BONGAARTS' MODEL OF PROXIMATE DETERMINANTS OF FERTILITY APPLIED TO THE KENYA DEMOGRAPHIC AND HEALTH SURVEY 1989 DATA.

BY

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THIS THESIS IS SUBMITTED IN THE PARTIAL FULFILLMENT OF THE DEGREE OF MASTER OF SCIENCE (POPULATION STUDIES) IN THE POPULATION STUDIES AND RESEARCH INSTITUTE, UNIVERSITY OF NAIROBI.

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DECLARATION

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

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This thesis has been submitted for examination with our approval as University Supervisors.

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DEDICATION

To

My father, Mathias Wamalwa
and my Mother, Selina Wamalwa.

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ABSTRACT.

The reasons advanced for the difference in fertility levels in 1977 by Mosley and Kalule-Sabiti can not be the same 14 years later. That is why we found it necessary to undertake this kind of study to establish the causes of variations in fertility among subgroups in Kenya using data collected in 1989.

The major objective of this study was to explain the differences in fertility levels among the various socio-economic and socio-cultural subgroups in Kenya using the Bongaarts' model of fertility. Before this the study sort to establish the accuracy of the Bongaarts' model as a method of estimating fertility levels. This was done by comparing the fertility levels obtained using the Bongaarts' model with those obtained using the Coale-Trussell P/F technique. In this case the Coale-Trussell P/F technique was used as a standard method. The intermediate variables studied were lactation, non-marriage and contraception. We used the Bongaarts' model to estimate total fertility rate, total natural fertility and total marital fertility. To test whether or not there exists any significant difference in total fertility rates obtained using the two methods, the Pearson product moment correlation and a paired t-test were used.

The data used was the Kenya Demographic and Health Survey data of 1989. The KDHS interviewed 7,150 women aged between 15 and 49 years and 1,116 husbands whose wives were successfully interviewed.

The findings of this study indicate that among the three

variables, breastfeeding plays the most important role in reducing fertility in Kenya and that contraception plays the least role in reducing the total natural fertility. Breastfeeding, contraception and non-marriage were found to reduce the total fecundity by 36%, the total natural fertility by 18% and the total marital fertility by 26% respectively. It was established that contraception reduces total natural fertility most among the women in Nairobi; Central province; with secondary education and higher; belonging to protestant churches; of Kikuyu ethnic group and lastly among women residing in urban areas. The effect of contraception was found to be least among the women in Western and Nyanza provinces; with no education; belonging to muslim and catholic religions; of Luo ethnic group and among women living in rural areas. The study indicates that among the regions non-marriage reduces the total marital fertility most among women in Coast province and least among those in Western province. This study has also established that the effect of non-marriage on fertility increases with an increase in the level of education and that this effect is greatest among women of the Mijikenda ethnic group; of muslim religious group; women residing in urban areas. In addition the study established that it is because of contraception that women in Nairobi and Central province; those with secondary and higher education; of Kikuyu ethnic group and women in urban areas have a lower fertility rate compared to the other subgroups. Among the women in Coast province; of Mijikenda ethnic group; of muslim religion and among those in residing in the urban areas their fertility rates are low basically due to non-marriage.

When comparing the two methods of estimating fertility we found that the total fertility rates obtained using the Coale-Trussell model are abit higher than those obtained using Bongaarts' model.

From the above findings, it is recommended that breastfeeding should be promoted particularly for women of the working class and contraception use should also be encouraged since the fertility reducing effect of breastfeeding reduces with modernization. To encourage contraception use in areas such as Nyanza and Western provinces, the problem of high mortality in this regions should first be solved. For cases where modern contraceptive use is not accepted, alternative methods such as natural family planning should be introduced. Women in Coast province; of Mijikenda ethnic group and of muslim religion where fertility levels are low due to non-marriage, the study recommends that family planning programmes should give special attention to these sub-groups.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

Most fertility studies in Kenya that have been done particularly at the PSRI have concentrated on the effect of socio-economic socio-cultural and demographic factors on fertility. For example, Osiemo (1986) estimated fertility differentials at the national, provincial and district levels using the 1969 and the 1979 censuses. His study clearly showed that even with generally employed factors such as education, medical services, for rural and urban populations, there are marked differentials among districts. Mwobobia (1982), showed that the regional fertility differentials were influenced by female schooling, urbanization, age at marriage and child mortality. Ong'uti (1987), on the other hand, found out that fertility varies by education, residence, marital status, religion and regions. Omagwa (1985), found out that the major factors which influence the levels of fertility are education, mortality and in-migration. Gaitta (1982) also found out that working women were proportionately more educated and more urbanized, had late age at marriage, desired smaller family sizes and had the highest use of contraceptives. These factors are, no doubt important, but do not operate in isolation as there exist the biological or behavioural factors, called the intermediate fertility variables, through which socio-economic, cultural, or environmental variables affect fertility. Only a few studies have attempted to account for the observed fertility levels using these intermediate fertility variables.

Bongaarts', in 1978, presented a model for analyzing the relationships between intermediate fertility variables and the level of fertility. The model identifies a small number of conceptually distinct and qualitatively important intermediate fertility variables. He also demonstrated in 1982 in his paper, 'The Fertility-Inhibiting Effects of the Intermediate Fertility Variables', that differences in fertility among populations are largely due to variations in only four intermediate variables. Some of the studies that have used this Bongaarts' model to account for variations in fertility levels in Kenya includes work done by Kalule-Sabiti (1984), Mosley (1982) and Ferry (1984). These three studies used the Kenya Fertility Survey data of 1977/78 to explain how socio-economic and cultural factors affect fertility through the intermediate fertility variables. Because fertility is a dynamic element, this study used the most recent data available (the Kenya Demographic and Health Survey data, 1989), to explain how the socio-economic and cultural factors affect fertility through the proximate determinants of fertility or the intermediate fertility variables (non-marriage, non-contraception and lactation).

This chapter contains the statement of the problem, the objectives of this study, Justification of the study, the scope and the limitations of the study, literature review, the theoretical statement, the conceptual framework, and the definition of the key concepts used in the study.

1.2 Statement of the problem.

Studies already carried out in Kenya have indicated that the in Kenya, fertility levels are high and there exist quite a variation in fertility among populations. (Osiemo, 1986; Onguti, 1987; Omagwa, 1985; Mwabobia, 1982) established that fertility can be as high as 8.6 and 9.1 as it is in Western province and Bungoma district. They also established that fertility varies with the level of education, place of residence and religion, such that women with no education have the highest total fertility while those with secondary education have the lowest fertility rate. Single women had a lower fertility rate than the married women while those in the urban areas had a lower total fertility rate than there rural counterparts.

A few studies have been carried out to try and explain the above mentioned variations in fertility among populations in Kenya. Kalule-Sabiti (1984), using the Kenya Fertility Survey data, the combined effect of non-marriage, contraception and lactation reduces total fecundity rate to 7.7 in Kenya, with breast-feeding playing a major role. Kalule-Sabiti also found that the indices of proportion married and of contraception reduces as the level of education increases. This means that non-marriage and contraception are common among educated women. He also found out that urban residents have lower indices of non-marriage and contraception than rural residents, while rural residents have a lower index of lactational infecundability. This means that non-marriage and contraception are common among the urban residents and breast-feeding is practiced more and for longer periods in rural areas. Mosley (1982), using the same Kenya Fertility Survey data demonstrated how socio-economic and cultural factors operate on the intermediate variables to produce some of the major differentials in marital fertility that existed in Kenya then.

Since the role of each of these proximate determinants of fertility changes with time, the impact of lactation, non-marriage and contraception on fertility in 1977/78, as determined by Kalule-Sabiti, Mosley and Ferry, may not be the same in 1989. It becomes, therefore, necessary to undertake a study of this kind to establish the effect of these variables on fertility using the most recent data available, Kenya Demographic and Health Survey data of 1989.

1.3 Objectives.

1.3.1 The general objective.

To determine the fertility levels of the various sub-groups in Kenya and to account for the fertility levels using the Bongaarts' model.

1.3.2 Specific objectives.

(i) To estimate fertility levels of the regions, socio-economic and cultural groups using the Bongaarts' model.

(ii) To compare these results with those obtained using the Coale-

Trussell P/F ratio technique.

(iii) To establish the contribution of contraception on fertility.

(iv) To investigate the contribution of non-marriage on fertility.

(v) To determine the contribution of breast-feeding on fertility.

1.4 Justification of the study

Since this study concentrates on the contribution of each of the four proximate determinants of fertility to fertility, it is considered important because it will enable us to determine the possible causes of fertility differences in Kenya.

This study would also enable us to estimate how much one or a combination of several of the intermediate fertility variables have to be modified to obtain a given reduction in fertility. This projection of alternative paths towards a future fertility decline could be of interest to the planners and policymakers.

Apart from the above mentioned, this study will open up new areas of research for interested future researchers.

1.5 Scope & limitations of the study

Kenya, located in Eastern Africa, consists of 8 areas called provinces and 41 lower administrative units called districts. This study depends on data from The Kenya Demographic Health Survey which looked at 24 rural clusters in 13 districts, namely; Kilifi, Machakos, Meru, Nyeri, Murang'a, Kirinyaga, Kericho, Uasin Gishu, South Nyanza, Kisii, Siaya, Kakamega and Bungoma,in which a total of almost 10,000 households were interviewed. About 450 rural households were selected in each of these districts, just over 1000 households in other districts, and about 3000 households in urban areas. This study would have been more reliable and more comprehensive, had it covered all the districts in Kenya. This has been made impossible because we do not have the time and funds required for such a study and therefore we have had to rely on the Kenya Demographic and Health Survey data which covers only 13 districts. Abortion in Kenya is illegal, unacceptable and considered immoral, therefore although it is done by a few individuals, no official records do exist and respondents are normally very reluctant to answer any questions on abortion. This made it very difficult to look at the effect of abortion on fertility. This study therefore suffers from the assumption that the effect of abortion on fertility in Kenya is negligible.

1.6 Literature review

There are several approaches to the analysis of the proximate determinants of fertility. Basically, these approaches can be classified into two major groups: those that require longitudinal data and the ones that require cross-sectional data. By longitudinal data we mean the data that contains information about women for a long period of time while by cross-sectional data we mean data that contains information about women at a given time. Using this definition, the Kenya Demographic and Health Survey data falls under cross-sectional data.

Among the approaches that require longitudinal data we looked at the work advanced by Potter, Sheps, Tietze and Gaslonde while for those approaches that require cross-sectional data we looked the model that was first formulated by Davis and Blake and modified by Bongaarts' latter. Henry (1956,1957), constructed the first detailed mathematical models of the reproductive process. Following this pioneer work, the investigation of the proximate determinants was pursued during the 1960s by a number of researchers, most notably Potter, Sheps and Tietze.

Potter (1979) distinguished three main classes of contraceptive acceptance strategy: "fixed duration T" (for women counselled to accept T months after childbirth); "postamenorrheic" (for those counselled to accept directly after the first postpartum menses; and "mixed T" (for those counselled to accept T months after childbirth or after menses, whichever occurs sooner). Any two strategies may be compared by means of probability model simulating the first passage time from childbirth to next pregnancy of two cohorts of mothers identical in their fecundity and in the effectiveness and continuation with which contraception is practiced, but contrasting in their acceptance regimens. Relative efficiency is measured by mean intervals to next conception. Of particular interest is the class of mixed T strategies, which has only recently come under theoretical study. The efficiency of the mixed T rule at least equals, and usually exceeds, that of corresponding fixed duration rule.

Sheps (1964), concerned herself with models for the number and timing of a sequence of births to women living in a sexual union, thus, for what he called "couple fertility" patterns. According to her, reproductive performance of human populations results from births to couples marrying or cohabiting at different ages, of different innate fecundity, different rates of fetal loss, and different practices of family planning, breastfeeding, etc.

His study of couple reproduction is in part an effort to evaluate the effects of such variables on natality rates. Although utilizing information from other approaches to natality, students of reproductive patterns of couples have had to devise new methods of analyzing data and to assess critically the possible role of these methods in systematizing and illuminating the study of this major component of population change.

Gaslonde (1982) developed the sexual activity table (SAT) which can be included in a survey to gain information on the exposure status of each woman for each month preceding the survey over the period of interest, usually 12 months. Each woman can then be classified into one of the following exposure states for each month covered by SAT:pregnant,absence of sexual relations,sexual relations using efficient contraception,sexual relations using inefficient contraception,sexual relation using no contraception.

The immediate advantage of this approach is that it eliminates the problems associated with using marital status alone to define women exposed to sexual intercourse,since the SAT obtains information directly on exposure status.However there are some societies where such intimate questions would be unacceptable. From the data obtained from the SAT,the reducing effect of the absence of sexual relations, r_{ASR}, the reducing effect of contraceptive practice, r_{CP}, and the reducing effect of foetal mortality, r_{FM}, can be estimated using simple relationships and a model set to associate the theoretical fertility rate,p",which is defined as the rate that would have been achieved had all the women had sexual relations regularly without using any means of deliberate fertility control,either contraception or induced abortion,and is thus similar in concept to Bongaarts TNM (total natural marital fertility rate),with observed fertility rate, f.

Fertility differences among populations and trends in fertility over time can always be traced to variations in one or more of the proximate determinants. These relationship were first recognized in a now classical study by Davis and Blake (1956). Starting from the premise that reproduction involves three necessary steps of intercourse, conception, and completion of gestation, Davis and Blake identified a set 11 proximate determinants which they called "intermediate fertility variables". Much of their efforts of the earlier researchers focused on the construction of increasingly more realistic but sometimes highly complex models for the relationship between fertility and the proximate determinants of fertility. This development has continued into the 1980s and relatively simple yet quite realistic fertility models now exist. The construction of these models and their validation has been made possible by the greatly increased availability of empirical measures of the proximate variables in many populations.

The resulting improvement in the understanding of the fertility effect of the proximate variables has led to a more frequent inclusion of the proximate factors in studies of socio-economic and environmental determinants of fertility (for example, Bongaarts 1980, Cochrane 1979, Lesthaeghe, Shah and Page 1981).

