Impact of Proximate Determinants of Fertility on Change in Total Fertility Rate in Kenya between 2003 and 2008/09

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A Project Submitted in Partial Fulfillment of the Requirement for the Award of Masters of Science Degree in Population Studies of University of Nairobi

2010

DECLARATION

This project is my original work and has not been presented before for a degree or other awards in this or any other University.

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Q56/71741/2008

Supervisors' Approval

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

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Dedication

This work is dedicated to my wife Nelly Waithera, and children Francis, Mineh and Diana whose love, encouragement and support kept me going even when I felt like giving up.

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Acknowledgement

I am grateful to my supervisors Dr. Kimani Murungaru and Mr. Andrew Mutuku for their tireless support in preparation of the proposal, analysis of data and compilation of the final report. I am also greatly indebted to the entire teaching and non teaching staff at PSRI for valuable feedback and criticism given in the course of my studies and especially during initial stages of this project. My fellow students also came in handy with constructive feedback and for this, I am humbled and wish to say thank you very much. To all of you I say without your support, it would have been next to impossible to complete this project.

May the good Lord, who alone gives us strength, wisdom and understanding reward you abundantly and bless the work of your hands now and in future.

Abstract

The study set out to find the contribution of each of the principal proximate determinants of fertility to the change in fertility observed between 2003 and 2008/09. Bongaarts model as proposed in 1978 and modified in 1983 was used in this study. Four factors were examined and these were marriage, contraception, postpartum infecundability and sterility. The other factor, abortion, which was identified by Bongaarts as being a key factor was not examined due to lack of data. The study first calculated the index of each of the four factors for both 2003 and 2008/09. After calculating these indexes, fertility levels for each of the two years were estimated by fitting the indexes into Bongaarts model. Using the estimated total fertility rates, the study estimated the reduction of total fecundity rate (TF) due to each of the four factors. Lastly, the study decomposed the estimated fertility change between 2003 and 2008/09 into proportions that were due to each of the four proximate determinants.

The findings of the study indicate that TFR declined by 7.5% at the aggregate level between 2003 and 2008/09. This decline is decomposed into a 3.3% decline due to change in marriage patterns, a 7.1% decrease due to an increase in contraceptive practice and a 2.9% increase due to shortening of the duration of postpartum infecundability. At sub population level TFR decreased in all regions except in Central province where fertility increased by 3.0% between 2003 and 2008/09. This increase can mostly be attributed to the shortening of the duration of postpartum infecundability which contributed 8.1% increase. A change in marriage pattern in Central province also contributed to the increase in TFR by 1.9%. The change in TFR in Central would even have been higher had the effect of postpartum infecundafrility and change in marriage pattern not been offset by the increase in contraceptive practice. Among all the regions, Western province had the highest decline in TFR of about 19% between 2003 and 2008/09. The province also had the highest increase in contraceptive practice as attested by 16.0% decrease in TFR due to this practice. TFR among women with no education, women with secondary education and higher and the richest women increased between 2003 and 2008/09. It is interesting to note that, among the most educated women, all the 3 key proximate determinants contributed to the increase in TFR between 2003 and 3008/09 with change in marriage pattern and decrease in the duration of postpartum infecundability each contributing about 4% in the 12% of estimated fertility increase.

Richest women also saw their TFR increase between the two reference years by 2.2%. This increase was mostly due to the shortening of the duration of postpartum infecundability which contributed 4.0% in this increase. There was no change in marriage pattern among the richest between 2003 and 2008/09. All in all, increase in the contraceptive practice had the highest impact in the decrease of

fertility between 2003 and 2008/09 at the aggregate and across all sub population levels except among the most educated women. Except in Eastern province, the duration of postpartum infecundability decreased at the aggregate and at sub population levels leading to an increase in fertility due to this factor between 2003 and 2008/09. The highest such increase was recorded among women with no education and women in Central province.

The study recommends that due to the important role contraception is playing in fertility reduction in the country, there is need to sustain the current trend in the increase in contraception prevalence. In particular, special attention should be paid to regions that have continued to register low contraception prevalence such as North Eastern province by addressing the known factors that are responsible for this. These factors are accessibility, affordability, and awareness. The case of Central province calls for enhancing other fertility control methods other than just relying on contraception. Despite the province having some of the highest increase in contraception prevalence, it still recorded an increase in fertility rate. Contraception alone is not enough to reduce fertility levels. Lastly, the study recommends that research be done on the role of induced abortion in Kenya in order to give more accurate estimates of the impact of fertility inhibiting variables and their implication on family planning programs.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This section gives a brief background to the study, the problem being addressed by the study and its objectives as well as the study rationale and its limitation. The background subsection looks at how Kenya has over the years responded to the issue of fertility, what impact the various fertility control initiatives have had and what the general impression on fertility transition in Kenya has been.

1.2 Background

Although Kenya became one of the first Sub Saharan Africa countries to develop a population policy in 1968, the policy remained dormant until the findings of 1977/78 World Fertility Survey (WFS) showed that the country had one of the highest fertility rates in the world (Ian et al 2009). The survey showed that the total fertility rate (TFR) was 8 children per woman and this served to focus policy and public attention on fertility issues. The population policy was also reinvigorated and a vigorous national family planning program was developed with both national and international support. With this kind of investment, the country soon started recording accelerated decline in fertility rate and the achievement led to the country being regarded as having entered fertility transition. Between 1977/78 and 1984, fertility rate declined by 4.9% from 8.1 to 7.7 births per-o^oman (Ian et al. 2009). The rate of decline of total fertility rate increased between 1984 and 1989 to 13% and then to 19.4% between 1989 and 1993. This trend was a sure indication that Kenya was truly on its way to completing fertility transition (Robinson 1992; Ian et al 2009; Blacker et al 2005). However, the subsequent fertility surveys showed that fertility decline in Kenya had stalled or even shown signs of reversal. Between 1993 and 1998, the rate of fertility decline was 13% and then there was a complete reversal between 1998 and 2003 where fertility rate increased by 4.3% from 4.7 to 4.9 births per women (Bongaarts 2005; Ian et al 2009). Due to this, the government of Kenya sought to 'provide a foundation for the refinement of the design and implementation of effective population programs in the country' (NCAPD 2005, pg 2). These efforts seem to have paid off going by the findings of the latest survey- Kenya Demographic and Health Survey (KDHS) 2008/09. The findings of the survey indicate that total fertility rate in the county declined from a high of 4.9 children per woman in

2003 to 4.6 children in 2008. This decline in fertility rate is significant in two ways; first, whereas 2003 survey showed that fertility decline was stalling, the results presented by the 2008 survey suggest a decline that heralds a resumption of the decline observed in the 1980s and 1990s. Secondly, the total fertility rate of 4.6 children is by far the lowest fertility rate ever recorded in Kenya (Kenya National Bureau of Statistics et al 2010). Looking at these latest findings, the question is whether Kenya is finally back on track in fertility transition and whether the country will complete this transition or it will stall midstream.

However, the dynamics of this current trend can be better understood by studying the role played by various factors known to influence fertility. This study sought to unravel the role of proximate determinants of fertility in the observed fertility change. Any other factor known to influence fertility acts through these proximate determinants hence their importance in trying to explain any observed trend and levels of fertility.

Similar studies to examine the role of proximate determinants in fertility rates decline have been carried out in other parts of the world. In 2002, a study on the effect of proximate determinants of fertility on reproductive changes in Ghana was undertaken. The study found out that these determinants had varying effects on fertility with postpartum infecundability having far more dominant inhibiting effect than the other determinants (Chuks 2002). A comparative study of Botswana, Zambia and Zimbabwe on the role of proximate determinant in fertility transition was undertaken in 2002 (Latemo et al 2002). A methodological approach to study the relative effect of proximate determinants on fertility was provided by Dr. N. P. Das and Mr. A. C. Padhiyar in 1991 by extending Bongaarts model. The two gave a model to study socio-cultural determinants of fertility by showing how proportion change in total fertility rate due to proportion change in the indices of proximate determinants can be obtained. These studies show that quantifying the relative contribution of change in proximate determinants to change in fertility is not only possible but also important in the study of population dynamics. Understanding these dynamics play a key role both in policy formulation and program design and implementation.

1.3 Problem Statement

Between 2003 and 2008/09, Kenya recorded a decline in Total Fertility Rate (TFR) from 4.9 births per woman in 2003 to 4.6 births in 2008/09. This rate of 4.6 children per woman is the

lowest rate ever recorded in Kenya. TFR in Kenya had shown signs of stagnating in the late 1990s and the new findings present evidence of a resumption of the fertility decline observed in the 1980s and the 1990s (Kenya National Bureau of Statistics et.al 2010).

