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DETERMINANTS OF BIRTH INTERVALS IN KENYA: EVIDENCE FROM THE 2003 KDHS

BY:

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DECLARATION

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

Signed: . . . . I________________________ Date......!...!.... ....!.....

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Eston Ngugi Njoroge

SUPERVISORS

This project has been submitted for examination with our approval as university supervisors.

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DEDICATION

This project is dedicated to my late father John Njoroge Mwangi.

ACKNOWLEDGEMENT

My special gratitude goes to the almighty God for the gift of life and for seeing me through the entire period of my study. **I**'m also greatly indebted to my supervisors for their advice and guidance throughout the development of this project.

Many thanks also go to my family, all my classmates and all my friends for their contribution and support in the course of completing this degree.

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ABSTRACT

High fertility in any part of the world is a cause for concern among policy makers. In sub-Saharan Africa, high fertility has been attributed to unwanted childbearing and a desired family size of above two surviving children. Kenya's fertility history can be traced from the 1960s when family planning programmes were initiated. During this period, the total fertility rate (TFR) had been increasing steadily and was the highest in the world at 8.06 in the mid 1970s. This trend was however reversed from the 1980s till 1998, when TFR declined from 6.7 to 4.7. In 2003, fertility stalled at a high level of 4.9 children per woman. There is a need to explain this stall so as to attain national goals and targets on fertility. The study of the determinants of birth intervals accounts for changes in the timing of childbearing and thus gives a better picture than the study of the determinants of completed fertility.

The general objective of this study was to identify the determinants of birth intervals in Kenya. Specifically, it sought to establish the determinants of birth intervals among married women in Kenya as well as examining the role of intermediate, demographic, socio-cultural and economic factors that influence birth intervals in the country. Data for this study was drawn from the 2003 KDHS where a sample of 2608 women, who reported being currently married and also in first union, were selected. A total of 5216 birth intervals were obtained, this being a combination of 2608 open and 2608 closed intervals. Frequencies provided a description of the study population while the cox proportional hazards model was used for the bivariate and multivariate analysis.

At the bivariate level, only sex of the index child was found to be insignificant relative to other independent variables considered in the study. All other variables had a statistically significant association with the risk of giving birth. At the multivariate level, three models were fitted to assess the effect of the independent variables on the risk of giving birth. Model one comprised of demographic variables; model two introduced socio-economic and cultural variables while model three added intermediate variables. In all three models, sex of the index child was statistically insignificant. This was the only insignificant variable in model one. In model two, all variables except maternal education and sex of the index child were statistically significant. However, paternal education was only statistically significant for those who had attained secondary and above levels of education. In model three, the effect of the background factors were diminished with the introduction of the intermediate variables. As such, only age of the mother at the start of the interval, birth order, ever use of contraception and duration of breastfeeding had statistical significance.

The study concluded that the following are important covariates of the risk of giving birth; age of the mother at the start of the interval, birth order, survival status of index child, length of preceding birth interval, maternal and paternal education, region, type of place of residence, ever use of contraception and duration of breastfeeding.

The study recommended the promotion of contraceptive use and breastfeeding practices due to their association with a reduced risk of giving birth. There is also a need to promote universal education as a step towards tackling high fertility. The study also recommended further research on the topic to shed light on the link between birth intervals and completed family size.

CHAPTER ONE: INTRODUCTION

1.1 Background

Over the past few decades, the world has experienced more rapid and more extensive demographic change than in any other comparable period in history. The best known example is the rapid increase in human numbers (Bongaarts, 2005). World population grew slowly from 1 billion in 1800 to 2.5 billion in 1950. Since then, growth accelerated and by 2007, total population stood at 6.6 billion (Population Reference Bu reau, 2007). The United Nations (UN) expects this total to grow to 9.1 billion in 2050.

Despite the fact that there has been a sharp decline in fertility rates, further growth will take place in the future. Bongaarts gives three reasons to explain this phenomenon: That the large decline in fertility since the 1960s still leaves fertility of about 50 percent of the population above the two-child level needed to bring about population stabilization; second, that declines in death rates—historically the main cause of population growth— will almost certainly continue. Higher standards of living, better nutrition, greater investments in sanitation and clean water supplies, expanded access to health services and wider application of public health measures such as immunization, will ensure longer and healthier lives in most countries. And finally, "population momentum", the tendency for a population to keep growing even if fertility could immediately be brought to the replacement level of two children per woman with constant mortality and zero migration, will also add to growth. Population momentum accounts for about half of the expected future growth in the developing world. Consequently, further large increases in the population of the developing world are

Since fertility is a major determinant of population growth, many countries have put in place national programmes to influence this. Kenya has had an impressive record of success in providing family planning services in the past leading to substantial declines in fertility from the late 1970s to the early 1990s (NCAPD and MEASURE, 2006). The country's total fertility rate has fallen from 8.1 children in 1978 to 4.9 in 2003 (Anyara and Hinde, 2005). Past studies have attributed this to increased use of contraceptives (Brass and Jolly, 1993; NCPD, 1989; Blacker,

2002) (cf Anyara and Hinde, 2005), while others have emphasized post partum infecundability and the effect of late or not marrying altogether.

However, evidence from the 2003 Kenya Demographic and Health Survey (KDHS) revealed a stall in the country's fertility transition (NC.APD and MEASURE, 2006; Bongaarts, 2005) - total fertility rate increased from 4.7 to 4.9 births per woman. High fertility in sub-Saharan Africa has been attributed to two distinct underlying causes: unwanted childbearing and a desired family size above two surviving children (Bongaarts, 2005). This has led to about one in five births being unwanted while an even larger proportion is mistimed. These observations are supported by findings from a study based on data from twenty sub-Saharan countries by Westoff et al. (2001). They observed that there is a difference between actual and preferred birth intervals (birth interval is the duration between two consecutive live births of a woman) with births occurring more than one year sooner than women prefer in these countries. They concluded that there is a significant amount of unwanted fertility throughout the developing world, which is particularly evident in the middle stages of the fertility transition when women are increasingly aiming for fewer children. Along the same vein, approximately 23 percent of births in Kenya occur within short intervals of less than 24 months and another 37 percent occur between 24 and 35 months (Borda and Winfrey, 2006). According to the World. Health Organization (WHO), an interval is short if it's less than 24 months. There is a recommendation that women space births by 24 months or more.

Past studies have credited birth intervals with influencing the tempo and pace of child bearing, and hence the resulting fertility level in a society (Mutuku, 2001), as well as a strategy of fertility limitation during the demographic transition in Europe (Bavel, 2004). Understanding birth intervals is therefore a crucial component in understanding a country's demographic transition as they influence overall fertility by either increasing or decreasing a woman's fertility outcomes during her reproductive years. Where intervals are short, the reproductive potential increases unlike where intervals are long. This is not to say that intervals are the sole determinants of fertility; much has been contributed over the years towards understanding the proximate determinants of fertility beginning with Davis and Blake (1956), and Potter and Bongaarts (1983).

It is only in the recent past that the study of birth intervals has begun to receive attention from demographers. This got support from. Rindfuss, Palmore and Bumpass (1987), who

observed that the determinants of total family size were not similar to those of moving from one **parity to** the next. Subsequently, various researchers have contributed to this area of study: **Otieno** (1999) postulates that any change in fertility levels depends on shifts on the quantity as **well as** the pace of childbearing. This is further supported by Njogu and Martin (1991) (cf **Otieno,** 1999), who hold that changes in timing and spacing of births, is the most important **source of** decline.

Studies on birth intervals in Kenya can be traced back to the 1977/78 World Fertility Survey (WFS). These studies have shed light on the central role that birth intervals play in influencing the level of fertility. For instance, Mosley observed that although prolonged lactation has an important fertility reducing effect, it is less adequate as a birth spacing method than modem contraceptives. He also attributed the differentials in birth spacing to differences in women's health status, education and place of residence (cf Otieno, 1999). Sabiti (1984) observed that child spacing, achieved primarily by prolonged lactation, remains the major restraint on fertility levels in most subgroups among women with no education, protestant and among the Mem. On the other hand, Mace and Sear (1997), while studying the Gabbra community in Northern Kenya, observed that birth intervals were longer after the birth of boys.

1.2 Problem Statement

Kenya's fertility history can be traced back to the 1960s with the introduction of family planning programmes. The country's fertility trend, as observed from surveys and censuses data, indicates that total fertility rate (TFR) was at 8.06 during the mid 1970s. Prior to the 1970s, fertility had been rising steadily. However, there was a dramatic change after the 1970s when fertility began to fall rapidly. Data indicates that total fertility rate declined from 6.7 in 1989 to 4.7 in 1998. However, in 2003, a stall was observed in the decline when TFR rose to 4.9. These developments occurred against a backdrop of government initiatives to check population growth. The three prime pillars of these initiatives are the adoption of an explicit population policy as well as the official launch a national family planning programme in 1967; the issuing of a set of population policy guidelines to guide the population policy and programme implementation in 1984 and adoption of Sessional Paper No.l of 1997, the National Population Policy for Sustainable Development, in the year 2000.

Despite all these, the country's fertility has stalled at a high level considering that the national goals and targets set by Sessional Paper No.1 of 1997 aimed at reducing TFR from 4.0 in the year 2000 to 2.5 by the year 2010. There is a need to explain the stall so as to design appropriate interventions. Policy makers and programme designers must understand the determinants of fertility to be in a position to address the stall. This can be approached by examining the determinants of completed fertility or the determinants of moving from one birth to another. While both approaches lead to valuable knowledge, the former has the inability of accounting for changes in the timing of childbearing and this is a major shortfall since a woman's total fertility outcome is influenced by the duration between her consecutive births during her reproductive years.

The study of fertility is, therefore, incomplete without looking into the aspect of birth intervals. Several studies exist on birth intervals in Kenya. Mosley et al. (1982)(cf Mutuku, 2001), using the 1977/78 Kenya Fertility Survey (KFS) data, found out that the average birth interval increases with maternal age i.e. the duration was 33.7 months and 35 months for women aged below 25 and those above 35 years respectively. Njogu and Martin (1991), using the 1977/78 KFS and 1988/89 KDHS, observed an increase in birth interval lengths between the two surveys. They attributed this to an increase in contraceptive use. In addition, they found out that changes in birth interval dynamics were not confined to the higher order births but that fertility reduction was confined to the medium parities. Minyancha (1989), while studying fertility on the basis of birth interval analysis, found out that regional differences in live birth intervals and marital fertility in Kenya still persist. Kimani (1992), while studying the effects of infant and child mortality on fertility in Kenya, found out that short birth intervals were associated with infant and child deaths. The study attributed the short birth intervals to differences in coital frequency, contraceptive use and breastfeeding patterns.