Davis and Blake framework of 1956 contains 11 intermediate variables divided into three categories as follows:-

I. Factors affecting exposure to intercourse

1. Age of entry into sexual unions.

2. Permanent celibacy: proportion of women never entering sexual unions.

3. Amount of reproductive period spent after or between unions.

4. Voluntary abstinence.

5. Involuntary abstinence (from impotence, illness, unavoidable but temporary separations).

6. Coital frequency (excluding periods of abstinence).

II. Factors affecting exposure to conception.

7. Fecundity or infecundity, as affected by involuntary causes.

8. Use or non-use of contraception.

(a) By mechanical and chemical means.

(b) By other means.

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

etc).

III.Factors affecting gestation and successful parturition.

10. Fetal mortality from involuntary causes.

11. Fetal mortality from voluntary causes.

Bongaarts' (1978) improved on the davis and blake model to come up with his model which contains a set of eight intermediate variables: proportion married, contraception usage and effectiveness, prevalence of induced abortion, duration of postpartum infecundability, fecundability (or frequency of intercourse), spontaneous intrauterine mortality, prevalence of permanent sterility and duration of the fertile period. Of all these, Bongaarts' identified the first four to be the primary causes of fertility differences. He went ahead and showed that among these four, lactation plays the most important role in tropical Africa.

The model can estimate how much one or a combination of several of the intermediate fertility variables have to be modified to obtain a given reduction in fertility.

1.6.1 Application of the approaches based on cross-sectional data.

(a) In world regions in general.

Many studies have been carried out to try and explain the differences in fertility levels among populations. 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. Without breast-feeding the average amenorrhea interval is short, usually 1.5- 2 months. With increasing duration of breastfeeding, the duration of amenorrhea rises, although not at the same rate. An additional month of breastfeeding increases amenorrhea, on average, by less than one month. To summarize this relationship between breastfeeding and amenorrhea a number of curves were fitted; the best fit was provided by,

$A=1.753\exp(0.1396B-0.001872B^2)$..........(1.1)

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

B= Mean or median duration of breastfeeding in months.

For individual women the ovulation and menstrual-inhibiting effect of breastfeeding is somewhat less predictable than in the population level. This is the consequence of the fact that amenorrhea is affected not only by the duration of breastfeeding but also and perhaps most 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. In the United States of America and other modern societies one can expect to find differences in the number of children born because the desired family size varies among women and contraception is available to help achieve these objectives. In addition some women will have fewer or more than the desired number of births for the non-voluntary reasons such as the premature onset of sterility or contraceptive failure. In natural fertility populations, contraception and induced abortion are virtually absent.

Bongaarts and Kermeyer (1982), observed that on average, prevalence increases with age until a maximum in age group 30-34 and declines slightly to older ages and as noted in previous studies the patterns of different populations are similar in shape. The only significant difference appears to be the relatively high prevalence among younger women in France and United States. This presumably indicates a correspondingly greater inclination to use contraception for spacing purposes. They discussed the excess fertility in Yemen, Kenya, Syria,Jordan and Zimbabwe in 1987 and demonstrated that in some instances the explanation lies in the relatively low fertility inhibiting effects of other proximate determinants such as breastfeeding and marriage given the stage of development implied by contraceptive prevalence. Bongaarts demonstrated that differences in fertility among and between populations are mainly a function of four intermediate variables; proportion married among females, contraceptive use and effectiveness, prevalence of induced abortions and duration of post-partum infecundability. Data on the natural fertility factors (the remaining 3 variables) is available but not used in this analysis for reasons given by Bongaarts who considered them less important. Fecundability,for instance, can be estimated either directly from data on last closed or open interval or indirectly through Mosley's model and so can sterility. Primary sterility was found to be very insignificant as a fertility variable among Kenya women; about 97% of all the women interviewed had at least one pregnancy (Central Bureau of Statistics,1980). Mosley's recent analysis found higher secondary sterility (Mosley,1982), than would be expected in a healthy population.

Singh, Casterline and Cleland (1985), observed that the fertility-reducing impact of marriage and contraception is nearly always greater among women living in towns and small cities than for rural women and greater still for those living in major urban centers. The general expectation is that fertility reducing effect of marriage and contraception will increase with education but that the opposite relationship will hold for post-partum infecundability. For contraception and infecundability this expectation is fulfilled; with a few exceptions, mostly attributable to unreliable estimates based on small number of women, the effect of contraception increases monotonically with ascending levels of education and the effect of lactational infecundability decreases. In all the three regions (Africa, Asia and America) the effect of nuptiality is stronger among women with between 4-6 years of schooling than among those with between 1-3 years. The major cause of the high fertility in Kenya in the 1970s is the fast decline in breastfeeding and the slow compensating movements in contraception and nuptiality.

Goldscheider and Mosher (1988) ,on the other hand, carried out a study on religious affiliation and contraceptive usage (changing American patterns 1955-82) and found out that higher rates of sterilization was among protestants than catholics, Jews and those of no religion. Among the current users, pill ranks highest for protestants, catholics and women of no religion. Ranking next among the protestants and catholics was the condom followed by the diaphragm and intra-uterine device with the rhythm method being the least used. The pill was by far the leading method among never-married protestant and catholic women, since a larger proportion of catholics than protestants are never married.

(b) In Latin America and Asian countries

Hobcraft (1984) analyzed the World Fertility Survey and established that considerable fertility differences exist between socio-economic groups in the Dominican republic. Those with 0 to 2 years of schooling had their total fertility rate reduced to 7.19 by the four proximate determinants of fertility. While those with 3 to 5 years of schooling and 6+ years of schooling had their total fertility rate reduced to 5.87 and 3.06 respectively. According to Craft, urban residents had a total fertility rate of 3.65 while rural residents had a total fertility rate of 7.34.

Davies (1989), in his study on the components of high fertility for observed contraceptive use in North East Brazil observed that since Davies and Blake (1956) produced their seminar paper on the proximate determinants of fertility, many frameworks have been proposed, for example, Bongaarts (1978), Gaslonde (1982), and Hobcraft and Little (1984). Of these perhaps the most widely used has been the Bongaarts framework which relates the TFR to relative levels of marriages, breastfeeding, contraceptive use and induced abortion. These were designed to isolate the causes of fertility differences between societies since they represent those factors that directly affect fertility and vary across different cultures. Other proximate determinants such as natural sterility and spontaneous abortions are in general, fairly constant across populations and hence do not contribute to fertility differentials.

Nortman (1980), noted that one-third of married women of reproductive age are currently using contraception and contraceptive prevalence varies widely among countries; it is less than 10% in a number of developing countries and it reaches nearly 80% in some developed societies. Contraceptive use increased during the decade from 1965 to 1975, but the rise was so small in Pakistan that fertility is still close to natural.

(c) Africa (excluding Kenya)

Among the studies that have been carried out in Africa, Bongaarts'(1979), showed that in, tropical Africa, the large majority of women are not at risk of conceiving for prolonged periods after they have given birth. This postpartum infecundability results from the practice of lactation and postpartum abstinence from sexual relations while the prevalence and duration of lactation is not very different from that of traditional societies in other parts of the developing world. Postpartum abstinence is practiced widely and for much longer durations than is usually found in areas outside sub-saharan Africa.

biological potential fertility (total fecundity rate) to 7.8, which compared well with the reported total fertility rate and complete family size of 7.3 and 7.2 respectively-these actual figures include also the effect of contraception and abortion that might be existing in the society however minimal; thus the robustness of the Bongaarts model is shown. For the patterns of educational attainment, as no new findings have been seen except the usual positive effect of education on age at marriage, it suffices to leave it at this.

(d) **In Kenya**

A few studies have also been carried in Kenya to explain these variations in fertility levels among populations. Mosley (1977) examined the interactions of contraception and breastfeeding and found out that, although prolonged lactation has an important fertility reducing effect, it is less adequate as a birth spacing method than modern contraceptives for two reasons. First, the effectiveness of lactation during amenorrhea in preventing pregnancy is lower than that of oral contraceptives and intra-uterine device. Second, the period of protection against the risk of contraception provided by lactation is shorter than that of oral contraceptives and the intra-uterine device. The use of modern contraceptives will through prolonging birth-spacing naturally facilitate and support longer breastfeeding.

Using the Kenya Fertility Survey data of 1978, Mosley (1982) also found out that the highest levels of fertility were observed among the Kalenjin and Kisii, while the Mijikenda had the lowest fertility because they had the longest birth intervals and breastfeeding periods. He also found out that polygamy was prevalent among the Luhya, Kisii, Luo and Mijikenda, while it was lowest among the kikuyu.

Kalule-Sabiti (1984) while studying Bongaarts' proximate determinants of fertility applied to group data from the Kenya Fertility Survey (1977/78), found out that fertility inhibiting effect of both non-marriage and contraception increases with education and metropolitan environment. In other sub-groups based on religious affiliation, ethnic group and region of residence with the exception of Nairobi, which has a markedly lower index of non-marriage and a high index of contraception, such variations are less apparent. The sub-groups coast, mijikenda and muslim, with low total fertility rate, have also a reduction effect attributed to non-marriage. The low fertility inhibiting effect rises from 6% to 30% among women with no education and those with 9 or more years of schooling and from 9% to 12% for rural and metropolitan women respectively. Elsewhere the reduction effect accounted for by contraception is lowest among muslims, mijikenda, luo, luhya, kisii, kalenjin, coast, rift Valley and western categories.

The reduction effect of breastfeeding is highest among women with little or no education and among the rural population. It is also high among the catholics, protestants,mijikenda,kisii,luo and kalenjin categories. Kalule-Sabiti also found out that the number of women in each age group who have not used contraception in the open interval but who never the less have had no birth in the last 5 years, suggests relatively higher secondary sterility or unreported abortions among the metropolitan, mijikenda, muslim and coast populations than among other sub-groups. In the model it is assumed that in the absence of lactation and contraception there is an average birth interval of about 20 months of which about 7 months represent the interval of exposure (i.e the menstrual interval) so that potential fertility of populations would vary within a narrow range of 13.5 to 17.5 births per woman with an average of 15.3. Postpartum abstinence can be ignored as an appreciable factor in Kenya. The mean duration of abstinence for the majority of women is 6 months. The length of postpartum amenorrhea increases slightly with age but decreases drastically with education and rural-urban residence (Central Bureau of Statistics,1980). Mijikenda, muslim, coast and Nairobi populations reported much shorter durations compared to other sub-groups(Kenya Fertility Survey,1977/78).

Ferry and Page (1984), used the Kenya Fertility Survey data of 1977/78 and found out that there existed a strong impression of the dominating role still played by lactational amenorrhoea, followed by the marriage pattern. Contraception, especially non-reversible forms, had only a limited impact in a few subgroups. There was a clear indication of a two-stage fertility transition, with declines in lactation and abstinence not yet being compensated by contraceptive use except among the highest socio-economic groups and among some of the oldest women.

fertility. Secondary education is probably a prerequisite for a woman to change her attitude towards family size (Osiemo 1986, Henin 1982, Ominde 1983). They also went further and established that in Kenya today, both marital and non-marital fertility are contributing to increased fertility. The total fertility rate of 4 and above for the single women is predominant. With high pre-marital fertility and almost universal marriage in Kenya, the fertility after marriage is bound to be high. This combination of two status, namely, fertility before and fertility after marriage, becomes even higher should a woman come with boys and should she, after marriage, first produce girls.The only districts with minimal non-marital fertility are Mombasa and Lamu which are dominated by muslims. Pre-marital fertility is prohibited by islamic law.

In conclusion it can be seen that although there exist a number of alternative models of proximate fertility determinants, for example: Gaslonde and Carrasco, 1982; Hobcraft and Little, 1984, the best known and probably the most widely used is the Bongaarts' model of 1978. The major proximate determinant of observed fertility levels is contraception in the developed world; breastfeeding in Latin America and Asian countries; and breastfeeding in Kenya by the 1977/78 data. This study therefore applies the Bongaarts' model to examine the impact of each of the three intermediate variables of fertility.

1.7 Theoretical statement

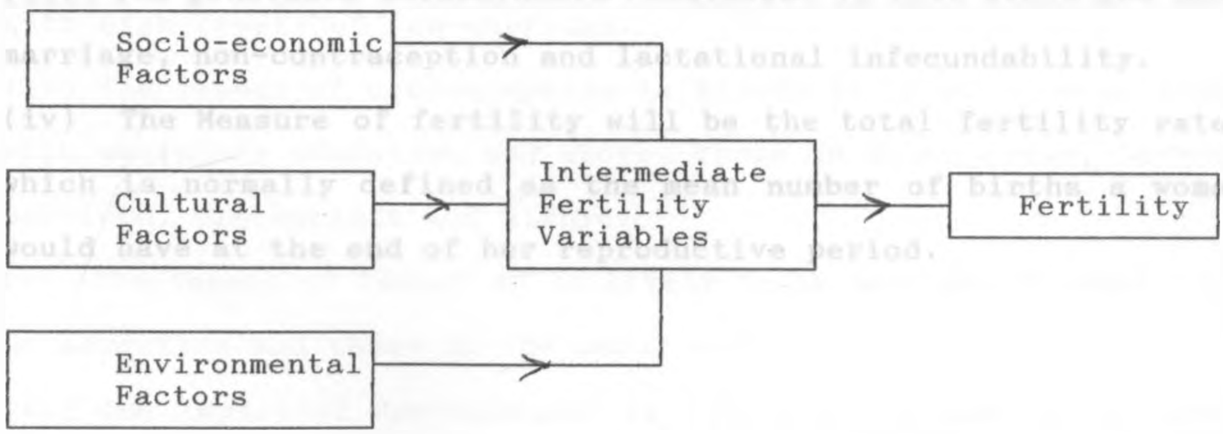
From the above literature review we can isolate socio-economic and cultural factors as the factors which affect fertility through proximate determinants of fertility.