Many studies have been carried out to find out the role of proximate determinants of fertility in feiii+fty"ebaag04fi- Kenya. Looking at these studies, there has not been found one determinant that has consistently had the most impact on observed levels of fertility. In 1984, Kalule-Sabiti applied Bongaarts model to 1977-78 KFS data and found that induced abortion, secondary fertility and/or unreported contraception use had the highest impact on the observed fertility rate. In 1990, at the pick of fertility decline in Kenya, it was found out that contraception and abortion accounted for about half of fertility decline (cited in Kizito et al 1991)). In 1991, the three key proximate determinants of fertility namely postpartum infecundability, contraception and marriage were found to have varying effect on fertility change (Kizito et al 1991). Postpartum infecundability was the most important fertility inhibiting variable in 1977/78 and 1989 while contraception had no significant role in 1977/78 but its importance increased over the years. Marriage was more important in 1977/78 than in 1989 as a variable in fertility inhibition. Close assessment of these studies does not explicitly give a clear picture of which proximate determinants of fertility can be expected to have had the most impact on the observed fertility change between 2003 and 2008/09. The most recent analyses of the role of proximate determinants of fertility have been conducted with an aim of assessing their contribution in observed stagnation in fertility decline. Stall in contraceptive use has been identified as one of the reasons why fertility decline also stalled (Ian et al 2009). With no clear answer as to what may have contributed to fertility decline in Kenya at a time when there was fear that the shift of focus from family planning services to HIV/AIDS was having its toll on support to population programs and amidst changing lifestyles, the need to understand what has happened is paramount. This study sought to examine the relative role of each of the four key proximate determinants of fertility (marriage, contraception, postpartum infecundability and sterility) on the decline in TFR in Kenya between 2003 and 2008/09 and suggest policy implication for a sustained fertility transition.

1.4 Research Questions

The study attempted to provide answers to the following research questions:

- What is the magnitude of fertility-inhibiting effects of marital, contraception, postpartum infecundability and sterility variables in Kenya in 2003 and 2008/09?
- What proportion of change in total fertility change in Kenya between 2003 and 2008/09 can be attributed to change in each of marital, contraception, postpartum infecundability and sterility variables as proximate determinants of fertility?

1.5 Research Objective

The broad objective of the study was to find out what impact proximate determinants of fertility have had on the change in total fertility rate in Kenya between 2003 and 2008/09. Specifically, the study sought:

- To estimate the indices of marriage, contraception, postpartum infecundability and sterility from 2003 and 2008/09 Kenya Demographic and Health Surveys.
- To examine the percentage change in total fertility rate due to change in the index of each of marital, contraception, postpartum infecundability and sterility variables between 2003 and 2008/09.

1.6 Rationale

Kenya is back on track in fertility transition going by the findings of 2008/09 KDHS. This study provides information necessary to explain this change in fertility trends. The government of Kenya and other players in matters of demographic change have all the reason to want to know what factors can be attribcitetUo resumption of fertility transition and how this momentum can be sustained. Most, if not all, of population programs undertaken have the aim of decelerating fertility and controlling the rate of population growth and whenever a particular trend is observed, it becomes imperative to try and understand what factors may have contributed to the trend.

The information that is generated by this study is crucial in pointing out which of the proximate determinants have had the greatest contribution to fertility decline. Empirical evidence has shown that much of the variations in fertility among populations can be accounted for by changes in proximate determinants (Chuks, 2002). The information may be used in reinvigorating fertility transition in Kenya which is a necessary catalyst in the achievement of the country's development vision.

1.7 Scope and Limitation of the Study

The study focused on the entire country and presents findings at aggregate national level as well as regional level. Results are also disaggregated by three other socioeconomic characteristics namely place of residence, level of education, and wealth. This is important in giving more detailed information useful in program design and development.

One main limitation of this study is that the impact of induced abortion will not be assessed due to lack of appropriate data. KDHS does not collect data on induced abortion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section looks at the proximate determinants of fertility from a historical and theoretical perspective and the current thinking in regard to these determinants. The literature is organized into three subsections; the theory of the proximate determinants of fertility, models of applying proximate determinants of fertility and empirical evidence where these models have been applied and the analytical framework employed in this study.

2.2 Fertility and the Proximate Determinants

Fertility is an important component of the study of demography. It is one of the three processes through which population changes, the other two being mortality and migration. Fertility is defined by demographers as the actual product or output of reproduction, as opposed to the ability to have children (Bongaarts and Potter 1983). The level of fertility in the world varies broadly by country and culture, social and economic conditions, as well as by individual characteristics such as age. Current total fertility ranges from a high of about six children per woman on average in Africa to a low of under two children per woman in Europe.

Fertility rates in Sub Saharan Africa (SSA) remain high relative to other regions of the world. Despite this, there has been a%teady decline in some countries like Malawi, Ghana and Namibia over the last few decades (Amy et al 2008). Fertility transition in SSA countries is either incomplete, declining very slowly relative to other regions or it has stalled altogether (cited in Amy et al, 2008)). Kenya, one of the countries in the region, has had its total fertility rate fall from 8.1 children in 1978 to 4.9 in 2003 (Ekisa et al 2005). The latest figures as per KDHS 2008/09 results indicate that the country has a total fertility rate of 4.6 children per woman, the lowest rate ever recorded in the country.

The study of fertility and its determinants has been a subject of much interest worldwide perhaps due to the role fertility plays in population growth. Fertility is a major determinant of population growth rate. A rapid rate of population growth poses major challenges to the country's overall development (NCAPD 2005). A population growth rate that is not matched with a corresponding

economic development will eventually lead to constrained resource allocation. It is therefore important to understand factors likely to be responsible for fertility changes and also the processes that account for this (Ekiza et al 2005).

Often, studies of the causes of fertility trends and differentials seek to measure directly the impact of socioeconomic factors on fertility (Bongaarts et al 1983). This approach however has its shortcomings especially because the results of these studies are far from conclusive and to improve understanding of the mechanism through which socioeconomic variables influence fertility, the study of proximate determinants of fertility has become popular among demographers (Bongaarts et al 1983). Proximate determinants of fertility are the biological and behavioral factors through which social, economic and environmental variables affect fertility. According to Bongaarts and Potter (1983) '…the distinguishing feature of a proximate determinant is its direct connection with fertility. If a proximate determinant, such as contraceptive use, changes, then fertility necessarily changes also (assuming the other proximate determinants remain constant), while this is not necessarily true for an indirect determinant of fertility such as income or education. Consequently, fertility differences among populations and trends in fertility over time can always be traced to variations in one or more of the proximate determinants.'

In 1956, E)avis and Blake identified the first list of 11 proximate determinants which they called 'intermediate fertility variables'. They divided these variables into three sets in line with the necessary steps of reproduction namely intercourse variables, conception variables and gestation variables. This list of variables however has not found wide acceptance in quantitative fertility studies due to difficulties in operationalizing them in a reproductive model (Bongaarts et al 1983). A different but closely overlapping list of proximate determinants was produced based on Henry's analysis of the reproductive process in 1957. This set of proximate determinants simplified greatly the task of constructing fertility models. The analysis of the reproductive process identified seven proximate determinants grouped into two categories i.e. factors that determine the duration of the reproductive period and the factors that determine the rate of childbearing and the duration of birth interval (Bongaarts et al 1983). The seven factors are: marriage; onset of permanent sterility; postpartum infecundability; natural fecundability; use and effectiveness of contraception; spontaneous intrauterine mortality and induced abortion. In order

to allow quantification of the influence of proximate determinants, Bongaarts in 1978 collapsed the set of 11 variables identified by Davies and Blake into 8 variables grouped into three broad categories. These categories are exposure factors; deliberate marital fertility control factors and natural marital fertility factors (Bongaarts 1978). The 8 factors were proportion of women married, contraception, induced abortion, lactational infecundability, frequency of intercourse, sterility, spontaneous intrauterine mortality and duration of the fertile period. Using these variables, Bongaarts constructed a set of equations for measuring the influence of the intermediate fertility variables on fertility in different settings. Out of these 8 factors, Bongaarts distinguished proportion married, contraception, postpartum infecundability and induced abortion as the key factors since the others do not largely depend on ones behavior. He later added a fifth variable, primary fertility, to the principal proximate determinants of fertility. This model, called aggregate fertility model that describes the relationship between fertility and the proximate determinants in the general case and which takes into account the effect of deliberate marital fertility control has had a wide use with varying degrees of accuracy. Bongaarts et al in 1983 demonstrated how the validity of the model can be tested by comparing observed total fertility rate (TFR) with the model estimates of TFR (Bongaarts et al 1983). This comparison of estimated TFR with observed TFR determines how well the principal proximate determinants predict the fertility level of a population. Bongaarts demonstrated that there was good agreement between observed and estimated TFR. In fact, his findings showed that about 96% of the variation in the observed fertility rate could be explained by proportion married, contraception, induced abortion and postpartum infecundability factors.

A few suggestions have been made to modify Bongaarts aggregate model by recognizing that more data is now available as compared to when Bongaarts first proposed the analytical approach to the analysis of fertility and fertility change. One such suggestion was given by John Stover in 1998. He suggested four major modifications to the model namely the use of sexual activity rather than marriage to indicate exposure to pregnancy; a revision of the sterility index to measure infecundity from all causes; a revised index of contraception that accounts for the fact that users of sterilization may become infecund before age 49; and a revised definition and estimate of total fecundity (Stover 1998). However, while recognizing that the suggested modifications may give more precise descriptors of the actual fertility-inhibiting factors, Stover pointed out the possibility of the new definitions being measured less accurately than the original

definitions. He points out that the indexes calculated with the new definitions may be less accurate than the indexes calculated using original equations as constructed by Bongaarts. Due to this and the fact that the additional data required to use the new definitions suggested by Stover may not always be available renders the modified model beyond the scope of this present study.

