ANALYSIS OF PROXIMATE DETERMINANTS OF FERTILITY IN NAIROBI:
A CASE STUDY OF MAKONGENI ESTATE, NAIROBI

BY KIPSIELE J. KIRUI

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
MASTER OF ARTS DEGREE IN POPULATION STUDIES

POPULATION STUDIES AND RESEARCH INSTITUTE

UNIVERSITY OF NAIROBI

DEDICATION

To my granny , Tabtebui Koros

DECLARATION

I, KIPSIELE J.K. DO HEREBY DECLARE THAT THIS IS MY ORIGINAL WORK AND HAS NOT BEEN SUBMITTED AND IS NOT CURRENTLY BEING SUBMITTED FOR A DEGREE IN ANY UNIVERSITY.

SIGN ______________________

KIPSIELE JOSEPH KIRUI

THIS THESIS IS SUBMITTED FOR EXAMINATION WITH APPROVAL AS UNIVERSITY SUPERVISORS.

SIGN.

______________________ 17/2/93

DR. Z. MUGANZI

SIGN.

______________________ 17/2/93

PROF. J.A.M. OTIENO

ACKNOWLEDGEMENTS

This study would not have been possible without the contribution and efforts of many people whom I am grateful to.

I wish to thank all members of staff of Population Studies and Research Institute for giving me their needed support and understanding, and in particular my supervisors Prof. J.A.M. Ottieno and Dr. Z. B. Muganzi.

I would also like to express my appreciation to University of Nairobi and the Population Studies and Research Institute for awarding me scholarship that made this study a success.

Acknowledgement is due to my family members and Colleagues at the Population Studies and Research Institute whose moral and academic support helped in the completion of this study. Special thanks go to railway management for the assistance they accorded me during the study.

I won't forget to thank the research assistants who sacrificed their valuable time to do the most difficult job of interviewing the residents of Makongeni estate. I also thank the residents for their patience during the interviewing process.

I am indebted to my friends who contributed in any kind to this work.

TABLE OF CONTENTS.

LIST OF TABLES.

LIST OF FIGURES.

CHAPTER 1

1.1 INTRODUCTION.

In recent years demographic research has been influenced by a consensus that there are appropriate analytical frameworks for the investigation of the determinants of fertility. This view has been based on the premise that all social and economic influences on fertility operate through a common set of biological mechanism to exert an impact on fertility (Mosley and Chen 1984).

Fertility studies which have been done so far in the world in general all point out that fertility levels vary by background characteristics; biological and behaviourial factors. But the factors which influence fertility do not operate in isolation since there are mechanisms through which they affect fertility. The mechanisms they operate through are 'proximate determinants of fertility'. The proximate determinants of fertility are the biological and behaviourial factors through which social, economic and environmental variables affect fertility.One of the most widely known model of proximate determinants of fertility was presented by Bongaarts (1978) and it is now referred to as Bongaarts model.

There are a few researchers who have attempted to account for the observed fertility levels using this model. Bongaarts (1982) employed the model and developed four indexes that would measure the effects of the crucial proximate determinants of fertility using data from both developed and developing countries including some from World Fertility Survey. They included marriage, postpartum infecundity, contaception and induced abortion and showed that they are the most important proximate determinants of fertility. Komba and Kamuzora (1986) did a study in Tanzania on proximate determinants and used Bongaarts'model to find total fertility rates in Kibaha District and conluded that non-marriage and breastfeeding were important factors in fertility reduction in the area.

Kalule-Sabiti (1984), using the Kenya fertility survey data of 1977/78, showed that variations in proportions married among the population, level of contraceptive use and post-partum lactational infecundability account for much but not all of the observed marital fertility differentials. Mosley (1982) and Ferry (1984) also used KFS data to find out how social , cultural and socio-economic factors influence fertility through intermediate fertility variables.

Wamalwa (1990), in his unpublished thesis, also used Bongaarts' model to analyze fertility levels in Kenya at national level and stressed that breastfeeding plays a crucial role in inhibition of fertility rates.

All the above mentioned studies , with the exception of Komba and Kamuzora, used secondary data at national level to account for proximate determinants of fertility. Although gaps in knowledge of proximate determinants remain and continuing periodic measurement is necessary to monitor their levels and changes, the primary need now is to improve the understanding of the causal links between the social and economic features of a population and the proximate determinants. This study attempts to explain how the socio-economic and cultural factors influence fertility through the proximate determinants of fertility at micro-level. The Makongeni study acts as a reference in analyzing proximate determinants of fertility in a small urban area, normally called 'estate'.

1.2 Statement of the problem .

Fertility levels in Kenya are generally lower in urban areas as compared to rural areas.This low fertility has been attributed to various differentials such as level of education , occupation of the mothers, contraceptive use , marriage patterns, religion and ethnicity. This assertion has been confirmed by studies done by Omagwa (1985), Onguti (1987), Mwobobia (1982) and Ikamari (1985).

As was stated earlier fertility differentials do not operate in isolation to determine total fertility rate but act through proximate determinants of fertility. These proximate determinants of fertility include proportion married among females, postpartum infecundability, contraceptive use and effectiveness, prevalence of induced abortion, spontaneous intrauterine mortality, permanent sterility, and waiting time to conception. The last three factors have been shown by Bongaarts to have relatively little influence on fertility. The incorporation of the proximate determinants in estimation of fertility has received little attention especially in the micro-studies.

Attempt to use Bongaarts' model was made by Kalule-Sabiti (1984) who found that non-marriage ,lactation and contraception reduced total fecundity rate to 7.7 in Kenya with breast-feeding having the largest influence. Kalule-Sabiti also argued that modernization through education and urbanization , had offsetting effects on fertility by reducing lactation period and increasing contraception. Though Kalule-Sabiti tried to analyze the effect of proximate determinants on fertility , there is need to do a research at micro-level using primary data. At the moment there is no study that has been done in Kenya using primary data at the community level to show the effect of intermediate fertility variables. A comprehensive study of all the intermediate fertility variables and an evaluation of the contribution of each to fertility itself is, therefore, essential if we are to understand fertility behaviours and the likely impact of policy interventions. In order to understand the cause of fertility differentials, we need to study the way in which the proximate determinants both individually and as a set respond to social and economic pressures. A study of Makongeni using primary data acts as a reference and points to the need for further research in other areas on the effect of proximate determinants on fertility. There is a lot of primary data concerning the proximate determinants and it is the intention of this study to highlight some of them. The levels of fertility and the factors that account for their differentials are important for poliy planners.

1.3 Objectives of this study.

The general objective of this study is to find out fertility levels of women in Makongeni estate in Nairobi and to account for this fertility using the Bongaarts' model of fertility analysis. This study focuses on socio-economic (educational level) and cultural (ethnicity) factors which influence fertility through proximate determinants of fertility . The specific objectives are :

(i) To estimate fertility levels of women in Makongeni based on socio- economic and cultural factors using the Bongaarts' model.

(ii) To determine the contribution of proximate determinants of fertility (contraception , non-marriage and breast-feeding) on fertility levels in Makongeni estate.

iii) To find out total fertility rate of Nairobi by applying the Bongaart's model to KDHS data.(This facilitates comparison with results yielded by data collected in the Makongeni estate)

1.4 Justification of the study.

As it has been pointed out earlier, studies done so far in Kenya have mostly been on social, economic and cultural factors with very little focus on how these factors act through intermediate variables to influence fertility level. The few studies which have been done on proximate determinants of fertility have used secondary data and focused on national level. This study uses primary data and concentrates on a small area in Nairobi. This points out the importance of directing attention to micro-level studies. The study considers three proximate determinants of fertility (marriage, contraception and lactation).Thus it points out the fertility differences in Makongeni in line with the determining factors .

Mwobobia (1982) found that Nairobi experiences the lowest total fertility rates in the country when compared to other provinces and districts. The low fertility rates experienced are mainly explained by the' modernization effect' in terms of socio-economic, socio-cultural and demographic factors existing in urban centres. With these various factors influencing fertility, the intermediate variables through which fertility is affected, can be manipulated to achieve a given fertility level. This study gives alternative ways to effect fertility change by planners so as to suit their interest at micro-level (Makongeni estate).
Whether their major concerns are health, education, community development, the status of women, or other population-related

subject, those responsible for population policies and programmes will find a rich field in reflections on the proximate determinants of fertility. The researchers likewise have a fertile area of research in the intermediate variables of fertility.

1.5 Scope and limitations.

This research explores the influence of socio-economic and cultural practices on fertility through the intermediate fertility variables at micro-level (i.e "estate" level). This is indeed a very relevant and needed research for it reveals how each of the variables contributes to fertility level. Makongeni is a residential estate for employees of the Kenya Railways Corporation which has uniform provision of social services. Despite this, the impact of use of provided services vary from individual to individual. The study interviewed women aged between 15-49 years in the estate. About 400 households were visited and women within the stated age group interviewed. Makongeni is inhabited mainly by people from Western Kenya and this is a limitation in the sense that fertility level based on ethnicity shows little information. There is no true picture on how ethnicity influences fertility,because of the sample size for some of the ethnic groups.

Modernization in the of urban region influence some of the intermediate fertility variables to a large extend. This creates great disparity in the fertility differentials thus being a unintended objective of this research.

Regarding abortion, it is illegal in Kenya and is considered immoral. This is why it is not included in this study. Despite this abortion is still illegally practiced by a minority group of people and thus influences fertility. This study suffers from all these limitations but nonetheless it is an essential research.

1.6 Description of Makongeni estate.

Makongeni has been popularly called" Maisha Makongeni" by most residents of Nairobi. It is situated at the Eastlands of Nairobi, just along the main Jogoo road. It borders Muthurwa to the North East, Bahati to the North West, Mbotela to the West, Industrial Area to the South and Kaloleni to the East. Makongeni was established by the British government as early as 1901 as a residential estate for the then East Africa Railways Employees. When Kenya achieved independence in 1963 the whole place was expanded and subsequently more buildings were built in modern style.

The estimated population of Makongeni is in the tune of twenty seven thousand with about four thousand well planned houses. The houses are arranged in rows and numbered while some are flats. They are categorised into four major classes which show the grade of the occupant in employment position. The classes are ; class(iv), class (v), class (vi) and class (vii) which is also called the" mixed group". Class (vii) houses are very many in number and are occupied by the low grade workers. Class (iv) houses are very few and are meant for senior personnel in the corporation. The other classes are for the middle class workers who have advanced from the mixed group or employed on the higher grade.

Since Makongeni is a corporation residential place, this implies that the inhabitants have at one time migrated to the area as a result of employment by the Kenya Railway corporation. Some of the people came later to reside with their relatives. All these people have now formed the Makongeni population. But a majority of the population are from Western Kenya and in particular the Luhya and the Luo ethnic groups. The other next dominant ethnic groups are the Kikuyus and the Kambas.

The Kenya Railways take care of its employees well. They are provided with toilet facilities even though the latter are badly used.The drainage facilities are well maintained by the corporation. There is a school meant for the children of the employees though outsiders are also admitted. There are social places and a clinic which cater for employees' needs.

1.7 LITERATURE REVIEW.

Literature of various studies done in some parts of the world are cited in this section to give a background on which this study is based. The review of these studies is given starting with what has been done in the rest of the world followed by Sub-saharan Africa countries. The studies done in Kenya are also reviewed. In all these ,results obtained and research set up are carefully noted and related to the present study.

Rest of the world

Proximate determinants of fertility are the locus of the institutional arrangements through which societies restrict their reproductive capacity. Age at marriage and breastfeeding are the main factors that can affect the total fertility rate of a society.In societies where contraception is widely accepted, it becomes a powerful inhibitor of reproduction. This is what Davis and Blake (1956) pointed out and concluded that cultural, social and economic settings impinge on fertility only indirectly through the intermediate variables. The variations in fertility levels of populations are due to variations in one or more of these proximate determinants. The model of Davis and Blake were modified by Bongaarts (1978).

Shaoxian Wang et al (1982) conducted a survey in Beijing city and found that fertility had been brought down to a level close to the goal of one-child policy by a rare combination of the very strong fertility-inhibiting effects of non-marriage, contraception and induced abortion. They found that breastfeeding was low and had little effect on postpartum amenorrhea which was only 2.8 months an almost equivalent no breastfeeding.

Reproduction is known to involve three main steps;intercourse, conception and full-term pregnancy. Davis and Blake identified a set of eleven proximate determinants which they called 'intermediate fertility variables'. Earlier researchers concentrated on construction of more realistic models for the relationship between fertility and the proximate determinants of fertility. These improvements resulted in frequent inclusion of the proximate determinants of fertility in socio- economic and cultural effect on fertility (Bongaarts 1980).

The 11 intermediate variable of Davis and Blake (1956) are divided into three categories as follows;

(1) Factors affecting exposure to intercourse;

(i) Age of entry into sexual unions

(ii) Permanent celibacy, proportion of women never entering sexual unions.

(iii) Amount of reproductive period spent after or between unions.

(iv) Voluntary abstinence.

(v) Involuntary abstinence (from impotence, illness, unavoidable but temporary separation).

(vi) Coital frequency (excluding period of abstinence).

(2) Factors affecting exposure to conception

(vii) Fecundity or infecundity, as affected by involuntary causes.

(viii) Use or non- use of contraception

(a) By mechanical and chemical means

(b) By other means.

(ix) Fecundity or infecundity, as affected by voluntary causes (sterilization, sub-incision, medical treatment etc.).

(3) Factors affecting gestation and successful parturition.

(x) Fetal mortality from involuntary causes

(xi) Fetal mortality from voluntary causes.

Bongaarts (1978) modified the Davis and Blake model and came up with his model with a set of eight intermediate variables:namely proportion married , prevalence of induced abortion , duration of post- partum infecundability, spontaneous intrauterine mortality , permanent sterility , prevalence of contraceptive use and effectiveness and duration of the fertile period. However, Proportion married, prevalence of induced abortion , duration of post-partum infecundability and contraception use and effectiveness have been documented as are the main causes of fertility differences between countries with lactation playing a crucial role in developing countries. The above four proximate determinants are used in this study. The proximate determinants of fertility have received some treatment especially through the use of Bongaarts model of 1978. The analysis of fertility differentials in Dominican republic using data from World Fertility Survey (WFS), revealed that mothers with 0-2 years of education had their total fertility reduced to 7.19 by the four proximate determinants of fertility. Those with higher years of schooling had their fertility further reduced to lower levels (6.84). This in itself shows the relationship between education and fertility.

Bogue (1969) concluding from his surveys in the United States found that throughout the world, there seems to be a strong inverse relationship between the amount of educational attainment and the level of fertility. In his studies, Bogue found that rising educational levels, school attedance and elimination of early marriages are much more powerful in promoting fertility reduction than simple urbanization and rising levels of income.

It is accepted that women are less likely to conceive while breast-feeding their infants. Potter and Bongaarts (1983) observed that variations in the fertility of individual women are caused by variations in the proximate determinants and that breastfeeding is the principal determinant of amenorrhea. Post-partum amenorrhea is an important component of birth intervals and is one of the most important natural contraceptive mechanisms that the world has. Without breast-feeding the average amenorrhea interval is short, usually 1.5-2 months. Prolonged breast-feeding is identified as being instrumental in achieving longer birth intervals in countries where little or no contraception is practiced (Van Ginnerken 1977; et al; Chen et al 1974). The fertility -reducing effect of breastfeeding stems from its role in lengthening the period of postpartum amenorrhea and the inhibition of ovulation.

The inter-relationship between breast-feeding and amenorrhea has been found to be as follow (Bongaart 1983).

$$A = 1.753\ Exp(.1396B - 0.001872B^2).$$

A= Mean or median duration of postpartum amenorrhea in months.

B= Mean or median duration of breasfeeding in months.

For a woman , the ovulation and menstruation inhibiting effect of breastfeeding is somewhat less predictable than on the whole general population level. This is the consequence of the fact that amenorrhea is affected not only by the duration of breastfeeding but also, and perhaps more importantly, by the type and intensity of breastfeeding. It has been demonstrated that women who give their infants only breast milk have a much lower probability of resuming menstruation than women who supplement the diets of their infants with fluids by bottle or with solid food (Perez 1971). Jelliffe and Jelliffe (1972) in their study concluded that ovulation and menstruation are delayed among the lactating women for at least 10 weeks and upto 26 months but only if breastfeeding is complete , successful and unsupplemented. Better survival chances are expected for breastfed infants, epècially under conditions of poverty, ignorance, crowding, and overall high morbidity. Lactation tends to delay the resumption of ovulation after birth. Thus, extended breastfeeding contributes to moderately lengthy birth intervals. On the other hand, there is some evidence to suggest that very close spacing of previous births impairs a woman's ability to breastfeed the current child (Federick and Adelstein,1973).