The theoretical statement guiding this study as formulated by Bongaarts (1978) is that:

Socio-economic, cultural and environmental factors are likely to affect fertility through the biological and behavioural factors called intermediate fertility variables.

1.8.0 Conceptual framework

The schematic figure below depicts the operations of the socio-economic, cultural and environmental factors affecting fertility through intermediate fertility variables.



Source: J. Bongaarts (1978)

Studies in fertility have shown that where most women are married the fertility is higher than where the majority of the women are single. It has also been shown that the more effective contraception is practiced the lower the fertility. Long durations of breastfeeding delay the return menstruation and ovulation. This has the effect of reducing fertility as it needs a fertilized egg to make a child. We also expect women with higher education and those residing in urban areas to breastfeed for shorter durations and to do so less frequently.

1.8.1 Definition of key concepts

(i) The socio-economic factors considered in this study are education and place of residence.

(ii) The cultural factors looked at in the study are ethnicity and religion.

(iii) The proximate determinants considered in this study are non-marriage, non-contraception and lactational infecundability.

(iv) The Measure of fertility will be the total fertility rate, which is normally defined as the mean number of births a woman would have at the end of her reproductive period.

1.8.2 Operational framework

1.8.3 Operational hypothesis

(i) There is likely to be no major difference between the levels of fertility obtained using the Bongaarts' model and those obtained using the Coale-Trussell P/F technique.

(ii) Fertility is likely to be low among the women with secondary education and above and those residing in urban areas.

(iii) Fertility is likely to be low among the women with long durations of breastfeeding, high levels of contraception and those with high levels of non-marriage.

(iv) The impact of contraception is likely to be more among women with secondary education and above, those in urban areas, Central province, protestants and Kikuyu.

(v) The impact of lactation is likely to be more among women with no education and those in the rural areas.

(vi) The impact of non-marriage is likely to be more among women with secondary education and higher and among the women in Coast province.

CHAPTER TWO

SOURCES OF DATA AND METHODS OF DATA ANALYSIS.

2.1 Introduction.

As mentioned earlier this study is an application of the Bongaarts' model to the Kenya Demographic and Health Survey of 1989. This chapter therefore is going to look at the sources of data as described in the Kenya Demographic and Health Survey. We are also going to describe the Bongaarts' model, the Coale-Trussell P/F technique and the Pearson product moment correlation. The Coale-Trussell P/F technique is necessary since it is very important to first compare fertility rates obtained using the Bongaarts' model with those obtained using the Coale-Trussell model. The Pearson product moment correlation was used to establish how different the fertility rates obtained using the Coale-Trussell P/F technique are from those obtained using the Bongaarts' model.

2.2 Sources of data.

This study drew information from the 1989 Kenya Demographic and Health Survey, which is a national survey that was carried out by the National Council of Population and Development (NCPD) in collaboration with the Central Bureau of Statistics (CBS) and the Institute for Resource Development (IRD).

The Kenya Demographic and Health Survey sample was designed to produce completed interviews with 7,500 women aged between 15 and 49 and with a subsample of 1000 husbands of these women. A total of 9,836 households were selected, of which 8,343 were identified as occupied households during the fieldwork and 8,173 were successfully interviewed.Respondents for the individual interview were women aged between 15 and 49 who had spent the night before the interview in the selected households. In the interviewed households, 7,424 eligible women were identified and 7,150 were successfully interviewed. In addition, 1,116 husbands were interviewed out of a total of 1,397 eligible ones. The eligible husbands were those who spent the night before the interview in the selected households and whose wives were successfully interviewed.

Data collection was done in two stages, stratified by urban-rural residence and within the rural stratum, by individual districts. In the first stage, 1979 census enumeration areas were selected with probability proportional to size. The selected enumeration areas were segmented into the expected number of standard-sized clusters, one of which was selected at random to form the NASSEP cluster. The selected clusters were then mapped and listed by CBS field staff. In rural areas, household listings made between 1984 and 1985 were used to select the Kenya Demographic and Health Survey households, while Kenya Demographic and Health Survey pretest staff were used to relist households in the selected urban clusters. It was felt that in the Kenya Demographic and Health Survey reliable estimates of certain variables could be produced for the rural areas in the 13 districts that have been initially targeted by the National Council of Population Development: Kilifi, Machakos, Meru, Nyeri, Murang'a, Kirinyaga, Kericho, Uasin Gishu, South Nyanza, Kisii, Siaya, Kakamega and Bungoma.Thus all 24 rural clusters in the NASSEP were selected for inclusion in the Kenya Demographic and Health Survey sample in these 13 district. About 450 rural households were selected in each of these districts, just over 100 rural households in other districts, and about 3000 households in urban areas, for a total of 10,000 households. Sample weights were used to compensate for the unequal probability of selection between strata and the weighted figures are used in the data analysis in chapter 3.

The survey utilized 3 questionnaires: household questionnaires, one to list members of the selected households; Women's questionnaire, to record information from all women aged 15-49 who were present in the selected households the night before the interview; husband's questionnaire, to record information from the husbands of interviewed women in a subsample of households.

The field staff for the survey consisted of nine teams, each of which was fluent in one of the major indigenous languages. The interviewers and the date entry staff were recruited in october 1988 and trained in november 1988. The training included practice interviewing both in the classroom and in the field. Data collection started on 1st of december and was completed during the last week of may. Lastly, the distribution of women of the Kenya Demographic and Health Survey fits the pattern established by the 1977/78 Kenya Fertility Survey and the 1984 Kenya Contraceptive

Prevalence Survey. The distribution of all women by province indicates only minor differences among the 3 sources of data.

2.2.1 Limitations of the KDHS data set

Though national in coverage, the KDHS excluded the North Eastern Province and four northern districts which together account for about 5% of Kenya's population. Besides, the KDHS selected 6,850 rural households and about 3,000 households in urban areas for a total of about 10,000 households. The implication of this is that most of the women interviewed were from the rural areas. The KDHS also failed to obtain information on induced abortion, an important intermediate fertility variable.

2.3 Methods of data analysis.

2.3.1 The Bongaarts' model.

<u>Description of the method.</u>

In addition to modifying the classification of the intermediate fertility variables, Bongaarts took the ideas of Davies and Blake one step further by placing them within an analytic framework which enables the total fertility rate of a population to be estimated from the proximate determinants, and also enables the fertility reducing impact of each individual proximate determinant to be estimated.

This is achieved through an index for each determinant which takes the value 1 when that determinant has no effect on fertility and 0 when that determinant eliminates all fertility, a situation which does not arise in practice.

The three indices: the index of marriage, the index of contraception and the index of lactational infecundability, are associated to the TFR by a multiple relationship as shown in equation (2.1).

The total fecundity rate (TF), which is a theoretical role that represents fertility in the absence of the inhibiting effect of the four proximate determinants although it is influenced by the remaining intermediate variables such as fecundity, spontaneous abortions and permanent sterility, has been estimated to be about 15.3 on average.

$$TFR = C_m{*}C_a{*}C_c{*}Ci{*}TF \quad ....(2.1)$$

The index of marriage, c_m ,measures the effect of the marriage pattern of a population on its fertility.

It takes the value 1 if all women of reproductive age(15-45) are married and 0 if there is no marriage.

Each value is defined as the ratio of the fertility levels in the presence and in the absence of the inhibitions caused by the corresponding proximate determinants, and hence:

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

$$= \frac{\Sigma(f(a))}{\Sigma(f(a)/m(a))} \quad ....(2.2)$$

An alternative way of considering c_m is that it is the average of the age specific proportions 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 hence:

$$C_M = \frac{\Sigma(m(a)g(a))}{\Sigma g(a)} \qquad (2.3)$$

and equation (2) is equivalent to equation (3).

The index of contraception, c_c, incorporates both the prevalence of contraceptive use and its effectiveness. c_c takes the value 1 if nobody uses contraception, or if all use is totally ineffective, and takes the value 0 if all women use 100% effective contraception.

It should be calculated from equation (4), (Bongaarts' and Potter, 1983).

$$C_C = 1-1.08*U*E \qquad (2.4)$$

Where U = Proportion of married women of reproductive age currently using contraception.

E = Average use effectiveness of contraception.

Therefore,

$$U = \frac{\Sigma U(a)}{35}$$
$$= \Sigma U(m) \qquad (2.5)$$

and,

$$E = \Sigma(E(a)*U(a)/U)$$
$$= \Sigma(E(m)*U(m)/U) \qquad (2.6)$$

and the factor 1.08 is a correction for 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.

Use-effective levels are likely to differ between populations for methods for which there is room for user-error,for example pill or condom, since higher levels of user-failure might be expected in populations where little education is available on how to use a method correctly.

The final index, the index of lactational infecundability, c_i, measures the effect of the duration of postpartum infecundity as determined by the breastfeeding patterns prevalent in a particular society.The average birth interval in the absence of lactation has been estimated as 20 months, made up of 1.5 months of non-lactational infecundity, an average of 7.5 months waiting time to conception, 9 months gestation and an average of 2 months added on by spontaneous abortions.

Hence,

$$C_i = \frac{20}{18.5+i} \quad \ldots\ldots\ldots\ldots(2.7)$$

Where i months is the mean duration of postpartum infecundability and 18.5+i months is the average birth interval in the presence of breastfeeding or postpartum abstinence.

we can estimate i using the formula ,

$$i = 1.753\exp(0.1396*B-0.001872*B^2)\ldots(2.8)$$

where B is the mean duration of breastfeeding.

Estimation of the duration of breastfeeding can be done either directly or indirectly. Studies that have been done have indicated that the direct technique of estimating the duration of breastfeeding is not very reliable. This study has used the prevalence-incidence method to estimate the duration of breastfeeding. This method was chosen because we were only interested in the mean duration of breastfeeding. If it is reasonable to assume that the number of births per month has been constant throughout the years, then an extremely simple and robust estimation procedure can be used (Mosley et al 1982).

If we denote the total number of children currently breastfed (irrespective of their age) by P, and the average number of births per month by I, then we can estimate the mean duration of breastfeeding, in months, as:

$$D = \frac{P}{I} \qquad \text{.....................(2.9)}$$

Where P is the prevalence and I is the incidence.

For any characteristic the prevalence (here the observed number currently breastfeeding) is the function of incidence (the number who start breastfeeding) and the duration of the characteristic (here still breastfeeding).

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

By defining the denominator in equation (2.1) as the monthly number of births rather than as the monthly number of children who start breastfeeding (the incidence of breastfeeding), the necessary allowance for those who are never breastfed has already been built in to our estimate.

The major advantage of this method is it's relative insensitivity to errors in the reported dates of birth for the children in question.

The numerator does not require any information on dates at all. The denominator does, but it can be estimated from births in the year preceding the survey, or from the two years, or from the three years etc. Any misreporting of dates will affect the result only if the misreporting transfers births across the boundary of the period chosen.We are free to choose the period that we think minimizes any such transfers. A period of one year, or two years is too short because of the small sample sizes (especially if we want to make estimates for subgroups). We have therefore used the period of three years. To be specific, taking into account the fact that dates are available as calendar months differences, we took as the total number of births that occurred in the three years before the interview all those for whom the difference between calendar month of interview and calendar month of birth was 0-35 plus one half those for whom this difference was 36 months.

Therefore in our case,

$$D = \frac{P}{I}$$

Where P = Number of children currently breastfed irrespective of age.

and I = 1/36{All births 0-35 months before the survey + 1/2 of the births occurring 36 months before the survey}.

and D = The mean duration of breastfeeding.

Equation 2.1 can be further broken down to form equations 2.10,2.11 and 2.12 where TNM represents the total natural fertility rate, that fertility in the absence of contraception and induced abortion and free from the influence of marriage patterns or "natural" fertility.

These equations are based on the original definitions of the four indices as the rates of the fertility levels in the presence and absence of the inhibition caused by the particular determinant and can be used to estimate the impact and importance of each individual determinant on fertility levels.

$$TNM = C_i*TF..........................(2.10)$$

$$TM = C_c*C_a*TNM.......................(2.11)$$

$$TFR = C_m*TM...........................(2.12)$$

Hence the difference between TF and TNM represents the impact of post-partum infecundity or breastfeeding, 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.

In order to apply this model the following data is required; Total female population in each five-year age group (irrespective of marital status), the total female population of married women in each five-year age group, the total births in the last year by five-year age groups of married mothers, the total number of married women using each modern contraceptive method, the total number of women who are currently breastfeeding, the total number of births which occurred 0 to 35 months before the survey and lastly the total number of births which occurred exactly 36 months before the survey.

2.3.2 The Coale and Trussell P/F technique.

(a) <u>The rationale of the method</u>

The Coale-Trussell P/F technique is necessary in this study for comparison purposes. There are a number of techniques which could have been used instead of the Coale-Trussell P/F technique, but among them we chose the latter because it is the most refined and the most commonly 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 assumed to be accurate. Measures of average parity equivalents, F, comparable to reported average parities, P, are obtained from period fertility rates by cumulation and interpolation (these measures are effectively averages of the cumulated fertility schedule over age groups). 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. Note that P/F ratios are generally calculated for the entire age range from 15 to 49, even though not all the ratios are used for adjustment purposes. This is recommended because the pattern of the ratios with age may reveal data errors or fertility trends.

The main assumption underlying this technique is that the pattern of fertility has been constant in the past. The method is inappropriate if there have been recent changes in marital fertility or changes in ages at marriage, since it will no longer be valid to assume that the pattern of fertility experienced by the older women was the same as that experienced now.
However, when fertility decline is mainly due to effective contraception at older ages, an adjustment based on the experience of women in their 20's may still be useful.

(b) Data Required

(1) Total children ever born classified by five-year age group of mother.

(2) Total births in the last year by five-year age group of mother.

(3) Total female population in each five-year age group (irrespective of marital status)

(c) The Computational Procedure

The computation of the total fertility rate using the Coale-Trussell technique involves 6 distinct steps which will be described in details in this section. The 6 steps are: the computation of reported average parities, the calculation of age-specific fertility rates using births in the last year, the calculation of cumulated fertility schedule for a period, estimation of average parity equivalents for a period, calculation of a fertility schedule for convectional five-year age groups and adjustment of period fertility schedule.