The contributions of the above studies towards an understanding of fertility in Kenya cannot be underrated. Though based on older data, the studies provide a pictorial of the phenomenon of birth intervals in Kenya. However, there exists no study that dwelt entirely on the determinants of birth intervals in Kenya. This study is influenced by this gap in knowledge, the existence of recent data (2003 KDHS) and the eventuality that absence of information on determinants of birth intervals would lead to an arbitrary focus for policy and programmatic interventions.

1.3 Research Questions

This study intends to answer the following questions:

1. What are the determinants of birth intervals among married women (this is the combination of those who are married and those living together with a man) in Kenya?

2. What is the significance of intermediate, demographic, socio-cultural and economic variables on birth intervals?

1.4 Objectives

The general objective is to identify the determinants of birth intervals in Kenya. The study has the following specific study objectives:

1. To establish the determinants of birth intervals among married women in Kenya.
2. To determine the role of intermediate, demographic, socio-cultural and economic factors that influence birth intervals in Kenya.

1.5 Justification

Short birth intervals are associated with health risks, both for the mother and infant. This is pronounced in developing countries where levels of socio-economic development are low. Stones and Ngianga-Bakwi (2004) found out that short birth intervals contribute to mortality risks extending beyond the first year of life and the effect is apparent even after taking into account other potential determinants such as maternal ill health or access to health care services. These are as a result of the harmful effects of early weaning of a child when another birth follows closely: "maternal depletion syndrome," which drains the mother's strength and can result in poor birth outcomes (low birth weight and prematurity) and poorer nutrition for children; and a variety of socioeconomic pressures resulting from the additional drain on household resources (Boerma and Bicego, 1992) (quoted in Westoff et ah, 2001). If people prefer to avoid short birth intervals, and if these aspirations are realized, morbidity and mortality will eventually reach lower levels.

Secondly, the desire to lengthen birth intervals could fuel the fertility transition (in Kenya's case it could be part of the solution to the observed stalling), initially because extending the interval between births, i.e., delaying births, would lower the birth rate. The demographic mechanism is similar to increasing the age at marriage, which would normally increase the age at first birth. Moreover, some of the postponed births would never occur. According to Westoff et al. (2001), TFR would decline by one third in Kenya. As such, if we know the characteristics of women who prefer intervals of different lengths, a nation can design programmes to influence fertility decisions.

Thirdly, a clear understanding of the determinants of birth intervals will contribute to the attainment of national goals on fertility. In addition, the study will contribute to the growing literature on fertility in Kenya more so since it provides a simple means of studying the patterns of reproduction of only those women who continue to reproduce. By sub-dividing the total childbearing span into time segments (open and closed intervals), the study of birth intervals permits further analysis of each component.

1.6 Scope and Limitations

The study was based on data collected in the 2003 KDHS. Since society is dynamic, and since some of the determinants revolve around people's attitudes and behavior, the determinants of birth intervals captured in this survey may have changed during the 2008 KDHS.

The varying conceptualization of marriage among communities generates two limitations all tied to identifying when a union is regarded as a marriage: birth of first child, living under one roof or wedding ceremony. As a result, only births occurring to married, women as defined by the KDHS were analyzed. Secondly, the interval between marriage and first birth was omitted. Thirdly, only women who were in their first union were selected since the duration between one union and a subsequent one does bias the inter-birth intervals.

Collection of data on birth intervals is prone to recall biases. Some of the respondents may have ceased child bearing ten or twenty years before the survey date. Their accuracy in recalling exact birth dates may be hindered. However, limiting the observation period may result in a sample size that is too small for analysis. As such, this study limited its observations to women who had at least one closed and one open interval. The resulting sample revealed that 86.4 percent of the open intervals and 76.5 percent of the closed intervals were initiated in the ten year period prior to the survey. The remaining intervals, 13.6 percent of the open intervals and 23.5 percent of the closed intervals, were observed in a period exceeding ten years prior to the survey date.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Over the years, the study on birth intervals has benefited from numerous investigations. There is a theoretical understanding that informs such studies. Take for instance, the categorization of intervals into closed and open. A closed birth interval is the interval between two successive live births of a woman, while an open birth interval is the duration of time between the date of the last live birth and the date of a survey. The prime difference is that while the former assess the duration between two complete events, the latter focuses on an interval that is not yet complete by the time data is being collected.

Further, the study of intervals has established a number of associations; for instance, it has been established that breastfeeding practices determine the duration of post partum **infecundity** (the period after birth when a woman is insusceptible to the risk of pregnancy). **It** achieves this through inhibiting ovulation and has been found to be as effective as modern methods of contraception in the first six months after birth (Haggerty & Rutstein, 1999). During this period, Vanzo et al. (1991) credit it with a considerably greater effect on preventing short inter-birth intervals than contraceptive use.

The determinants of birth intervals have also been sought in features beyond the individual and the couple; the economic and social system provides opportunities and constraints within which choices can be made. The level of fertility in a society or a group is the cumulated outcome of deliberate actions (behavior) and biologic functioning, social pressures and chance operating for each pair of parents, actual or potential (Caselli, et al., 2006). The constraints that condition behavior are largely determined by the social environment inhabited by the individual or couple. For instance, decades of anthropological studies have revealed the existence of taboos against sexual intercourse in the period after birth. Postpartum abstinence, as it has come to be known, plays a vital role in extending inter-birth intervals.

The cultural, social and economic context influences fertility behavior, for instance, through marriage. Marriage (including consensual unions) patterns describe the ages at which people marry, how rapidly marital unions are formed, how long they last, and the proportion of people who ever marry in a population. This in turn, influences fertility by determining the length of time a woman is exposed to the risk of pregnancy. Culturally, a married woman may be subject to ridicule if the interval between her pregnancies is considered too long, if she fails to conceive or if she even suggests using contraceptives (Igun, 1972: 57-58). Others may require adherence to the small family norm, providing for it by abstinence, infanticide, abortion and so on (Taeuber, 1958: 31) Therefore, societies may not always permit the exercise of individual options.

To understand these factors an in-depth review of past studies was conducted. The review guided in identification of variables and their definition, identification of a theoretical framework and appropriate analytical tools to employ.

2.2 The International Context

Over the years, researchers have sought to establish numerous associations between birth intervals and the demographic processes of fertility and mortality. A recurring objective is the association between short birth intervals and health risks for the mother and child. Santow and Bracher (1984) found out that there is a positive association between child mortality and the time to the next birth in Ngaglik, Indonesia. This confirmed to findings derived from the 1973 Indonesian Fertility-Mortality Survey which related birth spacing to child death within two years of the last birth. In the rural segment of the sample, 12 percent of women who lost no children bore a third child within two years of the second, and 70 percent bore one within four years. Among women who lost a child within the first two years of post partum, these proportions rose to 31 percent and 82 percent respectively. In addition, after controlling for parity and maternal age, infant mortality rates were found to rise dramatically when the interval between one birth and the next was shorter than two years (Iskander and Jones, 1978) (cf Santow and Bracher, 1984).

Trussel et al. (1985) studied the determinants of birth-interval length in the Philippines, Malaysia, and Indonesia. The study found that birth order is not a significant covariate once other biological covariates are controlled for, while the length of the previous interval is an important covariate; short intervals are associated with short subsequent intervals, while long intervals are associated with long subsequent intervals. The study also found out that female education is not a significant determinant of the risk of pregnancy when differences of biological factors were controlled in the three countries, while male education and occupation were significant only in Philippines and Indonesia.

Bumpass et al. (1986) using data from Korea, found out that the death of a child whose birth initiated the interval is only important in the segment 17-22 months through the cessation of breastfeeding. Age is negatively related to fertility, particularly at parities 4-8 while education had a negative impact on fertility for intervals beyond the second. The main finding for the 2^{nd} birth interval is the positive effect of education during the early segments. During months 17-22 of the 2^{nd} birth interval, the conditional probability of a birth is almost twice as high among women with 12 or more years of education than among those with no education. Results from birth intervals of orders 4-8 showed very little mediation on the part of proximate variables. Contraceptive use was strongly and significantly related to education and had strong and significant positive effects on fertility in these intervals. The study found a significant interaction between the presence of living sons and the year the 3^{rd} birth interval began. The presence of sons had a significant effect in virtually all segments and the differences are large for birth intervals beyond the second. Only about 10 percent of 4^{th} birth intervals and those of higher orders are initiated by women with no living sons. Where this was observed, there was an indication of a strong motivation to try to have a son even among women who already had large families. The study also found out that the probability of another birth within 40 months was two thirds higher for those without sons.

Palloni and Millman (1986) examined the effects of inter-birth intervals and breastfeeding on infant and early childhood mortality. The study aimed to establish the magnitude and direction of the effects of breastfeeding and pace of childbearing on infant and early childhood mortality. The study found significant mortality reductions attributable to breastfeeding; long intervals (above 36 months) contribute to low mortality risks in countries with high mortality. The timing of the following conception had important effects mostly concentrated towards the end of the first year of life. Its impact on survivorship is stronger in countries of high mortality and in most deprived social groups. Their findings supported the maternal depletion hypothesis.

Using data from 17 DHSs, Boerma and Bicego (1992) investigated the effects of birth interval on child mortality. They found out that short preceding birth intervals are associated with increased mortality risks in the neonatal period and at 1-6 months of age, and to a much lesser extent, at 7-23 months of age. The effects of succeeding birth interval on nutritional status are rather moderate, and there is a weak relationship with lower attendance at prenatal care services. No consistent relationship was observed between the length of birth intervals and other health status or health service utilization variables. The results indicated that prenatal mechanisms are more important than postnatal factors, such as sibling competition, in explaining the causal nature of the birth interval effect.

Trussel et al. (1992) using data from Bangladesh and the Philippines, demonstrated that children born within 15 months of a preceding birth are 60 percent to 80 percent more likely to die in the first two years of life once the confounding effects of prematurity are removed. It was also observed that the risks associated with short conception intervals were confined to children of high birth order. These risks were however confined to children with conception intervals of six months or longer. A similar pattern was observed in incidences of prematurity (in both countries), low birth weight, small height at birth, and low weight for gestational age and weight for height. The high risks observed among children in the high birth order/short conception interval category, were consistent with the maternal depletion hypothesis.

Rahman and Da Vanzo (1993) while studying the gender preferences and birth spacing in Matlab, Bangladesh, found stronger effects of gender preference in the population that has more access to contraceptives and higher levels of contraceptive use. If a woman has at least one daughter, the risk of a subsequent birth is related negatively to the number of sons. Women with no daughters also experience a higher risk of having a subsequent birth; a finding supporting daughter preference. Son preference is strong in both the early and later stages of family formation, but women also want to have at least one daughter after having several sons.