Apart from using the aggregate fertility model to predict total fertility rate, Bongaarts et al did in 1983 suggest other applications of the model. One of these applications is in the decomposition of a change in fertility (Bongaarts et al 1983). Bongaarts presented a set of equations that allow the quantification of the contribution made by each proximate determinant to a given change in fertility. This decomposition is more useful especially when one is looking at change in fertility between two time periods

2.3 Bongaarts Aggregate Fertility Model and its Application

Study of proximate determinants of fertility is important as it affords policy makers with the necessary knowledge to help them make informed decisions in formulating policies and programs that have high impact in reducing high fertility levels which would otherwise impede social and economic development (Lateino et al 2002).

In studies of fertility levels or differentials it is generally not necessary to devote the same effort to analyzing and measuring each of the proximate determinants because they are not of equal interest (novelguide.com, accessed on 28/07/2010). Two criteria can be applied to select the proximate determinants that-reserve most attention. The first is the sensitivity of the fertility rate to variation in a determinant; it is relatively uninteresting if large variation produces only a minor change in fertility. The second criterion is the extent of a determinant's variability among populations or over time. A relatively stable determinant can contribute little to explaining either trends or differentials.

Studies with reproductive models (such as the 1983 study by Bongaarts and Potter) show that fertility is least sensitive to variations in the risk of spontaneous intrauterine mortality, and most sensitive to changes in the proportions of women in union and the prevalence of contraception. Variability is lowest for onset of sterility and risk of spontaneous intrauterine mortality. The overall rating, based on both criteria, indicates that four proximate determinants-onset of

cohabitation, postpartum infecundability, contraception, and induced abortion-are the most important for the analysis of fertility levels and trends.

The Bongaarts model of proximate determinants of fertility estimates total fertility rate (TFR) as a residual value derived from the multiplicative effect of the indexes of the four most important determinants together with primary sterility and is given as:

TFR = TF x Cm x Ci x Cc x Ca x Cp

where TF is the level of fertility expected in the absence of any of the eight proximate determinants (proportion married, contraception, induced abortion, lactational infecundability, frequency of intercourse, sterility, spontaneous abortion, and duration of the fertile period) or an assumed biological maximum fertility that is approximately constant across populations.

Cm is the index of proportion married

Cc is the index of contraception

Ca is the index of induced abortion

Ci is the index of postpartum infecundability

Cp is the index of primary sterility

Postpartum infecundability-due to postpartum amenorrhea and postpartum abstinence lengthens the time until a next birth and thereby reduces the number of births that a woman eventually has. Postpartum amenorrhea is the temporary disappearance of menstruation that a woman experiences in the period immediately following childbirth. Studies have established a direct relationship between the length and intensity of breastfeeding and the duration of postpartum amenorrhea (Bongaarts et al 1983).

This model has been applied widely across the world to study changes in fertility. The model is especially useful since its focus is appropriate given that the proximate determinants are the only factors that directly influence, and therefore determine, fertility levels and change (cited in Kizito et al, 1991)). Consequently changes in one or more proximate determinants have repercussion on fertility, assuming other variables remain constant.

Many studies have shown the relative importance of proximate determinant of fertility. In Ghana, it has been shown that postpartum infecundability has a far more dominant inhibiting effect on fertility than other proximate fertility determinants (Chuks, 2002). The same study attributed this to the long periods of more than two years that Ghanaian women breastfeed their children. This study not only looked at the fertility-inhibiting effects of the proximate determinants but also quantified the effects of these proximate factors in terms of births averted and percentage reduction in fertility. In 1991 Das et al demonstrated how the Bongaarts model could be extended to study socio-cultural determinants of fertility. He illustrated this using fertility survey data collected in south Gujarat (Das et al, 1991). The study showed that indices of proximate determinants of fertility assume different levels and also influence fertility in different directions based on socio-economic characteristics of individuals.

In a study undertaken in Uganda in 2007 to explain fertility decline in urban areas, it was established that the change in the proportion married and postpartum infecundability due to breastfeeding had the greatest inhibiting effect on fertility in urban areas of Uganda. Contraception use contributes the least (Lubaale, 2007). The study recommended that promotion of contraceptive use, prolonged breastfeeding habits, female education hence employment and general reproductive health education are important if the fertility in Uganda is to decrease. In a comparative study done in Botswana, Zambia and Zimbabwe aimed at investigating the changes within and between countries in order to determine the extent of fertility change and the fertility-inhibiting factor(s) most -responsible for the change, the study found that the effect of modern contraception was the major factor behind the fertility decline (Latemo et al 2002). Delayed marriage was also found to be assuming significant role in fertility transition.

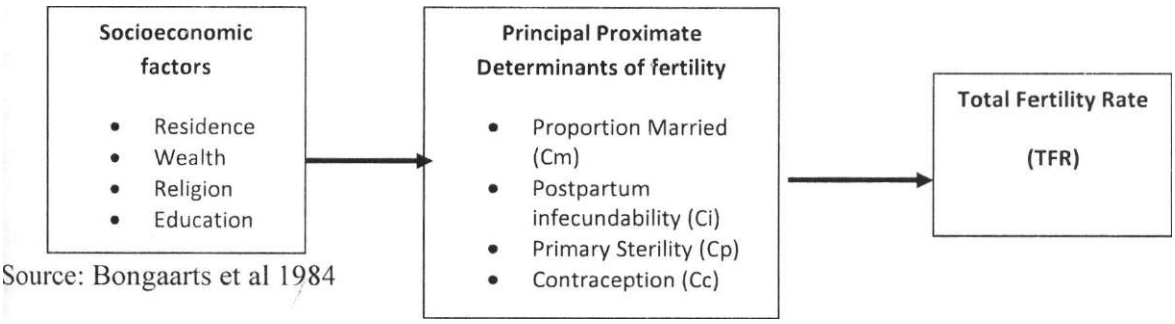
In Kenya, Bongaarts model has been used with varying success. In 1984, Ferry and Page used 1977-1978 Kenya Fertility Survey data and found out that lactational amenorrhea had the greatest effect on fertility followed by marriage patterns (Kizito et al 1991). In 1990, Harbinson and Robinson sought to establish components of fertility decline and found that contraception and induced abortion accounted for half of the fertility reduction in Kenya (Kizito et al 1991). A comparative study between Kenya and Lesotho was undertaken by Mhloyi in 1986 to determine the role of proximate determinants of fertility in the two countries. One of the most recent studies of the role of proximate determinants in Kenya was undertaken by Ekisa et al in 2005 using data

from the four Demographic and Health Surveys of 1989, 1993, 1998 and 2003. The study sought to quantify the impacts of late and non-marriage, contraceptive use, sterility and postpartum non-susceptibility on fertility in different regions of the country using the model of the proximate determinants of fertility developed by John Bongaarts (Ekisa et al, 2005). The study showed that postpartum infecundability had a significant impact in increasing the length of birth intervals in Kenya between 1998 and 2003.

2.4 Analytical Framework.

Bongaarts extended model of 1983 was used to investigate the impact of proximate determinants on fertility change (Latemo 2002; Chuks 2002). The Bongaarts model summarizes the effect of each of the fertility determinants in an index, which ranges between 0-1, with 0 having the greatest inhibiting effect on fertility and 1 having the least inhibiting effect. The index measuring the effect of marriage patterns on fertility is denoted by C_m. This index takes the value of 1 when all women of reproductive age are in union and 0 when none are union. The index of contraception is depicted as C_c and equals 1 if no contraception is used and 0 if all fecund women use modern methods that are 100% effective. The effect of postpartum amenorrhoea and abstinence on fertility is measured by Cj, the index of postpartum infecundability in such a way that when there is no lactation or postpartum abstinence, Q equals 1 and when infecundability is permanent, Q equals 0. The index of induced abortion is denoted by C_a and equals 1 in the absence of induced abortion and 0 if all pregnancies are aborted. The index of primary sterility is represented as C_p and assumes the value of 1 in the absence of primary sterility and 0 if all women are sterile.

The principal proximate determinants of fertility whose effect on fertility was measured using their indices will be the independent variables while fertility was the dependent variable.



Source: Bongaarts et al 1984

CHAPTER THREE

STUDY METHODOLOGY

3.1 Introduction

This section describes the data and the data source that was used in the study. The section also looks at the procedures used to analyze relative contribution of each of the four principal proximate determinants of fertility to fertility change between the two reference periods i.e. 2003 and 2008/09. The analysis employed Bongaarts framework of 1978 specifically to calculate the indices of each of the four proximate determinants of fertility for both 2003 and 2008/09. The study also employed the procedure suggested by Bongaarts in 1983 to decompose change in fertility for the reference time period. This section also briefly describes how the results of the analysis will be presented and interpreted.

3.2 Data Source and Sample size

Data for this study was secondary data obtained from the 2003 and 2008-09 Kenya Demographic and Health Surveys (KDHS). These were nationwide surveys based on a representative sample of households collected in all the eight provinces of Kenya. Both surveys were conducted in a similar manner including the set of questions asked, the target population and coverage and these make the two data sets comparable in many ways. The surveys collected information on demographic and health issu.es from a sample of women of the reproductive age of 15-49 and from a sample of men age 15-54 years in a one-in-two sub-sample of households. The 2003 KDHS sample had 8195 women while the 2008/09 sample had 8444 women all of reproductive age (between 15-49 years). About 60% of these women were currently married in both surveys, 30% had never been married while 10% had formerly been married. These proportions remained fairly unchanged between the two surveys. Among currently married women in both surveys, those aged between 25-29 years formed the highest proportion (21.5% and 22.1% in 2003 and 2008/09 respectively) while women aged between 15-19 years formed the smallest proportion (6.8% and 4.3% respectively).