To obtain the value of the reported average parity of women in the age group i, denoted by P(i), the total number of children ever born to women in the age group i was divided by the total female population 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 female population in that age group.

The computation of the cumulated fertility schedule, which was denoted by Q(i), involves adding the age-specific rates computed in step 2 from f(1) to f(i)

Therefore,

$$Q(i) = \sum_{j=1}^{i}(f(j)) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.13)$$

Average parity equivalents, which were denoted by F(i), are estimated by interpolation using the period fertility rates f(i) and the cumulated fertility values Q(i) calculated in the previous steps

Therefore F(i) is obtained as,

$$F(i) = Q(i-1)+a(i)*f(i)+b(i)*f(i+1)+c(i)*Q(7) \ldots (2.14a)$$

for i = 1,2,3,4,........6

and F(7) = Q(6) +a(7)*f(6)+b(7)*f(7)...............(2.14b)

The values of a(i), b(i) and c(i) are obtained from table 2.1.

TABLE 2.1 Coefficients for interpolation between cumulated fertility rates to estimate parity equivalents.

AGE GROUP	INDEX(i)	a(i)	b(i)	c(i)
(1)	(2)	(3)	(4)	(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	3.442	-0.563	0.0029
35-39	5	3.518	-0.763	0.0006
30-44	6	3.862	-2.481	-0.0001
45-49	7	0.392	2.608	

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

When age-specific fertility rates have been calculated from births in a 12-year month 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 convectional five-year age groups, f+(i), can be estimated by weighing the rates referring to unorthodox age groups according to equation 2 and 3 and using the coefficients displayed in table 4. It is important to note that When fertility rates have been calculated from births classified by age of mother at the time of delivery this step is not required.

f+(i) = (1-w(i))*f(i)+w(i)*f(i+1).............(2.15)

Where f(i) and f+(i) are respectively the unadjusted and the adjusted age specific fertility rates, and the weighing factor, w(i), is calculated as

$$w(i) = x(i)+y(i)*f(i)/Q(7)+z(i)*f(i+1)/Q(7) \quad \ldots\ldots(2.16)$$

TABLE 2.2 Coefficients for Calculation of Weighting Factors to Estimate Age-specific Rates for Convectional Age groups Shifted by Six Months.

AGE GROUP	INDEX(i)	x(i)	y(i)	z(i)
(1)	(2)	(3)	(4)	(5)
15-19	1	.031	2.287	-0.114
20-24	2	.068	0.999	-0.233
25-29	3	.094	1.219	-0.977
30-34	4	.120	1.139	-1.531
35-39	5	.162	1.739	-3.592
30-44	6	.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)/F(2) and P(3)/F(3) are reasonably consistent then either of them can be used as the adjustment factor. If not then a weighted average of the two can be used. However, if the ages of the women are believed to have been pushed up or down then the mean of all the P(i)/F(i) ratios can be used.

The adjusted age-specific fertility rates for convectional age groups (f*(i)), is obtained by multiplying the fertility rates for convectional age groups f(+(i), by k, the chosen adjustment factor.

$$f*(i) = k*f+(i)$$

The total fertility rate is calculated as

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

2.3.3 The pearson product moment correlation.

To establish the strength of the relationship between the total fertility rates obtained using the Coale-Trussell P/F technique and those obtained using the Bongaarts' model, the pearson product moment correlation, written as r, was used.

Most researchers calculate Pearson's r directly from data, using the formula,

$$r = \frac{N\Sigma(XY)-\Sigma(X)\Sigma(Y)}{\{\sqrt{(N\Sigma(X^2)-(\Sigma(X))^2)}\}\{\sqrt{(N\Sigma(Y^2)-(\Sigma(Y))^2)}\}}$$

Normally, r varies from -1 to +1, such that the closer r is to +1 the stronger the positive relation between the two sets of data and the closer it is to -1 the stronger the negative relation between the two sets of data.

In our case r will be taken as a measure of the difference between the two sets of fertility rates. If r is a big positive value it implies that the difference between the two sets of fertility rates is small and if this value is big and negative then the difference between the two sets of fertility rates is big. If r is zero, then at some points the difference is small while at other points the difference is big. Every researcher is very careful not to obtain results which occur by chance. In this study a t-test was used to determine whether the r obtained was by chance and the procedure was as follows:

For each pair of cases, the difference in the fertility rates was calculated. The statistic used to test the hypothesis that the mean difference in the population is zero was

$$t = \frac{\bar{D}}{S_D/\sqrt{N}}$$

Where $\bar{D}$ is the observed difference between the two means and S_D is the standard deviation of the differences of the paired observations. The sampling distribution of t, if the differences are normally distributed with a mean of zero, is Student's t with N-1 degrees of freedom, where N is the number of pairs. If the pairing is effective, the standard error of the difference will be smaller than the standard error obtained if two independent samples with N subjects each were chosen.

CHAPTER THREE

FERTILITY ESTIMATION.

3.1 Introduction.

The main aim of this chapter is to compare the fertility rates obtained using the Bongaarts' model with those obtained using the Coale-Trussell P/F technique for the various sub-groups looked at: education, provinces, religion, place of residence and ethnic groups. To achieve this aim three major steps were followed: estimation of the fertility levels using the coale-trussell P/F technique, estimation of the fertility levels using the Bongaarts' model and lastly, comparison of the model estimate of the total fertility rate obtained using the Bongaarts' model with the observed total fertility rates obtained using the coale-trussell P/F technique.

The total fertility rates obtained using the coale-trussell P/F technique were, therefore, used as a yardstick to measure the validity of the Bongaarts' model.

3.2 Background characteristics of the women respondents.

The distribution of all women by province indicates that about 21% of the KDHS sample were from Rift Valley province and only about 7% were from Coast province. These percentages are summarized in table 3.1 above. From table 3.2 below, nearly 27% of the women interviewed have never attended school, about 29% never completed primary school , and 22% attended secondary school and higher education.

Table 3.1 Percentage distribution of women, children ever born and births in the last year by level of province.

Region	FPOP	CEB	BLY
Nairobi	7.690050	4.839820	5.943331
Nyanza	17.24391	19.19323	19.62681
Coast	7.161726	6.091288	5.252246
Western	13.76578	15.49957	16.30961
Central	15.55621	14.66931	13.26883
R.Valley	20.63399	21.75692	22.32205
Eastern	17.94834	17.94986	17.27713
Total	6814	24691	1447
Total %	100	100	100

Table 3.2 Percentage distribution of women, children ever born and births in the last year by level of education.

Education	FPOP	CEB	BLY
No educ.	27.15972	40.32330	25.84658
Pri.incom	29.34697	32.40287	31.02972
Pri.comp	21.74666	17.45736	24.11887
Sec. & h.	21.74666	9.816473	19.00484
Total	6355	24683	1447
Total %	100	100	100

Of the three religious groups 60% of the women interviewed were protestants, 36% were catholics and lastly only about 4% were muslims. According to table ,more women from the Luhya ethnic group were interviewed than from any other ethnic group. Only 5% of the interviewed women were from the Mijikenda ethnic group.

Table 3.3 Percentage distribution of women, children ever born and births in the last year by religion.

Religion	FPOP	CEB	BLY
Protestan	60.39908	59.23621	61.16715
Catholic	35.88642	37.41256	35.80692
Muslim	3.714505	3.351228	3.025937
Total	6515	24588	1388
Total %	100	100	100

Table 3.4 Percentage distribution of women, children ever born and births in the last year by ethnic group.

Ethnicity	FPOP	CEB	BLY
Kalenjin	7.783883	6.647929	4.585007
Kisii	9.294872	11.42613	24.96653
Kamba	14.19414	13.78060	39.49130
Kikuyu	24.58791	22.62007	9.303882
Meru	6.868132	6.871970	2.576975
Luhya	17.35348	18.12701	9.404284
Luo	15.32357	15.41000	8.165997
Mijikenda	4.594017	5.116298	1.506024
Total	6552	24549	2988
Total%	100	100	100

Table 3.5 Percentage distribution of women, children ever born and births in the last year by place of residence.

Residence	FPOP	CEB	BLY
Rural	82.7	90	86
Urban	17.3	10	14
total	6813	24764	1469
total %	100	100	100

A bigger percentage of the KDHS sample were women from rural areas since they were about 83% of the whole sample.

3.3 Estimates of fertility using the Coale and Trussell P/F technique.

To compute fertility rates using the Coale-Trussell P/F technique, we required the total female population (FPOP), the children ever born (CEB)and the births in the last year. The raw data required appears in the appendix.

Table 3.6 Estimation of the total fertility rate using the Coale-Trussell technique.

National

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	1413	399	164	.2823779	.1160651
20-24	2	1238	1966	387	1.588045	.3126010
25-29	3	1268	4381	387	3.455047	.3052050
30-34	4	949	4737	245	4.991570	.2581665
35-39	5	860	5532	186	6.432558	.2162791
40-44	6	654	4778	69	7.305810	.1055046
45-49	7	431	3233	12	7.501160	.0278422
		6813				6.708318

Table 3.6 (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*	
0	.2510918	.0758812	.1397856	1.124600	.1483513	
.5803255	1.496353	.1039517	.3206070	1.061277	.3402530	
2.143330	3.075225	.1118609	.3023572	1.123510	.3208848	
3.669356	4.455654	.1144738	.2540460	1.120278	.2696133	
4.960188	5.644583	.1615732	.2085675	1.139598	.2213480	
6.041583	6.379295	.2351013	.0950036	1.145238	.1008252	
6.569106	6.973423		.0212965	1.075678	.0226015	
			Kmean=	1.110930	TFR=	7.119386
			K1=	1.061277		
			K2=	1.123510	Ka=	1.092394

In table 3.6, the number of children ever born and children born in the year preceding the survey for women who were interviewed during the Kenya Demographic and Health Survey are shown.

Using the two, children ever born and births in the year preceding the survey, parity P(i) and age specific fertility rate f(i) are computed as follows:

$$P(i) = \frac{\text{children ever born}}{\text{female population}} \quad \text{and} \quad f(i) = \frac{\text{births in the last year}}{\text{female population}}$$

Below is an illustration of the above;

$$P(2) = \frac{CEB(2)}{FPOP(2)} = \frac{1966}{1238} = 1.588045 \quad \text{and} \quad f(3) = \frac{BLY(3)}{FPOP(3)} = \frac{387}{1268} = 0.305205$$

The values of Q(i), the cumulated fertility schedule, are obtained using the following formula:

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

For example,

$$Q(4) = \sum_{j=1}^{4} f(j) = 5(0.1160651+0.3126010+0.3052050+0.2581665) = 4.960188$$

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

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

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

An example of this is;

$$F(2) = Q(1)+a(2)xf(2)+b(2)xf(3)+c(2)xQ(7)$$
$$= 0.5803255+(3.321)(0.3126010)$$
$$+(-0.754)(0.3052050)+(.0161)(6.708318)$$
$$= 1.496353$$

and F(7) = 6.569106+(0.392)(0.10550461)+(2.608)(0.0278422)

= 6.973423

The reported period rates, f(i), for convectional age groups using the equation:

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

Where,

w(i) = x(i)+y(i)*f(i)/Q(7)+z(i)*f(i+1)/Q(7)

and w(i) is the weighting variable.

For example,

f+(2) = (1-w(1))f(2)+(w(2)xf(3))

Since $w(1) = x(1)+\frac{y(1)xf(1)}{Q(7)}+\frac{z(1)xf(2)}{Q(7)}$

$= 0.031+\frac{2.287(0.1160651)}{6.708318}-\frac{0.114(0.3126010)}{6.708318}$

= 0.0758812

and $w(2) = x(2)+\frac{y(2)xf(2)}{Q(7)}+\frac{z(2)xf(3)}{Q(7)}$

$= 0.068+\frac{0.99(0.3126010)}{6.708318}-\frac{0.233(0.3052050)}{6.708318}$

= 0.1039517

then f+(2) = (1-0.758812)0.3126010+0.1039517(0.3052050)

= 0.3206070

The first step in selecting an adjustment factor, for the converted fertility rates obtained above is to calculate the P/F ratios. These are shown in the table above.

The probable reason for the inconsistence of the ratios is the up and down pushing of the women ages.Hence four K values were calculated as given below:

$K1 = P2/F2 = 1.061277$

$K2 = P3/F3 = 1.123510$

$Ka = (P2/F2+P3/F3)1/2 = 1.092394$

$Km = (P1/F1+P2/F2....P7/F7)1/7 = 1.11093$

Hence K = (K1, K2, Ka, Km)

$f*(i) = Kxf+(i)$

$= K_1Xf+(i)$

In this case, an example could be as follows,

$f*(1) = 1.061277x0.1397856$

$= 0.1483513$

The adjusted fertility rates for convectional age groups, f*(i), are obtained by multiplying the f+(i) values by the adjustment factor K.

This is illustrated below,

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

$=1.061277x(0.1483513+.3402530+.3208848+.2696133+.221348$

$+.1008252+.0226015)x5$

$= 7.119386$

Using the detailed computational procedure described above, the fertility levels of the sub-groups was estimated and the results are summarized in table 3.7 below:

Table 3.7: Fertility rates obtained using the P/F technique.

Region	TFR (unadjusted)	TFR (adjusted)
Nairobi	4.17	4.2
Central	5.88	6.5
Coast	4.6	5.9
Eastern	6.7	7.3
Nyanza	7.6	7.7
R.Valley	7.1	7.4
Western	8	8.4
No educ.	8.2	8
Pri. Inc.	7.4	7.9
Pri. Com	8.7	6.4
Sec.& Hig	4.7	5
Catholic	6.2	6.9
Protest	6.3	6.6
Muslim	5	6.2
Other	7.6	5.1
No rel.	5.9	7.5
Kalenjin	6.8	6.5
Kamba	6.6	6.7
Kikuyu	5.6	6.5
Kisii	7	6.6
Luhya	7.7	7.8
Luo	7.5	7.4
Meru	5.1	5.2
Mijikenda	4.7	5.4
Somali	12.5	3.4
Rural	7.1	7.7
Urban	4.8	4.6
National	6.7	7.1

3.4 Re-estimation of fertility levels using the Bongaarts' model.

As described in chapter 2, estimation of fertility using the Bongaarts' model involves the estimation of the three indices: the index of proportion married, the index of non-contraception and the index of lactational infecundability.