The fertility inhibiting effect of postpartum infecundability decreases with education. Results from several studies consistently indicate a much shorter duration of breastfeeding for women who are more educated , belong to upper socio- economic class and live in urban areas (Jain and Sun 1972 et al).

Contraceptive prevalence increases with old age until a maximum age is attained (30-34) and start declining slightly in older ages (Bongaarts and Kermeyer,1982). In developed countries contraceptive use is high among younger women especially in France and United States.

The general expectation is that fertility reducing effect of contraception increases with education. The effect of contraception increases with ascending levels of education and the effect of lactational infecundability decreases. Formal education prepares women for roles outside the home thus removing them from the traditional roles of the mothers at home (Cochrane 1979).

The major aspect of womens' status which has been the focus of interest in recent years has been women's employment in the formal sector away from home. The employed women are associated with low marriage rates and in a society where traditions still hold, the fertility levels are expected to be low.

The Bongaarts model (1978) is more widely used than any other frameworks known of proximate determinants of fertility. A somewhat different approach to the analysis of the proximate determinants was taken by Henry (1957), who constructed the first detailed mathematical models of the reproductive process. But the Bongaarts framework relates the total fertility rate to levels of marriage, breastfeeding, contraceptive use and induced abortion. Socially sanctioned childbearing, however, is in virtually all societies. Marriage may in practice be taken as the starting point of the actual reproductive years. Any changes in marriage are bound to affect fertility. Spousal separation has been treated as a kind of contraceptive, operating to delay the next conception by reducing or eliminating fecundability during the fecundable periods which it overlaps. This is what Bongaarts wanted to show when he proposed his model on intermediate variables of fertility. Nortman (1980) observed that one-third of married women of reproductive age were using contraception and of this , low proportion were from developing countries. This is in support of United Nation (1973) survey that the low levels of contraceptive use is in high fertility regions. But findings from various case studies do not hold a common view as to the strenght of the association between contraception and fertility Bongaart 1978). Knowledge, approval and interest usually precede the use of contraceptives.

Sub-saharan Africa

Odile(1987), has observed that little evidence exists presently of a generalized demand for contraception and fertility limitation in Sub-Saharan Africa. Nevertheless, particular groups can be identified who have an interest in controlling fertility at specific points in their life-cycle, or, who do demonstrate that they are limiting their fertility.

Bongaarts (1979) , in his study of Tropical Africa indicates that postpartum infecundability, caused by traditional African child spacing practices of lactation and postpartum abstinence,is a powerful inhibitor of fertility. In Tropical Africa average periods of postpartum abstinence duration ranging from two to two and a half years are common and if these periods are reduced to a minimum level, fertility can be expected to rise by 40 percent or higher depending on extend of these periods reduction. But nonetheless, postpartum abstinence is practised widely and for longer duration than is usually found in other parts of the world.

Gaisie(1969) found out that there exists a relationship between breastfeeding and amenorrhea : for women who had given birth one month ago and were no longer breastfeeding , were still amenorrhoeic but those who had given birth two to three months earlier showed a drastic decline in amenorrhea durations. In his analysis he observed that about 58 per cent of those who were still breastfeeding were amenorrhoeic and only 1.8 per cent of those who were no longer breastfeeding were amenorrhoeic. The correlation between breastfeeding and amenorrhea in most cases is not due to the direct effect of the termination of breastfeeding but to the correlation between the intensity of breastfeeding in the early months and its overall duration. The longest total durations of breastfeeding tend to have the longest period of intense breastfeeding that cause prolonged amenorrhea.

In Ghana, Gaisie (1969) found out that the uneducated women exhibited higher fertility rate than women with elementary schooling and the latter's completed fertility exceeded that of the secondary educated women in the urban and rural areas by 51 percent and 85 percent respectively.

Olusanya (1969) identified certain cultural barriers to the acceptance of modern techniques of fertility control among the Yoruba population in Western Nigeria, namely: sex preference, fears about promiscuity and marital infidelity and misunderstanding about modern contraception but felt that education would erode these traditional barriers. In most of the developing world countries these cultural barriers exist but the break down of some of them due to modernization result in rampant promiscuity among the population has created unnecessary births.

Komba and Kamuzora (1986) conducted a survey in Kibaha District in Tanzania and used Bongaarts model to analyze their data. Their findings were that non-marriage and infecundability reduced total fecundity to a level that compares well with the reported total fertility rate (TFR). They argued that contraception and induced abortion might have accounted for this TFR but they didn't get information regarding them.

Kenya

Though the population of Kenya is without doubt the most written about in Tropical African,as far as demographic issues are concerned,only a very small number of studies has specifically examined the demographic situation in Nairobi (Gasana, 1985)

Studies have also been done in Kenya using Bongaarts model to analyze the proximate determinants of fertility . Kalule-Sabiti (1984) applied Bongaarts model to Kenya Fertility Survey (1977/78) data and found that the proportion married among the population, the level of contraceptive use and effectiveness and postpartum lactational infecundability accounted for much of the observed marital fertility differentials. However, modernization through education and urbanization have offsetting effects on fertility by reducing lactation and probably increasing contraception. The high fertility experienced in Kenya has been associated with cultural beliefs and practices. The World Bank report (1980) has documented that most Kenyans desire seven to eight children because of old age support and to keep the family line going. Kenyan parents have high expectations from their children and hence the need to have more of them to provide the necessary labour and care at the time of need. However, urban and better educated mothers have less expectations from their children than the rural and less educated mothers.

Historical evidence points to the fact that movement of population from rural areas to urban centres preceded fertility declines in the more developed countries (Adelman 1963). This is only one explanation for the generalized view that urban fertility is lower than rural fertility. However, it does not hold true for all countries.

Urbanization makes people drop or loose contact with their cultural beliefs and practices, though this is a gradual process as it has been found in various studies. Rural-urban migrants have relatively traditional values which change slowly over time. These migrants retain some of their fertility behaviours of their original environment until they make adjustments at their new environment. Traditonally, individuals are motivated to have many children in order to "shine" in social ceremonies. But in the case of Makongeni traditions are expected to have changed but still some practices are hard to die over time.

Ferry and Page (1984), also using Kenya Fertility Survey data have revealed that the traditional birth spacing mechanisms are not very strong in Kenya. Breastfeeding, post-partum amenorrhoea and, particularly, post-partum abstinence are relatively short by Africa standards.The problem is particularly due to cultural change and attitude of the people. The use of modern contraception to space births has not been widely adopted. From this conclusion of Ferry and Page two stage fertility transition is in process in Kenya whereby abstinence and lactation are declining without equal rise in compensatory effect of contraceptive use except the oldest women and the higher socio-economic groups who use them to terminate birth.

Ocholla- Ayayo and Osiemo (1989) have reported a controversial issue between Kikuyu and Luos. Though the latter marry earlier,the majority of them are polygamous whereas Kikuyu marry late and are less polygamous. The two ethnic groups have no difference in fertility as would have been expected due to what has been asserted above. Kikuyu have higher single fertility rate which is equivalent to that of polygamous Luo.

Anker and Knowles (1980) have argued that fertility differentials in Kenya are incomplete without including the effect of ethnicity. The African society values children so much that they see them as belonging to the community and not only the parents. Each ethnic group has cultural values and norms that guide the marriage pattern, breastfeeding and contraceptive use if any. For instance, the reduction effect of contraception was lowest among Mijikenda, Luo, Luhya, Kisii and Kalenjin . Ethnicity acts through cultural practices to directly influence fertility. But Cultural values change with modernization.

The major cause of the high fertility in Kenya in the 1970s was the fast decline in breastfeeding and the slow compensating movements in contraception and nuptiality. The socio-economic and cultural factors which influence both demographic characteristics and fertility itself are modified by the level of education of the mothers. Educational attainment for women is one of the most important factors accompanying modernization. In fact marriage postponement can be used as a major fertility control policy. This argument has been supported by various researchers who have found that educated women marry later than their counterparts; the uneducated ones. This is in fact in line with most developing countries but some studies have shown that women who had been in educational institutions for long will give birth at shorter intervals in order to compensate for the lost time in school (Ocholla-Ayayo 1983).

Ocholla-Ayayo and Osiemo (1986) in their study came up with an argument that women with primary education have higher fertility than those with no education. This is because of the fact that women with primary education breastfeed their children for shorter period and there is rare foetal wastage as they are conscious of the health and nutrition requirement. A comparision between the primary educated women and secondary educated ones shows that the later have the lowest level of fertility. Most researchers have been tempted to conclude that secondary education is probably a prerequisite for a woman to change her attitude towards family size (Ominde 1983; Henin 1982).

The recent study by Wamalwa (1990) applying Bongaarts model to Kenya Demographic and Health Survey (1989) data has documented that among the proximate determinants of fertility , breastfeeding plays the most important role in reducing fertility in Kenya and that contraception plays the least role in reducing total fecundity. Breastfeeding , contraception and non- marriage contributed to a reduction in total marital fertility by 26 per cent. Contraception is mostly used by the Kikuyu ethnic group and those with higher educational level. It is therefore true to state that proximate determinants of fertility are prominent in all societies with variations in their proportion.

1.8 Theoretical statement.

As has been discussed earlier, Bongaarts (1978) came up with a model of analyzing the intermediate fertility variables. Bongaarts found that intermediate variables such as contraceptive use, induced abortion, proportion married and duration of lactation influence fertility directly. The other proximate determinants of fertility ; frequency of intercourse, sterility ,spontaneous intrauterine mortality and duration of the fertile period are not considered because they have very little influence.

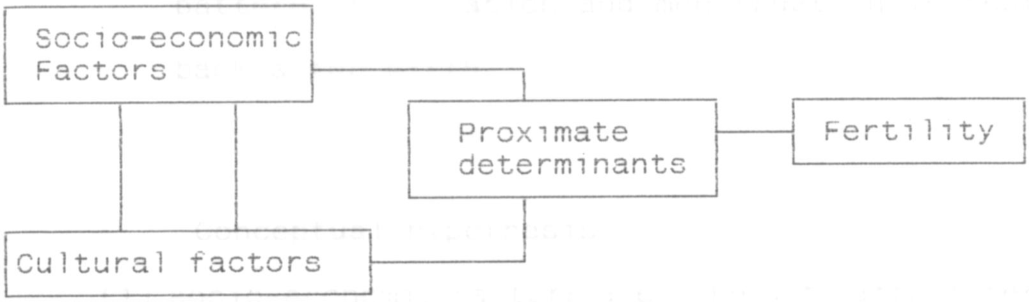
Bongaarts (1978) has argued that marriage is the principal intermediate determinant of fertility. Marriage influences fertility through: the number who marry, proportion who stay in stable unions and age at entry into unions. Prolonged lactation is also associated with longer period of post-partum amenorrhea. Lactation, in less developed countries is longer. This leads to longer periods of post-partum amenorrhea. Contraception influences fertility since the higher the rate of contraception, the lower the fertility rate.

From the literature and Bongaarts framework, the study on hand now is controlled by the contention that total fertility rates are a function of socio-economic and cultural factors acting through the biological and behaviourial factors called proximate determinants of fertility.

The conceptual model below summarizes the relationships among the determinants of fertility.

Figure 1.1.1

1.9 **Conceptual Model**



<u>*Source: Bongaarts (1978)*</u>

1.10 **Definition of concepts.**

(1) Total fertility rates (TFR): It is the average number of children born to a women during her whole reproductive life.

(2) Socio- economic factors: These are indices of socio-economic status. In this study education is considered to separate those who have had formal education from those who haven't.

(3) Cultural factors: These are rules and norms that govern the way of life of a people in a society. This study considers ethnicity as a measure of cultural influence on fertility.

(4) Proportion married: The Percent of women who are in childbearing age and living in legitimate stable sexual unions such as formal marriages and consensual unions out of total number of women in reproductive age gruops.

(5) Contraception: Any deliberate move that reduces the

probability of conception.

(6) Lactation infecundability: Periods before normal pattern of ovulation and menstruation is restored back after birth.

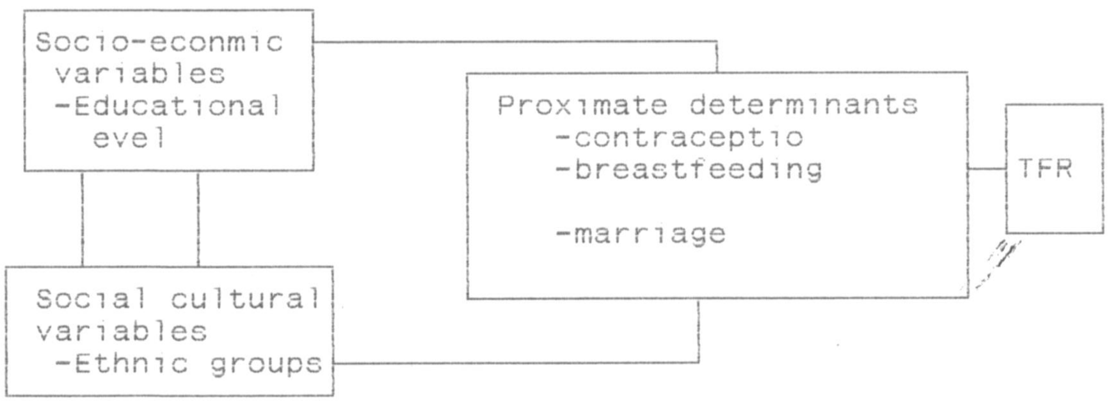
1.11 Conceptual hypothesis

(1) socio-economic factors are likely to affect fertility through proximate determinants.

(2) cultural factors are likely to influence total fertility rate of women.

1.12 Operational model

figure 1.1.2



1.13 Operational hypotheses.

This study tests the following hypotheses;

(i) Women's level of educational attainment is inversely related to fertility.

(ii) The use of contraception is likely to be more among women with higher level of schooling.

(iii) Duration of breastfeeding is likely to be low among educated women.

(iv) Proportion married of women is likely to influence fertility.

(v) Ethnicity is likely to play a major role in acceptance of contraceptive and thus inversely determine fertility rate

CHAPTER 2

METHODOLOGY

2.1 Introduction

This chapter is concerned with description of the study area and sources of data and methods of data analysis. In the first part of the chapter data sources are presented.The second part presents a detailed discussion of the Bongaarts Model and its weakness.Coale-Trussell technique is also explained. A brief note on cross-tabulation is also given .

Sources of data

2.2 Kenya Demographic and Health Survey (1989) and its design.

Kenya Demographic and Health Survey was conducted between December 1989 and May 1989 with an aim of collecting data concerning fertility, family planning and maternal and child health.The purpose of the survey was to provide planners and policy makers with data useful in making informed programme decisions.The KDHS was a national survey carried out by the National Council for Population and Development in collaboration with the Central Bureau of Statistics (CBS) and the Institute for Resource Development Funds (IRDF) which also provided technical assistance in all stages of the survey. The survey covered 7150 women aged 15-49 years and a sub-sample of 1116 husbands of these women.

The KDHS sample is based on the National Sample and Evaluation Programme (NASSEP) master sample frame maintained by the CBS. KDHS covered most districts except North Eastern and Northern Four districts which together account for only about five percent of Kenya's population. The NASSEP master sample is a two stage design, stratified by urban-rural residence and within the rural stratum by districts.

The KDHS utilised three questionnaires ;to list members of the selected households (household questionnaire); to record information from all women aged 15-49 who were present in the selected households the night before the interview (women's questionnaire); and to record information from the husbands of interviewed women in a sub-sample of households (husband questionnaire). In general, few problems were encountered during the interviewing process and the response rate was high: 98 per for households, 96 per cent for individual female respondents and 81 per cent husbands. The questionnaires were translated into various languages of the communities to be surveyed. The sample surveys normally suffer from non-sampling and sampling errors and the KDHS was non exception.

2.2.1 Questionnaires.

Closed ended standard questions were used. Open ended questions were avoided as much as possible so that the respondents could not be bored. The questions were designed in such away that all the wanted variables were accommodated in few pages to reduce incurring high expenses. The questionnaires were administered by research assistants. Respondents were allowed to repond freely without any interference.

2.3 Collection of primary Data.

Data to be used in this study are primary ,collected in Makongeni estate during the months of November 1991 and January 1992. Since the Bongaarts model was to be used to analyze the data, a mutual interaction between the researcher and the respondents (women aged between 15-49 years) was essential in order to obtain high quality information. Time and finance did not allow for the collection of the required information from all the women so a sample had to be drawn from the eligible population. In the study area, people have a class differentiation and hence necessary to get information from some of them within the class.