In calculating the indices, only currently married women in both surveys were included in the analysis with the exception of index of sterility where all ever married women were included.

3.3 Computation Procedures

There are 3 levels of computation that are required in the decomposition of the proportional change in TFR into the components Pm, Pc, Pi, Pp and Pr (Bongaarts et al 1983). First, measures of the proximate determinants have to be determined i.e. proportion of women married, proportion currently using contraceptive, average duration of postpartum infecundability, proportion of women aged 45-49 years who are infecund and average contraceptive use effectiveness. Second, using these measures of proximate determinants, the indexes Cm, Cc, Cp and Ci are estimated and thirdly, the P values are calculated from these indexes.

3.3.1 Determination of Measures of Proximate Determinants of Fertility

Proportion married: This variable is intended to measure the proportion of women of reproductive age that engages in sexual intercourse regularly. All women between 15 and 49 years who reported to be currently married during the surveys are included in this proportion.

Proportion currently using contraceptive: The proportion was calculated using u which is the average proportion of married women of reproductive age currently using contraception (average of age-specific use rates); average use effectiveness, e, was estimated as the weighted average of the method specific use-effectiveness levels e(m), with the weights equal to the proportion of women using a given method, u(m) (Bongaarts et al 1983) i.e.

$$e = Xe(m)u(m)/u$$

Method-specific use-effectiveness values that were used in this study are: pill, 0.90; intra uterine device, 0.95; sterilization, 1.00; other 'modern' methods (injectables, norplant, condom and diaphragm/foam/jelly), 0.70 and traditional methods, 0.3 (adopted from Otieno 2008).

Average duration of postpartum infecundability in months: This duration was approximated using the formula described by Kizito et al in 1990:

Prevalence (average number of children whose mothers were either amenorrhoeic or abstaining at the time of the survey) divided by the incidence (average number of births per month over the last 36 months); i.e.

$$i = P/I$$

Where P is the prevalence

I is the incidence

P was approximated by the proportion of mothers still breastfeeding at the time of the survey and the incidence was obtained using the formula: 1= 1/36* (children born between 0 to 35 months before the survey + ^(children born exactly 36 months prior to the survey)

Proportion of women aged 45-49 who have had no live births

This proportion was used in the estimation of the index of primary sterility. It was measured using symbol s and the denominator was all ever married women aged 45 to 49 years in each of the two surveys.

3.3.2 Direct Estimation of the Fertility Effects of the Principal Proximate Determinants

A major objective of the application of Bongaarts aggregate fertility model is the estimation of the fertility-inhibiting effects of the proximate determinants as measured by the indexes Cm, Cc, Ci and Cp (Bongaarts et al 1983). These indexes are estimated directly from the measures of the proximate determinants.

3.3.2.1 Estimation of index of marriage (C_m)

The index of marriage is determined by the age- specific proportions currently married among females. Due to age effect, C_m is estimated as the weighted average of the age-specific proportions of females currently married, with the weights provide by the age-specific marital fertility rates:

$C_m =$ £m(a) g(a)/£g(a)

Where

m(a) = age-specific proportions currently married among females

g(a) = age-specific marital fertility rates.

For age group 15-19, a multiplication factor was used in calculation of g(15-19) so as to take into account the fact that most of the people married in this group are mostly 18 or 19 years old and hence not a true representative of the entire age group (Bongaarts et al 1983). Thus, g(15-19) = 0.75 * g(20-24).

3.3.2.2 Estimation of index of contraception C_c

The index of contraception varies inversely with prevalence and use effectiveness of the contraception practiced by couples. The equation used to estimate C_c is:

$C_c = 1 - 1.08*u*e$

where

u= proportion currently using contraception among married women of reproductive age

e = average use-effectiveness of contraception.

3.3.2.3 Estimation of the index of postpartum infecundability (C,)

Postpartum infecundability does not influence the duration of the reproductive years and its effect on fertility operates entirely through modification of the birth interval. The ratio of natural fertility in the presence and absence of postpartum infecundability equals the ratio of the average birth interval without "afttk with postpartum infecundability. The index of postpartum infecundability is therefore calculated as:

$C, = 20/(18.5+i)$

where

i = mean number of months of postpartum infecundability (estimated as the mean number of months of postpartum amenorrhoea or abstinence, whichever is longer) for women in marriage.

3.3.2.4 Estimation of index of primary sterility ($C_{„}$)

The index of sterility was estimated as :-

$C_p = (7.63-.1\ ls)/7.3,$

where s = proportion of ever married women between ages 45 and 49 who have never had a live birth, the assumption being that all women should have had a child by age 45 in Kenya.

3.3.3. Decomposition of Change in Fertility between 2003 and 2008/09

Bongaarts in 1983 presented a set of equations that can be used to quantity the contribution made by each proximate determinant to a given change in fertility. The decomposition is based on equations which link TFR to the fertility-inhibiting effects of the proximate variables (in this study marriage, contraception, postpartum infecundability and primary sterility) measured by the indexes Cm, Cc, Ci and Cp to total fecundity rate (TF):

TFR=Cm*Cc*Ci*Cp*TF

In fitting the Bongaarts model above, total fecundity rate (TF) of 16.5 births per woman was used as opposed to 15.3 which Bongaarts estimated to be the average TF across different populations. Some studies in Kenya have shown that a TF of 15.3 always gives an underestimation of TFR (Kizito et al 1991) and some of these studies have used 16.5 as the most appropriate estimate of TF (Blacker et al 2005).

Given the two reference years 2003 and 2008/09 where 2003 represents the first and 2008/09 the last of the time period for which decomposition is desired, the ratio of fertility change from $TFRo3$ to TFR_o8 between the two time periods with corresponding changes in the indexes Cm, Cc, Ci and Cp can be expressed by:

$TFRo_8/TFRo3 = Cmo_8/Cmo3 * Ccos/Cc_03 * Ci_0g/Cio3 * Cp_0s/Cp_03$ ..... (i)

This can further be defined as;

$pf = TFR_{08}/TFR_03 - 1$

=proportion change in TFR between 2003 and 2008,

Pm =Cmo8/Cmo3-1

=proportion change in TFR due to change in the index of marriage

Pc = Cco_8/Cco3 - 1

=proportion change in TFR due to change in the index of contraception

Pi = Cio_8/Cio3 — 1

=proportion change in TFR due to change in the index of postpartum infecundability

Pp =Cp_{08}/Cp03-1

=proportion change in TFR due to change in the index of sterility

Pr =TF_{08}/TF03-1

=proportion change in TFR due to change in the remaining proximate variables.

Decomposition equation (i) can therefore be rearranged as

Pf=Pm+ Pc+ Pi+ Pp+ Pr+I

Where **P** values represent proportion change in TFR due to change in marriage pattern (Pm), contraception (Pc), postpartum[!]4nfecundability (Pi), sterility (Pp), other proximate determinants (Pr) and I is an interaction term (Kizito et al, 1991).

3.4 Presentation and interpretation of Results

The findings of the study are presented in tables, graphs and in narrative form. A table giving summary demographic characteristics of the study subjects is presented for both surveys. For each of the four proximate determinants, a summary table for both surveys is presented by various socioeconomic characteristics of the study subjects. Summary tables giving estimates of the indexes of the proximate determinants, number of births averted due to each of the factors and decomposition of the change in TFR between 2003 and 2008/09 are also presented.

The interpretation of the inhibiting effect of the proximate determinants of fertility was guided by the estimated indexes of each of the proximate determinants. The value of each index varies from 0 to 1, with a value of one implying that the specific proximate determinant had no any inhibiting effect on fertility while a value of 0 indicates that the specific proximate determinant had 100% inhibiting effect on fertility. As an example, if the index of contraception is 1, this would imply that none of the married women of reproductive age was using any form of contraception while a value of 0 would imply that all married women of reproductive age were using contraception that was 100% effective e.g. sterilization. If all women of reproductive age were married, the index of marriage would be 1 while the index would be 0 if none of the reproductive age women was married.

In comparing two or more proximate determinants, the determinant with the lowest index has the most inhibiting effect as compared to the others. Thus, comparing marriage, contraception and postpartum infecundability, marriage would have the greatest inhibiting effect if the values of the indexes were 55%, 60% and 65% respectively. The inhibiting effect of a proximate determinant on fertility is the reciprocal of the value of its index i.e. (1- Index). For the above example, the effect of the three variables is 45%, 40% and 35% respectively. Though a proximate determinant of fertility may have the highest inhibiting effect on fertility compared with any other variable, its contribution in fertility change between any two time periods may be the least. If say in first year the indexes were 50%, 60% and 70% for marriage, contraception and sterility respectively and in year 2-,--»£9%, 50% and 60% respectively, then, though marriage had the highest inhibiting effect for both years, its contribution in fertility change that may have been observed was the least. It may also happen that the inhibiting effect of a variable may be reversed between any two periods of time.

3.5 Data Required for Analysis

The following data elements were used in the analysis:

Age of the women; marital status of women; residence; region; economic status; education level, number of children ever born, contraception method in use; postpartum amenorrheic status and number of births in the last 36 months prior to the survey.