Yalle (2005) found out that the survival of the previous child and the existence of miscarriages or still births during the interval diminished the risk of having another child. The risk of having a second child decreased by 22 percent when the first child survived at least before the conception of the second child, while the occurrence of intrauterine mortality, compared with its no occurrence, contributed to diminish that risk by 46 percent. In addition, the older the mother and the longer the previous birth-interval length (for the second and third birth intervals), the less was the risk of having another child. In contrast, being married, compared with being divorced, separated or widowed, duplicated the risk of having another child. The study also revealed that exclusive breastfeeding and urban residence were not significant determinants.

Rasekh and Momtaz (2007) using data from Iran, found that the first birth interval has direct relation with contraceptive use, women's age at first marriage and women's occupation. The second birth interval has direct relation with first birth interval, women and men's views about number of child, women's view about birth interval, access to media, women's education level, women's age at first marriage and first child breast feeding duration. The third birth interval has direct association with second birth interval, men's access to media, women and men's views about number of children, women's sex preference, women's age at first marriage, first child breast-feeding duration, number of abortions and contraceptive use in third birth interval. In addition, it was observed that women with a lower age at first marriage delayed their first births. On the other hand, ethnicity had no association with birth intervals.

2.3 The sub-Saharan Context

Using Demographic and Health Surveys (DHS) data from 20 sub-Saharan countries, Westoff et al. (2001) compared women's actual lengths of birth intervals to preferred lengths and assessed the implications of the differences for selected demographic and health indicators. The results showed that women prefer much longer birth intervals than they actually have in Comoros, Ghana, Kenya, Rwanda, and Zimbabwe, compared with women in the other fifteen countries studied. The covariates of preferred birth interval lengths were also examined. In general, women who know, approve of, discuss, and use family planning prefer longer intervals than their counterparts. Secondly, the educational attainment of husbands matters more than that of female respondents in determining spacing preferences.

Thirdly, birth intervals in which the "opening" child died before the conception of the "closing" child have shorter preferred lengths than intervals whose opening child was alive at the conception of the next child. Fourthly, the length of the preceding birth interval does not influence the preferred length of the actual interval. Also, the preferred length of birth interval has a curvilinear relation with the woman's age: it increases with age, but the increase tapers off among older women (usually age 40 and over). The preferred length also increases with the number of surviving children. Finally, women's desire for more children and rural residence are negatively associated with preferences in less than half the countries. Similarly, women's exposure to mass media, their educational attainment, and their having discussed family size with their husbands are positively associated with preferences in less than half the countries.

2.4 The Kenyan Context

Mace and Sear (1997) examined the length of birth interval in a traditional African population (the Gabbra pastoralists of Northern Kenya) by sex of children. The sex of the preceding child was found to influence the duration of the interval to the next birth. The authors also introduced an economic dimension to spacing; that spacing is also a measure of parental investment in a child. Parental investment is anything parents give to their children that benefits the future reproductive success of that child at a potential cost to the parent (Trivers, 1972) (cf Mace and Sear, 1997). From this study, the authors identified the following determinants:

a. Sex of preceding child
b. Parental investment
c. Maternal age

Birth intervals after the birth of a boy were significantly longer than after the birth of a girl, indicating higher parental investment in boys. However, in women of high parity, this differential disappeared. Birth intervals for women with no son were shorter than for those with at least one son. The study found out that birth intervals after boys were longer than after girls with a difference of about two months.

A long birth interval sacrifices time in which a mother could be producing more children, in order to enhance the development of an existing child. Mace and Sear found out that first bom sons have particularly high reproductive success, daughters have average reproductive success and late born sons have low reproductive success. The birth interval follows a similar trend, suggesting that longer birth intervals represent higher maternal investment in children of high reproductive potential.

If birth intervals after boys are longer, then, on average, mothers with many sons will be slightly older than mothers with only daughters, and thus potentially less fertile. However, the effect of not having a son is significant, even accounting for the age of the mother. Thus the determination of the birth interval is not simply an effect of maternal age.

Kimani (2001) in a study of the behavioral effects of infant and child mortality on fertility in Kenya, found out that women in Kenya adopt various strategies such as curtailing the duration of breastfeeding, increasing frequency of coitus, and to a lesser extent use of contraception in order to replace infant or children who have died or to insure against those who are likely to die. Biological effects are said to occur when an infant or child who is breastfeeding dies, consequently leading to the curtailment of the duration of breastfeeding. This in turn results in the shortening of the postpartum amenorrhea period, leading to an early return of ovulation. In the study, mothers whose birth opening the interval had died had higher coital frequency, while breastfeeding duration was shorter in intervals where births before the one opening the interval had died.

Behavioural effects on the other hand are assumed to take place as a result of mothers' attempt to replace infants or children who have died or having more children than desired in anticipation that some of them might die. The direct response to experienced death is referred to as replacement effect while the effect due to anticipated deaths is referred to as insurance or hoarding. The hoarding effect is distinguished from the replacement effects, since unlike the latter, it is not a behavioral change arising from the death of a particular birth but rather behavioural response among mothers in communities where mortality is high. In such, communities, mothers would modify their behaviour to ensure that the resulting birth intervals are shorter on the average.

2.5 Summary of Literature Review

The key determinants of birth intervals from the review are: length of preceding birth interval, survival status of preceding birth, sex of preceding child, birth order, maternal age at the beginning of interval, maternal education, paternal education, contraception, duration of breast feeding, region of residence and type of place of residence. Subsequently, their effect on the dependent variable (the risk of giving birth) will be considered in the preceding chapters.

2.6 Theoretical Framework

The framework developed by Bongaarts (1978) is most suited for this study (see Figure 2.1). Bongaarts built upon the framework developed by Davis and Blake (1956) who introduced the intermediate variables of fertility. While Davis and Blake had identified eleven variables, Bongaarts refined the framework and settled on eight proximate determinants of fertility. These are:

1) Exposure factors

   a) Proportion of married women

2) Deliberate marital fertility control factors

   b) Contraception

   c) Induced abortion

3) Natural marital fertility factors

   d) Lactational infecundity

   e) Frequency of intercourse

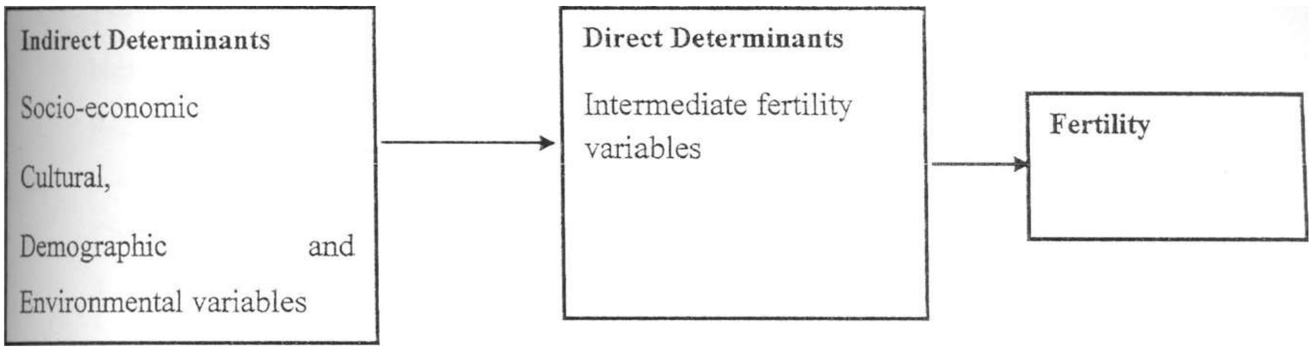
   f) Sterility

   g) Spontaneous intra-uterine mortality

   h) Duration of the fertile period

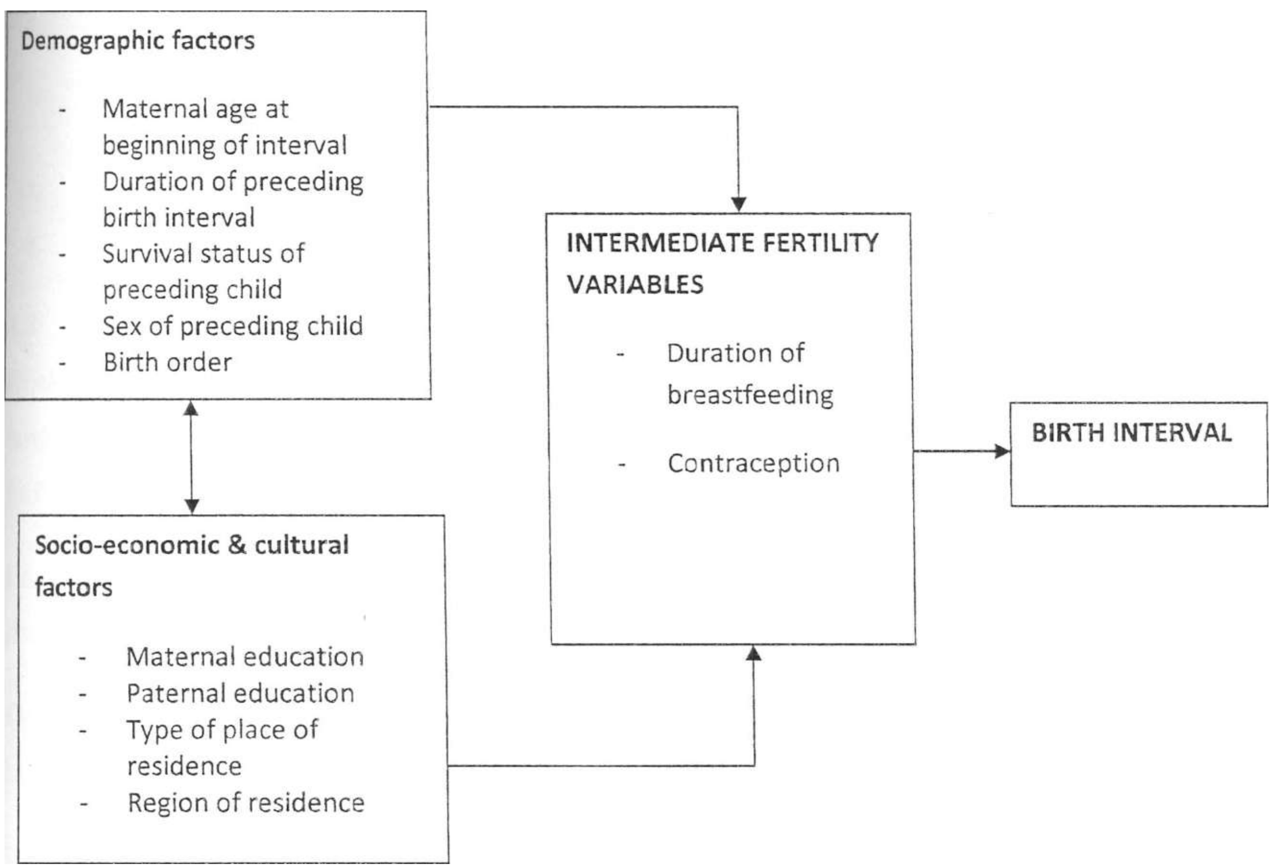
The above factors are influenced by the indirect determinants which are the socioeconomic, cultural and environmental variables. These include: education, place of residence, religion, income, marriage structure, and separation of spouses among others. A complete set of the expected covariates of the risk of giving birth is given in the operational framework (see Figure 2.2)

Figure 2.1 Theoretical framework



(Source: Bongaarts, 1978)

Figure 2.2 Operational Framework



The operational framework is a modification of Bongaarts' theoretical framework and is based on factors that have been seen to be important covariates of the risk of giving birth from past studies.