2.3.1 The Sample selection.

A study of this nature often requires a sample on which the study is done. The sample must be very representative of the original population if the findings from it are to be applied accurately to the original population. To meet this requirement, statistical tools have been developed.

The known ones are those arrived at through probability sampling techniques. These are random sampling, systematic sampling, stratified sampling, and cluster sampling ; just to mention a few. A probability sample is that in which every individual in the population has a known probability of being included in the sample. This is done by using sampling fractions, weights and many other procedure to choose study samples.

Choosing the sample for this study did not create any problems. This was because Makongeni is stratified by way of job status.As it has been pointed out earlier Makongeni is categorised into four classes of different standard in terms of job position. Those with higher job grades reside in houses classified as class (iv) and those with lower grade in class (vii). This categorisation was advantageous to this study in that it allowed the use of stratified random sampling which is a technique in which the population is divided into various strata by age , social status, occupation and so on. For this to happen a sampling frame was obtained for each stratum from the senior estate supervisor, Makongeni. What gave problems was the ascertaining sampling fractions. After scrutinising the sampling frame and the amount of time and money available it was decided to interview four hundred respondents: women aged 15-49 years. The important thing about houses in Makongeni is that all are numbered. Every single house is numbered. Given that the total number of houses in the estate is 4000 the sampling fraction chosen was one-tenth.

After getting a sampling fraction, the next thing was to apply this fraction to each of the categorised houses.A uniform fraction was used to enable fair representations. To get samples in each category, systematic sampling technique was used after listing all house numbers in each stratum. This procedure was utilized so that each house got an equal chance of being picked or included in the sample to be interviewed. This procedure was repeated in all the categories of houses. With the help of interviewers, each of the chosen house was visited and eligible women interviewed. Where there was nobody found in the house or the respondent failed to respond , random selection was repeated in order to avoid reducing the samples size. Interviews were done between 5 p.m. and 7 p.m. This was convenient since most of the women respondents were in one way or another engaged in various activities during the day. The time 5 p.m. to 7 p.m. was the best time to carry on with the interviews. Saturdays were also convenient in that many women were at home and thus few were missed.

2.3.2 Type of data collected

The questionnaire was designed in such away that the variables needed in the research were accommodated. This research aimed at analysing the proximate determinats of the fertility in an estate (Makongeni). Therefore , the data collected were on breastfeeding; its duration and intensity, practice of contraception, and marital status of the mothers. Also data on educational background of the mother was collected including her ethnic group.

2.4 Methods of data analysis

2.4.1 The Bongaart's model.

Data can be of no use if they are not analysed using suitable methods. In this study Bongaart's model is used to analyze the survey data. Bongaart's took the ideas of Davis and Blake an additional step forward by placing them within an analytical framework which enables the total fertility rate of a population to be estimated using the proximate determinants. The model enables the estimation of the fertility reducing effect of each individual proximate determinant . This is achieved through an index for each determinant which takes the value 1 when that determinant has no effect on fertility and 0 (zero) when that determinant eliminates all fertility.

Bongaart's model starts from the total fecundity (TF), (a hypothetical potential of fecundity that a woman could have in her life) and subjects it to various inhibiting factors:non-marriage, contraception, induced abortion, lactation infecundability, spontaneous abortion and permanent sterility. In this study only three proximate determinants of fertility are analsyed: marriage , contraception and lactation infecundability.

The three indices : the index of marriage, the index of contraception and the index of lactational infecundability, are associated with the total fertility rate (TFR) by a multiple relationship as shown below in equation (2a).

$$TFR = C_m * C_a * C_c * C_i * TF \text{ .... (2a)}$$

Where,

TFR = Total fertility rate

C_m =Index of marriage

C_a = Index of induced abortion

C_c = Index of contraception

C_i = Index of post-partum infecundability

TF = Total fecundity.

The total fecundity rate of most populations falls within the range of 13 to 17 births per woman with an average of 15.3.

The index of marriage , C_m, measures the effect of the marriage pattern of a population on its fertility. It assumes the value 1 (one) if all women of reproductive age groups are married and 0 (zero) if there is no marriage. The Two extremes are situations which rarely arise in practice.

$$C_m = \frac{TFR}{TM}$$

$$= \frac{\Sigma g(a)}{\Sigma g(a)/m(a)} \text{ .... (2b)}$$

Where,

g(a) = age specific fertility rate

m(a) = age specific proportion of women married.

An alternative way of considering C_m is that it is the average of the age -specific proportion of married women ,m(a), but since the impact of marriage on fertility also depends on the age distribution of married women, these age-specific proportions of married women are weighted by the corresponding age-specific marital fertility rates, g(a) and thus :

$$C_m = \frac{\Sigma(g(a)m(a)}{\Sigma g(a)} \quad \ldots\ldots (2c)$$

The index of lactational infecundability, C_l, measures the effect of the duration of postpartum infecundity as determined by the breastfeeding patterns practised in any society . Lactation has inhibiting effect on ovulation and thus increases the birth interval and reduces natural fertility. In the absence of breastfeeding and post-partum abstinence practice, the birth interval averages about 20 months, the sum of 1.5 months of minimum post-partum anovulation (non-lactational infecundity), 7.5 months of waiting time to conception ,2 months of time added by spontaneous intra uterine mortality and 9 months for a full term pregnancy. With lactation and abstinence, the average total duration of the infecundable period is equal to average duration of post-partum infecundability in months plus 18.5 months. The ratio of average birth intervals with and without lactation is called the index of lactational infecundability.

$$C_l = \frac{20}{18.5+i} \quad \ldots\ldots (2d)$$

where, i=mean duration of postpartum infecundability in months.

18.5+i= average birth interval in the presence of breastfeeding or post-partum abstinence.

i can be estimated using the formula shown below

$$i = 1.753 \exp(0.1396 * B - 0.001872*B_2) \quad \text{.................(2e)}$$

where, B= is the mean duration of breastfeeding.

Duration of breastfeeding can be obtained either directly or indirectly . So far, as indicated by past studies, direct estimation of duration of breastfeeding is not reliable. But since in this study we are only interested in mean duration of breastfeeding it is justifiable to use the indirect technique; the prevalence-incidence method. Mosley et al (1982) stressed that if births per month have been constant throughout the year, then a simple and robust estimation can be used. If the total number of children currently breastfeeding (non-consideration of age) is represented by p, and the average number of births per month by i, then mean duration of breastfeeding in months (D) is equal to

$$D = p/i \quad \text{..................................(2f)}$$

where

p = prevalence

i = incidence

For any characteristic the prevalence (the observed number currently breastfeeding) is the function of incidence (the number who start breastfeeding) and the duration of the characteristics. This can also be calculated by using the following equation;

$$I_a = A/W \times D \quad \text{............................(2g)}$$

where

I_3 = duration of post-partum ammenorrhea

A = number of women currently in ammenorrhea

W = number of women having had their most recent live birth in the past D months before interview, usually 12 months.

With a constant stream of entrants, the mean duration can be estimated by dividing the observed prevalence by the estimated incidence.

By making some allowance for equation (2f) it is possible to include those children who are never breasfed. The allowance necessary is to define denominator as the monthly number of births rather than as the monthly number of children who start breastfeeding (the incidence of breastfeeding).

This method has one major advantage in that it's relatively insensitive to errors in the reported dates of birth for the children in question.

The numerator does not require any dates at all whereas the denominator does, but it can be estimated from births in the year preceding the survey. Any misreporting of dates will affect the results only if such misreporting transfers births across the boundary of the period chosen. It is upto the researchers to choose periods that will minimize the transfers. Short periods are not good enough for small sample sizes. In this research a period of three years is used. The total number of births that occurred in the three years before the interview are all those whose difference between calender month of birth was 0-35 months. There are also those for whom this difference was 36 months. To obtain exact incidence we add half of those the difference is 36 months

Hence D= p/i where

p= number of children currently breastfeeding irrespective of age

i=1/36(all births 0-35 months before survey +1/2 of the births occurring 36 months before the survey)

D= the mean duration of breastfeeding.

The index of contraception, C_c, is one major factor that is primarily responsible for the wide range in the levels of fertility within marriage. In traditional developing countries the practice of contraception is rare or virtually absent and marital fertility is relatively high. Contraception incorporates both the prevalence of contraceptive use and its effectiveness. C_c takes the value 1 (one) if nobody uses contraception, or if the method used is totally ineffective and takes the value 0 if all women use 100 per cent effective contraception. The effect of contraception on marital fertility can be estimated by use of the following equation.

$TM = C_c * TNM$ ....(2h)

where

TM = total marital fertility rate

TNM = total natural marital fertility rate equal to TM in the absence of contraception and induced abortion

C_c = index of contraception.

The value C_c can be estimated using the equation below

$C_c = 1 - 1.18 * u * e$ where

u= average proportion of married women currently using contraception.

e= average contraceptive effectiveness.

Hence

$u = 1/30 \sum u(a)$ where u(a) is proportion of all women who are currently using contraception.

$u = \sum u(m)$.. ...(2i)

and

$$e = \frac{\sum e(a) * u(a)}{u}$$

where a = age in single years

$$e = \frac{\sum e(m) * u(m)}{u} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2j)$$

The factor 1.18 is a correction of sterility. The average use effectiveness is calculated as the weighted average of the method specific use-effectiveness levels with the weights equal to the proportions of women using the corresponding method. It is a known fact that failures of contraceptive use is a characteristic of the population of the developing countries. This reduces use-effectiveness. This has been associated with little or no education among the population which has led to none use and user errors.This could be the major contributor to contraceptive failure rate in less developed countries.

To find the inhibiting effect of each of the proximate determinants, it is necessary to look back at the original definitions of the four indices. The fertility levels in the presence and absence of the inhibition caused by the particular determinant can be used to quantify the importance of it on fertility levels. If contraception and induced abortion is removed fertility will be total natural marital fertility rate (TN).

$$TNM = C_i * TF \quad (2k)$$

If the fertility-inhibiting effect of non-marriage is removed without affecting other factors, fertility will be total marital fertility rate (TM)

$$TM = C_c * C_a * TNM \quad (2l)$$

With inhibiting effects of all proximate determinants present, a population actual level of fertility is observed, measured by the total fertility rate (TFR)

$$TFR = C_m * Tm \quad (2m)$$

Therefore, the difference between TF and TNM represents the impact of post-partum infecundability or breastfeeding , while the difference between TNM and TM represents the impact of deliberate marital fertility control, i.e contraception and induced abortion, and the difference between TM and TFR represents the impact of marriage on fertility.

The impact of proximate determinants on fertility can alternatively be calculated using the equation shown here below.

$$Z = I * \log Xi/Y \quad \text{where}$$

Z -fertility-inhibiting effect of determinant being estimated.

I- total fertility-inhibition by all determinants.

Xi -index of determinant being estimated.

Y - sum of logarithms of all indexes.

The data required for this model to be applied are those related in estimation of all the indices. The relevant indices and their data requirement are as follows:

C_m : Age specific proportions married, m(a), and age specific marital fertility rates g(a) obtained from :total female population in each five - year age group, the total female population of married women in each five-year age group and the total births in the last year by five-year age groups of married mothers.

C_c : Age- and method-specific proportions currently contracepting among married women, and age- and method -specific effectiveness levels of contraception. The proportion currently contracepting among married women and method- specific effectiveness levels from contemporary countries can be used .This information is obtained from the total number of married women who are using each modern contraceptive method with relevant use effectiveness.

C_i : Average duration of lactational infecundability (i) which is obtained from knowing ; total number of women who are currently breastfeeding to the total number of births which occurred 0 to 35 months before the survey and total number of births which occurred exactly 36 months before the survey.

2.4.2 **Weakness of the Bongaarts model.**

Total fertility rate obtained using Bongaarts model is not a true estimate but the main objective is to quantify the fertility effects of the different main intermediate fertility variables. Some of the errors associated with the model are:

(1) Errors in the measurements of the intermediate fertility variables.

(2) Errors in the specification of the model. To arrive at a simple analytic model for the relationship between fertility and the intermediate fertility variables, a number of simplifying assumptions had to be made. These assumptions make the model less than 100 percent accurate.

(3) Deviations from the total fecundity value of 15.3. The total fecundity rate is a function of the three intermediate fertility variables not included in the model; fecundability, intrauterine mortality and the prevalence of

permanent sterility. While the variations in these variables may be relatively small, they are not zero. As a consequence,the assumption that TF=15.3 is only an approximation.

(4) Induced abortion is assumed absent.If incorrect,this assumption results in an upward bias in the model estimates of TFR.

Each of these error components contributes to the fertility variance not explained by the four principal intermediate fertility variables. The contribution of each of these errors is relatively small to cause significant variation in total fertility. In fact some of the errors cancel each other.

2.5 Tabulations

The task of analysis using this method is the determination of the basic distributional characteristics of respondents by each of the variables. Frequency distribution and cross-tabulation are the techniques used. In this study some tables were used to show the association of some proximate determinants and some variables like education. In some cases it was used to show the spread out of a determinant. In all tables were used to display the results of the study.

2.6 The Coale and Trussel P/F technique.

The Coale-Trussell P/F technique is used in this study for comparison purposes. This method is more refined than other methods that could have been been used.

The Coale-Trussell P/F technique seeks to adjust the level of observed age-specific fertility rates, which are assumed to represent the true age pattern of fertility, to agree with the level of fertility indicated by the average parities of women in age groups lower than ages 30 and 35, which are taken to be accurate. Ratios of average parities (P) to the estimated parity equivalents (F) are calculated by age group, and an average of the ratios obtained for younger women is used as an adjustment factor by which all the observed period fertility rates are multiplied. P/F ratios are calculated for all age groups even though not all the ratios are used for adjustment purposes.

This technique assumes that the pattern of fertility has been constant in the past thus the method is inappropriate if there have been recent changes in marital fertility or ages at marriage. The age pattern of the period fertility rates is combined with the level implied by the average parities of younger women to derive a set of fertility rates that are generally more reliable than either of its constituent parts

(b) Data required

(i) Total number of children ever born by five-year age group of the mother.

(ii) Total number of children born during the year preceding the survey by five-year age group.

(iii) Total number of women in each five-year age group(irrespective of marital status)

(c) Computational procedure

The computation of the total fertility rate using Coal-Trussell technique involves six major steps which are; calculation of reported average parities, calculation of total fertility rates using births in the last year, calculation of cumulated fertility schedule for a period, estimation of average parity equivalents for a period, calculation of a fertility schedule for conventional five-year age groups and adjustment of period fertility schedule.

The reported average parity of women in age group (i) denoted by P(i) is obtained by dividing the total number of children ever born to women in that age group by total number of women in that age group. The age-specific fertility rates denoted by f(i), are obtained by dividing the number of births occurring to women in age group (i) during the year preceding the interview by the total number of women in that age group.

computation of cumulated fertility schedule for a period denoted by Q(i) is obtained by adding the age-specific fertility rates computed previously or in steps from f(1) to f(i).

$$\text{Hence} \quad Q(i) = 5.\sum_{j=1}^{i} f(j) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2n)$$

Average parity equivalents ,F(i), are estimated by interpolation using the period fertility rates f(i) and the cumulated fertility values Q(i) calculated in previous steps above. The interpolation equation used is

$$F(i)=Q(i)+a(i) \times f(i)+b(i) \times f(i+1)+c(i) \times Q(7) \ldots\ldots(2o)$$

where i=1,2,3,4, ...7.

a,b and c are constants.

for instance F(7)=Q(6)+a(7)f(7)+b(7)f(6)+c(7)Q(7)

Table 2.1 Coefficient for interpolation between cumulated fertility rates to estimate parity equivalents.

Age group 1	Index (i) 2	a(i) 3	b(i) 4	c(i) 5
15-19	1	2.531	-0.188	0.0024
20-24	2	3.321	-0.754	0.0161
25-29	3	3.265	-0.627	0.0145
30-34	4	3.445	-0.563	0.0029
35-39	5	3.518	-0.763	0.0006
40-44	6	3.862	-2.481	0.0001
45-49	7	0.392	2.608	0.0000

Source:UN Manual X, 1983, P. 34

when age-specific fertility rates have been calculated from births in a 12-months period classified by age of mother at the end of the period, they are specific for unorthodox age groups that are shifted by six months. A fertility schedule for conventional five-year age groups $f^{+}(i)$ can be estimated by weighting the rates referring to unorthodox age group according to equations (2p) and (2q) and using the coefficients displayed in table 2.2 below.

$$f^{+}(i)=(i-w)(i-1)f(i)+w(i)f(i+1)\ldots\ldots\ldots\ldots\ldots\ldots(2p)$$

where $f(i)$ and $f^{+}(i)$ are respectively the unadjusted and the adjusted age specific fertility rates.