CHAPTER FOUR

FERTILITY INHIBITING EFFECT OF PROXIMATE DETERMINATS

4.1 Introduction

This chapter summarizes the key findings of the study. Possible explanations of the findings are also provided.

4.2 Background Characteristics of Study Subjects

The findings indicate that among currently married women, contraceptive use increased from 39% to 46% between 2003 and 2008/09. Proportion of currently married women with primary education remained at 58% between the two surveys while that of women with no education decreased from 16% to 12%. Women with secondary education and above increased from 26% to 30% between the two samples. Distribution of women in terms of place of residence remained fairly the same with rural women contributing about 77% of all currently married women in both surveys.

North Eastern province had the smallest proportion of women in both surveys at about 3% while Rift Valley had the highest proportion at 24% in 2003 and 26% in 2008/09. The proportions did not change much in the other provinces between the two surveys. Women in the lowest wealth category had the highest representation in both surveys at 39% and 36% respectively. Except for women in the rich category *whose proportion increased from about 20% in 2003 to 26% in 2008/09, the proportions in the other two categories (middle and richest) remained fairly the same between the two surveys.

In general, distribution of women across the various background characteristics in both surveys remained mostly the same and this makes the two surveys comparable in many aspects and more so in the analysis of fertility change and contribution of the various proximate determinants.

Table 1: Demographic and socioeconomic characteristics of currently married women of reproductive age in 2003 and 2008/09 KDHS - based on weighted cases.

Characteristic	Proportion with characteristic (%)	
	2003 KDHS (N=4919)	2008/09 KDHS (N=4928)
Age Distribution		
15-19	6.8	4.3
20-24	19.6	19.4
25-29	21.5	22.1
30-34	17.7	19.5
35-39	14.0	14.1
40-44	12.5	11.1
45-49	7.9	9.5
Contraception Use		
Not using	60.7	54.5
Currently using	39.3	45.5
Education Levels		
No Education	15.5	11.5
Primary Education	58.6	58.4
Secondary +	25.9	30.2
Place of Residence		
Rural	77.8	76.6
Urban	22.2	23.4
Region		
Nairobi	8.5	7.4
Central	13.3	10.8
Coast	8.5	8.7
Eastern	15.9	17.1
Nyanza	15.8	16.9
Rift Valley	24.1	26.0
Western	11.4	10.5
North Eastern	2.5	2.6
Wealth Index (currently married women)		
Lowest	38.7	35.6
Middle	18.6	19.3
Rich	19.6	20.5
Richest	23.1	24.6

Source: Analysis of 2003 and 2008/09 KDHS

4.3 Indices of Marriage, Contraception, Postpartum Infecundability and Sterility

This section presents the estimated indices of the four principal determinants of fertility both at aggregate and sub population levels.

4.3.1 Index of Marriage

The fertility inhibiting effect of marriage was determined by calculating the index of marriage. The index of marriage is itself a function of proportion of women married within a given age group. The index of marriage determines the proportion by which marriage reduces actual fertility levels below total marital fertility rate (TM). Total marital fertility rate is the fertility that would be observed if the fertility-inhibiting effect of delayed marriage and marital disruption is removed without other changes in fertility behavior. At the aggregate level, marriage patterns reduced actual fertility below marital fertility by 39% (C_m= 0.61) in 2003 and by 41% (C_m = 0.59) in 2008/09. This means that although proportion of married women in 2003 was almost the same as in 2008/09, marriage was delayed more in 2008/09 than in 2003. While the inhibiting effect of marriage remained the same among urban women between 2003 and 2008/09 at 48%, among rural women, the inhibiting effect increased from 35% in 2003 to 38% in 2008/09. Despite this change, its effect was still far much higher in urban areas than in rural areas during both periods, indicating that women in rural areas marry younger than women in urban areas. North Eastern province recoded the lowest fertility inhibiting effect of marriage at 20% in 2003 and 27% in 2008/09 whiiej^lairobi had the highest fertility inhibiting effect of marriage at 51% in 2003 and 52% in 2008/09. Rift Valley province recorded the highest change in the effect of marriage on fertility (9.4% decline in C_m) between 2003 and 2008/09 followed by Western (9.0% decline in C_m) and then North Eastern (8.8% decline in C_m). Central, Coast and Eastern saw their index of marriage increase between 2003 and 2008/09. The table below illustrates this.

Table 2: Estimated index of marriage for women of reproductive age in Kenya by socioeconomic characteristics - 2003 and 2008/09 KDHS

Characteristic	2003	2008/09	Percentage change during period 2003-2008/09
Residence			
Rural	0.65	0.62	-4.6
Urban	0.52	0.52	0.0
Region			
Nairobi	0.49	0.48	-2.0
Central	0.52	0.53	1.9
Coast	0.63	0.66	4.8
Eastern	0.59	0.61	3.4
Nyanza	0.69	0.64	-7.2
Rift Valley	0.64	0.58	-9.4
Western	0.67	0.61	-9.0
North Eastern	0.80	0.73	-8.8
Education			
No Education	0.74	0.74	0.0
Primary	0.65	0.63	-3.1
Secondary +	0.49	0.51	4.1
Wealth Index			
Lowest	0.71	0.66	-7.0
Middle	0.63	0.61	-3.2
Rich	0.54	0.56	3.7
Richest	0.52	0.52	0.0
Total	0.61	0.59	-3.3

Source: Analysis of 2003 an<K2008/09 KDHS data

As can be seen from the above table, there is a clear pattern on the effect of marriage across women of different education levels and wealth categories. Marriage patterns have highest fertility inhibiting effect among most educated women and the lowest effect among women with no education. The same pattern is observed across the different wealth categories with the richest category showing the highest effect of marriage on fertility and the poorest showing the lowest effect. This pattern is observed in both 2003 and 2008/09 KDH data. Educated women tend to delay marriage as they pursue their career thus reducing their duration of exposure to the risk of pregnancy which subsequently leads to low fertility. Wealthy women in most cases tend to be independent and single and even when they settle down to marry, it is often at an advanced age thus ending with only a short duration of exposure to the risk of pregnancy.

4.3.2 Index of Contraception

Fertility inhibiting effect of contraception is quantified through calculation of the index of contraception. The reciprocal of this index indicates the magnitude by which total natural marital fertility rate (TN) is reduced relative to total marital fertility rate (TM) by contraceptive practice. As shown in table 3, in 2003, total natural marital fertility rate was reduced by 30% (C_c = 0.70) while in 2008/09, the fertility inhibiting effect of contraception increased to 35% (C_c = 0.65). The fertility reducing effect of contraception increased between 2003 and 2008/09 across all sub populations except among women of secondary education. This increase was however of varying magnitude with women in Western, Nyanza, Coast and those in middle class recording a reduction in the index of contraception of over 10%.

As would be expected, contraception had a higher fertility inhibiting effect among urban women than rural women. This can be attributed possibly to better access to contraceptives by urban women and more awareness. Education and wealth were also found to form a clear pattern in contraceptive practice with higher education being associated with higher fertility inhibiting effect and vice versa. Wealth also had a similar effect with the richest category recording lowest index of contraception and the poorest recording the highest index of contraception. The only exception to this pattern was in 2008/09 when rich women recorded the highest fertility inhibiting effect due to contraception followed by those in the richest category.

Regionally, Central provinc&-ta<j the lowest index of contraception in the two periods (0.46 and 0.43 respectively) followed by Nairobi (0.58 and 0.56 respectively). Contraception had no any fertility inhibiting effect in North Eastern province in 2003 (Cc=1.00) but this improved slightly in 2008/09 when the index reduced to 0.98. The province however lagged behind all the other provinces in the use of contraception in both years. Coast and Nyanza also recorded relatively high value of the index of contraception although the two had some of the highest decline in this index between 2003 and 2008/09 among all sub populations.

Looking at the contraceptive patterns across subgroups, it can be supposed that issues of availability, access, affordability and awareness play a key role in determining contraception prevalence. The type of contraception used may also vary across subpopulations hence varying contraceptive effectiveness and the index of contraception.

Table 3: Estimated index of contraception among married women of reproductive age in Kenya by socioeconomic characteristics - 2003 and 2008/09 KDHS

Characteristic	2003	2008/09	Percentage change during period 2003-2008/09
Residence			
Rural	0.72	0.67	-6.9
Urban	0.63	0.59	-6.3
Region			
Nairobi	0.58	0.56	-3.4
Central	0.46	0.43	-6.5
Coast	0.83	0.74	-10.8
Eastern	0.63	0.61	-3.2
Nyanza	0.80	0.71	-1 1.3
Rift Valley	0.76	0.69	-9.2
Western	0.75	0.63	-16.0
North Eastern	1.00	0.98	-2.0
Education			
No Education	0.91	0.90	-1.1
Primary	0.73	0.66	-9.6
Secondary +	0.51	0.53	3.9
Wealth Index			
Lowest	0.83	0.78	-6.0
Middle	0.69	0.61	-11.6
Rich	0.61	0.55	-9.8
Richest	0.59	0.58	-1.7
Total	0.70	0.65	-7.1

Source: Analysis of 2003 and 2O0M)9 KDHS Data

4.3.3 Index of Postpartum Infecundability.

The index of postpartum infecundability is determined by the duration that a woman remains insusceptible to pregnancy after the birth of a child. The longer the duration the smaller is the index and the bigger is its effect in inhibiting fertility. Postpartum sexual abstinence and duration and frequency of lactation in turn determine the duration of postpartum infecundability. When calculated, the index of postpartum infecundity shows the extent to which this factor reduces total fecundity rate (TF). Table 4 below summarizes this index both at the aggregate and sub population levels. At the aggregate level, postpartum infecundability reduced total fecundity rate by 32% (C| = 0.68) in 2003. The fertility inhibiting effect of this factor however reduced in

2008/09 when it reduced total fecundity rate by 30% (Cj = 0.70). One interesting observation is that both at the aggregate and subpopulation levels, the effect of postpartum infecundability in inhibiting fertility reduced between 2003 and 2008/09 except in Eastern province where it increased slightly and in Coast province where it remained constant. The implication of this is that had postpartum infecundability been the only fertility control option available among Kenyan married women, then TFR would have increased substantially across all sub populations except in the two provinces and at the aggregate levels between 2003 and 2008/09.