2.7 Operational Hypotheses

i. The more educated a woman and her partner are the longer the duration of their inter-birth intervals.

ii. Region of residence influences birth intervals.

iii. A woman's place of residence influences the duration of her birth intervals.

iv. The older the woman is at the start of an interval the less likely she is to give birth.

v. A woman whose index child is dead is more likely to give birth than her counterpart whose child is alive.

vi. A woman whose preceding child is male is less likely to have a birth as compared to a woman who had a daughter.

vii. Birth order of the preceding child influences birth interval.

viii. Women whose preceding birth interval was 24 months and above are less likely to give birth as compared to their counterparts whose preceding birth interval was less than 24 months.

ix. The longer the duration of breastfeeding the lesser the risk of giving birth.

x. Use of modern contraception reduces the risk of giving birth.

2.8 Variable Definitions and their Measurement

Birth interval - this is the length of time in months between a woman's two consecutive live births. In this study, the variable will be constructed by combining the last closed and last open birth interval of a woman.

Last closed birth interval - measures the duration of time in months between the most recent live birth and the one preceding it. It is divided into three segments: <24, 24-36 and >36

Open birth interval - measures the duration of time in months between the most recent live birth and the date of survey. It is divided into three segments: <24, 24-36 and >36

Length of preceding birth interval - measures the duration of time in months between the a live birth and the one preceding it. This study considers the length of the preceding birth for the open and closed intervals. It is divided into three segments: <24, 24-36 and >36

Survival status of preceding child - it measures whether or not the index child died within the specified reference period considered in the study. It is coded as either dead or alive

Sex of the preceding child - refers to whether a child is male or female.

Maternal age at the beginning of interval - this measures the number of completed years lived **bv** the mother at the beginning of the interval of interest. This has been coded as **<25, 25-34** and 35 plus

Maternal education - this is the highest level of formal schooling attained by the mother. It's coded as: no education, primary and secondary plus

Paternal education - this is the highest level of formal schooling attained by the father. It's coded as: no education, primary and secondary plus

Type of place of residence - this is the place where the respondent was at the time of the interview. It's coded as either urban or rural

Region of residence - refers to the province where the respondent was at the time of the interview. This is coded as follows: Nairobi, Central, Coast, Eastern, Nyanza, Rift Valley Western, and North Eastern.

Duration of breastfeeding - measures how long the preceding child was breastfed in months. It has been coded as **<10, 10-19** and **20** plus.

Birth order - measures the chronological order of siblings in a family. This has been coded as **0-3, 4-5** and **6** plus.

Ever use of Contraceptive - measures whether the mother had ever used contraception.

Table 2.1: Variable Definitions and their Measurements

VARIABLE	MEASUREMENT	CODE	TYPE
Birth interval	Closed Open	1 0	Dependent
Survival status of preceding child	Dead Alive	1 2	Independent
Sex of preceding child	Male Female	1 2	Independent
Birth order	0-3 4-5 6+	1 2 3	Independent
Duration of breastfeeding	<10 10-19 20+	1 2 3	Independent
Ever use of contraception	Never Used traditional method Used modern method	1 2 3	Independent
Length of preceding birth interval	<24 24-36 >36	1 2 3	Independent
Maternal age at beginning of interval	<25 25-34 35+	1 2 ĵ	Independent
Maternal education	No education Primary Secondary plus	1 2 3	Independent
Paternal education	No education Primary Secondary plus	1 2 j	Independent
Type of place of residence	Rural Urban	1 2	Independent
Region of residence	Nairobi Central Coast Eastern Nyanza Rift Valley Western 1 North Eastern.	1 2 3 4 5 6 7 8	Independent

CHAPTER THREE: DATA AND METHODOLOGY

3.1 Data Source

The data used were drawn from the 2003 KDHS. This was a national survey involving 8,195 women and 3,578 men. It obtained detailed information on fertility levels, marriage, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of women and young children, childhood and maternal mortality, maternal and child health, awareness and behavior regarding HIV/AIDS, and other sexually transmitted infections (STIs). The survey targeted women aged 15 to 49 and men aged 15 to 54, selected from 400 clusters throughout the country. This study utilized the birth history information collected from each respondent using the female questionnaire. Birth history questions capture items such as sex, date of birth, survival status and age at death for births that had died. Other data which is relevant to this study which was collected included: region, type of place of residence, education levels, ever use of contraception among other background characteristics.

3.2 Birth Intervals Selection Procedure

Selection of birth intervals for analysis is a daunting task for any researcher. First, the target population from whom the intervals are obtained needs to be addressed. For there to be a birth interval, there must be at least two live births. While all women who are in their reproductive years and have at least two children are eligible, their risk of exposure must also be the same to enable comparison of results. As such, this study limited its selection of intervals to women who reported being married or living together with a man. Secondly, since the duration between one union and the next may affect the length of a woman's birth intervals, the study limited its observations to women who reported being in their first union.

The study also acknowledged that an interval can either be open or closed depending on the date of survey. While the definition of a closed interval is clear cut, identification of an open interval may not be accurate since a pregnancy may not be recognized or reported until the fourth or fifth month of gestation (Trussel et al. 1985). To address this challenge, the selection of birth intervals was based on the definition of an interval as the duration between two live births of a woman. Further, only women who had at least one closed and one open interval were selected to have a representative figure for both intervals.

Therefore, the first step in selecting the intervals entailed obtaining a subset of currently married women in their first union from the 8,195 women interviewed in the 2003 KDHS. This subset comprised 4,536 women. Second, two different files were created: last open interval file and last closed interval file. The first file was created by identifying and calculating the duration of the last open interval for each woman. This was obtained by deducting the date of the last birth from the date of interview. A total of 4,259 intervals were identified with 277 cases being recorded as missing (their durations were missing). A status variable (0) was created so as to identify these intervals as open during analysis.

Next, the second file was created by identifying and calculating the duration of the last closed interval for each woman. The latter was obtained by deducting the date of the last birth from the date of the second birth. A total of 3,536 closed intervals were identified with 1,000 cases being recorded as missing (their durations were missing). Just like in the first file, a status variable (1) was created.

The length of the preceding birth intervals for the open and closed intervals could now be obtained. For the closed interval, this was obtained by calculating the duration of time between the third and the second births while the duration of the closed interval provided the length of the preceding interval for the open interval. This variable was calculated for each file.

Since the dependent variable, birth interval, is a combination of last open and last closed intervals, the two files were merged to form the birth interval file. To eliminate the bias arising from missing cases, only women with both intervals as well as a duration of preceding birth interval for both intervals were selected. The new sample size after merging and selection was 2,608 women, while there were 5,216 intervals; 2608 open and 2608 closed. From the birth interval file, 86.4 percent of the open intervals and 76.5 percent of the closed intervals were observed in the 10 year period prior to the survey.

33 Methods of Analysis

The analysis was conducted using the Cox proportional hazard model (Cox, 1972). Since not all the women had completed their child bearing by the time of the survey, the model takes care of the censoring due to the trunked time in which the intervals were observed.

The model was expounded by Richard Cox (1982) in his paper *Regression Models and Life Tables.* The Cox proportional hazard model is a form of regression which is a statistical technique used to describe the relationship between values of two or more variables. When more than one explanatory variable needs to be taken into account, the method is known as multiple regression. The Cox method is similar to multiple regression except that it allows one to take more than one explanatory variable into account at any one time (Walters, 2001). It is based on a modeling approach on the analysis of survival data. The purpose of the model is to simultaneously explore the effects of several variables on survival. The Cox method assumes that the effect of different variables on survival are constant over time and are additive in a particular scale. This assumption is called the *proportional harzards* (a hazard simply means risk). The hazard model defines the risk of instantaneous occurrence of a given event.

The hazard function is the probability that an individual will experience the event of interest within a small time interval, given that the individual has survived up to the beginning of the interval. This is the risk of experiencing the event at time *t*. The hazard function h(/) is given by the following equation:

"h (t) = ^ (t)*exp (pi*Z,+ . . . .+Pm+Z_m) or k\ (t) = (t)exp (Zj (30

where:

i- are the index subjects (in this case intervals)

A,j(t)- denotes the resultant hazards (probability of birth), given by the values of the m covariates (socio-economic, demographic e.tc) for the respective cases (Zi . . . . Z_m) and the respective survival time (t)

Ao (t)- denotes the baseline hazard; it's the hazard for the respective individuals when all independent variables' values are equal to zero

Pi-represents the associated coefficients for the respective cases (Zj...... Z_m)

Three models were fitted. The choice of three models arose from observations made by Bongaarts et al. (1984) while studying the proximate determinants of fertility in sub-Saharan Africa. According to the researchers, for one to have a comprehensive understanding of the factors influencing fertility, a distinction must be made between the two classes of determinants: proximate variables and background variables. While proximate variables influence fertility directly, background variables can only affect fertility indirectly; they only act through the proximate variables. As such, a background variable can have negative fertility effects through one set of proximate variables (such as education's effect on use of contraception) and positive effects through another set (such as education's effect on length of breastfeeding). In addition, this study has further categorized the background variables into two: (1) demographic variables and (2) socio-economic and cultural variables. This categorization improves one's understanding of the operation of the background determinants.

The first model consisted of demographic variables (age of the mother at the beginning of interval, birth order, sex of index child, survival status of index child and duration of preceding birth interval). The second model introduced socio-economic and cultural variables (region, type of place of residence, maternal education and paternal education) while the third model added the intermediate variables (duration of breastfeeding and ever us of contraception).

The models were fitted using the SPSS computer package. The output was an equation for the hazard as a function of several explanatory variables. The proportional hazard model gave the monthly risk of giving birth for every woman. Interpreting the results involved examining the coefficients and odds ratios of each explanatory variable. A positive coefficient meant that the hazard was higher while a negative coefficient implied a lower hazard. The odds ratios gave the magnitude of the hazard (risk of giving birth).

CHAPTER FOUR: QUALITY OF DATA AND DESCRIPTION OF VARIABLES

4.1 Introduction

This chapter discusses the quality of data used in the analysis as well as the description of the characteristics of the study population. The analysis and interpretations were based on title 5,216 birth intervals obtained from the sample of 2608 women.