W(i)is calculated as:

$$w(i)=x(i)+y(i)f(i)/Q(7)+z(i)f(i+1)/Q(7)\ldots\ldots\ldots(2q)$$

Table 2.2 Coefficients for calculation of weighting factors to estimate age- specific fertility rates for conventional age groups shifted by six months.

Age group 1	Index (i) 2	x (i) 3	y (i) 4	z (i)
15-19	1	0.031	2.287	-0.114
20-24	2	0.068	0.999	-0.233
25-29	3	0.094	1.219	-0.977
30-34	4	0.120	1.139	-1.977
35-39	5	0.162	1.739	-3.5926
40-44	6	0.270	3.454	-21.492
45-49	7			

Source: UN, Manual X, 1983,p.34.

The adjustment factor is obtained by dividing P(i) by F(i) and if

P(2)/P(2) and P(3)/P(3) are reasonably consistent then either of them can be used as the adjustment factor.If they are not very similar, a weighted average of the two can be used.

Once an adjustment factor has been chosen, which can be denoted by k, an adjusted fertility schedule is computed by multiplying the fertility rates for conventional age groups, $f^{+}(i)$ by k.

$$f^{*}=kf^{+}(i)$$

The total fertility rate is then calculated as;

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

CHAPTER 3

ESTIMATION OF TOTAL FERTILITY RATE IN NAIROBI USING KDHS DATA

3.1 INTRODUCTION

In this chapter analysis of KDHS data of Nairobi only is carried out using Bongaarts model and Coale -Trussell P/F technique.The total fertility rate of Nairobi area is known to be among the lowest as compared to other provinces. As per the study in Cairo Demographic Centre the total fertility rate of Nairobi was 4.4.The purpose of this chapter is to highlight this fertility level.

The effect of socio-economic and cultural factors on fertility is analyzed with specific reference to education and ethnic group. These two factors are the only ones considered in this chapter to assess their effects on proximate determinants of fertility and hence fertility.

3.2 Female population interviewed in Nairobi.

The Kenya Demographic and Health Survey (KDHS) conducted in 1989 covered a total of 524 female population in Nairobi City. This was a small sample size compared to the total population of Nairobi which is well above one million plus. More respondents could have been covered. The distribution of the above women by age-specific age group is as shown below:

Table 3.1 Female population by age-specific group and marital status.

Age	Total women	Total married women	% married
15-19	113	28	28.76
20-24	139	87	62.59
25-29	104	74	71.12
30-34	75	55	73.33
35-39	47	33	70.21
40-44	32	25	78.13
45-49	14	10	71.14
TOTAL	524	312	

It can be seen from the table that most women in Nairobi are aged 20-24 years. This is an active age whereby most people are looking for jobs and with the notion that urban centres are the most likely place to acquire one, the influx to these places is high. The proportion married high after age 24.

Table 3.2 Female population by education and ethnic group.

Education	No. of women
No education	47
Primary	248
Secondary	220
Luhya	107
Kikuyu/Kamba	250
Luo	134
Others	23

The number of women with education in Nairobi are few meaning that they migrate when they had gone to school. Nonetheless they had only managed to reach primary as is shown by the high number.

In term of ethnic group the Kikuyu and Kamba combined are the majority in Nairobi. This is true but when it come to specific estates in Nairobi this is not the case . In some estate one ethnic group dominate while others are negligible.

3.3 Application of Bongaarts model.

The Bongaarts model gives total fertility rate that is determined by natural fertility inhibited by non-marriage, contraception, lactational infecundability and sterility. Sterility is included in here for the purpose of ascertaining its effect on the fertility level. The values of all these indexes vary from 0 to 1 showing that the inhibiting effect is more pronounced as it approaches zero. The TFR under this model is given by :

$$TFR = C_m * C_c * C_i * C_p * TF$$

Each of these indexes is obtained as has been explained in chapter 2 and briefly below.

3.3.1 Index of contraception.

Contraception is a new means of preventing conception among married couple or any partners who wish not to have a child.

A contraceptive practice is absent or completely inefficient if $C_c = 1$. This index of contraception is obtained using the formula given below:

$C_c = 1-1.08*u*e$ where u is proportion contracepting of married women and e is use-effectiveness of contraception.

Table 3.3 Married women contracepting, contraceptive use-effectiveness and contraception index; Nairobi.

Methods	u(m)	e(m)	u(m)*e(m)
Pill	0.12	0.90	0.110
Iud	0.08	0.95	0.080
Condom	0.01	0.62	0.010
Withdrawal	0.01	0.80	0.008
Abstinence	0.04	1.00	0.040
Others	0.09	0.66	0.060
Total	0.36		0.038

$$e = \frac{\Sigma\ u(m)*e(m)}{\Sigma\ u(m)}$$

$$= \frac{0.038}{0.36}$$

$$=0.85$$

$$C_c = 1-1.08*0.85*0.36$$

$$=0.67$$

3.3.2 Index of marriage.

This index is determined by the age-specific proportion married among females. Women in the middle childbearing years contribute more to the TFR than the youngest or oldest women because age-specific marital fertility rates reach their maximum in the central childbearing ages. This is taken into account by using the weighted average of the age-specific proportions of females currently married,with the weights provided by the age-specific marital fertility rates as shown in the formula below.

$$C_m = \frac{\Sigma\ m(a)*g(a)}{\Sigma\ g(a)}$$

Table 3.4 Age-specific fertility rate, proportion of women married and total age-specific fertility rate.

Age group	ASMFR g(a)	prop. married m(a)	TASFR g(a)*m(a)
15-19	0.39	0.25	0.50
20-24	0.41	0.63	0.66
25-29	0.30	0.71	0.42
30-34	0.16	0.73	0.22
35-39	0.21	0.70	0.30
40-44	0.00	0.78	0.00
45-49	0.00	0.71	0.00
Total	1.48	4.52	2.10

From the table above age specific marital fertility rate decreases as age increases. At the age of 40 and above the fertility rate reaches zero. This means that women who were above 40 years had no births in the previous year before the survey.

Applying the formula to the above data give index of marriage shown here below:

$$C_m = \frac{\Sigma m(a)*g(a)}{\Sigma\ g(a)}$$

$$= \frac{2.10}{1.48}$$

$$=0.70$$

3.3.3 Index of postpartum infecundability C_i

Postpartum infecundability modifies the birth interval by lengthening it. The index of infecundability is denoted by Ci. C_i is calculated using the equation ,

$$\frac{20}{18.5+i} ,$$

where i is average duration of postpartum infecundability caused by breastfeeding.

This i is not readily available but it can be estimated using equation, $i=1.753\ Exp(01396B-0.001872B^2)$ where B is mean duration of breastfeeding calculated using prevalence-incidence method explained in chapter 2.

The indexes of postpartum infecundability (C_i) for various characteristics obtained from the method mentioned above are as follows;

Table 3.5 Indices of postpartum infecundability by various characteristics.

Characteristics	Indices (C_i)
Nairobi	0.68
Education	
None	0.63
Primary	0.77
Secondary plus	0.74
Ethnic group	
Kamba	0.66
Kikuyu	0.67
Luhya	0.55
Luo	0.59
Others	0.83

3.3.4 Index of sterility, C_p.

Sterility is the physiological incapacity to produce a live birth and refers only to those who have attained childbearing age. In this study the women considered to be sterile are those above 40 years of age and who have had no child. This age is considered reasonable since the woman is old enough to be expected to produce any live birth.This is purely an assumption for there are occasions in which women beyond 40 years have been reported to produce a live birth.

Sterility index is calculated using the equation ,

C_p =(7.63-0.11*S)/7.3 where S is the percentage childless of women.

S is obtained by dividing the number of married women aged 40 and above who have borne no child by total number of married women. When this equation was applied to the data from Makongeni the proportion sterile was found to be too small to affect the fertility in the estate.

The other indices for the various characteristics are similarly calculated and the results are shown in the table below.

Table 3.6 Indexes estimate of selected proximate determinants and the model estimate of the total fertility rate for various characteristics.

Characteristics	marriage index C_m	contraception index C_c	infecundability C_i	sterility index C_p	TFR
Nairobi	0.70	0.67	0.67	1	4.25
Education					
None	0.74	0.97	0.63	1	6.95
Primary	0.57	0.84	0.77	1	5.64
Seond.+	0.48	0.76	0.74	1	3.03
Ethnic group.					
Kamba	0.49	0.94	0.66	1	5.21
Kikuyu	0.64	0.81	0.67	1	4.67
Luhya	0.73	0.94	0.55	1	6.92
Luo	0.87	0.93	0.59	1	7.38
Others	0.69	0.93	0.83	0.98	8.24

3.4 Discussion of results.

The effect of proximate determinants of fertility on fertility varies with socio-economic and cultural factors existing within a population. In Nairobi as a whole breastfeeding and contraception seem to have equal impact. The duration of breastfeeding has been affected and at the time of survey 0.67 (67per cent) of the overall fertility in Nairobi was due to non-breastfeeding. Duration of breastfeeding has been reduced may be due to mothers taking up jobs far from home or because of influence of urbanization. Urban life has a negative effect on breastfeeding - both duration and intensity.

At the survey period only 67 per cent of the mothers interviewed were non contracepting leaving 33 per cent contracepting. Contraception practices is understood better in Nairobi especially by educated mothers. The proportion married in Nairobi (0.7) is attributed to the fact that most of the population are migrants who moved when they were already married. Sterility has no effect in the fertility in Nairobi.

The educational effect on proximate determinants is similarly seen. High proportion of married women are those with no education while those with secondary plus show least proportion. Contraceptive use is more pronounced among the educated mothers than those with no education. Also breastfeeding period and its associated postpartum infecundability is higher for non-educated group than those with higher education.Educated mothers are likely to take up jobs in private or public sectors which take them away from home.

The various ethnic groups vary widely in connection with each of the proximate determinants of fertility. From this study the Luo community have highest proportion married while the Kamba have the lowest. The KDHS survey targeted at women and therefore it is possible that only few women were interviewed among the Kamba community due to their small numbers. The Luhya also have high proportion of women married. In term of contraceptive use the Kikuyu and Kamba appear to be the communities that practice contraception. The Luo and the Luhya are the least users.

Postpartum infecundability is more pronounced among the Luhya and the Luo showing that most of the women are not engaged in salaried employment. The Kikuyu breastfed their infants for shorter periods almost like the Kamba community.

The effect of sterility on fertility is very insignificant in all the communities except those designated the ''other'' communities which include the Embu,the Somalia,the Kalenjin and many others.It is not known with certainty why this is so but it can be suggested that majority of these communities are not aware of venereal diseases which cause sterility.

3.5 Fertility estimation using Coale-Trussell P/F technique.

This technique is the most refined and mostly used by researchers. The method takes care of the problem of the tendency of older women to omit some of their children. The detail of this method is thoughly explained in chapter two.

Table 3.7 Female population ,children ever born and birth last year prior to survey-Nairobi.

Age group 1	Index 2	Fem. pop. 3	CEB 4	BLY 5
15-19	1	113	35	12
20-24	2	139	181	36
24-29	3	104	244	24
30-34	4	75	280	10
35-39	5	47	222	9
40-44	6	32	162	0
45-49	7	14	71	0

From this table it can be seen that female population in Nairobi is mostly young women under 30 years of age.

The application of Coale-Trussell P/F technique follows numerous steps outlined in chapter 2. Using columns (3) and (4) average parities P(i) are obtained. P(i) is computed by dividing the children ever born by the female population;

P(i) =CEB/Fpop.

For example P(2) =181/139=1.302

The values of age-specific fertility rate,f(i), are obtained by dividing the births in the last year preceding the census by the female population.

f(i) =BLY/Fpop. For instance, f(3) = 24/104=0.2308

The results for both P(i) and f(i) are shown in the table 3.8

Table 3.8 Average parities, age specific fertility rates and cumulated fertility by age group of mothers- Nairobi.

Age group (1)	Index (i) (2)	Average parity P(i) (3)	Age specific fertility rate f(i) (4)	Cumulated fertility Q(i) (5)
15-19	1	0.309734	0.10619	0.5310
20-24	2	1.302158	0.25899	1.8259
25-29	3	2.346153	0.23077	2.9797
30-34	4	3.733333	0.13333	3.6464
35-39	5	4.723404	0.19149	4.6030
40-44	6	5.062500	0.00000	4.6030
45-49	7	5.071428	0.00000	4.6030

The values of Q(i),cumulated fertility schedule are obtained by adding the values of f(i) step by step and then multiply by five at each stage.

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

$Q(3)= 5(0.10619+0.25899+0.23077)=2.97973$

The current average parity equivalent F(i), are computed using the formula:

$F(i) = Q(i-1)+a(i)*f(i)+b(i)*f(i+1)+c(i)*Q(7)$

$F(6) = Q(5)+ a(6)*f(6)+b(6)*f(7)+c(6)*Q(7)$

Where the coefficients for a(i), b(i),and c(i) are given in chapter 2.

For example $F(3)=Q(2)+3.321*0.25899+0.754*0.230769+0.0161*4.603$

$=2.56255$

and $F(7) =Q(6)+a(7)*f(6)+b(7)*f(7)$

$=4.603$

The full results are shown below .

Table 3.9 Average parities,estimated parity equivalents and P/F ratios- Nairobi.

Age group 1	Index 2	average parity per women 3	Estimated parity equivalent 4	P/F Ratio P(i)/F(i) 5
15-19	1	0.309734	0.231137	1.3400
20-24	2	1.302158	1.291211	1.0080
25-29	3	2.346153	2.56250	0.9156
30-34	4	3.733333	3.34425	1.1163
35-39	5	4.723404	4.60300	1.0927
40-44	6	5.062500	4.60300	1.0997
45-49	7	5.071428	4.60300	1.1016

Since what is being considered now is a case in which births in the past year were tabulated by age of mother at the time of census, the reported period fertility rates,f(i), need to be converted into a fertility schedule, f+(i), for conventional age groups.The converted f(i) is denoted by f+(i).The results for this conversion are shown on table 3.10.

Table 3.10 Reported period fertility rates and fertility rates for conventional age groups-Nairobi.

Age group (1)	Index (2)	Reported fertility rate f(i) (3)	w(i) (4)	fertility rates for conventional age groups f+(i) (5)	Adjusted fertilit-y rates f*(i) (6)
15-19	1	0.106194	0.090165	0.129546	0.118607
20-24	2	0.258992	0.112519	0.261606	0.239514
25-29	3	0.230769	0.126807	0.221710	0.202987
30-34	4	0.133333	0.089307	0.133527	0.122251
35-39	5	0.191489	0.234330	0.174387	0.159661
40-44	6	0.000000	0.027000	0.000000	0.000000
45-49	7	0.000000	0.000000	0.000000	0.000000

f+(i) = (1-w(i-1)*f(i)+w(i)*f(i+1)

w(i) is the weighted variable obtained using the formula shown below. w(i) = x(i)+y(i)*f(i)/Q(7)+z(i)*f(i+1)/Q(7)

x, y and z are constant given in chapter 2.

For example ,f+(1)=(1-w(0)*f(1)+(w(1)*f(2)). W is obtained using the above formula,and it was 0.090165

Hence f+(1)=1*0.106194+0.090165*0.258992 =0.360295

The values of f+(i) are shown on table 3.10 above.

In the selection of adjustment factor for the converted fertility rates obtained above , the first step was to calculate the P/F ratios. These are shown in table 3.9. The value of k was calculated by adding the P/F values and getting the mean so as to allow the use an averaged figure. k used was 0.915552. The adjusted age specific fertility rates for conventional age groups f*(i), were obtained by multiplying the f+(i) values by the adjustment factor k. Total fertility rate was estimated by multiplying the sum of the adjusted age-specific fertility rate, f*(i) by five.

$$TFR = 5\sum_{i=1}^{7} f^*(i) = 5(0.118607+..+0.159661) = 4.21510$$

Following the same procedures TFR by other characteristics were obtained as summarised below.

Table 3.11 Total fertility rates estimate by using Coale-Trussell P/F ratio technique by education and ethnic groups.

Characteristics	TFR
Nairobi	4.215
Education	
None	5.790
Primary	5.460
Secondary +	4.377
Ethnic group	
Kamba	4.520
Kikuyu	4.870
Luhya	6.960
Luo	7.400

The total fertility rate is found to be 4.2 using the P/F ratio technique. When these fertility rates are compared with those obtained using Bongaarts model they appear to be relatively the same. This shows that Bongaarts model is as well fit for fertility estimation.