Table 4: Estimated index of postpartum infecundability among married women of reproductive age in Kenya by socioeconomic characteristics - 2003 and 2008/09 KDHS

Characteristic	2003	2008/09	**Percentage change during period 2003-2008/09**
Residence			
Rural	0.66	0.69	4.5
Urban	0.74	0.77	4.1
Region			
Nairobi	0.76	0.80	5.3
Central	0.74	0.80	8.1
Coast	0.68	0.68	0
Eastern	0.69	0.68	-1.4
Nyanza	0.66	0.71	7.6
Rift Valley	0J&	0.68	4.6
Western	0.70	0.74	5.7
North Eastern	0.63	0.67	6.3
Education			
No Education	0.59	0.64	8.5
Primary	0.70	0.72	2.9
Secondary +	0.74	0.77	4.1
Wealth Index			
Lowest	0.63	0.67	6.3
Middle	0.70	0.73	4.3
Rich	0.72	0.73	1.4
Richest	0.75	0.78	4.0
Total	0.68	0.70	2.9

Source: Analysis of 2003 and 2008/09 KDHS Data

Another interesting observation is the clear pattern formed in the fertility inhibiting effect of postpartum infecundability among women in different sub groups. The factor has a higher inhibiting effect in rural areas than in urban areas. The role of education is also evident as women with no education registered a higher fertility inhibiting effect due to postpartum infecundability as compared to those with primary and higher education. The factor also had the highest effect on women in poorest wealth quartile and the least effect on the richest women. Across the regions, the factor was more effective in North Eastern province and least effective in Nairobi and Central provinces. This pattern can be well understood when we relate postpartum infecundability with the duration and frequency of lactation. Rural women are expected to lactate for a longer period compared to their urban counterparts hence the duration of postpartum infecundability will be longer. Similarly, more educated women are bound to be career women and due to this, they may either breastfeed for a shorter period as compared to their counterparts who are not educated or even if they breastfeed for a longer duration, the frequency will most likely be only during morning and evening.

4.3.4 Sterility

The index of sterility was calculated using all ever married women (both formerly married and currently married). The aim was to increase the proportion of women who have ever been exposed to the risk of pregnancy and who had had no live births, were not currently using any contraception and were not currently pregnant. The findings indicated that primary sterility had no any fertility inhibiting efifect during the two reference years at aggregate and even at sub population levels. Of all ever married women aged between 45 and 49 years in 2003, only a scant 0.02% reported as having not given any live birth in their lifetime. In 2008/09, the proportion of these women was negligible. This finding reveals fertility in Kenya both in 2003 and in 2008/09 would have reached the optimal total fecundity rate of 16.5 children per woman had all women been married and had not taken deliberate birth control measures such as contraception. The findings also indicate that sterility in Kenya is in line with the international levels.

4.4 Fitted Bongaarts Fertility Model

Bongaarts fertility model uses the indices of proximate determinants of fertility to estimate total fertility rate (TFR). Using this model, TFR for both 2003 and 2008/09 was estimated using the formula: TFR = C_m*C_c*Ci*C_p*TF where TF was taken to be 16.5. As table 5 below illustrates, TFR was 4.8 children per woman in 2003 and it reduced to 4.4 children per woman in 2008/09 at the aggregate level. As would be expected, TFR varied considerably across all sub populations with place of residence, province, education and wealth having a great impact. Rural areas had higher TFR than urban areas as was the case for women with no education as compared to women with primary and higher education. Poorest women had the highest TFR while richest women had the lowest. Among the regions, Central province had the lowest TFR followed by Nairobi while North Eastern province had the highest. Only women in Central, Nairobi, Eastern, urban areas, those with secondary education and higher, rich and the richest women had TFR below national TFR. All the other sub populations registered TFR above the national average during the two reference years.

Though Central province remained the region with the lowest TFR among all the regions, it recorded a slight increase between 2003 and 2008/09 from 2.9 to 3.0 children per woman. TFR also increased among women with secondary education and above and the richest women while all the other subpopulations recorded a decline in TFR between the two years. Western province had the highest decline of 1.1 children per woman. TFR in Eastern remained unchanged.

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Table 5: Total Fertility Rate by socioeconomic characteristics as estimated by fitting Bongaarts' proximate determinant model for Kenya - 2003 and 2008/09

		Index of Marriage		Index of Contraception		Index of Infecundability		Index of Sterility		Fitted TFR	
		2003	2008/09	2003!	2008/09	2003	2008/09	2003	2008/09	2003	2008/09
Residence	**Rural**	0.65	0.62	0.7V	0.67	0.66	0.69	1.00	1.00	5.1	4.7
	Urban	0.52	0.52	0.63	0.59	0.74	0.77	1.00	1.00	4.0	3.9
Region	**Nairobi**	0.49	0.48	0.58	0.56	0.76	0.80	1.00	1.00	3.6	3.5
	Central	0.52	0.53	0.46	0.43	0.74	0.80	1.00	1.00	2.9	3.0
	Coast	0.63	0.66	0.83	0.74	0.68	0.68	1.00	1.00	5.9	5.5
	Eastern	0.59	0.61	0.63	0.61	0.69	0.68	1.00	1.00	4.2	4.2
	Nyanza	0.69	0.64	0.80	0.71	0.66	0.71	1.00	1.00	6.0	5.3
	Rift Valley	0.64	0.58	0.76	0.69	0.65	0.68	1.00	1.00	5.2	4.5
	Western	0.67	0.61	0.75	0.63	0.70	0.74	1.00	1.00	5.8	4.7
	North Eastern	0.80	0.73	1.00	0.98	0.63	0.67	1.00	1.00	8.3	7.9
Education	**No Education**	0.74	0.74	0.91	0.90	0.59	0.64	1.00	1.00	6.6	7.0
	Primary	0.65	0.63	0.73	0.66	0.70	0.72	1.00	1.00	5.5	4.9
	Secondary +	0.49	0.51	0.51	0.53	0.74	0.77	1.00	1.00	3.1	3.4
Wealth Index	**Lowest**	0.71	0.66	0.83	0.78	0.63	0.67	1.00	1.00	6.1	5.7
	Middle	0.63	0.61	0.69	0.61	0.70	0.73	1.00	1.00	5.0	4.5
	Rich	0.54	0.56	0.61	0.55	0.72	0.73	1.00	1.00	3.9	3.7
	Richest	0.52	0.52	0.59	0.58	0.75	0.78	1.00	1.00	3.8	3.9
	Overall	0.61	0.59	0.70	0.65	0.68	0.70	1.00	1.00	4.8	4.4

Source: Analysis of 2003 and 2008/09 KDHS Data

4.5 Reduction in Total Fecundity Rate (TF) Due to Proximate Determinant of Fertility

The study also sought to find out the number of births per woman that were averted due to each of the proximate determinants of fertility in each of the two years. The number of births averted is the difference between total fertility rate (TFR) and total fecundity rate (TF). The explanation is that in the absence of the inhibiting effect of proximate variables, fertility would reach its maximum value, TF, but in the presence of the inhibiting factors, fertility is reduced to TFR. The difference between TFR and TF is therefore attributed to the proximate determinants of fertility and this section apportions the number of averted births to each of the principal proximate determinants.

The total fertility-inhibiting effect being accounted for by each of the proximate determinants was prorated by the logarithm of each index to the sum of the logarithm of all indices (Wang et al, 1987), e.g. for effect of marriage: [TF-TFR (estimated)] x log C_m/(log C_m + log C_c + log C,)- As can be seen in table 6 below, out of the 11.8 births that were averted in 2003, 4.7 of them or 40% were due to the effect of marriage variable, 3.4 (29%) were due to the effect of contraception and 3.7 (31%) were due to the effect of postpartum infecundability. In 2008/09, out of the total 12.1 births averted per women, marriage variable accounted for 4.8 (40%) of them, contraception accounted for 4.0 (33%) of them and postpartum infecundability accounted for 3.3 (27%) of them. It can be seen that marriage variable still remains an important fertility inhibiting factor while contraceptive practice is in the right direction. The role of postpartum infecundability however is in the reverse trend going by the two years in reference. This reverse trend can be attributed to changing behavior among women, with more ancfmore women becoming career women and opting to do replacement feeding instead of breastfeeding. Emergency of such diseases as AIDS which encourage infected women to avoid breastfeeding if they could may also have played a role in reducing the inhibiting effect of postpartum infecundability.