4.2 Data Quality

Data for this study was subject to two types of errors: coverage and content errors. Coverage errors deal with completeness and the quantitative aspects of enumeration, while content errors pertain to qualitative characteristics such as age, sex, marital status etc. As for coverage errors, the 2003 KDHS report indicates that a total of 9,865 households were selected in the sample, of which 8,889 were occupied and therefore eligible for interview. Of these, 8,561 were successfully interviewed, yielding a household response rate of 96 percent. In the households interviewed in the survey, 8,717 eligible women were identified; interviews were completed with 8,195 of these women, yielding a response rate of 94 percent.

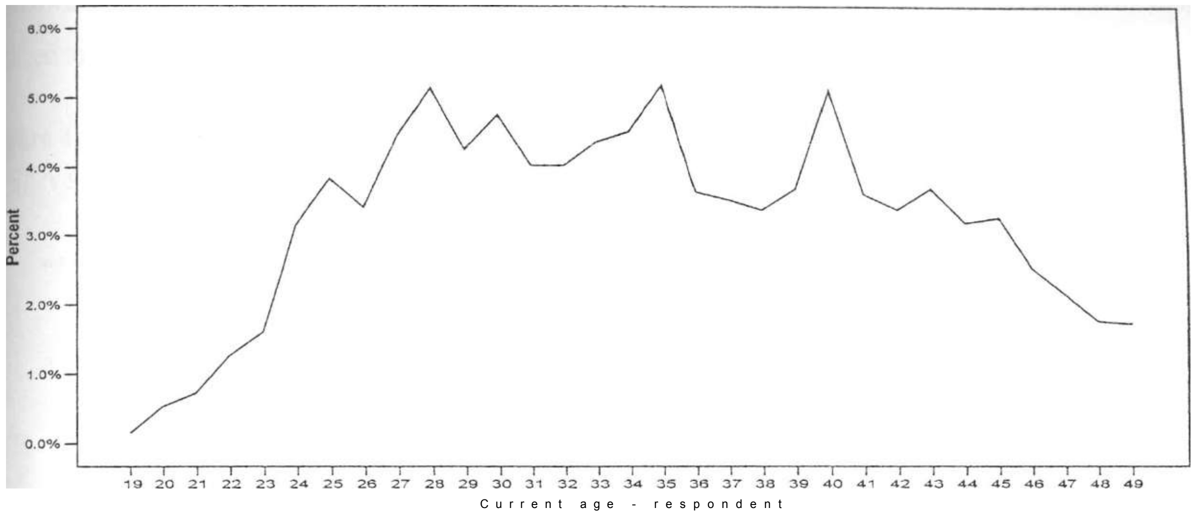
The term "errors of content" refers to instances where the characteristics of the respondent are incorrectly reported. In the study of birth intervals, content errors may be observed for reported age, omission of births and deaths, and reporting on the duration of breastfeeding. To assess the quality of these data, the following tests were conducted:

4.2.1 Age Distribution of Women

The assessment of the quality of age data can be conducted using two methods; graphical and arithmetic methods. Through graphical methods, the extent of digit preference can be determined by plotting the percent of women against the reported ages in single years. The plot is expected to decline smoothly with age.

Figure 4.1 shows the result of the graphical test. The presence of peaks and troughs indicate that there was preference for digits: 25, 28, 30, 35, 40, 43 and 45.

Figure 4.1 Percentage Distribution of Women in Single Years



4.2.2 Omission and Misplacement in the Reporting of Births and Deaths

To evaluate the extent of omission and misplacement in the reporting of births and deaths, sex ratios are calculated for both child birth and deaths. Calculation of sex ratios by age give an indication of the defects in the data since in any given population, the ratio should not fluctuate from one age to another unless migration has played an important role. Omission was determined by examining the extent to which the calculated sex ratio differed from the expected ratio of 1.08. If smaller than 1.08, male births were omitted while if the ratio was larger than 1.08, female births were omitted.

Sex ratio = male births/female births

-2676/2540

=1.05

At 1.05, the data is within range and thus is of good quality.

To assess the quality of death data, the percent distribution of infant and children deaths is plotted against the month of death. This study utilized death data from the last two births that occurred to women prior to the survey. Two plots were therefore generated which showed that there was considerable heaping for both sets. Figure 4.2 represents details on the last live birth (birth 1), it shows preference for digits: 4, 7, 9, 12, 18, 24 and 60. For birth 2, representing the second last birth prior to the survey, preference was observed for digits: 2, 4, 6, 9, 12, 18, and 30 as shown in Figure 4.3, (No consideration was given to birth three at this point since it was only utilized to calculate the duration of the preceding birth interval for birth 2.)

Figure 4.2 Percentage Distribution of Deaths by Age at Death in Months for the Last Birth to Survey Date

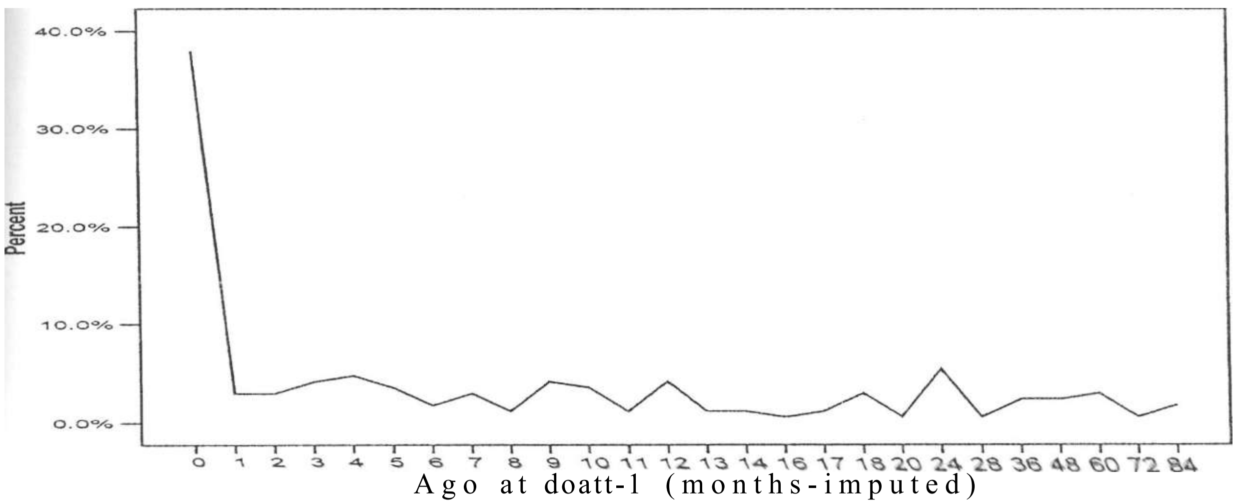
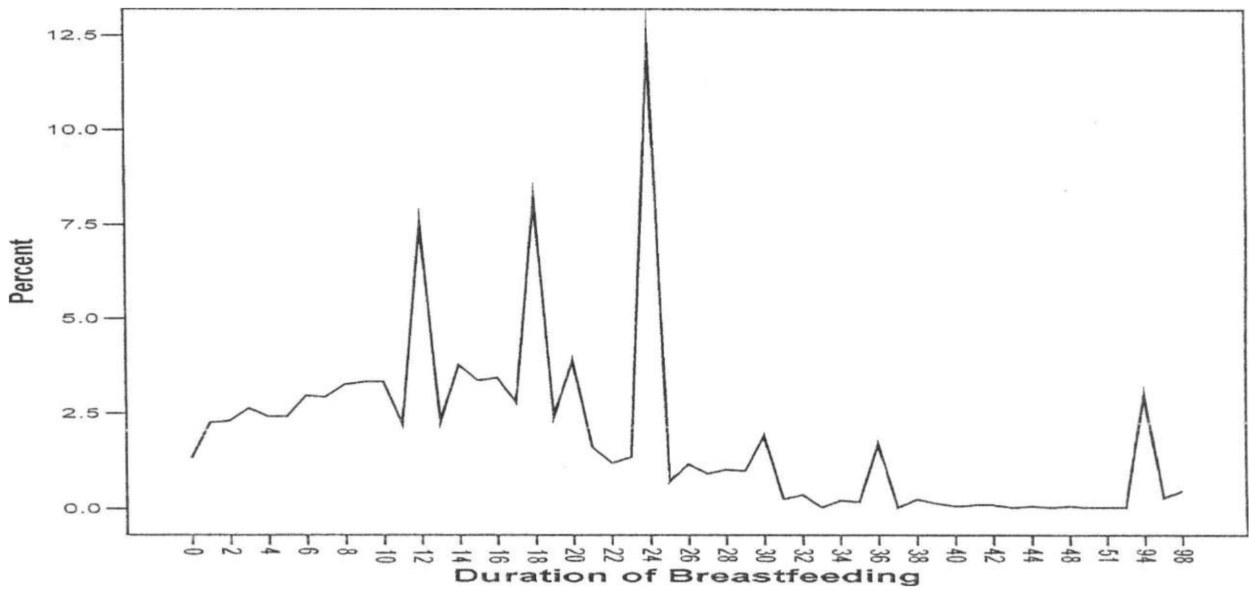


Figure 4.3 Percentage Distribution of Deaths by Age at Death in Months for the Second Birth to Survey Date

4.2.3 Breastfeeding Data

To assess the extent of heaping of breastfeeding data, the percentage of women in the sample (the 2,608 women who provided the 5,216 birth intervals) is plotted against the duration of breastfeeding in months. In the SPSS software, the percentage of women is automatically generated by the computer while the analyst has to specify the variable in the category axis (in this case duration of breastfeeding). According to Figure 4.4, there was heaping at months 13, 20, 25,30, 36 and 95.

Figure 4.4 Percentage Distribution of Women against the Reported Duration of Breastfeeding in Months



4.3 Summary of Quality of Data

The assessment of the quality of data revealed considerable heaping for reported ages for women, the duration of breastfeeding and reported ages at death for children. Heaping is a common source of error for data and the extent exhibited above is not expected to bias the results of the analysis. It was also observed that data on the reporting of births for both males and females were of good quality.

4.4 Description of Variables

Table 4.1 provides a summary of the percentage distribution of birth intervals by the background characteristics of women. An examination of the demographic factors reveal that 54 percent of the intervals were contributed by women aged 25-34 years. Women aged less than 25 years contributed 31 percent of all intervals while those aged 35 and above contributed 15 percent of all intervals.