Table 3.12 TFR obtained by Bongaarts model and Coale-Trussell technique compared

Characteristics	Total Fertility Rate	
	Bongaarts model	P/F ratio techn.
Nairobi	4.98	4.21
Education		
None	5.70	5.79
Primary	5.10	5.46
Secondary plus	4.10	4.37
Ethnic group		
Kamba	4.45	4.52
Kikuyu	4.83	4.87
Luhya	6.92	6.97
Luo	7.30	7.40
Others	7.90	8.00

CHAPTER 4

ESTIMATION OF TOTAL FERTILITY RATES (TFR), MAKONGENI ESTATE NAIROBI.

4.1 INTRODUCTION.

This chapter is purposely to present outcome of this study. In the first part tables of some independent variables are specifically outlined. The emphasis is mostly on the proximate determinants of fertility as this is the theme of the study. Bongaarts model is used to estimate the total fertility rate of the area (Makongeni). The fertility of women in different socio-economic status were analyzed. The ethnic groups fertility was calculated using the Bongaarts model as well.

For purely comparison reason Coale-Trussell P/F ratio was used to estimate the total fertility rate of Makongeni area as well as other women in various socio-economic position. Coale-Trussell technique is mostly representative when used in analyzing data

4.2 Some Tables.

Education is one of the important socio-economic factors that have been identified by most demographers as a lubricant to changes in most demographic issues. In fact modernization came about because of education which helped in opening up the minds of people to face reality. Excessive modernization has produced far reaching consequences especially in fertility level. With ascending levels of education the duration of breastfeeding becomes smaller and smaller to almost nil. This practice has the effect of changing the lactational infecundability of women.

Table 4.1 Mean duration of breastfeeding in months by level of mothers education.

Level of education	Mean duration of breastfeeding in months
No education	20.7
Primary education	16.8
Secondary education plus	15.5
Kikuyu/kamba	10.7/9.8
Luhya	15.4
Luo	20.6
Other (tribe)	22.7

The mean duration of breastfeeding varies with the level of education with secondary plus showing the shortest duration. Although all the figures for each level are unexpectedly high and low, they conform with the Makongeni living standard. Most mothers are just at home doing nothing apart from small businesses of selling vegetables in the "created vendors" around the estate. The most educated ones (those with secondary plus) depict a duration of 15.4 months showing that as the level of education increases breastfeeding practice is constantly abandoned in preference to bottle feeding. To quote one of the mothers interviewed in the research; " breastfeeding a child is unnecessary at this age when there is better food given in the health centres." The kind of attitude that mothers have developed towards breastfeeding is traceable to urban influence.

Table 4.2 Contraception among married women by method used - Makongeni.

Methods	Women married	Percentage
Pill	49	47.6
IUD	15	14.6
Condom	6	5.8
Withdrawal	5	4.9
Abstinence	4	3.9
Others	24	23.2
Total	103	100.0

It appears from the table above that contraceptive prevalence varies widely among the married women with the pill being the most preferred and abstinence the least. In an urban region abstinence is looked at as an unapplicable method given the fact that most of the married women live with their husbands. On average, almost a half of the users take the pill, one-sixth wear IUD, about 16per cent use either condoms, withdrawal or abstinence and the remaining one-fifth use other methods such as female sterilization, injection, foam or coil.

4.3 Application of the Bongaarts Model.

Analysis of the survey data enable us to apply the Bongaarts model of the proximate determinants of fertility. The model formulates the total fertility rate that is determined by the total fecundity that a woman could have in her life time,being inhibited by the indexes of non-marriage (C_m),contraception (C_c),lactational infecundability (C_i) and also spousal separation and induced abortion as has been explained earlier in chapter two. Application of the model is as follow:

$$TFR = TF*C_m*C_c*C_i$$

4.4 Measurement of indexes of proximate determinants.

4.4.1 Index of proportion married.

The index of proportion married is simply the ratio between the total fertility and the total marital fertility rates. In this study the women interviewed were those within ages 15-49 inclusive with no distinction of marital status. Therefore it is necessary to separate the married from non-married women. Married women include consensual unions.

The age-specific fertility rates , shown by g(a) are calculated by dividing the births in the last year of all married women interviewed by the total number of married female population. The age-specific proportion married,m(a), is calculated by dividing the number of married women in each age group by the total female population in that age group. The g(a) of age group 15-19 is high when the above method is used. It is however calculated by using a multiplication factor to adjust the age-specific marital fertility rate of age 20-24. Thus g(15-19) = .75*g(20-24).

The index of proportion married has been derived using the following formular. The results are presented in table 4.3.

$$C_m = \frac{\Sigma\ m(a)*g(a)}{\Sigma\ g(a)}$$

Table 4.3 Age-specific marital fertility rate,proportion of women married, total fertility and the index of proportion married.

Age group	Age-specific marital fertility rate g(a)	Proportion of women married m(a)	Total fertility rate g(a)*m(a)
15-19	0.4736842	0.35849056	0.169811
20-24	0.3396226	0.77372262	0.262773
25-29	0.3513513	0.81318681	0.285714
30-34	0.2000000	0.87301587	0.174603
35-39	0.2127655	0.94000000	0.200000
40-44	0.1250000	0.94176470	0.117647
45-49	0.2500000	0.66666667	0.1666667
Total	1.9524241		1.3772160

Therefore, $C_m = \frac{\Sigma m(a)*g(a)}{\Sigma g(a)}$

$$= \frac{1.377216}{1.9524241}$$

$$= 0.70538$$

4.4.2 Index of contraception.

The index of contraception varies inversely with prevalence and use effectiveness of contraceptive methods practised by couples in the reproductive age groups. The proportion of women using a specific methods denoted by u(m) is obtained by dividing the total number of married women using that specific method by the total number of married women. The contraceptive effectiveness denoted by e(u) is difficult to calculate and therefore in this study the figures used are those from Philippines assuming that they correspond well to the Kenya situation.

The average use-effectiveness of contraception (e) is calculated as the weighted average of the method specific use-effectiveness levels ,e(m), with the weights equal to the proportion of women.

After getting all the other necessary figures the index of contraception is calculated as:

$$C_c = 1-1.08*u*e.$$

Table 4.4 Contraceptive prevalence, contraceptive use-effectiveness and index of contraception.

Methods	Proportion using at the time of the interview u(m)	Use-effectiveness of contraceptives e(u)	e(u)*u(m)
Pill	0.127725	0.90	0.1149532
Iud	0.031152	0.95	0.0295950
Condom	0.018691	0.62	0.0115140
Withdrawal	0.012461	0.80	0.0099688
Abstinence	0.009345	1.00	0.0093457
Other	0.031152	0.66	0.0205607
Total	0.230529		0.1959376

$$e = \frac{\sum e(u)*u(m)}{\sum u(m)}$$

$$= \frac{0.1959376}{0.230529}$$

$$= 0.849945$$

$$C_c = 1-1.08*0.230529*0.849945$$

$$= 0.788387$$

4.5 Estimation of the index of non-breastfeeding (C_i) from the duration of postpartum infecundability.

Breastfeeding is the principal determinant of postpartum infecundability. Without breastfeeding the average amenorrhea interval is shortened. In other word breastfeeding is a natural contraceptive that people have. The relationship between breastfeeding and amenorrhea interval is that prolonged breastfeeding result in the extension of amenorrhea period.

Theories on this kind of relationship has been put forward and one of them is that the relationship is mainly harmonious.Amenorrhea is affected by the duration and intensity of breastfeeding. The suckling by the infant stimulates receptors in the breast nipple which is transmitted to the brain where it will cause the pituitary gland to increase or decrease production of prolactin hormone. Prolactin inhibit ovulation hence amenorrhea. Frequent suckling produces a high level of prolactin. Thus the duration of breastfeeding is seen as extending the duration of amenorrhea.

Therefore , in computing the index of lactational infecundability, the average duration of amenorrhea for the breastfeeding women need to be estimated from the survey data. This is not straight forward since at the time of the interview some of the respondents were still breastfeeding and they will continue the process for sometime. Although some were able to tell how long they will continue braestfeeding some were completely unable hence forcing us to look for alternative method to use to accommodate everybody other than the direct method. In direct method duration of breastfeeding is obtain simply by dividing the total number of months women breastfed in a sub-group by the total number of women in that sub-group.

The method used in this study is the indirect method called the prevalence-incidence method and the detailed procedure of this method has been presented elsewhere in this study. The formula is given as p/i where p is the prevalence and i is the incidence. Incidence (i) is obtained using the equation given below:

I =1/36 (all births 0-35 months old before the survey + 1/2 of births exactly 36 months before the survey)

In Makongeni the total number of children who were 0-35 months and exactly 36 months were 230 and 42 respectively.

Thus i = 1/36 (230 +1/2 42)

= 6.9722

Prevalence (p) is the number of children who were breastfeeding at the time of the interview notwithstanding the age. There were 98 children breastfeeding. From these the mean duration of breastfeeding is given as p/i which is equal to 98/6.9722=14.632. All the other mean duration of breastfeeding were similarly calculated and summarized in the table below.

Table 4.5 Estimates of the mean duration of breastfeeding obtained using prevalence-incidence method.

sub-group	Prevalence	Incidence	Duration of breastfeeding period
Makongeni Overall	98	6.97	14.6
No education	11	0.50	21.7
Primary	23	1.42	19.0
Secondary plus	32	2.54	12.0
Kikuyu/ Kamba	10 / 9	0.93/0.92	9.82/10.75
Luhya	29	2.33	12.43
Luo	43	2.75	15.64
Other communities	6	0.26	22.74

The index of postpartum infecundability is obtained as has been explained in the other chapers and shown by the following formula:

$C_i = \frac{20}{18.5+i}$, where i is the mean duration of postpartum infecundability in months obtained using equation

$i=1.753 \ Exp(0.1396B-0.00187B^2)$ where B is the mean duration of breastfeeding previously calculated by the prevalence - incidence method. In Makongeni the mean duration of breastfeeding was 9.0545 giving Ci to be ;

$$C_i = \frac{20}{18.5+9.0545}$$
$$=0.725832$$

Other indexes of postpartum infecundability were similarly calculated and the results obtained are summarized here below.

Table 4.6 Indices of postpartum infecundability obtained by method discussed above.

Sub-group	Indexes
Makongeni (Overall)	0.725832
No education	0.626880
Primary	0.764665
Secondary plus	0.626880
Kikuyu/Kamba	0.805/0.8242
Luhya	0.770939
Luo	0.705713
Kikuyu	0.805472
Other communities	0.581042

4.5.1 Estimation of Total Fertility Rates.

Using all the above indices the total fertility rates obtained were as shown in table 4.7;

Table 4.7 Estimate of the indexes of the selected proximate determinants and the model estimate of the total fertility rate for various sub-groups.

Sub-group	Index of marriage C_m	Index of contraception C_c	Index of postpartum infecundability, C_i	Total fertility rate, TFR
Makongeni overall	0.705387	0.788387	0.725832	6.175
Education				
None	0.858691	0.835470	0.626880	6.864
Primary	0.855601	0.722835	0.764666	6.680
Secondary	0.751753	0.709285	0.626880	5.114
Ethnic group				
Kikuyu/ Kamba	0.58/0.6	0.71/0.6	0.81/0.8	5.1/5.5
Luhya	0.846799	0.675312	0.770939	6.745
Luo	0.954293	0.744721	0.705713	7.673
Other communities	1.000000	0.758800	0.581042	6.745

The overall total fertility for Makongeni obtained using the proximate determinant fertility is 6.2. This is in line with our expectation since Makongeni is in urban area where women's fertility is significantly influenced by modernization. Despite the fact that marriage has not undergone drastic changes, most of the inhabitants of Makongeni are migrants who have had stable families before moving there or had not married.

Apparently sterility has no effect on fertility in Makongeni estate thus confirming the assumption stated earlier.Only 10 women had had no children(2.5) . Sterility will not be considered as a determinant of fertility.

4.6 Fertility estimation using Coale-Trussell P/F technique.

The estimate of total fertility rates using this method involves numerous closely related calculations but the initial and important requirement is format and well organised step by step approach. As highlighted earlier in chapter two the base data are: the number of women interviewed, number of children ever born and number of children born in the year preceding the survey as shown in table 4.9.

Table 4.9 Births last year and children ever born by age group of mother.

Age group (i)	Index (i)	Number of women (2)	Children ever born (3)	Birth last year (4)
15-19	1	53	36	9
20-24	2	137	220	36
25-29	3	91	251	26
30-34	4	63	281	13
35-39	5	50	265	11
40-44	6	17	89	2
45-49	7	6	38	1

To calculate reported average parities, p(i), the fertility schedule, f(i) and cumulated fertility, Q(i) the procedure is well outline in chapter two. The results are shown in table 4.10.

Table 4.10 Average parities,period fertility rate and cumulated fertility by five year age group of mother.

Age group	Index (i)	Average parities per woman p(i)	Period fertility rate f(i)	cumulated fertility rate Q(i)
15-19	1	0.679245	0.109811	0.546780
20-24	2	1.605839	0.262773	0.849056
25-29	3	2.758241	0.285714	2.162925
30-34	4	4.460317	0.206349	3.591496
35-39	5	5.300000	0.220000	4.623242
40-44	6	5.235294	0.176470	5.723242
45-49	7	6.333333	0.166667	6.311477

The fertility schedule for conventional five year age group is obtained by using some constants. The f(i) is converted into fertility schedule, f^{+} . The conversion is done using the equations given earlier.

$$w(i)= x(i)+y(i)*f(i)/Q7+z(i)*f(i+1)/Q7$$

where w is a weighted variable.

$$w(1) =0.031+2.287*0.109811/6.311477+0.114*0.262773/6.311477$$
$$=0.089548$$

Thus, $f^{+}(i)=(1-w(i-1))f(i)+w(i)*f(i+1)$

$$f^{+}(1)= 1*0.109811+0.089548*0.262773$$
$$=0.193342$$

$$f^{+}(7)=(1-w(6))f(7), =(1+0.76449)0.16666 =0.195764$$

The first step in selecting an adjustment factor k for the converted fertility rates obtained above is to calculate the P/F ratios. P/F ratio is obtained by dividing average parity by parity equivalent.

Table 4.11 **Parity equivalents, weighted variable, fertility rate for conventional age groups, P/F ratios and adjusted fertility rate.**

Age group	Index (i)	Parity equivalent $F(i)$	Weighted variables $w(i)$	Fertility rate conventional $f^{+}(i)$	P/F ratio $\frac{P(i)}{F(i)}$	Adjusted fertility rate $f^{*}(i)$
15-19	1	0.39753	0.08955	0.19334	1.70863	0.17371
20-24	2	1.62133	0.09542	0.26651	0.99045	0.23944
25-29	3	3.07000	0.11453	0.28208	0.89845	0.25344
30-34	4	4.19861	0.10575	0.20598	1.06233	0.18506
35-39	5	5.31172	0.15640	0.21513	0.99779	0.19329
40-44	6	5.76381	-0.17460	0.07015	0.90837	0.06303
45-49	7	6.76449	-	0.19576	0.93626	0.17588

The adjustment factor (k) was obtained by averaging the values P2/F2, P3/F3 which was equal to 0.898449.

Adjusted age-specific fertility rates for conventional age groups $f^{*}(i)$,was obtained by multiplying the $f^{+}(i)$ value by the adjustment factor k - $f^{*}=k*f^{+}$. The values of $f^{*}(i)$ are shown in the table 3.11.

Total fertility rates (TFR) for Makongeni and other sub-groups were estimated by multiplying the sum of the adjusted age-specific fertility rates ,f^*, by five. For example, the TFR for Makongeni was derived as follows:

$$TFR = 5\sum_{i=1}^{7} f^*(i)$$
$$=5(0.173708+0.239443+....0.175884)$$
$$=6.419$$

Table 4.12 Total fertility estimate obtained through Coale-Trussell P/F ratio technique.

Sub-group	TFR
Makongeni (overall)	6.419
Education	
No education	6.921
Primary	6.478
Secondary plus	5.391
Ethnic group	
Kikuyu/Kamba	5.145/4.92
Luhya	7.350
Luo	7.808
Other communities	7.109

4.7 Comparison of Estimates derived from using Bongaarts Model and Coale Trussell P/F Ratio Technique.

Table 4.13 Fertility levels obtained using Bongaarts model and Coale Trussell P/F ratio technique.