This section of chapter 3 is essentially concerned with the estimation of these indices and their use to estimate the level of fertility for the various sub-groups.

3.4.1 Breastfeeding.

Breastfeeding patterns influence fertility. Breastfeeding is natural contraceptive. The mechanism is hormonal, and not yet fully understood. However, it is known that it is the suckling stimulus itself, not the production of milk, which is crucial. The MRC Reproductive Biology Unit in Edinburgh found that 27 breastfeeding women menstruated at 33 weeks and ovulated at 36 weeks versus 10 not breastfeeding women menstruated at 8 weeks and ovulated at 11 weeks on average. Their "rule of thumb" was that no woman ovulated if she breastfed 6+ times a day and for 60 minutes total and no women ovulated during unsupplemented breastfeeding. Prolonged breastfeeding lengthens birth intervals due to its relationship with lactational amenorrhea since, for a great majority of women, the ovaries are inactive for most of the period of lactational amenorrhea.

Using the direct method of estimating the duration of breastfeeding, we were able to come up with durations of breastfeeding for the various sub-groups.

This was obtained by dividing the total number of months women breastfed in a sub-group by the total number of women in that sub-group.

The results are summarized in the table below:

Table 3.8: The mean durations of breastfeeding obtained using the direct method.

	Duration of breastfeeding
Nairobi	16.1
Central	17.0
Coast	17.4
Eastern	17.9
Nyanza	19.0
R.Valley	16.7
Western	16.9
National	16.8
Kalenjin	17.0
Kamba	17.2
Kikuyu	16.9
Kisii	16.8
Luhya	16.4
Luo	17.0
Meru	19.1
Mijikenda	18.3
Other	17.8
Rural	16.9
Urban	16.1
Catholic	17.1
Protestant	17.2
Muslim	17.2
No religion	15.8
No education	18.7
Primary incomplete	17.6
Primary complete	17.0
Secondary & higher	15.6

In Kenya breastfeeding is both nearly universal and prolonged. The average mean duration of breastfeeding (including a count of zero months for those children who were never breastfed) was 19.4 months.

Studies done have shown that the direct method of estimating the duration of breastfeeding cannot yield accurate results since the data used has errors in most cases.

These errors are caused by misreporting of the durations of breastfeeding by the women interviewed, as some women may underreport while others may over report their durations of breastfeeding. When using the direct method of estimating the duration of breastfeeding there also exists the truncation problem. This is so because during the interview, some of the respondents might still be breastfeeding such that some children have been breastfed a certain number of months already, but we do not ho much longer they will be breastfed. Incompleteness of data is also a common source of errors in the data collection.

It is because of the above mentioned reasons that we found it necessary to use an indirect method to estimate the durations of breastfeeding. Among the many indirect methods of estimating the duration of breastfeeding, we chose a simple estimation procedure, the prevalence-incidence method, since we were interested only in the mean duration of breastfeeding.

3.4.2 Estimation of the mean duration of breastfeeding using the prevalence-incidence method.

The computational procedure.

To obtain the mean duration of breastfeeding, using the prevalence-incidence method, the procedure is as follows.

Nairobi.

Step 1: Computation of the incidence.

I = 1/36(All births occurring 0-35 months before the survey + 1/2 of the births occurring 36 months before the survey).

In the case of Nairobi the total number of children who were aged 35 months or less were 233 while the children who were aged exactly 36 months years were 13.

From the above therefore, the incidence

$$I=1/36(233+(1/2*13))$$

$$=239.5/36$$

$$=6.6527778$$

Therefore Nairobi had approximately 7 births per month.

Step 2: Computation of the prevalence.

P= Number of children currently breastfed irrespective of age.

=133

Step 3: Computation of the mean duration of breastfeeding.

$$\text{Mean duration of breastfeeding} = \frac{\text{observed prevalence (P)}}{\text{Average number of births per month (I)}}$$

$$=133/6.652778$$
$$=19.991649$$

Using the above procedure, the prevalence, the incidence and eventually the mean duration of breastfeeding has been computed for all the sub-groups. The results are summarized in the table below:

Table 3.9 :The mean durations of breastfeeding obtained using the prevalence-incidence method.

Region	Prevalence	Incidence	Duration of Breastfeeding
Nairobi	133	6.66	19.99
Central	284	15.86	17.91
Coast	121	6.74	17.96
Eastern	442	21.31	20.75
Nyanza	402	20.93	19.21
R.Valley	477	24.82	19.22
Western	377	19.25	19.58
National	2238	115.58	19.36
Kalenjin	229	11.61	19.72
Kamba	302	15.96	18.92
Kikuyu	421	23.17	18.17
Kisii	119	6.51	18.27
Luhya	421	22.25	18.92
Luo	362	18.25	19.84
Meru	161	6.69	24.05
Mijikenda	85	4.28	19.87
Other	134	6.68	20.06
Rural	1942	99.72	19.47
Urban	296	15.74	18.8
Catholic	771	40.20	19.17
Protest	1295	67.35	19.23
Muslim	60	3.29	18.23
Other	30	1.32	22.74
No Relig.	73	2.92	25.03
No educ.	623	29.75	20.94
Pri. incom.	695	36.60	18.99
Pri. com.	540	27.89	19.36
Sec. & higher	378	21.22	17.81

To obtain the total fertility rates using the Bongaarts' model we need to have the proportions of married women (PMAR), the proportions of women contracepting (PCON) and the mean durations of breastfeeding (B/F). This raw data required is summarized in table 3.10 below

Table 3.10: The raw data for the Bongaarts' model.

	15-19		20-24		5-29		30-34		
	pmar	pcon	pmar	pcon	pmar	pcon	pmar	pcon	
Nairobi	.230	.115	.619	.232	.702	.356	.733	.455	19.9
Central	.096	.217	.604	.313	.751	.366	.959	.418	17.9
Coast	.272	.045	.636	.071	.824	.243	.791	.222	18.0
Eastern	.140	.333	.761	.333	.940	.440	.874	.415	20.7
Nyanza	.237	.063	.737	.120	.941	.109	.940	.230	19.2
R.Valley	.153	.209	.686	.204	.838	.289	.845	.396	19.2
Western	.192	.032	.747	.041	.833	.111	.870	.195	19.6
No educ.	.403	.115	.849	.233	.900	.356	.915	.455	20.9
Pri. inc.	.266	.217	.897	.313	.852	.366	.868	.418	19.0
Pri. com.	.155	.045	.794	.071	.832	.243	.830	.222	19.4
Sec & hig	.070	.333	.503	.333	.801	.440	.828	.415	17.8
Catholic	.169	.115	.650	.233	.853	.356	.872	.455	19.2
Protestant	.173	.217	.638	.313	.832	.366	.864	.418	19.2
Muslim	.122	.045	.444	.071	.927	.243	.820	.222	18.2
Kalenjin	.148	.125	.489	.164	.826	.193	.861	.215	19.7
Kamba	.179	.217	.598	.346	.795	.462	.821	.400	18.9
Kikuyu	.082	.250	.678	.319	.827	.459	.829	.503	18.2
Kisii	.353	.261	.925	.392	.952	.421	.962	.398	18.3
Luhya	.262	.017	.755	.063	.892	.216	.931	.231	18.9
Luo	.342	.074	.793	.105	.941	.108	.931	.180	19.8
Meru	.065	.250	.393	.348	.742	.373	.789	.475	24.0
Mijikenda	.280	.037	.721	.059	.957	.127	.892	.086	19.9
Rural	.156	.115	.653	.233	.858	.356	.894	.455	19.5
Urban	.257	.217	.631	.313	.779	.366	.759	.418	18.8

Table 3.10 (cont.)

	35-39		40-44		45-49	
	pmar	pcon	pmar	pcon	pmar	pcon
Nairobi	.681	.406	.781	.560	.714	.5
Central	.952	.553	.820	.418	.863	.338
Coast	.835	.167	.889	.313	.786	.091
Eastern	.877	.466	.924	.458	.835	.254
Nyanza	.892	.161	.817	.171	.880	.103
R.Valley	.873	.287	.944	.254	.798	.263
Western	.870	.195	.752	.105	.754	.245
No educ.	.876	.406	.870	.560	.791	.500
Pri. inc.	.890	.553	.895	.418	.904	.338
Pri. com.	.889	.167	.873	.313	.844	.091
Sec.& hig	.874	.466	.774	.458	.909	.254
Catholic	.886	.406	.845	.560	.851	.500
Protestan	.878	.553	.885	.418	.810	.338
Muslim	.931	.167	.882	.312	.833	.091
Kalenjin	.889	.317	.947	.227	.812	.258
Kamba	.842	.453	.846	.448	.848	.308
Kikuyu	.928	.554	.861	.488	.837	.278
Kisii	.958	.462	.727	.457	.828	.200
Luhya	.921	.242	.891	.230	.758	.233
Luo	.872	.144	.845	.121	.923	.095
Meru	.902	.477	.943	.448	.840	.214
Mijikenda	.920	.131	.926	.087	.850	.087
Rural	.897	.406	.895	.560	.840	.500
Urban	.771	.553	.689	.418	.730	.338

3.4.3 **Computation of the three intermediate variables.**

The following tables illustrate how in details how the three intermediate variables were be computed for the various sub - groups.

National

1. Index of non-marriage.

The age-specific fertility rates, denoted by f(a), are obtained by dividing the births in the last year of married women by the total married female population. Married women include consensual unions but visiting unions were given a weight of 0.5 and when computing f(a), only births to married women were included. The ratio f(a)/m(a), called the age-specific marital fertility rate, is denoted by g(a). For age-group 15-19 it was estimated as g(15-19)=0.75*g(20-24), because the direct estimate f(15-19)/g(15-19) tends to be unreliable, especially in populations with low values for m(15-19). The index of non-marriage, denoted by Cm, is obtained by dividing the sum of the age-specific fertility rates by the sum of the age-specific marital fertility rates.

Table 3.11 Estimation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.3660714	.1742210	.4573750
20-24	.3950617	.6478191	.6098334
25-29	.3253253	.8422713	.3862476
30-34	.2912234	.8703899	.3345896
35-39	.378187	.8825581	.4285123
40-44	.1074074	.8759571	.1226172
44-49	.0351906	.8306265	.0423663
	1.898467		2.381541

Since Σf(a)/m(a)=2.381541

and Σf(a) =1.898467

Cm=Σf(a)/Σ(f(a)/m(a))

=0.7971588

2.Index of non-contraception.

The proportion of women using a specific method, 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.

Since estimates of contraceptive effectiveness are difficult to obtain and therefore rarely available, the above standard method-specific values (adapted from data from the philippines) are used in the calculation of average effectiveness levels in developing countries.

The average use effectiveness, denoted as e, is estimated as the weighted average of the method-specific use-effectiveness levels, u(m).

$$u = \Sigma u(m)$$

$$e = \Sigma e(m) x u(m)/u$$

$$= 0.8902010$$

To obtain the index of non-contraception, the following formula was applied

$$Cc = 1-1.08xuxe$$

$$= 0.8216528$$

Table 3.12 Estimation of the index of non-contraception.

method	u(m)	e(m)	e(m)u(m)
pill	.0538336	.9	.0484502
Iud	.0382195	.95	.0363086
Ster.	.049871	1	.0498718
Other	.0435796	.7	.0305057
U =	.1855045		.1651363

Cc = 1-1.08*u(m)*e(m)
= 0.8216528 E = 0.8902010

3.Index of infecundability

The index of non-marriage, denoted by Ci, was obtained using the formula below:

$$Ci = \frac{20}{18.5+i}$$

Since a direct estimate of i was not available and it was possible to obtain the mean durations of breastfeeding, B, with the following equation:

$$i=1.753\exp(0.1396*B-0.001872*B^2)$$

Where i is the mean duration of post-partum infecundability. At the national level the mean duration of breastfeeding was 19.4 months (see table 3.9), yielding i=12.97 months and

$$Ci= \frac{20}{18.5+12.97}$$

$$=0.6356039$$

Using the same procedure described above, the Bongaarts' model was used to obtain the three indices for all the sub-groups summarized in table 3.13.

These indices were in turn eventually applied in the formula described below to obtain the total fertility rates.

TFR = Cm * Cc * Ci * 15.3.

Table 3.13 Estimation of the total fertility rates using the three indices

	TFR	Cm	Cc	Ci
Nairobi	4.507349	.6569347	.7179026	.6246576
Central	5.972962	.8350716	.7062327	.6619524
Coast	5.644665	.6460772	.8640471	.6608835
Eastern	6.420542	.8486465	.8079612	.6120162
Nyanza	7.082151	.8095895	.8957252	.6383136
R.Valley	6.661893	.8251085	.8270099	.6380937
Western	8.102659	.9321739	.8993794	.6316787
No educ.	8.292932	.9857295	.9031724	.6088191
Pri. Inc.	7.315343	.9000564	.8272491	.6421511
Pri. Com.	6.508360	.8547012	.7830868	.6355591
Sec.& Hig	4.850047	.6796549	.7027349	.6637041
Catholic	6.494112	.7761475	.856	.6388668
Protestan	6.082030	.7892471	.7895487	.6379185
Muslim	5.663174	.7063043	.7988846	.655983
Other	3.594957	.5111033	.7912	.5810417
No rel.	6.411550	.8326889	.9149541	.550034
Kalenjin	6.383507	.7289513	.8896759	.6433356
Kamba	6.264472	.7299766	.8718595	.6433356
Kikuyu	5.788531	.8624895	.667664	.6569997
Kisii	6.378607	.7613292	.8357311	.6552324
Luhya	7.366477	.8598861	.8702709	.6433881
Luo	7.521155	.8731133	.8974806	.627332
Meru	4.136805	.6621377	.7257529	.5626476
Mijikenda	6.043841	.7127864	.8842511	.6267388
Somali	7.824999	1	.8202392	.6235228
Rural	6.655860	.8211998	.8360773	.6336034
Urban	4.993911	.6826201	.7407515	.6455022
National	5.874693	.7352766	.8216528	.6355573

For example, to obtain the total fertility rate of the nation level using the three indices,

TFR = 0.7352766x0.8216528x0.6355573x15.3

= 5.874693

3.5 Comparison of the two models.

Below is a table which contains a summary of the total fertility rates obtained using the Bongaarts' model and those obtained using the Coale-Trussell technique. Before applying any statistical technique it can be deduced that the two sets of fertility rates are not very different. Infact the differences between the two fertility rates range from 0.1 among the women with completed primary education to 1.2 at the national level.