Most of the intervals were of order 0-3 as compared to those of orders 4-5 and 6 and above. Thirty seven percent of the intervals were contributed by women whose index child was of birth order 0-3 while those whose index child was of birth order 4-5 and. 6 and above contributed 32 percent and 31 percent of all intervals respectively. The survival status of the preceding birth revealed that most of the children were alive at 92 percent. On the other hand, there were more male than female births. The former stood at 51 percent while the latter represented 49 percent of all intervals. Most the birth intervals were in the 24-36 month category (38 percent) while those above 36 months were 36 percent and finally less than 24 months were 25 percent.

In the socio-economic and cultural factors category, most of the intervals were from women residing in the Rift Valley, (20 percent) of all intervals, while Nairobi provided the least number of all intervals (8 per cent). The other regions contributions lie between 8 percent and 15 percent. In addition, there were more intervals from rural than urban dwellers, 78 percent and 22 percent respectively.

Women with primary level of education contributed 53 percent of the intervals, followed by secondary and higher level at 24 percent and lastly no education at 23 percent. On the other hand, a similar pattern was observed for the level of paternal education: primary at 44 percent, secondary at 37 percent and no education at 18 percent. This variable had an additional category catering for instances where the educational level was unknown representing 1 percent of the cases.

Table 4.1 Percentage Distribution of Birth Intervals by Background Characteristics of Women

Variable	Frequency (n)	Percent
DEMOGRAPHIC VARIABLES		
Age of Mother at start of Interval		
<25	1,620	31.1
25-34	2,826	54.2
35+	770	14.8
Birth Order		
0-3	1,951	37.4
4-5	1,643	31.5
6+	1,622	31.1
Survival Status		
Alive	4,805	92.1
Dead	411	7.9
Sex of child		
Male	2,676	51.3
Female	2,540	48.7
Length of Preceding Birth Interval		
<24	1,320	25.3
24-36	2,002	38.4
>36	1,894	36.3
SOCIO-ECONOMIC AND CULTURAL VARIABLES		
Maternal Education		
No Education	1,206	23.1
Primary	2,778	53.3
Secondary & Higher	1,232	23.6
Paternal Education		
No Education	926	17.8
Primary	2,316	44.4
Secondary & Higher	1,908	36.6
Region		
Nairobi	406	7.8
Central	756	14.5
Coast	524	10.0
Eastern	656	12.6
Nyanza	708	13.6
Rift Valley	1,060	20.3
Western	670	12.8
North Eastern	436	8.4
Type of place of residence		
Urban	1,150	22.0
Rural	4,066	78.0

Table 5.1: (continued)

INTERMEDIATE VARIABLES		
Ever use of Contraception		
No Method	1,846	354
Traditional	402	7.7
Modern	2,968	56.9
Duration of Breastfeeding		
<10	706	13.5
10-19	1,072	20.6
20+	853	16.4
NBF	82	1.6
n=5,216		

Note that percentages for paternal education and duration of breastfeeding do not add up to 100 percent due to the omission of missing cases.

The final category examined intermediate variables. Contraception use was measured using the ever use of any method variable. It was observed that most intervals occurred to women who were using modem methods at 57 percent of all intervals, followed by never used at 35 percent and traditional methods at 8 percent. Finally, the duration of breastfeeding was categorized into four: less than 10 months, 10-19 months, 20 and above months and never breastfed. It was observed that most of the cases were missing at 48 percent of all intervals while 0.2 percent of all intervals come from women whose breastfeeding information was unknown. In the remaining categories, the duration between 10-19 months contributed most intervals at 21 percent, followed by 20 and above months at 16 percent and finally, less than 10 months at 14 percent of all intervals.

CHAPTER FIVE: DETERMINANTS OF BIRTH INTERVALS

5.1 Introduction

The analysis was conducted at the bivariate and multivariate levels. In the former case, a bivariate cox regression was fitted for every independent variable against the dependent variable while the latter case involved fitting three models for the multivariate cox analysis. The analysis is based on the 5,216 birth intervals which were obtained from a sample of 2,608 women.

The dependent variable was the risk of giving birth while the independent variables were in the three categories specified in the operational framework: Demographic, Socio-economic, cultural and proximate variables. The Demographic variables were: age of the mother at the start of the interval, birth order, length of preceding birth interval, sex of preceding child and survival status of preceding child. The Socio-economic and cultural variables were: maternal and paternal education, region and type of place of residence. Finally, the intermediate variables were: ever use of contraception and duration of previous birth interval.

5.2 Results of the Bivariate Cox Regression Analysis

This section presents the results of the bivariate analysis. Table 5.1 shows the results from the analysis which indicate that all variables except one had a statistically significant effect on the dependent variable. The exception is sex of the index child.

The demographic category had five variables: age at start of the interval, sex of preceding child, survival status of preceding child, birth order and duration of preceding birth interval. It was expected that the older a woman was at the start of an interval, the less likely she was to give birth. The study results in Table 5.1 confirmed this. Women aged between 25 and 34 were 0.6 times less likely to give birth as compared to those in the reference category (less than 25 years), while those aged 35 and above had a slightly less risk of giving birth (0.4 times) as compared to the reference category. These results are consistent with previous studies, for instance, Mace and Sear (1997) identified maternal age as an important determinant of the duration of the interval to the next birth among the Gabbra pastoralists of Northern Kenya. The effect of age has been seen to increase for women aged 25 and above as compared to those aged below 25. At the start of a

Table 5.1: Factors Associated with the Risk of Giving Birth to a Live Birth

Variable	B	Exp(B)
Demographic variables		
Age of Mother At Start of Interval		
<25 (Ref)		
25-34	-0.562 (0.041)	0.570*
>34	-0.963(0.074)	0.382*
Birth Order		
0-3 (Ref)		
4-5	-0.503(0.047)	0.605*
6+	-0.534(0.048)	0.586*
Survival Status of Child		
Alive (Ref)		
Dead	0.402(0.067)	1.495*
Sex of Child		
Male (Ref)		
Female	0.048(0.039)	1.049
Length of Preceding Birth Interval		
<24 (Ref)		
24-36	-0.065(0.048)	0.937
>36	-0.388(0.050)	0.678*
Socio-economic & cultural variables		
Maternal Education		
No Education (Ref)		
Primary	-0.065(0.049)	0.937
Secondary & Higher	-0.347(0.057)	0.707*
Paternal education		
No Education (Ref)		
Primary	-0.140(0.055)	0.870**
Secondary & Higher	-0.327(0.057)	0.721*
Region		
Nairobi (Ref)		
Central	-0.081(0.087)	0.922
Coast	0.170(0.094)	1.185
Eastern	0.145(0.089)	1.156
Nyanza	0.183(0.088)	1.201***
Rift Valley	0.343(0.083)	1.410*
Western	0.299(0.089)	1.348**
North Eastern	0.556(0.098)	1.743*
Type of Place of Residence		
Urban (Ref)		
Rural	0.155(0.047)	1.168**

Table 5.1: (continued)

Variable	B	*Exp(B)*
Intermediate variables		
Ever Use of Contraception		
Never Used (Ref)		
Traditional Method	-0.109(0.078)	0.897
Modern	-0.398(0.042)	0.672*
Duration of Breastfeeding		
<10 (Ref)		
10-19	-0.608(0.087)	0.544*
20+	-1.663(0.095)	0.190*
Never Breastfed	-0.016(0.163)	0.984

Ref- Reference Category
() standard errors
* p<0.1 **p<0.01 ***p<=0.05

woman's reproductive age, she may be interested in completing her child bearing before her late twenties and this may account for why the risk of giving birth is higher among this group.

Women whose index child had died were 1.5 times more likely to give birth as compared to their counterparts whose index child was alive. This association was also statistically significant and conformed to the hypothesis that women whose preceding child had died were more likely to give birth as compared to their counterparts whose preceding children were alive. This finding was consistent with that by Kimani (2001). The latter found out that women in Kenya adopt various strategies such as curtailing the duration of breastfeeding in order to replace infants or children who have died. It is expected that women who are still in their reproductive ages would adopt measures to replace a dead child if they have not already attained the desired family size.

The results for birth order do not confirm with previous findings, i.e. women whose last birth was of order 4-5 or 6 and above were 0.6 times less likely to give birth as compared to the reference category (0-3). This association was also statistically significant. Trussel et al. (1985) found birth order to be an insignificant determinant of birth interval length in Philippines, Malaysia and Indonesia, however, this study found the same variable to be significant. Birth order is the chronological ordering of siblings in a family. Women whose last child was of a higher birth order (4 and above) may have already attained then desired family size and as such their risk of giving birth ought to have been minimal. On the other hand, women whose last child was of a lower birth order (0-3) may not have attained their desired family size and hence the higher chance of giving birth as compare to the other categories.

Short birth intervals are associated with short subsequent intervals, while long intervals are associated with long subsequent intervals. The finding for this variable was consistent with expectations and previous studies, for instance Trussel et al. (1985). Women who had spaced their previous births by a long duration (24 and above) can be expected to wait for a similar duration for other additional births they expect to have. This should be the case if the measures they took, for instance, breast feeding for a long time, use of contraception and/or post partum abstinence, were still available to them.

In this study, women whose preceding birth interval was between 24 and 36 months were 0.9 times less likely to give birth while those who exceeded 36 months also had a reduced risk of giving birth by 0.7 times.

All the four variables in the Socio-economic and cultural category (maternal education, paternal education, region and type of place of residence) had a significant effect on birth intervals. The results show that women with primary education were 0.9 times less likely to give birth as compared to those with no education. This association was, however, not significant. Women with secondary level of education and above were 0.7 times less likely to give a birth as compared to their counterparts with no education. This finding differed with Trussel et al. (1985) who found out that female education was not a significant determinant of the risk of giving birth. However, educational attainment was found to be significant by Westoff et al. (2001) who observed that the higher the level of education, the longer the preferred duration of a woman's birth intervals.

Women whose partners had primary education were 0.9 times less likely to give birth as compared to the reference category, while those whose partners had secondary and above level of education were 0.7 times less likely to give birth. Both of these associations were statistically significant. This finding conformed to expectations; the more educated a woman's partner was the lesser her risk of giving birth.

The risk of giving birth in all regions except Central, Coast and Eastern provinces is higher compared to Nairobi. Women living in Nyanza were 1.2 times more likely to give birth as compared to the reference category, while those in Rift Valley, Western and North Eastern provinces, had 1.4, 1.3 and 1.7 times higher risk of giving birth respectively. Similarly, the risk of giving birth is higher in rural areas (1.2 times) as compared to those residing in urban areas. The differences by region and type of place of residence may be a reflection of differentials in the distribution, access and utilization of family planning services and levels of social and economic development existing in the regions. For instance, the lower levels of education found in rural areas may be associated with a lack of awareness by women inhibiting these regions and in turn disempower them in decision making on fertility issues.