Sub-group	Bongaarts model TFR	P/F ratio technique
Makongeni (overall)	6.175	6.419
Education		
No education	6.864	6.921
Primary	6.680	6.779
Secondary plus	5.114	5.391
Ethnic group		
Kikuyu/Kamba	5.094/5.065	5.145/4.9
Luhya	6.745	7.350
Luo	7.673	7.808
Other community	6.745	7.689

The overall total fertility rate from the two methods are not far from each other confirming that the Bongaarts model estimates are relatively correct.Although no one can rule out the unsuitability of the P/F method to small sample size there is some consistency in the results. The Bongaarts model has been applied by several researchers whose results have confirmed those obtained by other methods (Komba and Kamuzora 1986 and Shaoxian Wang et al 1982). These studies and others have confirmed the suitability of the Bongaarts model in fertility estimation. Not only is the method suitable,but it gives the trend of fertility levels in relation to social development.

The fertility level of over 6 children per woman in Makongeni estate is not unexpected when compared to what Omwagwa (1985) obtained. In his study he found fertility level of over 8. This was the results using the 1979 census data.The present fertility shows a lower level which can be attributed to the rapid socio-economic changes that have taken place since 1979. Makongeni is an estate in Nairobi and the people are expose to various life style. Due to this they change their attitude towards life and has been shown by the rate they accept contraceptives. Most women know some contraceptives and some use them.

4.8 IMPACT OF PROXIMATE DETERMINANTS ON FERTILITY.

One of the objective of this study was to find the effect of each proximate determinant on the fertility reduction. This in fact is the main reason for applying the Bongaarts model.Bongaarts identifies a small number of conceptually distinct and qualitatively important intermediate fertility variables. In this way the fertility-inhibiting effects of the proximate determinants shown by the indexes of non-marriage, contraception and non-breastfeeding can be estimated.

The fertility level of Makongeni obtained using Bongaarts model indicates that despite urbanization fertility was still being controlled by strong fertility-inhibiting effects of non-marriage, contraception and breastfeeding. Breastfeeding is a natural form of contraception. That the overall fertility of Makongeni was 6.1 indicates how these determinants contribute to fertility reduction. But it should not be forgotten that proximate determinants respond to the same general set of factors differently. With modernization coupled with urbanization it is expected that breastfeeding will be shortened to the disadvantage of high fertility rate while contraception is suppose to increase. An evaluation of the contribution of each of these proximate determinants to fertility reduction is essential if we are to understand fertility behaviour and prescribe appropriate intervention programmes and policies.

4.8.1 Discussion of various indexes.

The indexes obtained were as shown below;

Table 4.14 **Summary of estimates of proximate determinants in Makongeni Estate.**

Sub-group	C_m	C_c	C_i
Makongeni (overall)	0.705387	0.788387	0.725832
Education			
None	0.858691	0.833470	0.62688
Primary	0.798615	0.772835	0.76467
Secondary plus	0.751753	0.707029	0.75602
Ethnic group			
Kikuyu/ Kamba	0.580268/ 0.633618	0.71245/ 0.633856	0.805472/ 0.824294
Luhya	0.846799	0.675312	0.770939
Luo	0.954293	0.744721	0.705713
Other tribes	1.000000	0.758800	0.581042

From the above table it is seen that the overall fertility level in Makongeni is the outcome of all the three proximate determinants. The index of proportion married (0.705387) appears to have the greatest fertility -inhibiting effect, followed by lactational infecundability (0.725832). The index of contraception is low suggesting that most of the residents still hold to the traditional values. Generally, all the indices have a role in the fertility reduction.

When the indices are analyzed by the various factors it appears that the general accepted views of other researchers hold. For instance the indices for the group with no education indicate that breastfeeding and marriage patterns still play a major role in fertility-inhibition. This implies that married women with no education experience high marital fertility and low contraception rate. Education therefore prepares a woman to adopt new programmes quickly.

The various ethnic groups which were only represented by four major tribes and the rest classified as "others" show that cultural background and customs have a major role in the determination of fertility levels. The Luo have one of the highest index of proportion married apart from those designated as "others". Hence the the contribution of marriage to fertility-inhibition is quite low and insignificant. The Kikuyu community seems to have lowest index of proportion married among all the ethnic groups. Contraception is highest among the Kamba followed by the Luhya. This is not in line with what is known in practice whereby the Kamba are supposed to have lower use of contraception than the Kikuyu.Worse still is the fact that Luhya community contracept more than the Kikuyu. However, given that this is an urban area each community is exposed to family planning unlike in the rural areas where accessibility varies from region to region. The incidence of breastfeeding is changing very fast among the Kambas and the Kikuyus where it is decreasing.

4.8.2 Assessing the contribution of each proximate determinant.

In this part the contribution of each determinants is calculated so as to give the impact of each. If contraception and induced abortion is assumed to be absent the total marital fertility rate is obtained as :

$$TNM = C_i * TF \text{ ,where TF is total fecundity.}$$

In Makongeni TNM = 0.725832*15.3

= 11.10523

In the present of non-marriage the fertility is reduced to 10.7924.

Cm*TF=0.705387*15.3 =10.7924

While fertility is reduced to 12.06 if contraception is the only factor considered: Cc *TF =0788387*15.3=12.06.

From the above consideration it seen that non-marriage is most important factor in fertility reduction.

If the fertility-inhibiting effect of non-marriage is removed the fertility obtained is total marital fertility rate :

$$TM = C_c * TNM$$

$$=0.788387*11.105 \quad =8.755.$$

With inhibiting effects of all proximate determinants present a population actual fertility is given by:

$$TFR = C_m * TM$$

=0.705387*9.259 =6.175

The difference between TNM and TF shows the impact of breastfeeding, while the difference between TM and TNM shows the impact of contraception and the difference between TFR and TM shows the impact of marriage on fertility. The breastfeeding fertility reduction is therefore 15.3-11.105=4.195, while for contraception 11.105-8.755=2.35 and for marriage 8.755-6.176=2.579.This can be shown as percentage as follow:

Breastfeeding =4.195/15.3*100 =27.4 per cent

Contraception =2.35/11.105*100=21.2 per cent

Contraception =2.579/8.755*100=29.5 per cent

Using the procedure above the rest of sub-groups were likewise calculated and summarized as shown below.

Table 4.15 Actual fertility-inhibiting effect and percentage reduction of the proximate determinants.

Sub-group	Cm		Cc		Ci	
	Reduc. in No.	% Reduct.	Reduct. in No.	% Reduct.	Reduc. in No.	% Reduct.
Makongeni	2.6	29.5	2.35	21.2	4.195	27.4
No educa.	1.1	14.1	1.597	16.7	5.709	37.3
Pri. 1-4	1.2	14.7	2.708	21.5	3.546	23.3
Pri. 5-8	2.3	25.5	2.782	23.9	3.655	23.9
Sec.+	1.7	24.8	2.788	29.1	2.708	17.7
Kamba	2.3	29.3	4.618	36.7	2.688	17.6
Luhya	1.2	15.3	2.829	26.5	3.505	22.9
Luo	0.4	4.6	2.756	25.5	4.503	29.9
Kikuyu	3.7	42.0	3.544	28.8	2.976	19.5
Others	0	0	2.145	24.1	6.410	42.0

In Makongeni estate the index of proportion married contributes the highest percentage (29.5 per cent) in the fertility reduction. Although it is completely a railway residential estate and thus we expected the people there to be married because they are able to up-keep their families and are migrants, the incidence of finding a woman not married was high especially from Kamba and Kikuyu ethnic groups. Postpartum infecundability follows marriage in fertility-inhibition while contraception contributes only 21.2 per cent.

The women with no education show a small percentage among the non-married group while those with secondary plus indicate high non-marriage rate as shown by the high percentage. The incidence of breastfeeding is high in non-educated lot while it is low with secondary plus group. However , contraceptive use is quite low among the non-educated group as compared to the educated ones.

Among the ethnic groups the lowest index of proportion married is portrayed by luo community . In fact it was also found out that polygamous marriage was common with this community. The Kikuyu have the highest incidence of non-marriage and low level of breastfeeding period. Breastfeeding plays a crucial role in fertility reduction among the Luhya and the Luo . Contraceptive use is something new to most communities but adoption rate varies. From the research the Kamba seem to use contraceptives more than any other ethnic group .The Kikuyu follow next in the rank. This indicates that fertility reduction by this factor is effective among the Kamba and the Kikuyu though others are also experiencing some impact.

The above analysis of proximate determinant can also be done using formula : $Z = I*\log Xi/Y$ where,

Z -fertility-inhibiting effect of determinant being determined.

I- total fertility-inhibition by all determinants

Xi- Index of determinant being estimated for contribution in total fertility-inhibition.

Y- sum of logarithms of all indexes.

In Makongeni the total fertility rate using Bongaarts model is 6.175. The total inhibition is therefore 15.3-6.175 =9.125 which is represented by I in the equation. Determination of inhibition by non-marriage can be done as follow: C_m =0.705387.

$$Z = \frac{9.125 \log 0.705387}{\log 0.705387+\log 0.788387+\log 0.725832} = 3.32$$

In percentage it becomes $\frac{3.32}{9.125}$ =36.4%

Subjecting the rest to the same calculations the outcome were as shown in the table below;

Table 4.16 Portioning fertility-inhibiting effect using the above method for various subgroups.

Subgroup	Cm		Cc		Ci	
	Reduc. in No.	% reduct.	Reduc. in No.	% reduct.	Reduc. in No.	% reduc.
Makongeni	3.32	36.4	2.39	26.2	3.22	35.3
No educ.	1.60	19.0	1.90	22.7	4.92	58.2
Pri.1-4	1.70	19.9	4.03	47.2	2.81	32.9
Pri.5-8	3.05	35.0	2.82	32.4	2.82	32.4
Sec.+	4.34	42.6	3.19	31.3	2.65	26.6
Kamba	4.20	41.3	4.22	41.2	1.79	17.5
Luhya	1.70	20.3	3.90	40.9	2.72	38.7
Luo	0.52	14.7	2.90	28.7	3.85	56.5
Kikuyu	5.05	49.5	3.15	31.0	2.00	19.6
Others	0.00	0.0	2.90	33.7	5.70	66.3

The fertility-inhibiting effect obtained using this method tallies well with those of the previous one even though the levels are high in this second one . The disparity is extremely high in some cases but they show a similar trend. The non-marriage proportion is high indicating that fertility is highly reduced by this determinant.Non contraception is high among those with no education . Each of this method can be used to assess the impact of proximate determinants of fertility even though the logarithm method gives high figures hence it can be misleading in terms of policy recommendations.

CHAPTER 5

5.1 SUMMARY, CONCLUSION AND RECOMMENDATIONS

The purpose of this chapter is to give a summary and conclusion of the major findings of this study. In the first part of this section the summary and conclusion are presented. The second part gives policy recommendations that arise from the findings of the study. The last section highlights a few areas for further research.

5.2 SUMMARY AND CONCLUSION OF THE FINDINGS .

The observations made in this study have added enormously to the understanding of total fertility rate of Nairobi in general and more so of Makongeni estate. These results are of major importance to the Kenya Railway Corporation management and city planners. To railway management these findings will help them get to know the population growth in the estate and therefore adequately plan for them. The city planners will be able to plan for education facilities and health provision.Knowing the population size of Makongeni helps to know the general pattern of population in the so called "estates" in Nairobi.

The objectives of this study were:

(1) to find out fertility levels of Makongeni based on socio-economic and socio-cultural factors.

(2) to determine the contribution of each proximate determinant of fertility on fertility levels in Makongeni.

(3) to find out total fertility rate in Nairobi using KDHS data.

The data used in order to meet the stated objectives were collected by the author with the help of four research assistants in the months of November 1991 and January 1992 at Makongeni estate. Questionnaires were used by the researchers to get detailed information through interviews. A total of 417 women aged 15-49 years were successfully interviewed. For confirmation purposes secondary data from the Kenya Demographic and Health Survey of 1989 for Nairobi only were used.In KDHS a total of 524 women were included in the survey in Nairobi area.

Using the data from the two sources the demographic techniques used to estimate total fertility rates were the Bongaarts model and Coale-Trussell P/F ratio.

The findings from the analysis of KDHS data show that the total fertility rate in Nairobi is 4.2 using P/F ratio while it is 4.98 using Bongaarts model as shown in table 3.9. The two levels are close to each other though the Bongaarts model rates are high. But the Bongaarts model is able to disintegrate this fertility to various contributory levels by each proximate determinant. For instance of the 4.98 fertility level in Nairobi 0.7 is due marriage, 0.67 is due to contraception and 0.68 is a contribution of non-breastfeeding. In this way Bongaarts model is able to explain the achieved fertility level.

Mother's education plays key role in fertility determination in

Nairobi. Analysis of KDHS data reveals that mothers with no education have higher fertility rate than those with primary and above education. The two methods give almost similar total fertility rates in terms of education. However, the non-marriage effect is more pronounced among the educated women than among the uneducated ones. Marriage seems to be common among women with no education and in fact have low contraceptive practice and high duration of breastfeeding . On the other hand women with secondary education use contraceptives ,breastfeed for shorter period and have low marriage rate. In summary female education is found to be inversely related to total fertility rates in Nairobi.

The socio-cultural variable considered in this study is ethnicity. The results show that despite the fact that all the communities were staying in an urban area their fertility rates still vary.The Luo champion the list followed by the Luhya and other communities not mentioned by name. The Luo community has high proportion married, long duration of breastfeeding and low contraceptive used. The kamba tribe has low marriage though they also show high use of contraception. The Kikuyu use contraceptives more than any other community except Luhya and Kamba. However, this shows that, despite their stay in Nairobi, which is a modern city, they still carry with them their traditional beliefs and practices. Most of the tribes are known to uphold their traditional cultures regardless of where they are residing.

On the whole, Makongeni , which was the main study area, the fertility rates obtained using both Bongaarts model and P/F ratio technique were 6.175 and 6.419 respectively. The Bongaarts model further explained using the various proximate determinant of fertility how this total fertility rate was reached. It was found out that non-marriage contributes more to fertility reduction in Makongeni. In fact, in terms of percentage 29.5 per cent was due to non-marriage and 27.4 per cent was due to breastfeeding and only 21.2 per cent was due to contraception. The high percentage of non-marriage may be attributed to difficulties experienced by the urban dwellers in taking care of the families. This could have forced most men to postpone marriage. Education, for those women who have had any, has enabled them to acquire white collar jobs and be independent.

When analyzed by mothers level of education it was found out that those with no education, breastfeeding contributes 37.3 per cent in fertility reduction while non-marriage and contraception contribute only 14.1 per cent and 16.7 per cent respectively. It is apparent that with increasing level of education the contribution of breastfeeding decreases while that of non-marriage and contraception increases. With education, mothers are able to make useful decisions relating to their child birth. Female education, not only has the effect of postponing the age at first marriage, but also facilitates the use of modern methods of family planning. Education breaks the cocoon of traditional values.

The role of ethnicity in fertility reduction is also evident in Makongeni. It was found that the Luo community had the highest total fertility rate followed by the Luhya and those designated "others". The study results show that 42 per cent of fertility reduction among the Kikuyu tribe is due to non-marriage. The Kikuyu have a low proportion married compared to the Luo who only have 4.6 per cent of the fertility reduction due to non-marriage. Marriage is almost universal among the Luo community. Marriage was also found to be high in the Luhya ethnic group.

Contraceptive use was found to be highest among the Kamba followed by the Kikuyu, Luhya, Luo and "others". Thus fertility reduction due to contraception is highest among the Kamba and the Kikuyu.Though this may not be explained adequately, the Kamba and the Kikuyu have long been exposed to family planning controls and have had access to knowledge of how and importance of use. This could be that the Kikuyu got education earlier and were among the first ethnic groups to experience population pressure on availability of land. This might have forced them to reduce their total fertility rate.

Fertility reduction due to breastfeeding is seen to be high among the Luo community. The Luo mothers breastfeed their children for longer periods than any other community apart from those called 'others'. Fertility reduction in the Luo tribe was therefore found to be 29.9 per cent while it was only 17.6 per cent among the

Kamba, 19.5 per cent among the Kikuyu,22.9 per cent among the Luhya and 42 per cent among the 'others'. Breastfeeding plays a major role in fertility reduction and in fact a breastfed child is more healthy and has lower chances of dying than one who is not breastfed. Breastfeeding is a powerful inhibitor of fertility.

It can therefore be concluded that proximate determinants of fertility play a prominent role in fertility dynamics in all societies with variations in their magnitude of effect.

5.3 POLICY RECOMMENDATIONS.

The findings of this study may be useful to policy makers and interested scholars in the area of population studies. Some of the policy implications drawn from the findings include:

(1) The Kenya Railway Corporation management should look into an expansion programme for more schools, clinics and houses to cater for the expanding families as revealed by high total fertility rate.