Table 3.14 Total fertility rates obtained using the Bongaarts' model versus those obtained using the Coale-Trussell technique.

	TFR Bongaarts'	TFR unadjusted	TFR adjusted
Nairobi	4.507349	4.17	4.2
Central	5.972962	5.88	6.5
Coast	5.644665	4.6	5.9
Eastern	6.420542	6.7	7.3
Nyanza	7.082151	7.6	7.7
R.Valley	6.661893	7.1	7.4
Western	8.102659	8.0	8.4
No educ.	8.292932	8.2	8
Pri. Inc.	7.315343	7.4	7.9
Pri. Com.	6.508360	8.7	6.4
Sec.& Hig	4.850047	4.7	5
Catholic	6.494112	6.2	6.9
Protestan	6.082030	6.3	6.6
Muslim	5.663174	5.0	6.2
Other	3.594957	7.6	5.1
No rel.	6.411550	5.9	7.5
Kalenjin	6.383507	6.8	6.5
Kamba	6.264472	6.6	6.7
Kikuyu	5.788531	5.6	6.5
Kisii	6.378607	7.0	6.6
Luhya	7.366477	7.7	7.8
Luo	7.521155	7.5	7.4
Meru	3.878574	5.1	5.2
Mijikenda	6.043841	4.7	5.4
Somali	7.824999	12.5	3.4
Rural	6.655860	7.1	7.7
Urban	4.993911	4.8	4.6
National	5.874693	6.7	7.1

To compare the two models, the Pearson product moment correlation was computed and as we have already discussed in chapter two the formula for obtaining it is as follows:

$$r = \frac{1/N\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{(1/N\Sigma(\bar{X}-X)^2)}\sqrt{(1/N\Sigma(Y-\bar{Y})^2)}}$$

We also mentioned in chapter two that the Pearson product moment correlation is normally used to measure the association between two sets of data but in our case we used it to measure the difference between the two sets of fertility rates. This meant that the bigger the value of r the smaller the differences between the two sets of fertility rates and vis versa.

3.6 The computational procedure of r

For ease of computation, the fertility rates obtained using the Bongaarts' model were denoted by X, while those obtained using the Coale-Trussell P/F technique were denoted by Y.

The first step involved the computation of the means of the two sets of fertility rates.

$$\bar{X} = \frac{\Sigma X}{N} = \frac{156.98}{25} = 6.27792$$

$$\bar{Y} = \frac{\Sigma Y}{N} = \frac{165.98}{25} = 6.636$$

The next step involved creating two columns of the differences between the two sets of fertility rates and their means. The differences between the fertility rates obtained using the Bongaarts' model and their mean were

denoted by $X-\bar{X}$ while those of the Coale-Trussell P/F technique were denoted by $Y-\overline{Y}$.

$$\Sigma(X-\overline{X})^2 = 25.04298$$

$$\Sigma(Y-\overline{Y})^2 = 29.2776$$

Since,

$$r = \frac{1/N\Sigma(X-\overline{X})(Y-\overline{Y})}{\sqrt{(1/N(\Sigma(X-\overline{X})^2)}\sqrt{(1/N\Sigma(Y-\overline{Y})^2)}}$$

and,

$$\Sigma(X-\overline{X})(Y-\overline{Y}) = 24.41872$$

then $$r = \frac{1/25(24.41872)}{\sqrt{(1/25(25.04298))}\sqrt{(1/25(24.41872))}}$$

$$= 0.9018041$$

Although we have confirmed that the differences between the total fertility rates obtained using the Bongaarts' model and those obtained using the Coale-Trussell P/F technique are small (since r is big), we can not be sure that this result is not by chance. To prove that these findings did not occur by chance we used a paired t-test and the test statistic used to test the hypothesis that the mean difference is zero was:

$$t = \frac{\overline{D}}{S_D/\sqrt{N}}$$

Where $\overline{D}$ is the observed difference between the two means or the mean of the differences between the two sets of data and S_D is the standard deviation of the differences of the paired observations. N is the number of pairs while the degrees of freedom are N-1.

$S_D^2 = (\Sigma X^2 - N\bar{X}^2)/N-1$

Since from the table below $\bar{X} = 6.2792$ and $\bar{Y} = 6.636$,

$$t = \frac{6.636-6.2792}{0.4779794/\sqrt{25}}$$
$$= 3.732378$$

For $v = 20$
$t_5 = 3.85$

while for $v = 30$
$t_5 = 3.64$

This implies that by interpolation:

For $v = 24$
$$t_5 = 3.64 + \frac{(30-24)(3.85-3.64)}{30-20}$$
$$= 3.766$$

Table 3.15 Estimation of the Pearson product moment correlation

	Bongaarts TFR(X)	P/F TFR(Y)	X-Y	$X-\bar{X}$	$(X-\bar{X})^2$
Nairobi	4.51	4.2	.31	-1.7692	3.130069
Central	5.97	6.5	-.53	-.3092	.0956046
Coast	5.64	5.9	-.26	-.6392	.4085766
Eastern	6.42	7.3	-.88	.1408	.0198246
Nyanza	7.08	7.7	-.62	.8008	.6412806
R.Valley	6.66	7.4	-.74	.3808	.1450086
Western	8.1	8.4	-.3	1.8208	3.315313
No educ	8.29	8	.29	2.0108	4.043317
Pri.incom	7.32	7.9	-.58	1.0408	1.083265
Pri.comp	6.51	6.4	.11	.2308	.0532686
Sec.& hig	4.85	5	-.15	-1.4292	2.042613
Catholic	6.49	6.9	-.41	.2108	.0444366
Protestan	6.08	6.6	-.52	-.1992	.0396806
Muslim	5.66	6.2	-.54	-.6192	.3834086
Kalenjin	6.38	6.5	-.12	.1008	.0101606
Kamba	6.26	6.7	-.44	-.0192	.0003686
Kikuyu	5.79	6.5	-.71	-.4892	.2393166
Kisii	6.38	6.6	-.22	.1008	.0101606
Luhya	7.37	7.8	-.43	1.0908	1.189845
Luo	7.52	7.4	.12	1.2408	1.539585
Meru	4.14	5.2	-1.06	-2.1392	4.576177
Mijikenda	6.04	5.4	.64	-.2392	.0572166
Rural	6.66	7.7	-1.04	.3808	.1450086
Urban	4.99	4.6	.39	-1.2892	1.662037
National	5.87	7.1	-1.23	-.4092	.1674446
Total	156.98	165.9	-8.92	3.38e-14	25.04298

Table 3.15 (cont.)

	$Y-\bar{Y}$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
Nairobi	-2.436	5.934096	4.309771
Central	-.136	.018496	.0420512
Coast	-.736	.541696	.4704512
Eastern	.664	.440896	.0934912
Nyanza	1.064	1.132096	.8520512
R.Valley	.764	.583696	.2909312
Western	1.764	3.111696	3.211891
No educ	1.364	1.860496	2.742731
Pri. incom	1.264	1.597696	1.315571
Pri. comp	-.236	.055696	-.054469
Sec.& hig.	-1.636	2.676496	2.338171
Catholic	.264	.069696	.0556512
Protestan	-.036	.001296	.0071712
Muslim	-.436	.190096	.2699712
Kalenjin	-.136	.018496	-.013709
Kamba	.064	.004096	-.001229
Kikuyu	-.136	.018496	.0665312
Kisii	-.036	.001296	-.003629
Luhya	1.164	1.354896	1.269691
Luo	.764	.583696	.9479712
Meru	-1.436	2.062096	3.071891
Mijikenda	-1.236	1.527696	.2956512
Rural	1.064	1.132096	.4051712
Urban	-2.036	4.145296	2.624811
National	.464	.215296	-.189869
Total	4.35e-14	29.2776	24.41872

A Pearson product moment correlation of 0.90 indicates that there exists a very small difference between the total fertility rates obtained using the Coale-trussell P/F technique and those obtained using the Bongaarts' model. The test statistic (t) is less then t_5. It therefore follows that the results are significant at the 0.1% level of significance, an indication that they do not occur by chance. We can conclude therefore that a comparison of the model estimates with the observed total fertility rates reveals that there is a good agreement between these two fertility levels, where the model estimates are the total fertility rates obtained using the Bongaarts' model while the observed total fertility rates are the fertility rates obtained using the coale-trussell technique.

Since the difference between the fertility rates obtained using the Bongaarts' model and those obtained using the P/F technique is small and this observation does not occur by chance we can use the Bongaarts model to estimate the total fertility rates of the various sub-groups in this study.

It is important to note that this observation that the Bongaarts' model can be used to accurately estimate total fertility rates should not be generalized to apply on any data set. This is because studies already carried out have shown that only a theory can be generalized and not a model.

CHAPTER FOUR

THE EFFECT OF THE PROXIMATE DETERMINANTS OF FERTILITY ON FERTILITY.

4.1 Introduction.

The previous chapter has clearly indicated that a small number of intermediate fertility variables are responsible for most of the variation in fertility levels of populations in Kenya.
It has been shown that only three intermediate factors: proportions married, lactational infecundability and contraception are the most important determinants of fertility.
The remaining intermediate variables: frequency of intercourse, spontaneous intrauterine mortality and permanent sterility are generally much less important although they may substantially affect fertility in some populations.

This chapter therefore, examines the effect of each of these three intermediate variables and the combined effect of these variables on fertility in Kenya.

4.2 Discussion of the impact of the proximate determinants using the three indices (C_M, C_C and C_i)

In chapter three, while assessing the appropriateness of the Bongaarts' model, we used the Bongaarts' model to estimate the indices of the proximate determinants of fertility which take values ranging from 0 to 1.

These indices are the index of non-marriage (Cm), the index of non-contraception (Cc), and the index of lactational infecundability (Ci).

In chapter 2 section 2.3.1 we denoted the proportion of women using atleast a modern method by U while in chapter 3 section 3.4.2 we denoted the mean duration of breastfeeding with B/F.

Table 4.1 The indices of non-marriage, contraception and lactation at the national level.

	TFR (Bongaarts)	Cm	Cc	Ci	U	B/F
National	5.874693	.7352766	.8216528	.6355573	.1855045	19.36265

Equation 1 in chapter two (TFR=15.3xCmxCcxCi) then enables the total fertility rate of a population to be estimated from the proximate determinants. The indices summarized above take the value 1 when the determinant has no effect on fertility and the value 0 when the determinant eliminates all fertility, a situation which does not arise in practice.

In other words,the lower the index of a determinant the greater the impact of that particular determinant on fertility and vis versa.

Using table 4.1, one can easily deduce that the index of lactational infecundability is the lowest compared to the other two indices, while that of non-contraception is the highest. This means that fertility reducing impact of lactation is greater than that of the other two intermediate variables in Kenya and that contraception plays the least role in reducing fertility. From table 4.2 below one can also deduce that non-marriage has the greatest impact on fertility in Coast province and the least impact on fertility in Western province. Contraception, on the other hand, has the greatest depressing effect on fertility in Central province and the least depressing effect on fertility in Western province. Eastern province has the lowest index of lactational infecundability, while Central province has the highest index of lactational infecundability, which by itself is a clear indication that the reducing effect of lactation on fertility is greatest in Eastern province and least in Central province.

Table 4.2 The indices of non-marriage, contraception and lactation among women in the 7 regions.

REGION	TFR (Bongaarts')	Cm	Cc	Ci	U	B/F
Nairobi	4.507349	.6569347	.7179026	.6246576	.288961	19.99165
Central	5.972962	.8350716	.7062327	.6619524	.301855	17.90543
Coast	5.644665	.6460772	.8640471	.6608835	.144117	17.96289
Eastern	6.420542	.8486465	.8079612	.6120162	.199223	20.74576
Nyanza	7.082151	.8095895	.8957252	.6383136	.108541	19.20637
R.Valley	6.661893	.8251085	.8270099	.6380937	.185918	19.21880
Western	8.102659	.9321739	.8993794	.6316787	.102893	19.58442

When discussing the effect of the proximate determinants of fertility on fertility among the provinces, we divided the provinces into low fertility regions, moderate fertility regions and high fertility regions,whereby provinces whose total fertility rates were below 6 were classified as low fertility regions, those whose total fertility rates were between 6 and 7 were classified as moderate fertility regions and high fertility regions were provinces whose total fertility rates were above 7.

Using table 4.2, Nairobi, Coast and Central fell under the low fertility regions, Eastern and Rift Valley were under the moderate fertility regions and lastly Nyanza and Western fell under high fertility regions. In general, it can be seen that Nairobi has the lowest total fertility rate while Western province has the highest.

Since the index of non-marriage is lowest among women with secondary education and highest among those women with no education, the impact of non-marriage is greatest among the former and least among the latter. It can also be deduced from the table below that contraception has the greatest effect on fertility among those women with secondary education and higher as the index of non-contraception is lowest among them. Women with no education, on the other hand, have the highest index of non-contraception such that the effect of contraception on fertility is least among them. The depressing effect on fertility by lactation is least among the women with secondary education and higher and is highest among those with no education, since women with no education have a very low index of lactational infecundability while those with secondary education and higher have a very high index of lactational infecundability. Using the three indices the total fertility rates were computed and as evident from the table below, the level of fertility varies inversely with the level of education, such that the higher the level of education the lower the level of fertility.