Among the subpopulations, the most notable observation is the role of postpartum infecundability in inhibiting fertility among women in North Eastern province and those with no education. In 2003, postpartum infecundability accounted for 67% of all averted births per woman in North Eastern province and 57% of all such births among women with no education. Although the effect of this variable reduced in 2008/09 like in almost all other subpopulations, it still accounted for more than 50% of births averted in the two subpopulations, making it the most important birth control method in these sub groups. Conversely, the variable had the least effect in averting births

in Central province and among women in urban areas, those with secondary and higher education and the richest. In all these subgroups, postpartum infecundability accounted for less than 20% of all averted births.

Table 6: Number and percentage of births per woman averted for each proximate fertility determinant: Kenya: 2003 —2008/09

Characteristic	Fertility-inhibiting effect											
	2003						2008/09					
	Marriage C_m		Contraception C_c		Postpartum Infecundability C,		Marriage C_m		Contraception C_c		Postpartum Infecundability Q	
	Births Averted	%	Births Averted	%	Births Averted	%	Births Averted	%	Births Averted	%	Births Averted	%
Residence							**Residence**					
Rural	4.2	36.7	3.2	28.0	4.0	35.4	4.5	38.3	3.8	32.0	3.5	29.7
Urban	5.8	46.1	4.1	32.6	2.7	21.2	5.7	45.3	4.6	36.6	2.3	18.1
Region							**Region**					
Nairobi	6.0	46.5	4.6	35.5	2.3	17.9	6.2	47.8	4.9	37.7	1.9	14.5
Centra!	5.1	37.8	6.1	44.8	2.4	17.4	5.0	37.3	6.7	49.6	1.8	13.1
Coast	4.8	44.7	1.9	18.0	4.0	37.3	4.2	37.7	3.0	27.3	3.9	35.0
Eastern	4.8	38.8	4.2	34.0	3.3	27.3	4.4	36.0	4.4	36.0	3.5	28.1
Nyanza	3.9	36.7	2.3	22.1	4.3	41.2	4.4	39.5	3.4	30.3	3.4	30.3
Rift Valley	4.4	38.8	2.7	23.8	4.2	37.4	5.0	41.9	3.4	28.5	3.6	29.6
Western	4.1	38.3	2.9	27.5	3.7	34.1	4.6	39.3	4.3	36.7	2.8	23.9
North Eastern	2.7	32.6	0.0	0.0	5.5	67.4	3.7	42.8	0.2	2.7	4.7	54.5
Education							**Education**					
No Education	3.2	32.6	1.0	10.2	5.7	57.2	3.3	35.3	1.2	12.4	5.0	52.3
Primary	4.3	39.1	3.1	28.6	3.6	32.4	4.4	38.3	4.0	34.5	3.1	27.2
Secondary +	5.7	42.3	5.4	39.9	2.4	17.8	5.6	42.9	5.3	40.4	2.2	16.7
Wealth							**Wealth**					
Lowest	3.6	34.6	2.0	18.8	4.8	46.6	4.2	39.0	2.5	23.3	4.1	37.6
Middle	4.5	38.8	3.6	31.2	3.4	30.0	4.6	37.9	4.6	37.9	2.9	24.1
Rich	5.4	42.8	4.3	34.4	2.9	22.8	5.0	38.9	5.1	40.1	2.7	21.1
Richest	5.7	44.5	4.6	35.9	2.5	19.6	5.7	45.2	4.7	37.6	2.2	17.2
Total	**4.7**	**40.0**	**3.4**	**28.8**	**3.7**	**31.2**	**4.8**	**40.1**	**4.0**	**32.8**	**3.3**	**27.1**

Source: Analysis of 2003 and 2008/09 KDHS Data

4.5.1 Illustration of the Effect of Place of Residence, Education and Wealth on Number of Births Averted per Woman — 2008/09

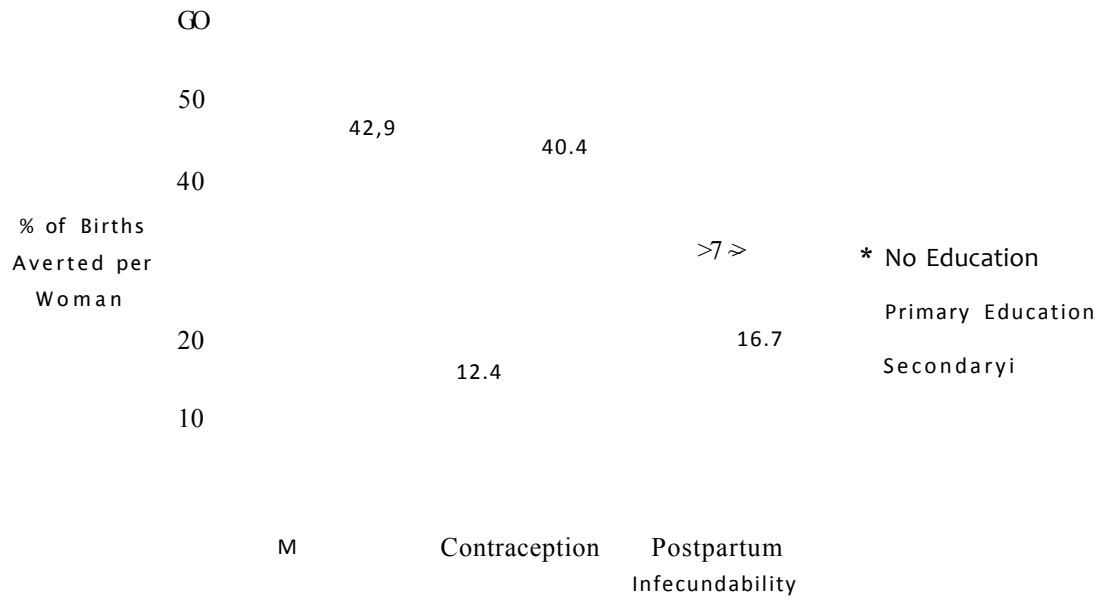
An attempt to illustrate the trend in the effect of each of the variables in averting births across the various subpopulations is presented in the figures below. Figure l demonstrates that the effect of marriage and contraception is higher among urban women as compared to rural women but the reverse is the case when it comes to the effect of postpartum infecundability.

Figure !: Trend in percentage of births averted per woman due to marriage pattern, contraception and postpartum infecundability by place of residence: Kenya —2008/09

Source: Analysis of 2003.aud 2008/09 KDHS Data

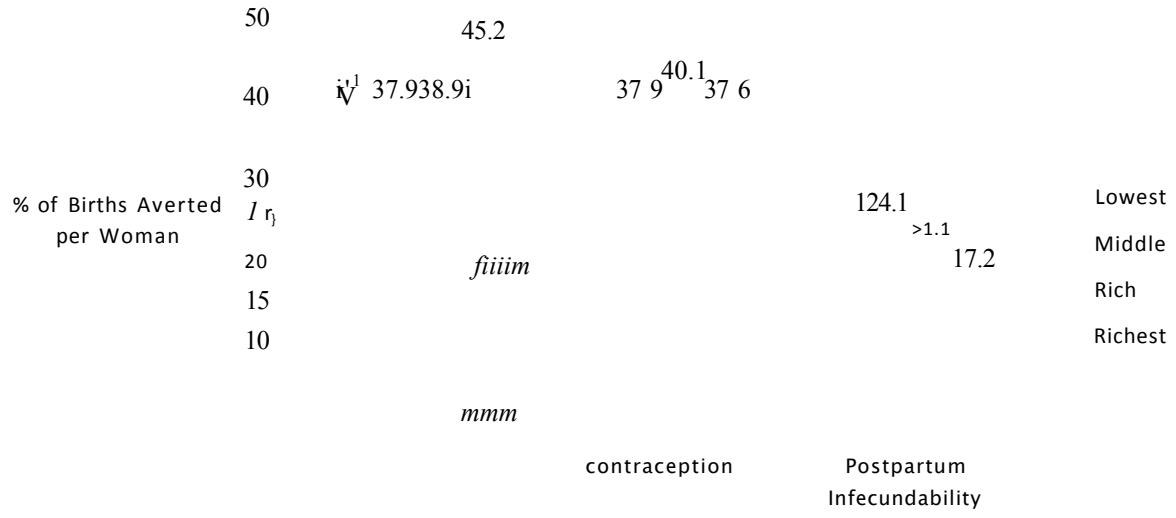
Similarly, figure 2 below shows the effect of the three variables among women with different levels of education. Like with place of residence, marriage and contraception have the highest effect among women with secondary and above education while postpartum infecundability has the highest effect among women with no education at all. Figure 3 still demonstrates the effect of marriage, contraception and postpartum infecundability but among women in different wealth quartiles. Like with place of residence and education, marriage and contraception have the highest effect among richer women as compared to the poorer women. Again, postpartum infecundability has the highest effect among poorer women and the lowest effect among richer women. In almost all the cases, the effect of marriage is always higher than that of contraception.