(2) Efforts should be mounted to encourage women to appreciate importance of breastfeeding and its intensity. Not only does breastfeeding reduce TFR but it also lowers infant mortality rate.

(3) Fertility decline in Makongeni (Nairobi) can be quickly achieved by emphasising the age at first marriage particularly among ethnic groups with high TFR. This can be achieved by providing education to female which

will enable them to stay longer in school saving them from early marriage and hence early age at first birth.

(4) Double the efforts to provide effective contraceptive methods especially among those ethnic groups with low use. This can easily be met if the population is taught the available contraceptive methods as it was noticed that majority of them didn't know most of the methods. Educating the people at the estate is commendable.Family planning unit in the estate (Makongeni) is necessary.

(5) A measure to increase the educational status of various ethnic groups right in their home area is necessary. This will make them become conscious of modern ways of life and it will also change their traditional values of large family sizes both in urban and rural areas.

5.4 RECOMMENDATIONS FOR FURTHER RESEARCH.

This research was a micro-level study, done in an estate - Makongeni. It is essential that other similar studies are done in various estates especially those which have high fertility rates. This will show how the proximate fertility determinants contribute to the overall fertility rate of those etates.

This study considers only two variables, education and ethnicity, meaning that a further research on wide base variables is necessary.From it ample detailed information can be obtained.

A study on why marriage is declining in Nairobi (Makongeni) is worth carrying out.

Elements of Demography ... Sons.

... of the ...

... and biology.

... Studies in population ...

... framework for analyzing the proximate ...

fertility. Population Research ...

B... J. (1979)

... fertility impact of traditional and changing ...

... practices in Tropical Africa. Working ...

... Center for Policy Studies. Population ... New

... B. and Page H. J. ...

The proximate determinants of fertility and their ...

effect on fertility patterns; an illustrative analysis

Bibliography

Adelman, I. (1963)

'An Economic Analysis of Population Growth'.

American Economic Review, vol. 53 part II

Anker R. and Knowles J . C . (1982)

Human fertility in Kenya, World Ement Programme

Research, Draft Geneva , ILO.

Blake,J. 1968.

Are BabiesConsumers Durables?

Population studies vol.20 pp. 19-20.

Bogue, D.J. (1969)

Principles of Demography, New York, John Wiley and Sons. inc.Bongaarts J. and Potter R. G. (1983)

Analysis of the proximate determinants; fertility, behaviour and biology.

Studies in population , New York Academic press.

Bongaarts J. (1978)

A framework for analyzing the proximate determinants of fertility. Population Research Laboratory.

Bongaarts J. (1979)

The fertility impact of traditional and changing child spacing practices in Tropical Africa. Working Paper No. 42, Center for Policy Studies. Population Council, New York.Ferry B. and Page H. J.

The proximate determinants of fertility and their effect on fertility patterns; an illustrative analysis applied to Kenya. World Fertility Survey Scientific Reports No. 71 Voorburg Internal Statistical Institute, Netherlands.

Bongaarts J.(1977)

A dynamic model of the reproduction process, population studies.

Bongaarts,J and Menken, J.(1977)

Reproductive models in the study of nutrtion-fertility interrelationships.

Bongaart, J. Burch, T. and Wachter, K. (1986)

Family demography, methods and their application.

Bongaarts, J. and Kirmeyer (1982)

"Estimating the impact of contraceptive prevalence on fertility: Aggregate and Age-Specific versions of a model". in the role of surveys in the analysis of family planning programmes.

Cadwell, J and McDonal P. (1981)

Influence of maternal education on infant and child mortality. International Population Conference, Manila, Vol. 2, Liege: International Union for the Scientific Study of Population.

Cairo Demographic Centre (CDC) 1981 seminar

Determinants of fertility in some African and Asian countries.

Central Bureau of Statistcs (1980).

Kenya Fertility Survey 1977-78.

First Report Vol. 1

Chen,L.C. et al (1974)

A Prospective Study of Birth Interval Dynamic in Rural Bangladesh.

Cochrane,S.H. (1979)

Fertility and education,what do we really know?IBRD, occassional papers, no.26, John Hopkins,University Press Baltimore.

Federick, J. and Adelstein, P. (1973)

Influence of pregnancy spacing on the outcome of pregnancy.

Gaisie S. K. (1984)

The proximate determinants of fertility in Ghana. Scientific Reports No. 53. Voorburg, Internal Statistical Institute, Netherlands.

Gasana , G.R. (1985)

fertility in Nairobi:levels, differentials and norms.

Jain, A.K. and Sun, T.H. (1972)

"Inter-relationship between socio-demographic factors, lactation and postpartum amenrrhea." Demographic :7.

Jain, A.K. (1970)

'Demographic Aspects of Lactation and Postpartum Amenorrhea,' Demography,7,2.

Jain, A.K. and Sun, T.H. (1972)

Inter-relationship between socio-demographic factors, lactation and postpartum amenorrhea." Demography:7.

Jelliffe,D. B. and Jelliffe, E.F.P. (1972)

Human milk inthe modern world.Psycho-social, Nutritional and Economic Significance. Oxford Press.Komba A. S. and Kamuzora C. L. (1988)

Fertility reduction due to non-marriage and lactation; A case study of Kibaha District ,Tanzania. Africa Population Conference, Vol. 1 Dakar , IUSSP, UAPS.

Kalule-Sabiti (1984)

Proximate determinants of fertility applied to data from the Kenya Fertility Survey (1977/78). Journal of Biological Science 16, WFS, Internal Statistical Institute, London.

Laing,J. (1978)

Estimating the effects of contraceptive use on fertility. **Studies in family planning**, Vol.9,no.6 p.150

Lesthaghe, R. and Page, H. (1980)

''Postpartum variables: Measurement problems, model schedules and simple relations'', population studies, vol. 34 no.1.

Nortman, D. (1980)

"Sterilization and the Birth Rate."

Studies in Family Planning, 11.

Ocholla- Ayayo and Osiemo J. A O. (1989)

Socio- cultural dynamics of fertility change and differential in Kenya .

Kenya Journal of Science Series, c.

Olusanya, P.O. 1969.

Rural/Urban fertility differentials in Western Nigeria.

Population studies,vol.23.

Omagwa (1986)

The influence of socio-economic and demographic factors on fertility levels in Nairobi.

M.Sc. thesis, Population Studies and Research Institute, University of Nairobi.

Perez, A.J. et al (1971)

"Timing and sequence of resuming ovulation and menstruation after childbirth."

Population Studies.

Ryder (1982)

Progressive fertility analysis, World fertility survey, Technical Bulletin, no.8.

Shaoxian Wang et al (1982)

Proximate determinants of fertility and policy implications in Beijing. Studies in Family Planning, Vol. 18, No. 4 July/Augst 1987.

United Nations (1973)

The determinants and consequences of population trends, Summary of Findings on Interaction of Demographic and Social Affairs, Population Studies, no. 50, New York.

Van Ginnerken, J.K. (1978)

The Impact of Prolonged Breastfeeding on Birth Interval and on Postpartum amenorrhea. Nutrition and Human Reproduction. New York.World Bank Report, (1980)

Kenya: Population and Development. A world Bank country study; East Africa Programs Department. World Bank Washington, D.C. July.

APPENDIX

FERTILITY ESTIMATION OF NAIROBI USING COALE-TRUSSELL TECHNIQUE RATIO- KDHS DATA.

Coefficients for fertility estimations.

Age group	index(i)	a(i)	b(i)	c(i)
15-19	1	2.531	-0.188	0.0024
20-24	2	3.321	-0.754	0.0161
25-29	3	3.265	-0.627	0.0145
30-34	4	3.442	-0.563	0.0029
35-39	5	3.518	-0.763	0.0006
40-44	6	3.862	-2.481	-0.0001
45-49	7	3.828	0.016	-0.0002

oup	index(i)	x(i)	y(i)	z(i)
15-19	1	0.031	2.287	0.114
20-24	2	0.068	0.999	-0.233
25-29	3	0.094	1.219	-0.977
30-34	4	0.12	1.139	-1.531
35-39	5	0.162	1.739	-3.592
40-44	6	0.27	3.454	-21.497
45-49	7			

SOME FERTILITY ESTIMATIONS BY VARIOUS CHARACTERISTICS.
NAIROBI.

AGE GROUP	INDEX	PPOP	CEB	BLY	P(i)	f(i)
15-19	1	113	35	12	0.309735	0.106195
20-24	2	139	181	36	1.302158	0.258993
25-29	3	104	244	24	2.346154	0.230769
30-34	4	75	280	10	3.733333	0.133333
35-39	5	47	222	9	4.723404	0.191489
40-44	6	32	162	0	5.0625	0
45-49	7	14	71	0	5.071429	0
		524				4.603897

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	0.231137	0.090166	0.129547	1.340045	0.118607
0.530973	1.291211	0.11252	0.261607	1.008478	0.239515
1.825937	2.562556	0.126807	0.221711	0.915552	0.202988
2.979784	3.34426	0.089308	0.133527	1.116341	0.122251
3.64645	4.322872	0.23433	0.174388	1.092654	0.159661
4.603897	4.603437	0.27	0	1.099722	0
4.603897	4.603897		0	1.101551	0

Kmean= 1.055716 K1=0.660211
K2=0.915552 Ka=0.962015
TFR=4.2109

NO EDUCATION

AGE GROUP	INDEX	PPOP	CEB	BLY	P(i)	f(i)
15-19	1	3	3	1	1	0.333333
20-24	2	8	18	1	2.25	0.125
25-29	3	11	39	1	3.545455	0.090909
30-34	4	8	26	1	3.25	0.125
35-39	5	6	40	1	6.666667	0.166667
40-44	6	7	50	0	7.142857	0
45-49	7	4	33	0	8.25	0
		47				4.204545

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	0.830258	[illegible]	0.360296	1.204446	0.49684
1.666667	2.080939	0.092662	0.106461	1.081242	0.146808
2.291667	2.571076	0.091311	0.093899	1.378977	0.129485
2.746212	3.094822	0.093174	0.129115	1.050141	0.178047
3.371212	3.960068	0.230933	0.151138	1.683473	0.208415
4.204545	4.204125	0.27	0	1.699012	0
4.204545	4.204545		0	1.962162	0

Kmean= 1.475835

K1= 1.081242

K2=1.378977 Ka=1.23011

TFR=5.79462

PRIMARY

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	64	27	6	0.421875	0.09375
20-24	2	66	101	18	1.530303	0.272727
25-29	3	43	112	5	2.604651	0.116279
30-34	4	32	163	5	5.09375	0.15625
35-39	5	24	128	3	5.333333	0.125
40-44	6	15	79	0	5.266667	0
45-49	7	4	30	0	7.5	0

Q(i)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	0.195177	0.095266	0.119732	2.161504	0.139821
0.46875	1.348305	0.13223	0.262121	1.134983	0.306103
1.832386	2.169459	0.091143	0.115145	1.200599	0.134465
2.413782	2.892297	0.116491	0.15657	1.761143	0.182841
3.195032	3.637074	0.218904	0.110439	1.46638	0.128969
3.820032	3.81965	0.27	0	1.378835	0
3.820032	3.820032		0	1.963334	0

Kmean=1.484212 K1= 0.660211 K2=1.200599

Ka=1.167791

TFR=5.4640998

SCONDARY & PLUS

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	46	8	1	0.173913	0.021739
20-24	2	64	66	13	1.03125	0.203125
25-29	3	50	102	14	2.04	0.28
30-34	4	34	97	3	2.852941	0.088235
35-39	5	15	70	1	4.666667	0.066667
40-44	6	6	39	0	6.5	0
45-49	7	5	21	0	4.2	0
		220				3.29883

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	0.024751	0.053091	0.032523	7.026383	0.043154
0.108696	0.625265	0.109737	0.223067	1.649301	0.295979
1.124321	2.03103	0.171335	0.264392	1.004416	0.35081
2.524321	2.80006	0.119525	0.081086	1.018886	0.107589
2.965497	3.20201	0.197144	0.058698	1.457418	0.077884
3.29883	3.298501	0.27	0	1.970592	0

Kmean=1.395632 K1=0.660211

K2=1.004416 Ka=1.326859 TFR=4.377082

KIKUYU

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	34	7	0	0.205882	0
20-24	2	36	49	10	1.361111	0.277778
25-29	3	32	71	5	2.21875	0.15625
30-34	4	26	91	3	3.5	0.115385
35-39	5	19	75	2	3.947368	0.105263
40-44	6	12	59	0	4.916667	0
45-49	7	4	31	0	7.75	0.
		163				3.273378

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	-0.04437	0.040674	0.011298	-4.64053	0.013376
0	0.857389	0.141653	0.288613	1.587507	0.341678
1.388889	1.874163	0.117749	0.147703	1.183862	0.17486
2.170139	2.517522	0.110916	0.113474	1.390256	0.134337
2.747062	3.119342	0.217922	0.093588	1.265449	0.110795
3.273378	3.27305	0.27	0	1.502166	0
3.273378	3.273378		0	2.367585	0

Kmcan=1.549471 K1=0.660211
K2=1.183862 Ka=1.385685 TFR=4.87227

LUHYA

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	17	5	1	0.294118	0.058824
20-24	2	26	40	9	1.538462	0.346154
25-29	3	25	54	5	2.16	0.2
30-34	4	12	40	2	3.333333	0.166667
35-39	5	10	58	3	5.8	0.3
40-44	6	5	32	0	6.4	0
45-49	7	2	21	0	0	0

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	0.096665	0.063472	0.080795	3.042644	0.065828
0. 294118	1.379162	0.123841	0.348951	1.115505	0.284312
2.024887	2.651081	0.109111	0.193417	0.814762	0.157589
	.445192	0.06971	0.169394	0.967532	0.138016
3.85822	4.916835	0.259364	0.279087	1.179621	0.22739
5.35822	5.357684	0.27	0	1.194546	0
5.35822	5.35822		0	0	0

Kmcan=0.878661 K1=1.115505
K2=0.814762 Ka=0.965133
TFR=6.965674

FERTILITY ESTIMATE OF MAKONGENI BY VARIOUS CHARACTERISTICS
USING P/F RATIO.

MAKONGENI.

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	53.00	36.00	9.00	0.68	0.17
20-24	2	137.00	220.00	36.00	1.61	0.26
25-29	3	91.00	251.00	26.00	2.76	0.29
30-34	4	63.00	281.00	13.00	4.46	0.21
35-39	5	50.00	265.00	11.00	5.30	0.22
40-44	6	17.00	89.00	2.00	5.24	0.12
45-49	7	6.00	38.00	1.00	6.33	0.17
		417.00				7.14

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0.00	0.40	0.09	0.19	1.71	0.17
0.85	1.62	0.10	0.27	0.99	0.24
2.16	3.07	0.11	0.28	0.90	0.25
3.59	4.20	0.11	0.21	1.06	0.19
4.62	5.31	0.16	0.22	1.00	0.19
5.72	5.76	-0.17	0.07	0.91	0.06
6.31	6.76		0.20	0.94	0.18

Kmean=0.97 K1=0.66 K2=0.90 Ka=0.94 TFR =6.42

NO EDUCATION

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	3.00	4.00	0.00	1.33	0.00
20-24	2	7.00	11.00	2.00	1.57	0.29
25-29	3	8.00	24.00	4.00	3.00	0.50
30-34	4	7.00	55.00	1.00	7.86	0.14
35-39	5	10.00	46.00	3.00	4.60	0.30
40-44	6	4.00	14.00	0.00	3.50	0.00
45-49	7	2.00	14.00	0.00	7.00	0.00
		41.00				6.14

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0.00	-0.04	0.04	0.01	-34.21	0.01
0.00	0.67	0.10	0.32	2.34	0.32
1.43	3.06	0.17	0.48	0.98	0.47
3.93	4.27	0.07	0.14	1.84	0.14
4.64	5.70	0.25	0.28	0.81	0.27
6.14	6.14	0.27	0.00	0.57	0.00
6.14	6.14		0.00	1.14	0.00

Kmean=1.28 K2=0.98 Ka=1.66 TFR=6.9212

SECONDARY & PLUS.