Table 4.3 The indices of non-marriage, contraception and lactation among women at the various educational levels.

	TFR (Bongaarts)	Cm	Cc	Ci	U	B/F
No educ.	8.292932	.9857295	.9031724	.6088191	.1005136	20.94118
Pri. inc.	7.315343	.9000564	.8272491	.6421511	.1794095	18.99051
Pri. com.	6.508360	.8547012	.7830868	.6355591	.2277339	19.36255
Sec.& hig	4.850047	.6796549	.7027349	.6637041	.3071529	17.81152

As evident from table 4.4 below, the reducing effect of non-marriage on fertility is greatest among the muslims and least among the protestants, since muslims have the lowest index of non-marriage while protestants have the highest. Contraception depresses fertility most among the protestants and least among the catholics since the index of non-contraception is highest among the latter and lowest among the former. Lactation,on the other hand, reduces fertility most among the protestants as they have the lowest index of lactational infecundability and reduces fertility least among the muslims since the index of lactational infecundability is highest among the latter.

Table 4.4 The indices of non-marriage, contraception and lactation among women in the three religious groups.

	TFR (Bongaarts)	Cm	Cc	Ci	U	B/F
Catholic	6.494112	.7761475	.856	.6388668	.1500339	19.17513
Protestan	6.082030	.7892471	.7895487	.6379185	.2186601	19.22871
Muslim	5.663174	.7063043	.7988846	.655983	.2307692	18.22785

The study also found out that index of non-marriage is highest among the Luo and lowest among the Meru. The implication of this is that non-marriage reduces fertility most among the Meru and least among the Luo. Contraception, on the other hand, depresses fertility most among the Kikuyu and least among the Luo as the index of non-contraception is highest among the latter and lowest among the former. The index of lactational infecundability is very low among the Meru as they have the longest duration of breastfeeding and very high, among the Kisii. This, in essence, implies that the impact of lactation on fertility is greatest among the Meru and least among the Kisii.

Like we divided the regions into low, medium, and high fertility regions, the ethnic groups were also divided into low, medium and high fertility ethnic groups. All the ethnic groups with total fertility rates of less than 6 were classified as low fertility ethnic groups, those with total fertility rates of between 6 and 7 were classified as moderate fertility ethnic groups and those whose total fertility rates was above 7, were classified as high fertility ethnic groups.

From table 4.5, therefore, it is quite clear that kikuyu and Meru fall under the low fertility ethnic groups.

The Kalenjin, Kisii, Kamba, and Mijikenda/Swahili, on the other hand, fall under the moderate fertility ethnic groups as the luo and luhya fall under the high fertility ethnic groups.

Table 4.5: The indices of non-marriage, contraception and lactation among women in the eight ethnic groups.

	TFR (Bongaarts)	Cm	Cc	Ci	U	B/F
Kalenjin	6.383507	.7289513	.8896759	.6433356	.121519	18.30123
Kamba	6.264472	.7299766	.8718595	.6433356	.1315315	18.92428
Kikuyu	5.788531	.8624895	.667664	.6569997	.3393871	18.17266
Kisii	6.378607	.7613292	.8357311	.6552324	.1764706	18.26866
Luhya	7.366477	.8598861	.8702709	.6433881	.1394422	18.92135
Luo	7.521155	.8731133	.8974806	.627332	.1044776	19.83562
Meru	4.136805	.6621377	.7257529	.5626476	.2921348	24.04979
Mijikenda	6.043841	.7127864	.8842511	.6267388	.1255605	19.87013

From table 4.6 below it is quite clear that women residing in urban areas have a lower index of non-marriage and a lower index of non-contraception than their counterparts in the rural areas. Meanwhile the women residing in rural areas have a lower index of lactational infecundability than those residing in urban areas. The implication of the above mentioned is that the impact of non-marriage and contraception on fertility is greatest among the women residing in urban areas while the impact of lactation on fertility is greatest among those women living in rural areas.

Table 4.6 **The indices of non-marriage, contraception and lactation among women in the rural & urban areas.**

	TFR (Bongaarts)	Cm	Cc	Ci	U	B/F
Rural	6.655860	.8211998	.8360773	.6336034	.1711289	19.47410
Urban	4.993911	.6826201	.7407515	.6455022	.2664671	18.8036

4.3 Discussion of the impact of the proximate determinants using the differences between TF & TNM, TNM & TM AND TM & TFR.

In chapter two we saw that the four measures of fertility;

total fecundity (TF), total natural fertility rate (TNM), total marital fertility rate (TM) and total fertility rate (TFR) can be computed as follows:

$$TNM = Ci X TF$$

$$TM = Cc X Ca X TNM$$

$$= Cc X Ca X Ci X TF$$

$$TFR = Cm X TM$$

$$= Cc X Ca X Ci X Cm X TF$$

We also saw that the difference between total fecundity (TF) and total natural fertility (TNM) represents the impact of post-partum infecundability or breastfeeding, the difference between total natural fertility rate (TNM) and total marital fertility (TM) represents the impact of deliberate marital fertility control, that is contraception and induced abortion. Since in this study we assumed that the effect of induced abortion on fertility in Kenya is negligible the difference between TNM and TM represents the impact of contraception alone. Lastly, we saw that the difference between the total marital fertility rate and total fertility rate represents the impact of marriage on fertility.

Since the effect of lactation on fertility can be established by obtaining the difference between the total fecundity and the total natural fertility rate and the bigger this difference is, the greater the impact of lactation on fertility, lactation has the greatest impact on fertility in Eastern province and the least impact on fertility in Central province. The differences between the total fecundity and the total natural fertility among the various regions are summarized in table 4.7 below.

Table 4.7 Differences between the TF & the TNM among the regions

REGION	TF	TN	TF-TN
Nairobi	15.3	9.557261	5.742739
Central	15.3	10.12787	5.172128
Coast	15.3	10.11152	5.188482
Eastern	15.3	9.363848	5.936152
Nyanza	15.3	9.766198	5.533802
R.Valley	15.3	9.762834	5.537166
Western	15.3	9.664684	5.635316

Generally, table 4.8 below indicates that the higher the level of education the smaller the difference between the total fecundity and the total natural fertility. Using the fact that the difference between the TF and the TNM represents the impact of lactation on fertility, we observed therefore that the impact of lactation on fertility reduces as the level of education among women increases. This results are summarized below in table 4.8.

Table 4.8 Differences between the TF & the TN among the various levels of education

	TF	TN	TF-TN
No educ.	15.3	9.314932	5.985068
Pri. inc.	15.3	9.824912	5.475088
Pri. com.	15.3	9.724054	5.575946
Sec.& hig	15.3	10.15467	5.145327

The Kenya Demographic and Health Survey basically looked at three religious groups; Catholics, Protestants and Muslims. Among this three religious groups, the difference between the total fecundity and the total natural fertility rate is biggest among women who are protestants followed by those who are catholics and this difference is least among the ones who are muslims. From table 4.9 where these differences are summarized, one can therefore deduce that impact of lactation on fertility is greatest among the protestants and least among the muslims.

Table 4.9 Differences between the TF & the TN among the various religious groups.

	TF	TN	TF-TN
Catholic	15.3	9.774662	5.525338
Protestan	15.3	9.760153	5.539847
Muslim	15.3	10.03654	5.263460
Other	15.3	8.889938	6.410062
No rel.	15.3	8.415520	6.884480

Table 4.10 below is a summary of the differences between the TF and the TNM among the various ethnic groups looked at by the Kenya Demographic and Health Survey. A close look at the table reveals to us that the difference between the TF and the TNM is biggest among the Meru. This difference, on the other hand, is smallest among the Kikuyu. As an example of interpreting table 4.10, the implication of the above observation is that the impact of lactation is greatest among the Meru and least among the Kikuyu.

Table 4.10 Differences between the TF & the TN among the various ethnic groups.

	TF	TN	TF-TN
Kalenjin	15.3	9.843035	5.456965
Kamba	15.3	9.843035	5.456965
Kikuyu	15.3	10.05210	5.247905
Kisii	15.3	10.02506	5.274944
Luhya	15.3	9.843838	5.456162
Luo	15.3	9.598180	5.701820
Meru	15.3	8.608508	6.691492
Mijikenda	15.3	9.589104	5.710896

This study also established that there exists a difference in the impact of lactation on fertility among women residing in rural areas and those residing in urban areas. As is evident from table 4.11 the difference between the total fecundity and the total natural fertility rate is bigger among the women in the rural areas than among those in the urban areas. This observation implies that the impact of lactation on fertility is greater among these women residing in the rural areas than among the ones residing in the urban areas.

Table 4.11 Differences between the TF & the TN among the women residing in the rural areas and among those residing in the urban areas.

	TF	TN	TF-TN
Rural	15.3	9.694132	5.605868
Urban	15.3	9.876184	5.423816

When one is keen on establishing the impact of contraception on fertility, we have already seen that a simple technique would be to obtain the difference between the total natural fertility and the total marital fertility. This study has evidence from table 4.12 below that the impact of contraception on fertility is greatest among the women in Central province since the difference between the TNM and the TM is biggest among the women in this province. Meanwhile the impact of contraception on fertility is least in Western province where the difference between the two measures of fertility is smallest. This technique of determining the impact of contraception on fertility can be extended to the other regions.

Table 4.12 Differences between the TN & the TM among the regions

	TN	TM	TN-TM
Nairobi	9.557261	6.861183	2.696079
Central	10.12787	7.152634	2.975238
Coast	10.11152	8.736827	1.374690
Eastern	9.363848	7.565626	1.798222
Nyanza	9.766198	8.747830	1.018368
R.Valley	9.762834	8.073960	1.688874
Western	9.664684	8.692218	.9724663

Table 4.13 clearly shows that the difference between the total natural fertility and the total marital fertility increases as the level of education increases. In other words the higher the level of education, the higher the difference between the TNM and the TM. The implication of this is that the impact of contraception increases as the level of education increases. An example from table 4.13 to illustrate this would be a comparison of the differences between the TNM and the TM for the women with no education and those with secondary education and above. It is very clear that this difference is bigger for those women with secondary eduction and above than for those with no education and therefore the impact of contraception on fertility is greater among the latter than the former.

Table 4.13 Differences between the TN and TM among the various levels of education.

	TN	TM	TN-TM
No educ.	9.314932	8.412990	.9019425
Pri. inc.	9.824912	8.127649	1.697262
Pri. com.	9.724054	7.614779	2.109276
Sec.& hig	10.15467	7.136043	3.018630

Like the impact of lactation varied, the impact of contraception also varies among the three religious groups. This observation is supported by the results in table 4.14, which indicate that the difference between the total natural fertility and the total marital fertility is biggest among those women who are protestants followed by those who are muslims. This difference is least among women who are muslims. This can be interpreted to mean that the fertility reducing effect of contraception is highest among the protestants and lowest among the catholics, with the muslims coming in between. The differences are summarized in table 4.14 below.

Table 4.14 Differences between the TN and the TM among the various religious groups.

	TN	TM	TN-TM
Catholic	9.774662	8.367111	1.407551
Protestan	9.760153	7.706116	2.054037
Muslim	10.03654	8.018037	2.018503
Other	8.889938	7.033719	1.856219
No rel.	8.415520	7.699815	.7157055

The differences between the TNM and the TM among the various ethnic groups are summarized in table 4.15 below. It is quite clear that the impact of contraception is highest among the Kikuyu and it is lowest among the Luo, Mijikenda and the Kalenjin. The conclusion is appropriate since this difference between the TNM and the TM is biggest among the Kikuyu and smallest among the Luo.

Table 4.15 Differences between the TN and the TM among the various ethnic groups.

	TN	TM	TN-TM
Kalenjin	9.843035	8.757111	1.085924
Kamba	9.843035	8.581743	1.261291
Kikuyu	10.05210	6.711422	3.340673
Kisii	10.02506	8.378251	1.646805
Luhya	9.843838	8.566806	1.277032
Luo	9.598180	8.614180	.983999
Meru	8.608508	5.857654	2.750854
Mijikenda	9.589104	8.479175	1.109928

Table 4.16 indicates that there is quite a difference in the impact of contraception on fertility between the women residing in rural areas and those residing in the urban areas. This conclusion was drawn because the difference between the total natural fertility and the total marital fertility rate is bigger among those women residing in the urban areas than among those in the rural areas. This observation implies that the fertility reducing effect of contraception is higher among the women in the urban areas than among those in the rural areas.

Table 4.16 Differences between the TN and the TM among the women in rural areas and among those in the urban areas.

	TN	TM	TN-TM
Rural	9.694132	8.105044	1.589088
Urban	9.876184	7.315798	2.560386

The third intermediate variable looked at by this study was non-marriage. Non-marriage reduces fertility because it is assumed that married couples are likely to have sex more frequently than the unmarried individuals. To establish the effect of non-marriage on fertility, we obtained the differences between the total marital fertility rate and the total fertility rate. Using this technique this study established that, among the regions, the impact of non-marriage is greatest among those women in Coast province and is least among those in Western province. This is so because the difference between the TM and the TFR is biggest among the latter and is smallest among the former. This differences between the TM and the TFR among the various regions are summarized in table 4.17 below.

Table 4.17 Differences between the TM and the TFR among the regions.

REGION	TM	TFR	TM-TFR
Nairobi	6.861183	4.507349	2.353834
Central	7.152634	5.972962	1.179673
Coast	8.736827	5.644665	3.092162
Eastern	7.565626	6.420542	1.145084
Nyanza	8.747830	7.082151	1.665679
R.Valley	8.073960	6.661893	1.412067
Western	8.692218	8.102659	.589559

As is evident from table 4.18, the higher the level of education the bigger the difference between the total marital fertility and the total fertility rate. This means that the higher the level of education the greater the impact of non-marriage on fertility. An example of this from table 4.18 would be a comparison the differences between the TM and the TFR among women with no education and those with secondary education and higher. The biggest difference was found among the women with secondary education and higher while the smallest difference was found among those women with no education. This meant that the impact of non-marriage on fertility is highest among former and is lowest among the latter. This results are summarized in table 4.18.