Figure 2: Trend in percentage of births averted per woman due to marriage pattern, contraception and postpartum infecundability by level of education: Kenya -2008/09



Source: Analysis of 2003 and 2008/09 KDHS Data

Figure 3: Trend in percentage of births averted per woman due to marriage pattern, contraception and postpartum infecundability by wealth index: Kenya -2008/09



Source: Analysis of 2003 and 2008/09 KDHS Data

4.6 Decomposition of Change in Fertility

As table 7 demonstrates, TFR declined by 7.5% at the aggregate level between 2003 and 2008/09. This decline is decomposed into a 3.3% decline due to change in marriage patterns, a 7.1% decrease due to an increase in contraceptive practice and a 2.9% increase due to shortening of the duration of postpartum infecundability. By standardizing these results so that they add to 100%, change in marriage pattern contributed to the decrease of fertility by 44% (3.3/7.5 * 100).

Table 7: Percentage change in Total Fertility Rate between 2003 and 2008/09 due to change in each of key proximate determinants of fertility- Kenya

	Pf	Pm	Pc	Pi	Pp	I	Total Absolute Change in TFR
Residence							
Rural	**-7.2**	**-4.6**	**-6.9**	**4.5**	**0.0**	**-0.2**	**-0.4**
Urban	**-2.6**	**0.0**	**-6.3**	**4.1**	**0.0**	**-0.3**	**-0.1**
Region							
Nairobi	**-0.4**	**-2.0**	**-3.4**	**5.3**	**0.0**	**-0.2**	**-0.1**
Central	**3.0**	**1.9**	**-6.5**	**8.1**	**0.0**	**-0.5**	**0.1**
Coast	**-6.6**	**4.8**	**-10.8**	**0.0**	**0.0**	**-0.5**	**-0.4**
Eastern	**-1.3**	**3.4**	**-3.2**	**-1.4**	**0.0**	**-0.1**	**-0.1**
Nyanza	**-11.4**	**-7.2**	**-11.3**	**7.6**	**0.0**	**-0.5**	**-0.7**
Rift Valley	**-13.9**	**-9.4**	**-9.2**	**4.6**	**0.0**	**0.0**	**-0.7**
Western	**-19.2**	**-9.0**	**-16.0**	**5.7**	**0.0**	**0.1**	**-1.1**
North Eastern	**-4.9**	**-8.8**	**-2.0**	**6.3**	**0.0**	**-0.5**	**-0.4**
Education							
No Education	**7.3**	**0.0**	**-1.1**	**8.5**	**0.0**	**-0.1**	**0.4**
Primary	**-9.9**	**-3.1**	**-9.6**	**2.9**	**0.0**	**-0.1**	**-0.6**
Secondary +	**12.5**	**4.1**	**3.9**	**4.1**	**0.0**	**0.5**	**0.3**
Wealth							
Lowest	**-7.1**	**-7.0**	**-6.0**	**6.3**	**0.0**	**-0.4**	**-0.4**
Middle	**-10.7**	**-3.2**	**-11.6**	**4.3**	**0.0**	**-0.2**	**-0.5**
Rich	**-5.2**	**3.7**	**-9.8**	**1.4**	**0.0**	**-0.5**	**-0.2**
Richest	**2.2**	**0.0**	**-1.7**	**4.0**	**0.0**	**-0.1**	**0.1**
Total	**-7.5**	**-3.3**	**-7.1**	**2.9**	**0.0**	**-0.1**	**-0.4**

Source: Analysis of 2003 and 2008/09 KDHS Data

Similarly, increase in contraceptive practice contributed to the decline by 95% while shortening of the duration of postpartum infecundability contributed to the increase of fertility by 39%. At sub population level TFR decreased in all regions except in Central province where fertility

increased by 3.0% between 2003 and 2008/09. This increase can mostly be attributed to the shortening of the duration of postpartum infecundability which contributed 8.1%> increase. A change in marriage pattern in Central province also contributed to the increase in TFR by 1.9%. The change in TFR in Central would even have been higher had the effect of postpartum infecundability and change in marriage pattern not been offset by the increase in contraceptive practice. Among all the regions, Western province had the highest decline in TFR of 19.2% between 2003 and 2008/09. The province also had the highest increase in contraceptive practice as attested by 16.0% decrease in TFR due to this practice. TFR among women with no education, women with secondary education and higher and the richest women increased between 2003 and 2008/09. It is interesting to note that, among the most educated women, all the 3 key proximate determinants contributed to the increase in TFR between 2003 and 3008/09 with change in marriage pattern and decrease in the duration of postpartum infecundability each contributing about 4% in the 12% of estimated fertility increase.

Richest women also saw their TFR increase between the two reference years by 2.2%. This increase was mostly due to the shortening of the duration of postpartum infecundability which contributed 4.0% in this increase. There was no change in marriage pattern among the richest between 2003 and 2008/09. All in all, increase in the contraceptive practice had the highest impact in the decrease of fertility between 2003 and 2008/09 at the aggregate and across all sub population levels except among the most educated women. Except in Eastern province, the duration of postpartum mfe^iindability decreased at the aggregate and at sub population levels leading to an increase in fertility due to this factor between 2003 and 2008/09. The highest such increase was recorded among women with no education and women in Central province.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter gives a summary of the study, conclusions of the main findings as well as recommendations for policy and further research.

5.2 Summary

The study set out to find the contribution of each of the principal proximate determinants of fertility to the change in fertility observed between 2003 and 2008/09. Bongaarts model as proposed in 1978 and modified in 1983 was used in this study. Four factors were examined and these were marriage, contraception, postpartum infecundability and sterility. The other factor, abortion, which was identified by Bongaarts as being a key factor was not examined due to lack of data. The study first calculated the index of each of the four factors for both 2003 and 2008/09. After calculating these indexes, fertility levels for each of the two years were estimated by fitting the indexes into Bongaarts model. Using the estimated total fertility rates, the study estimated the number of births averted per woman due to each of the four factors. Lastly, the study decomposed the estimated fertility change between 2003 and 2008/09 into proportions that were due to each of the four proximate determinants.

5.3 Conclusions

Fertility decline in Kenya between 2003 and 2008/09 portends that the country is once again in the right track towards completing fertility transition. The country has been undergoing this transition for a long time though in the recent past, the transition seemed to stall at very high and worrying levels. At the aggregate level, the observed decline is mostly due to two factors i.e. marriage and contraceptive practice among married women. Though marriage is almost universal in Kenya, the findings of this study indicate that many women are today delaying getting married the result of which is decline in fertility among several other potential benefits that this study did not look at. Despite this, the study has revealed that the contribution of marriage in the fertility decline varied across sub populations and the trend was contrary to what one would suppose. It would be expected that the urban, the rich and the most educated women would have more delayed marriage than their counterparts but the findings of the study show a clearly different picture. In fact, between 2003 and 2008/09, marriage variable either did not contribute to any

fertility decline or was responsible to fertility increase among urban, secondary educated and richest women. Had women in these sub groups not practiced any deliberate fertility control measures, then their 2008/09 fertility would have been far much higher than actually observed. Though the study did not seek to find out the possible reasons for this observation, it can be argued that perhaps among these sub populations, either they are getting married earlier or their marriages are more stable than in other sub populations.

Contraceptive practice permeates the entire Kenyan society albeit at different levels. The study shows that regardless of women status, contraceptive use increased across all sub populations and this led to reduced levels of fertility. The findings of the study help in reinforcing the important role that contraception plays in fertility control and that any society wishing to reduce its total fertility rate cannot ignore this. This calls for a country like Kenya to sustain and even surpass current levels of contraception and to look for opportunities to increase contraceptive use especially among women in traditionally marginalized regions like North Eastern province. One question though remains; why did contraception use decrease among women with secondary and above education yet this is a group that would actually be expected to be leading the other women in this practice? Have the current contraceptive marketing strategies if any been geared towards women of'lower' social status and ignored those of'higher' standing in the society or is it that there has been an increased desire for more children among these women? There is need to do more investigation about this and seek ways to address any existing gaps if all women are to enjoy benefits of reducedjgrtility.

The various fertility inhibiting factors play a complementary role in reducing fertility. It was however observed that postpartum infecundability actually helped increase fertility between 2003 and 2008/09. This could be attributed to the shortening of the duration of lactation among women especially due to changing lifestyles. Today's woman is most likely to be working and this means that most of them stop breastfeeding early so as to get time to concentrate on their careers. For those who continue breastfeeding for longer time, the practice is not regular and they will most likely only breastfeed in the morning and in the evening. This has an impact on the duration of postpartum amenorrhea hence duration of postpartum insusceptibility. While this will most definitely affect fertility, it is also feared that birth intervals would become shorter thus affecting both the health of the mother and that of the child.

5.4 Recommendations

The findings of the study clearly show that there some sub populations in Kenya that are not benefiting from increased prevalence of contraception. This call for the government and other players to come up with an affirmative policy that would be aimed at allocating more resources to the marginalized regions and other sub populations in order to address known factors that influence contraception behavior such as accessibility, affordability and awareness. More research also needs to be done to find out what other factors could be making some sub populations have low prevalence of contraception than others and advise program design aimed at addressing this.

Contrary to what would be expected, fertility among the most educated women increased between 2003 and 2008/09 and all the 3 fertility inhibiting factors actually contributed to this increase. More research should be done to find out why this was so. The case of Central province calls for enhancing other fertility control methods other than just relying on contraception. Despite the province having some of the highest increase in contraception prevalence, it still recorded an increase in fertility rate. Contraception alone is not enough to reduce fertility levels. Lastly, the study recommends that research be done on the role of induced abortion in Kenya in order to give more accurate estimates of the impact of fertility inhibiting variables and their implication on family planning programs.

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