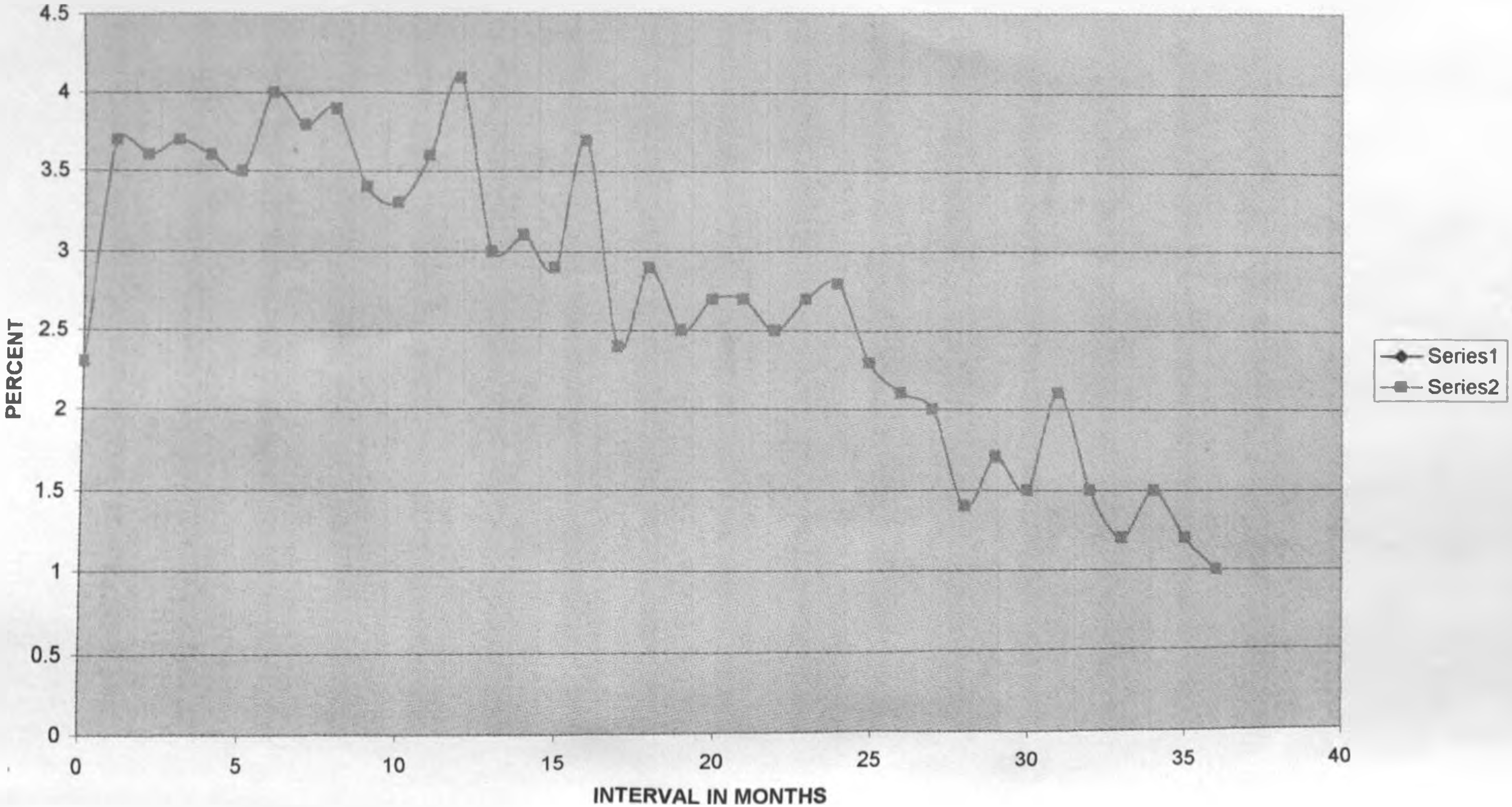


FIG.4.3(E)PERCENT BREASTFEEDING
PERCENT
5
4
3
2
1
0
-1
0
10
20
30
40
50
60
DURATION(MONTHS)
Series1
Series2

Appendix(L)

FIG.4.3(F)PERCENT DISTRIBUTION OF THE OPEN INTERVAL



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