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	25.00	14.00	9.00	0.56	0.36
20-24	2	71.00	99.00	18.00	1.39	0.25
25-29	3	45.00	114.00	15.00	2.53	0.33
30-34	4	19.00	62.00	8.00	3.26	0.42
35-39	5	13.00	69.00	6.00	5.31	0.46
40-44	6	3.00	21.00	0.00	7.00	0.00
45-49	7	0.00	0.00	0.00	0.00	0.00

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0.00	0.89	0.12	0.39	0.63	0.23
1.80	2.54	0.09	0.25	0.55	0.15
3.07	4.02	0.09	0.34	0.63	0.20
4.73	5.95	0.10	0.43	0.55	0.25
6.84	8.47	0.25	0.42	0.63	0.25
9.15	9.15	0.27	0.00	0.77	0.00
9.15	9.15		0.00	0.00	0.00

Kmean=0.52 K1=0.66 K2=0.63 Ka=0.59 TFR=5.39

LUHYA

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	15	15	7	1	0.466667
20-24	2	36	48	9	1.333333	0.25
25-29	3	25	82	5	3.28	0.2
30-34	4	21	96	4	4.571429	0.190476
35-39	5	10	63	4	6.3	0.4
40-44	6	5	30	2	6	0.4
45-49	7	0	0	0	0	0
		112				9.535714

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	1.157019	0.145912	0.503145	0.86429	0.387837
2.333333	3.166308	0.089304	0.231383	0.4211	0.178356
3.583333	4.255173	0.100051	0.201197	0.770827	0.155088
4.583333	5.041406	0.07853	0.202831	0.906777	0.156347
5.535714	6.643436	0.084271	0.402297	0.948305	0.310101
7.535714	9.079561	0.414887	0.366292	0.660825	0.282347
9.535714	11.06691		0	0	0

Kmcan=0.617972 K1=0.4211 K2=0.770827 Ka=0.595963 TFR=7.350382

FERTILITY ESTIMATE USING BONGAARTS MODEL.

NAIROBI.

Non-marriage index estimation.

Age	Total women	Toyal married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	113	28	11	0.3928571	0.24778761	0.495838
20-24	139	87	36	0.4137931	0.62589928	0.661118
25-29	104	74	22	0.2972973	0.71153846	0.417823
30-34	75	55	9	0.1636364	0.73333333	0.22314
35-39	47	33	7	0.2121212	0.70212766	0.30211
40-44	32	25	0	0	0.78125	0
45-49	14	10	0	0	0.71428571	
	524	312	85	1.4797051	4.51622206	2.10003

Cm=0.704611

Contraception index

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	38	0.11838	0.9	0.1065421
iud	26	0.080997	0.95	0.076947
condom	4	0.012461	0.616	0.007676
withdrawal	2	0.006231	0.8	0.0049844
abstinence	14	0.043614	1	0.0436137
others	30	0.093458	0.66	0.0616822
	114	0.35514	4.926	0.3014455

E= 0.848807

Co= 0.674439

Ci= 0.67435

TFR= 4.255785

NO EDUCATION

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	3	2	4	2	0.66666667	3
20-24	8	3	4	1.3333333	0.375	3.555556
25-29	11	8	2	0.25	0.72727273	0.34375
30-34	8	6	3	0.5	0.75	0.666667
35-39	6	3.		0	0.5	0
40-44	7	5	0	0	0.71428571	0
45-49	4	2	13	4.0833333	3.73322511	7.555972
	47	29	26	8.1666667	7.46645022	15.13194

Cm= 0.743959

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	2	0.006231	0.9	0.0056075
iud	2	0.006231	0.95	0.005919
condom	0	0	0.616	0
withdrawal	0	0	0.8	0
abstinence	2	0.006231	1	0.0062305
others	3	0.009346	0.66	0.0061682
	9	0.028037	4.926	0.0239252

E=0.853333

Cc=0.974161

births 0-35 months 351

births 36months 14

currently breastfeeding 12

I=9.944444

1.005587 Ci=0.6302 ,TFR=6.95

PRIMARY EDUCATION

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	64	22	6	0.2727273	0.34375	0.793388
20-24	66	46	18	0.3913043	0.6969697	0.561437
25-29	43	32	5	0.15625	0.74418605	0.209961
30-34	32	26	5	0.1923077	0.8125	0.236686
35-39	24	15	3	0.2	0.625	0.32
40-44	15	10	0	0	0.66666667	0
45-49	4	3	0	0	0	0
	248		37	1.2125893	3.88907241	2.121472

Cm= 0.57157

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	18	0.056075	0.9	0.0504673
iud	10	0.031153	0.95	0.029595
condom	1	0.003115	0.616	0.001919
withdrawal	1	0.003115	0.8	0.0024922
abstinence	8	0.024922	1	0.0249221
others	19	0.05919	0.66	0.0390654
	57	0.17757	4.926	0.1484611

E= 0.83607

Cc= 0.839662

births 0-35 months 173

births 36months

currently breastfeeding 72

I=6.490141 Ci=0.767613

TFR= 5.636569

SECONDARY EDUCATION PLUS

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	46	4	1	0.25	0.08695652	2.875
20-24	64	37	13	0.3513514	0.578125	0.607743
25-29	50	34	14	0.4117647	0.68	0.605535
30-34	34	23	3	0.1304348	0.67647059	0.192817
35-39	15	14	1	0.0714286	0.93333333	0.076531
40-44	6	6	0	0	1	0
45-49	5	5	0	0	1	0
	220	123	32	1.2149794	4.95488544	4.357626

Cm= 0.48817

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	30	0.093458	0.9	0.0841121
iud	21	0.065421	0.95	0.0621495
condom	1	0.003115	0.616	0.001919
withdrawal	2	0.006231	0.8	0.0049844
abstinence	15	0.046729	1	0.046729
others	11	0.034268	0.66	0.0226168
	80	0.249221	4.926	0.2225109

E= 0.892825
Cc= 0.759688

births 0-35 months 138
births 36months 19
currently breastfeeding 49
I=4.097222 , 13.6678
Ci=0.742881,TFR=3.031564

AKAMBA

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	12	1	1	0	0.08333333	0
20-24	21	8	1	0.125	0.38095238	0.328125
25-29	12	6	3	0.5	0.5	1
30-34	10	6	1	0.1666667	0.6	0.277778
35-39	3	2	0	0	0.66666667	0
40-44	5	4	0	0	0.8	0
45-49	3	3	0	0	0	0
	66		6	0.7916667	3.03095238	1.605903

Cm= 0.492973

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	6	0.018692	0.9	0.0168224
iud	4	0.012461	0.95	0.011838
condom	0	0	0.616	0
withdrawal	1	0.003115	0.8	0.0024922
abstinence	6	0.018692	1	0.0186916
others	4	0.012461	0.66	0.0082243
	21	0.065421	4.926	0.0580685

E= 0.887619

Cc= 0.937286

births 0-35 months 17

births 36months 6

currently breastfeeding 10

I=0.555556 ,=18

Ci=0.660195 ,TFR = 5.21223

LUHYA

Age	Total women	Total marriedwomen	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	17	6	1	0	0.35294118	0
20-24	26	15	9	0.6	0.57692308	1.04
25-29	25	17	5	0.2941176	0.68	0.432526
30-34	12	8	1	0.125	0.66666667	0.1875
35-39	10	7	2	0.2857143	0.7	0.408163
40-44	5	3	0	0.125	0.6	0.1875
45-49	2	1	0	0	0	0
	97		18	1.4298319	3.57653092	2.255689

Cm= 0.733878

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	8	0.024922	0.9	0.0224299
iud	3	0.009346	0.95	0.0088785
condom	0	0	0.616	0
withdrawal	0	0	0.8	0
abstinence	3	0.009346	1	0.0093458
others	8	0.024922	0.66	0.0164486
	22	0.068536	4.926	0.0571028

E= 0.833182
Cc= 0.938329

births 0-35 months 40
births 36months 5
currently breastfeeding 30
I=1.180556 , 25.41176, Ci=0.545357
TFR=6.932873

LUO

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	37	17	5	0	0.45945946	0
20-24	41	34	8	0.2352941	0.82926829	0.283737
25-29	24	22	3	0.1363636	0.91666667	0.14876
30-34	19	17	5	0.2941176	0.89473684	0.32872
35-39	10	8	1	0.125	0.8	0.15625
40-44	4	4	0	0.2941176	1	0.32872
45-49	1	0	0	0	0	0
	136	102	22	1.084893	4.90013126	1.246187

Cm= 0.87057

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	10	0.031153	0.9	0.0280374
iud	3	0.009346	0.95	0.0088785
condom	0	0	0.616	0
withdrawal	1	0.003115	0.8	0.0024922
abstinence	5	0.015576	1	0.0155763
others	4	0.012461	0.66	0.0082243
	23	0.071651	4.926	0.0632087

E=0.882174
Cc=0.931735
births 0-35 months 67
births 36 months 7
currently breastfeeding 48 i= 1.958333, Ci=0.5946
TFR=7.379252

FERTILITY ESTIMATION USING BONGAARTS MODEL -MAKONGENI ESTATE.

Makongeni-overall

Age	Total women	Total married women	Birth last year	g(a)	m(a)	g(a)/m(a)
15-19	53	19	9	0.4736842	0.35849057	0.32921
20-24	137	106	36	0.3396226	0.77372263	0.438946
25-29	91	74	26	0.3513514	0.81318681	0.432067
30-34	63	55	11	0.2	0.87301587	0.229091
35-39	50	47	10	0.212766	0.94	0.226347
40-44	17	16	2	0.125	0.94117647	0.132813
45-49	6	4	1	0.25	0.66666667	0.375
	417	321	95	1.9524242	5.36625902	2.163473

Cm= 0.705387

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	49	0.152648	0.9	0.1373832
iud	15	0.046729	0.95	0.0443925
condom	6	0.018692	0.616	0.011514
withdrawal	5	0.015576	0.8	0.0124611
abstinence	5	0.015576	1	0.0155763
others	24	0.074766	0.66	0.0493458
	104	0.323988	4.926	0.2706729

E= 0.835442

Cc= 0.788387

Ci= 0.725832

TFR= 6.1753

NO EDUCATION

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
20-24	6	5	4	0.8	0.83333333	0.96
25-29	7	6	4	0.6666667	0.85714286	0.777778
30-34	9	8	2	0.25	0.88888889	0.28125
35-39	10	9	3	0.3333333	0.9	0.37037
40-44	4	2		0	0.5	0
45-49	2	1	0	0	0.5	0
	38	31	13	2.05	4.47936508	2.389398

Cm= 0.85869

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	2	0.006231	0.9	0.0056075
iud	0	0	0.95	0
condom	0	0	0.616	0
withdrawal	0	0	0.8	0
abstinence	1	0.003115	1	0.0031153
others	3	0.009346	0.66	0.0061682
	6	0.018692	4.926	0.014891

E=0.796667
Cc=0.83547

births 0-35 months 51
births 36months 14
currently breastfeeding 10
I=1.611111 , 6.206897 Ci=0.62688
TFR=6.864

SECONDARY EDUCATION

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	24	13	5	0.3846154	0.54166667	0.710059
20-24	59	47	16	0.3404255	0.79661017	0.427343
25-29	38	29	9	0.3103448	0.76315789	0.406659
30-34	37	34	6	0.1764706	0.91891892	0.192042
35-39	27	26	4	0.1538462	0.96296296	0.159763
40-44	10	9	0	0	0.9	0
45-49	4	3	0	0	0.75	0
	199	161	40	1.3657025	5.63331661	1.895865

Cm= 0.751753

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	26	0.080997	0.9	0.0728972
iud	9	0.028037	0.95	0.0266355
condom	3	0.009346	0.616	0.005757
withdrawal	2	0.006231	0.8	0.0049844
abstinence	2	0.006231	1	0.0062305
others	9	0.028037	0.66	0.0185047
	51	0.158879	4.926	0.1350093

E= 0.849765

Cc= 0.709285

births 0-35 months 92

births 36months 19

currently breastfeeding 55

I=2.819444 ,19.86207

Ci=0.62688

TFR=5.114

AKAMBA

Age	Total women	Total maaried women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	10	1	0	0	0.1	0
20-24	22	15	4	0.2666667	0.68181818	0.391111
25-29	16	8	3	0.375	0.5	0.75
30-34	7	6	1	0.1666667	0.85714286	0.194444
35-39	11	10	0	0	0.90909091	0
40-44	4	4	0	0	1	0
45-49	1	1	0	0	0	0
	71		8	0.8083333	4.04805195	1.335556

Cm= 0.633618

Methods	users	u(m)	c(m)	u(m)*c(m)
Pill	8	0.024922	0.9	0.0224299
iud	4	0.012461	0.95	0.011838
condom	1	0.003115	0.616	0.001919
withdrawal	0	0	0.8	0
abstinence	1	0.003115	1	0.0031153
others	4	0.012461	0.66	0.0082243
	18	0.056075	4.926	0.0475265

E=0.847556

Cc=0.633856

births 0-35 months 31

births 36months 4

currently breastfeeding 9

I=0.916667 ,9.818182

Ci=0.824294

TFR=5.065

LUO

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	24	8	4	0	0.33333333	0
20-24	46	41	15	0.3658537	0.89130435	0.41047
25-29	30	29	9	0.3103448	0.96666667	0.321046
30-34	23	22	5	0.2272727	0.95652174	0.237603
35-39	22	22	4	0.1818182	1	0.181818
40-44	6	6	1	0.2272727	1	0.237603
45-49	2	2	0	0	0	0
	153	130	38	1.3125621	5.14782609	1.388541

Cm=0.954293

Methods	users	u(m)	e(m)	u(m)*e(m)
Pill	16	0.049844	0.9	0.0448598
iud	4	0.012461	0.95	0.011838
condom	3	0.009346	0.616	0.005757
withdrawal	3	0.009346	0.8	0.0074766
abstinence	3	0.009346	1	0.0093458
others	8	0.024922	0.66	0.0164486
	37	0.115265	4.926	0.0957259

E=0.830486

Cc=0.744721

births 0-35 months 94

births 36months 10

currently breastfeeding 43

I=2.75 , 15.63636, Ci=0.705713

TFR=7.673

KIKUYU

Age	Total women	Total married women	Births last year	g(a)	m(a)	g(a)/m(a)
15-19	2	1	0	0	0.5	0
20-24	25	6	2	0.3333333	0.24	1.388889
25-29	16	11	6	0.5454545	0.6875	0.793388
30-34	10	6	0	0	0.6	0
35-39	5	4	1	0.25	0.8	0.3125
40-44	2	2	0	0	1	0
45-49	2	2	1	0	0	0
	62	32	10	1.1287879	3.8275	2.494777

Cm=0.580268

Methods	users	u(m)	e(m)	u(m)*e(m)
Pill	5	0.015576	0.9	0.0140187
iud	2	0.006231	0.95	0.005919
condom	0	0	0.616	0
withdrawal	1	0.003115	0.8	0.0024922
abstinence	0	0	1	0
others	2	0.006231	0.66	0.0041121
	10	0.031153	4.926	0.0265421

E=0.852

Cc=0.71245

Births 0-35 months 29

births 36months 9

currently breastfeeding 10

i=7.930556 , 10.74627 , Ci= 0.805472

TFR= 5.094

POPULATION STUDIES AND RESEARCH INSTITUTE

UNIVERSITY OF NAIROBI

NB ALL INFORMATION IS CONFIDENTIAL

QUESTIONNAIRE *DATE OF INTERVIEW*____________

HOUSE NO.......................

NAME OF THE WOMAN ....

NAME OF THE HUSBAND....................

1. Do you live in this house? ....

Yes........ No........

(if yes move to no. 2)

2.When did you move into this house? 1.one year ago

2.two years ago 3.three years ago 4 specify........

3. How old are you? .... years

4(i) Have you ever attended school? Yes................

No...........................

(II) What was the highest level of school you attended?

Primary...........Secondary........... University or college.................

(ii)What was the highest (standard, form) you completed at that level?.......................................(specify)

4. You come from which community?......................(specify).

5. Now we come to matters of marriage. Are you now married?

Yes..................... No.........................

If no, have you ever been married? Yes......................

No.................................

6. What is the name of your last chid? ....

7. Now I would like to ask you about events in your life since the birth of............................ (Here called in the name of the last chid). Did you breastfeed....................?

(Name of the last or recent child)Yes...........No........

Currently breastfeeding....................

8. For how long (in months) did you breastfeed him/ her?

9(i) How many months after the birth of this child did your monthly period resumed? Months.............. Period not back yet.......

(ii) How many children do you have altogether?.................._

10.(i) Do you know of any method used for family planning?

Yes...... No........

10.Are you currently using any family planning method?

Yes............ No.............

11 Which method are you using ?

Pill ....

IUD ....

Injections ....

Foam/Jelly/Diaphragm..........

Condom ....

Female Sterilization..............

Male Sterilization ....

Withdrawal........................

Other..........................

12. Has this method cause any harmful effect to your health?

Yes .... No.........