The variables considered under the intermediate category were: ever use of contraception and duration of breastfeeding. Ever use of contraception was only statistically significant for users of modern methods. Women who reported using traditional methods were 0.9 times less likely to give birth, while users of modern methods were 0.7 times less likely to give birth. Due to the high success rate associated with modern methods of contraception, it was expected that users of modern methods were less likely to give birth as compared to users of other methods. This finding was consistent with previous studies such as Westoff et al. (2001), Rasekh and Momtaz (2007) and Valle (2005).

Breastfeeding induces hormonal changes that prevent ovulation for a period of time. This effect is also greatly determined by the length and intensity of breastfeeding. It was expected that the longer the duration of breastfeeding the lesser the risk of a woman giving birth. In this study, the duration of breastfeeding was statistically significant for those who breast fed for 10 months and above. Women who breastfed for 10 to 19 months were 0.5 times less likely to give birth as compared to the reference category, while those who breastfed for 20 months and above had a 0.2 times reduced risk of giving birth. Women who never breastfed experienced 0.9 times reduced risk of giving birth as compared to the reference category.

5.3 Determinants of Birth Intervals

Three models were fitted to assess the net effect of the independent variables on the risk of giving birth. These are: demographic factors model, socio-economic and cultural factors model and intermediate factors model. (Full results are presented in the Appendices I-III)

Results in Table 5.2 indicate that all the variables except sex of the index child were statistically significant. Age of the mother at the start of the intervals was statistically significant in all categories. Women aged between 25 and 34 had a 0.7 times lesser chance of giving birth as compared to the reference category - women aged below 25 years. Those aged above 34 experienced 0.6 times less risk of giving birth as compared to the reference category.

Women whose previous birth was of order 4-5 experienced 0.7 times reduced risk of giving birth while those whose previous child was of order 6 or higher, had their chances of giving birth reduced by 0.3 times. With regard to survival status of the index child, a woman whose child was dead experienced 1.6 times increased risk of giving birth as compared to those whose child was alive.

The duration of preceding birth interval was only significant for women who had spaced their previous birth by 36 months and above. The latter experienced 0.8 times reduced risk of giving birth as compared to women who had spaced their births by less than 24 months.

Results of model 2 reveal that all variables except maternal education were statistically significant. Paternal education was only statistically significant for those who attained secondary and above levels of education. Women whose partners had primary level of education were 0.9 times less likely to give birth when compared to those whose partners had not received any level of education. Women whose partners had secondary and above level of education were 0.8 times less likely to give birth as compared to those whose partners had not received any level of education (reference category). Region of residence was only significant for Central, Rift Valley, Western and North Eastern provinces. Women who resided in Central province had 0.8 times less chance of giving birth as compared to those in Nairobi, while those residing in Rift Valley, Western and North Eastern provinces experienced 1.2, 1.3 and 1.6 times more risk of giving birth. With regard to type of place of residence, living in a rural area exposed a woman to the risk of giving birth by 1.2 times as compared to living in an urban area.

Table 5.2 Determinants of Birth Intervals

	Model 1	Model 2	Model 3
Variables		**Odds ratios**	
Demographic variables			
Age of Mother At Start of Interval			
<25 (Ref)			
25-34	0.682*	0.774*	0.887
>34	0.459*	0.508*	0.439*
Birth Order			
0-3 (Ref)			
4-5	0.703*	0.611*	0.645*
6+	0.791*	0.595*	0.665*
Survival Status of Child			
Alive (Ref)			
Dead	1.571*	1.424*	1.040
Sex of Child			
Male (Ref)			
Female	1.054	1.054	1.017
Length of Preceding Birth Interval			
<24 (Ref)			
24-36	0.982	0.987	0.945
>36	0.772*	0.792*	0.923
Socio-economic & cultural variables			
Maternal Education			
No Education (Ref)			
Primary		1.045	1.102
Secondary & Higher		0.868	0.843
Paternal education			
No Education (Ref)			
Primary		0.923	1.199
Secondary & Higher		0.814***	1.262
Region			
Nairobi (Ref)			
Central		0.788**	0.916
Coast		1.114	0.938
Eastern		1.067	1.121
Nyanza		1.125	1.259
Rift Valley		1.221**	1.321
Western		1.312**	1.305
North Eastern		1.560*	1.057
Type of Place of Residence			
Urban (Ref)			
Rural		1.196**	1.100

Table 5.1: (continued)

	Model 1	Model 2	Model 3
Variables		**Odds ratios**	
Intermediate variables			
Ever Use of Contraception			
Never Used (Ref)			
Traditional Method			0.877
Modern			0.571*
Duration of Breastfeeding			
<10 (Ref)			
10-19			0.506*
20+			0.208*
Never Breastfed			1.091

Ref- Reference Category
* p<0.1 **p<0.01 ***p<=0.05

In this model, the effect of the demographic variables maintained their statistical significance even though the risk had reduced slightly. In addition, the sex of the previous child was still insignificant in this model.

Results from model 3 reveal that ever use of contraception and duration of breastfeeding had some statistical significance, though not in all their categories. Use of traditional methods of contraception had no statistical significance to the risk of giving birth, none-the-less, this category of women were 0.9 times less likely to give birth as compared to women who reported non-use of contraception. On the other hand, use of modern methods reduced the risk of giving birth by 0.6 times and was statistically significant.

While breastfeeding for 10 months and above was statistically significant, having not breastfed was not. Thus women who breastfed their children for between 10 and 19 months were 0.5 times less likely to give birth than the reference category, while those who breastfed for 20 months or more reduced their risk of giving birth 0.2 times. Though not statistically significant, having not breastfed the previous child increased a woman risk of giving birth by 1.1 times.

In the third model, the effect of background factors is seen to diminish with the inclusion of the intermediate variables, as such, and consistent with theory, the effect of education for both parents, region, type of place of residence, duration of the preceding birth interval, sex and survival status of the previous child were not significant. It was also noted that the mother's age at the start of the interval was only significant for those aged 35 years and above.

The diminished effect of the background factors is accounted for by the fact that proximate/intermediate factors influence fertility directly while background factors only influence fertility indirectly through the proximate factors. Therefore, the overall net effect of a background variable on fertility can be positive, negative, or insignificant depending on the relative contributions of the positive and negative effects of the proximate determinants (Bongaarts et al. 1984). This was elaborated earlier in chapter 3 when the choice of three models was discussed.

5.4 Summary

From the bivariate analysis, the important covariates of the risk of giving birth are: mother's age at the start of the interval, birth order, survival status of preceding child, length of preceding birth interval, maternal and paternal education, region, type of place of residence, ever use of contraception and duration of breastfeeding. In the multivariate analysis, it has been seen that all variables (background factors) in the demographic, socio-economic and cultural models, except sex of the preceding child, were important covariates of the risk of giving birth. Introduction of the intermediate variables diminished the effect of the background factors such that only maternal age at the start of the interval, birth order, ever use of contraception and duration of breastfeeding had any statistical significance on the risk of giving birth. This is consistent with the theoretical assumptions of the determinants of fertility; background factors only operate through the proximate factors.

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CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary and conclusion of the study results. It also looks at the recommendations arising from, the findings.

6.2 Summary

The objective of the study was to identify the determinants of birth intervals among married women in Kenya. Specifically, it aimed at examining the intermediate, demographic, socio- economic and cultural factors that influence birth intervals in Kenya. The data for the analysis was obtained while the analysis was undertaken using cox proportional hazards model. It has been seen that all the variables, except sex of the index child, were statistically significant. In addition, the analysis also supported the hypotheses for the statistically significant variables.

The bivariate analysis showed that the following covariates were important determinants of the risk of giving birth: maternal and paternal education, region, type of place of residence, maternal age at the start of an interval, length of preceding birth interval, survival status of preceding child, birth order, duration of breastfeeding and contraceptive use. The multivariate analysis involved fitting three models (demographic model, socio-economic and cultural model, and intermediate model). In the first two models, covariates which had statistical significance were similar to those identified in the bivariate analysis. However, and as anticipated from theory, introduction of the intermediate variables diminished the effect and even significance of the demographic, socio-economic and cultural factors. As such, only age of the mother at the start of the interval, birth order and duration of breastfeeding were statistically significant.

6.3 Conclusion

From the results of this study, the determinants of birth intervals are as would be expected from theoretical assumptions on fertility and from previous studies. However, distinctions have been made with regard to variables whose expected influence did not conform to previous studies. Even for studies that had been conducted in Kenya, it has been seen that not all variables conformed to expectations i.e. Mace and Sear (1997) found sex of the preceding child to be an important covariate of birth interval while the same variable was not significant in this study. None the less, the study did identify the following as the determinants of birth intervals among married women in Kenya: age of the mother at the start of the interval, birth order, survival status of index child, length of preceding birth interval, maternal and paternal education, region, type of place of residence, ever use of contraception and duration of breastfeeding. Also, the study has also established the significance of these determinants on the risk of giving birth.

6.4 Recommendations

The promotion of family planning has been a key feature of Kenya's population programmes. At the programme level, knowledge of the characteristics of women who prefer intervals of different lengths is crucial in designing interventions. It has been seen that education, region and place of residence are important covariates of the risk of giving birth. Subsequently, the study recommends the promotion of education for both men and women, and the need to address the bias between rural and urban residence, as well as among the various provinces, to reduce the obstacles women and couples face while making fertility decisions.

Secondly, ever use of contraception as well as having breastfed for 10 months and above reduced the risk of giving birth. As such, there is need to promote these practices among women and couples as a means of addressing unwanted fertility.

Further research on this topic is required to shed light on the link between birth intervals and completed family size. While the gap between preferred and actual birth intervals in sub-Saharan Africa has been studied by Westoff et al. (2001), further analysis of preferred birth intervals and how they are likely to impact on the process of childbearing is required.

REFERENCES

Bean, L. and Anderton, L. 1985. "Birth Spacing and Fertility Limitation: A Behavioral Analysis of a Nineteenth Century Frontier Population. " *Demography* 22, 2: 169-183.

Anyara, E. and Hinde, A. 2006. *Fertility Transition in Kenya: A Regional Analysis of the Proximate Determinants.* Southampton Statistical Sciences Research Institute Application & Policy Working Paper A06/03

Bavel, J. V. 2004."Deliberate Birth Spacing before the Fertility Transition in Europe: Evidence from Nineteenth -Century Belgium" *Population Studies* 58, 1:95-107.

Boerma, T. and Bicego, T. 1992. "Preceding Birth Intervals and Child Survival: Searching for Pathways of Influence." *Studies in Family Planning* 23, 4: 243-256.

Bongaarts et ai. 1984. "The Proximate Determinants of Fertility in Sub-Saharan AJrica" *Population and Development Review* 10, 3: 511-537

Bongaarts, J. 1978. "A Framework for Analyzing the Proximate Determinants of Fertility." *Population and Development Review A,* 1: 105-132.

2005. *Demographic Trends.* Population Council

Borda, M. and Winfrey, W. 2006. Kenya Demographic and Health Survey data 2003 Analysis. Futures/Constella

Bumpass et al. 1986. "Determinants of Korean Birth Intervals: The Confrontation of Theory and Data." *Population Studies* 40, 3: 403-423.

Caselli, G. Vallin, J. and Wunsch G., 2006. *Demography: Analysis and Synthesis.* London Elsevier Inc

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], and ORC Macro. 2004. *Kenya Demographic and Health Survey 2003.* Calverton, Maryland: CBS, MOH, and ORC Macro.

Cox, D. R. 1972. "Regression Models and Life-Tables." *Journal of the Royal Statistical Society* 34,2: 187-220

Haggerty, PA. and Rutstein, S. O. (1999) *DHS Comparative Studies: Breastfeeding and Complementary Infant Feeding, and the Post Partum Effects of Breastfeeding.* Calverton, Maryland: Macro International Inc

Igun, A. A. 1972. *Surveys of Fertility and Family Planning in Nigeria.* Ile-Ife. University of Ife

' Kalule-Sabiti I. 1984. "Bongaarts' proximate determinants of fertility applied to group data from the Kenya Fertility Survey 1977/78." *Journal of Biosocial Science,* 16: 205-218

Mace, R. and Sear, R. 1997. *Birth Interval and the Sex of Children in a Traditional African Population: An Evolutionary Analysis.* United Kingdom: Cambridge University Press

Kimani, M. 2001. "Behavioural Effects of Infant and Child Mortality on Fertility in Kenya." *African Journal of Reproductive Health / La Revue Africaine de la Sante Reproductive,* 5,3: 63-72.

Kimani, M. 1992. Effects of Infant and Child Mortality in Kenya. PhD Thesis. University of Nairobi

Mutuku, A. 2001. *Analysis of Birth Intervals in Kenya.* An unpublished MSC Thesis PSRI University of Nairobi.

National Coordinating Agency for Population and development (NCAPD) and MEASURE EVALUATION, 2006. A Closer Look at KDHS 2003: Further Analysis of the Contraceptive Prevalence and Fertility Stalls - Summaries of selected NCAPD Working papers 2005 Nairobi: NCAPD

Minyancha, O. S. 1989. Fertility Based on Birth Interval Analysis. An unpublished Msc Thesis PSRI University of Nairobi

Navarro, L. 1987. "Fertility Change in Five Latin American Countries: A Covariance Analysis of Birth Intervals. " *Demography* 24, 1: 23-41.

Njogu, W. and Martin, T. C. 1991. Fertility Decline in Kenya: The Role of Timing and Spacing of Births. In proceedings of a conference. World Demographic and Health Surveys 5th - 7th August, 1991 pp 1862-1865

Stones, R. and Ngianga-Bakwi, K. 2004. *Birth Intervals and Injectable Contraception in sub-Saharan Africa.* Southampton Statistical Sciences Research Institute Application & Policy Working Paper A04/24

Otieno, A.T.A. 1999. *Timing and Spacing of Births in Kenya.* An unpublished Phd Thesis International Institute for Population Sciences/Deemed University India

Palloni, A. and Millman, S. 1986. "Effects of Inter-Birth Intervals and Breastfeeding on Infant and Early Childhood Mortality." *Population Studies* 40, 2: 215-236.

Population Reference Bureau, 2007. *2007 World Population Data Sheet.* Washington

Rahman, M. and DaVanzo, J. 1993. "Gender Preference and Birth Spacing in Matlab, Bangladesh." *Demography* 30, 3: 315-332.

Rasekh, A., and Momtaz, M., 2007. "The Determinants of Birth Interval in Ahvaz-Iran: A Graphical Chain Modeling Approach." *Journal of Data Science* 5: 5-576.

Rindfuss, R. Palmore, J. and Bumpass, L. 1987. "Analyzing Birth Intervals: Implications for Demographic Theory and Data Collection." *Sociological Forum* 2, 4: 811-828.

Santow, G. and Bracher, D. 1984. "Child Death and Time to the Next Birth in Central Java." *Population Studies* 38, 2: 241-253.

Taeuber, I. B 1958. *The Population of Japan.* Princeton, New Jersey. Princeton University Press.

Trussed et al. 1985. "Determinants of Birth-Interval Length in the Philippines, Malaysia, and Indonesia: A Hazard- Model Analysis. " *Demography* 22, 2: 145-168.

Trussell, et al. 1992. "Birth Spacing and Child Mortality in Bangladesh and the Philippines" *Demography* 29, 2: 305-318.

Valle, W. 2005. "Marriage and Time to First Birth". *Population and Development Review* 9, 2: 259-278

Walters, S. J. 2001. "What is a Cox Model?" Kent: Hayward Group pic Vol. 1 No. 10

Westoff. et al. 2001. *Gap between Preferred and Actual Birth Intervals in Sub-Saharan Africa: Implications for Fertility and Child Health.* DHS Analytical Studies No. 2. Calverton, Maryland: ORC Macro.

APPENDICES

APPENDIX I: MULTIVARIATE ANALYSIS -MODEL 1 (DEMOGRAPHIC VARIABLES)

	B	SE	Wald	df	Sig.	Exp(B)
Age of Mother At Start of Interval						
<25 (Ref)			92.601	2	0.000	
25-34	-0.383	0.049	61.173	1	0.000	0.682
>34	-0.779	0.089	75.360	1	0.000	0.459
Birth Order						
0-3 (Ref)			48.228	2	0.000	
4-5	-0.353	0.051	47.642	1	0.000	0.703
6+	-0.235	0.061	14.950	1	0.000	0.791
Survival Status of Child						
Alive (Ref)						
Dead	0.452	0.068	44.209	1	0.000	1.571
Sex of Child						
Male (Ref)						
Female	0.053	0.039	1.807	1	0.179	1.054
Length of Preceding Birth Interval						
<24 (Ref)			32.278	2	0.000	
24-36	-0.018	0.048	0.136	1	0.713	0.982
>36	-0.259	0.052	24.497	1	0.000	0.772

APPENDIX H: MULTIVARIATE ANALYSIS - MODEL 2 (DEMOGRAPHIC, SOCIO-ECONOMIC AND CULTURAL VARIABLES)

	B	SE	Wald	df	Sig.	Exp(B)
Age of Mother At Start of Interval						
<25 (Ref)			56.250	2	0.000	
25-34	-0.256	0.052	24.617	1	0.000	0.774
>34	-0.678	0.092	54.376	1	0.000	0.508
Birth Order						
0-3 (Ref)			98.512	2	0.000	
4-5	-0.492	0.053	85.651	1	0.000	0.611
6+	-0.519	0.067	60.796	1	0.000	0.595
Survival Status of Child						
Alive (Ref)						
Dead	0.353	0.069	26.485	1	0.000	1.424
Sex of Child						
Male (Ref)						
Female	0.053	0.039	1.779	1	0.182	1.054
Length of Preceding Birth Interval						
<24 (Ref)			26.367	2	0.000	
24-36	-0.013	0.048	0.070	1	0.791	0.987
>36	-0.234	0.053	19.652	1	0.000	0.792
Maternal Education						
No Education (Ref)			10.585	2	0.005	
Primary	0.044	0.067	0.427	1	0.514	1.045
Secondary & Higher	-0.142	0.083	2.908	1	0.088	0.868
Paternal education						
No Education (Ref)			8.394	3	0.039	
Primary	-0.080	0.075	1.134	1	0.287	0.923
Secondary & Higher	-0.206	0.084	6.061	1	0.014	0.814
Region						
Nairobi (Ref)			64.358	7	0.000	
Central	-0.238	0.103	5.287	1	0.021	0.788
Coast	0.108	0.102	1.114	1	0.291	1.114
Eastern	0.065	0.106	0.378	1	0.539	1.067
Nyanza	0.118	0.101	1.355	1	0.244	1.125
Rift Valley	0.200	0.099	4.096	1	0.043	1.221
Western	0.271	0.103	6.932	1	0.008	1.312
North Eastern	0.445	0.123	13.096	1	0.000	1.560
Type of Place of Residence						
Urban (Ref)						
Rural	0.179	0.061	8.749	1	0.003	1.196

'PENDIX HI: MULTIVARIATE ANALYSIS - MODEL 3 (DEMOGRAPHIC, SOCIO-ECONOMIC, ,TURAL AND INTERMEDIATE VARIABLES)

	B	SE	Wald	df	Sig.	Exp(B)
Age of Mother At Start of Interval						
<25 (Ref)			31.612	2	0.000	
25-34	-0.120	0.090	1.766	1	0.184	0.887
>34	-0.822	0.154	28.415	1	0.000	0.439
Birth Order						
0-3 (Ref)			25.641	2	0.000	
4-5	-0.438	0.090	23.480	1	0.000	0.645
6+	-0.408	0.111	13.436	1	0.000	0.665
Survival Status of Child						
Alive (Ref)						
Dead	0.039	0.114	0.119	1	0.730	1.040
Sex of Child						
Male (Ref)						
Female	0.017	0.065	0.068	1	0.795	1.017
Length of Preceding Rirt.h Interval						
<24 (Ref)			0.880	2	0.644	
24-36	-0.057	0.080	0.512	1	0.474	0.945
>36	-0.080	0.089	0.810	1	0.368	0.923
Maternal Education						
No Education (Ref)			6.723	2	0.035	
Primary	0.097	0.120	0.653	1	0.419	1.102
Secondary & Higher	-0.171	0.157	1.192	1	0.275	0.843
Paternal education						
No Education (Ref)			4.927	3	0.177	
Primary	0.181	0.121	2.247	1	0.134	1.199
Secondary & Higher	0.232	0.139	2.805	1	0.094	1.262
Region						
Nairobi (Ref)			15.764	7	0.027	
Central	-0.087	0.196	0.199	1	0.856	0.916
Coast	-0.064	0.191	0.113	1	0.737	0.938
Eastern	0.114	0.192	0.355	1	0.551	1.121
Nyanza	0.230	0.185	1.547	1	0.214	1.259
Rift Valley	0.278	0.175	2.543	1	0.111	1.321
Western	0.266	0.181	2.152	1	0.142	1.305
North Eastern	0.056	0.203	0.075	1	0.784	1.057
Type of Place of Residence						
Urban (Ref)						
Rural	0.095	0.102	0.883	1	0.347	1.100
Ever Use of Contraception						
Never Used (Ref)			45.168	2	0.000	
Traditional Method	-0.132	0.119	1.217	1	0.270	0.877
Modem	-0.560	0.085	43.081	1	0.000	0.571
Duration of Breastfeeding						
<10 (Ref)			253.426	4	0.000	
10-19	-0.682	0.097	49.611	1	0.000	0.506
20+	-1.572	0.107	215.730	1	0.000	0.208
Never Breastfed	0.087	0.168	0.266	1	0.606	1.091