Table 4.18 Differences between the TM and the TFR among the various levels of education.

	TM	TFR	TM-TFR
No educ.	8.412990	8.292932	.1200576
Pri. inc.	8.127649	7.315343	.8123065
Pri. com.	7.614779	6.508360	1.106418
Sec.& hig	7.136043	4.850047	2.285996

The table below indicates that the difference between the total marital fertility and the total fertility rate is biggest among the women who are muslims followed by those who are catholics. Protestants have the least difference between TM and TFR. The implication of this is that the impact of non-marriage on fertility is greatest among the muslims and least among the protestants. Catholics lie between the two extremes.

Table 4.19 Differences between the TM and the TFR among the various religious groups.

	TM	TFR	TM-TFR
Catholic	8.367111	6.494112	1.872999
Protestan	7.706116	6.082030	1.624086
Muslim	8.018037	5.663174	2.354863
Other	7.033719	3.594957	3.438762
No rel.	7.699815	6.411550	1.288264

Like the differences between TNM and TM varied from ethnic group to ethnic group, the differences between the total marital fertility rate and the total fertility varied a great deal among the various ethnic groups looked at. This variations were such that this difference was biggest among the Mijikenda, the Kalenjin and the Kamba and smallest among the Kikuyu and the Luo. This meant that non-marriage played a bigger role in reducing the fertility among the Mijikenda, the Kalenjin and the Kamba than it did among the Kikuyu and the Luo.

Table 4.20 Differences between the TM and the TFR among the eight ethnic groups.

	TM	TFR	TM-TFR
Kalenjin	8.757111	6.383507	2.373603
Kamba	8.581743	6.264472	2.317272
Kikuyu	6.711422	5.788531	.922891
Kisii	8.378251	6.378607	1.999644
Luhya	8.566806	7.366477	1.200329
Luo	8.614180	7.521155	1.093025
Meru	5.857654	3.878574	1.979081
Mijikenda	8.479175	6.043841	2.435335

Women living in rural areas generally had a lower fertility depressing effect of non-marriage than those living in the urban areas. There is evidence in table 4.21 to support this assertion, since the difference between the total marital fertility and the total fertility rate is bigger among the women living in the urban areas than among those living in the rural areas.

Table 4.21 Differences between the TM & TFR for women in the rural areas and for those in the urban areas.

	TM	TFR	TM-TFR
Rural	8.105044	6.655860	1.449183
Urban	7.315798	4.993911	2.321887

4.1.1 Discussion of the impact of the proximate determinants using the % reduction of fertility by each determinant.

The percentage reduction of fertility by lactation, contraception, and non-marriage are obtained as follows;

$$L\% = \frac{(TF-TNM)}{TF} \times 100$$

$$C\% = \frac{(TNM-TM)}{TNM} \times 100$$

$$M\% = \frac{(TM-TFR)}{TM} \times 100$$

Whereby, L% is the percentage reduction of fertility by lactation, C% is the percentage reduction of fertility by contraception and M% is the percentage reduction of fertility by non-marriage. In other words lactation reduces total fecundity by L% while contraception reduces total natural fertility by C% and non-marriage, on the other hand, reduces the total marital fertility by M%.

Table 4.22 Percentage reduction of fertility by lactation, contraception & non-marriage among the 8 regions.

Region	Lactation	Contraception	Marriage
Nairobi	38%	28%	34%
Central	34%	29%	16%
Coast	34%	14%	35%
Eastern	39%	19%	15%
Nyanza	36%	10%	19%
R.Valley	36%	17%	17%
Western	37%	10%	7%
National	36%	18%	26%

It is clearly evident from table 4.22 above that breastfeeding plays the biggest role in reducing the level of fertility in Kenya, since it reduces the total fecundity by about 37% compared to non-marriage which reduces the total marital fertility rate by about 26%.

Contraception, on the other hand, also has a role to play, as it reduces the total natural fertility rate by 18%

When discussing the effect of the proximate determinants of fertility on fertility among the provinces, we divided the provinces into low fertility regions, moderate fertility regions and high fertility regions,whereby provinces whose total fertility rates were below 6 were classified as low fertility regions, those whose total fertility rates were between 6 and 7 were classified as moderate fertility regions and high fertility regions were provinces whose total fertility rates were above 7.

Using table 4.2, Nairobi, Coast and Central fell under the low fertility regions, Eastern and Rift Valley were under the moderate fertility regions and lastly Nyanza and Western fell under high fertility regions.

4.4.1 The low fertility regions.

There exists a difference in the effect of the proximate determinants even among the regions with low fertility.

We had seen earlier that among the married women of reproductive age about 29% are using atleast a modern method of contraception in Nairobi, while about 30% are doing so in central province. This has the effect of reducing the total natural fertility by 28% and 30 % in Nairobi and Central respectively as indicated in table

4.22. Therefore, Nairobi and Central lie among the regions with low fertility, basically, because of the high levels of contraception.

Nairobi, among this low fertility regions, has the lowest fertility since, apart from having a high level of contraception, it has the longest mean duration of breastfeeding. This has the effect of reducing the total fecundity by 38%. Coast province, on the other hand lies among these low fertility regions essentially because the index of non-marriage is very high, infact the highest with the effect of reducing the total marital fertility by about 36%.

4.4.2 Moderate fertility regions.

Eastern and Rift valley provinces are the moderate fertility regions, as there total fertility rates lie between 6 and 7.

As is evident from table 4.2, Eastern province could be a high fertility region, were it not for the long mean duration of breastfeeding of 20.7 months, which reduces the total fecundity by about 39%.

4.4.3 High fertility regions.

With only about 11% and 10% of the currently married women of reproductive age using atleast one modern method of contraception, Nyanza and Western respectively, are distinct because of their high total fertility rates. The effect of this on fertility is that contraception reduces the total natural fertility by only 10% for both Nyanza and Western.

Contraception aside, Western province has the highest index of non-marriage, which reduces the total marital fertility by about 7% only.

Table 4.23 Percentage reduction of fertility by lactation, contraception & non-marriage among women at the various educational levels.

	Lactation	Contraception	Marriage
No Educ.	39%	10%	1%
Pri. Inc.	36%	17%	10%
Pri. Com	36%	22%	15%
Sec.& Hig	34%	30%	32%

According to table 4.3 the level of fertility varies inversely with the level of education, such that the higher the level of education, the lower the level of fertility.

Women with no education at all have the highest level of fertility because of their three distinct characteristics: they have the lowest level of contraception, with only 10% of the married women of reproductive age using atleast one modern method of contraception, they also have the longest mean duration of breastfeeding of 20.9 months and they have the lowest level of non-marriage. Because of the above mentioned, contraception has the effect of reducing the total natural fertility by about 10% among these women, while breastfeeding reduces the total fecundity by 39% as is evident from table 4.23. Non-marriage, on the other hand, depresses the total marital fertility by only 1%.

Women with secondary education and higher have the lowest mean duration of breastfeeding and therefore breastfeeding has the greatest effect on fertility among them, such that it reduces the total fecundity by about 34%. The index of non-contraception is lowest among these same women with secondary education and higher, since about 31% of the married women in this sub-group are using atleast one modern method of contraception. With such a high proportion of women contracepting, the effect of contraception on fertility among these women with secondary education and above is that it reduces the total natural fertility by about 30%.

The index of non-marriage, on the other hand, is lowest among these women with secondary education and higher such that non-marriage depresses the total marital fertility by only 32%.

Table 4.24 Percentage reduction of fertility by lactation, contraception & non-marriage among the three religious groups.

	Lactation	Contraception	Marriage
Catholic	36%	14%	22%
Protest.	36%	21%	21%
Muslim	34%	20%	29%

As is evident from table 4.4, only about 15% of the married women among the catholics were using atleast a modern method of contraception, while 22% are using atleast a modern method among the protestants. This is basically why contraception reduces the total natural fertility by only 14% among the catholics and by 20% among the protestants. The mean duration of breastfeeding, on the other hand, is longest among the protestants with an effect of reducing the total fecundity by about 36% and it is shortest among the muslims such that it reduces the total fecundity by about 34%. The above could be the best explanation for the high total fertility rate among the catholics and the low total fertility rate among the protestants.

Table 4.25 Percentage reduction of fertility by lactation, contraception & non-marriage among the 8 ethnic groups.

	Lactation	Contraception	Marriage
Kalenjin	36%	11%	27%
Kamba	36%	13%	27%
Kikuyu	34%	33%	14%
Kisii	34%	16%	24%
Luhya	36%	13%	14%
Luo	37%	10%	13%
Meru	44%	27%	34%
Mijikenda	37%	12%	29%

All the ethnic groups with total fertility rates of less than 6 were classified as low fertility ethnic groups, those with total fertility rates of between 6 and 7 were classified as moderate fertility ethnic groups and those whose total fertility rates was above 7, were classified as high fertility ethnic groups. From table 4.5, therefore, it is quite clear that kikuyu and Meru fall under the low fertility ethnic groups. The Kalenjin, Kisii, Kamba, and Mijikenda/Swahili, on the other hand, fall under the moderate fertility ethnic groups as the luo and luhya fall under the high fertility ethnic groups.

4.4.4 **Low fertility ethnic groups.**

Kikuyu have a very low total fertility rate, basically, because they have the lowest index of non-contraception, with about 34% of the married women of reproductive age using atleast a modern method of contraception. This level of contraception depresses the total natural fertility by about 33%. Infact were it not for the fact that they have the shortest mean duration of breastfeeding, which reduces the total fecundity by 34%, Kikuyu could have a much lower total fertility rate. Meru on the other hand lie among the ethnic groups with low fertility rates, essentially, because of having the longest mean duration of breastfeeding, which has the effect of reducing the total fecundity by 44%. Their level of contraception is also high, next only to the Kikuyu, with about 29% of their married women using a modern method of contraception. This has an effect of reducing the total natural fertility by about 27%.

4.4.5 Moderate fertility ethnic groups.

Mijikenda/Swahili have a moderate fertility level of 6.04, because they have a long duration of breastfeeding, which has an effect of reducing the total fecundity by 37%. Otherwise, with only 13% of the married women in reproductive age using atleast one modern method of contraception they could be having a very high total fertility rate. Kalenjin could be among the low fertility ethnic groups, were it not for the high index of non-contraception, which has the effect of reducing the total natural fertility by only 11%. Among then only 12% of the married women were using atleast one method of contraception.

4.4.6 High fertility ethnic groups.

Luo have the highest total fertility rate primarily, because they have the highest indices of non-marriage and contraception. The effect of this on fertility is that non-marriage reduces the total marital fertility by 13%, while contraception reduces total natural fertility by 10%.This is as a results of only 10% of the married women using atleast one modern method of contraception. Luhya, on the hand, have a high total fertility rate since only 14% of the married women were using atleast one modern method of contraception, with the effect of reducing the total natural fertility by only 13%. They also, like the luo, have a high index of non-marriage with the effect of depressing the total marital fertility by 14%.

Table 4.26 Percentage reduction of fertility by lactation, contraception & non-marriage among women in rural areas and among those in urban areas.

	Lactation	Contraception	Marriage
Rural	37%	16%	18%
Urban	35%	26%	32%

Only 17% of the currently married women of reproductive age were using atleast one modern method contraceptive in the rural areas. It is as a result of this that contraception has the effect of reducing the total natural fertility by only 16%. This is a very small % compared to 27% of the married women using atleast a modern method among the women in the urban areas which had the effect of reducing the total natural fertility by 26%.

With an index of non-marriage of 0.82, which is higher than that of the women in the urban places, non-marriage has the effect of reducing the total marital fertility by only 18% in the rural areas compared to 32% in the urban areas.

Table 4.27. The four measures of fertility for the seven regions.

Region	TF	TN	TM	TFR
Nairobi	15.3	9.557261	6.861183	4.507349
Central	15.3	10.12787	7.152634	5.972962
Coast	15.3	10.11152	8.736827	5.644665
Eastern	15.3	9.363848	7.565626	6.420542
Nyanza	15.3	9.766198	8.747830	7.082151
R.Valley	15.3	9.762834	8.073960	6.661893
Western	15.3	9.664684	8.692218	8.102659

Central province and coast province have the highest total natural fertility, since they have the shortest mean duration of breastfeeding. Meanwhile, Eastern has the lowest total natural fertility because of having the longest duration of breastfeeding. The combined effect of breastfeeding and contraception has the greatest effect on fertility in Nairobi, where the total fecundity is reduced by 55% and the least effect on fertility in Western province, where the total fecundity is depressed by 43%.
Lastly, the combined effect of the three intermediate variables: contraception, lactation and non-marriage is greatest in Nairobi, where the total fecundity is reduced by 71% and least in western province, where the total fecundity is depressed by 47%.
The four measures of fertility for the regions are illustrated in figure 1 below.

Table 4.28 The four measures of fertility for the various levels of education.

	TF	TN	TM	TFR
No Educ.	15.3	9.314932	8.412990	8.292932
Pri. Inc.	15.3	9.824912	8.127649	7.315343
Pri. Com	15.3	9.724054	7.614779	6.508360
Sec.& Hig	15.3	10.15467	7.136043	4.850047

Among the women with no education, lactation alone reduces total fecundity by 39% while the combined effect of breastfeeding and contraception reduces total fecundity by 45%. The combined effect of lactation, non-marriage and contraception,on the other hand, reduces total fecundity among these women by only 46%.

Among the women with secondary education and higher, lactation reduces the total fecundity by 34%, the combined effect of lactation and contraception does it by 53%, while lactation, contraception and non-marriage reduces it by 68%.

Figure 2 gives an illustration of the above.

FIGURE 1 : The effect of lactation, non-marriage & contraception on fertility by region.

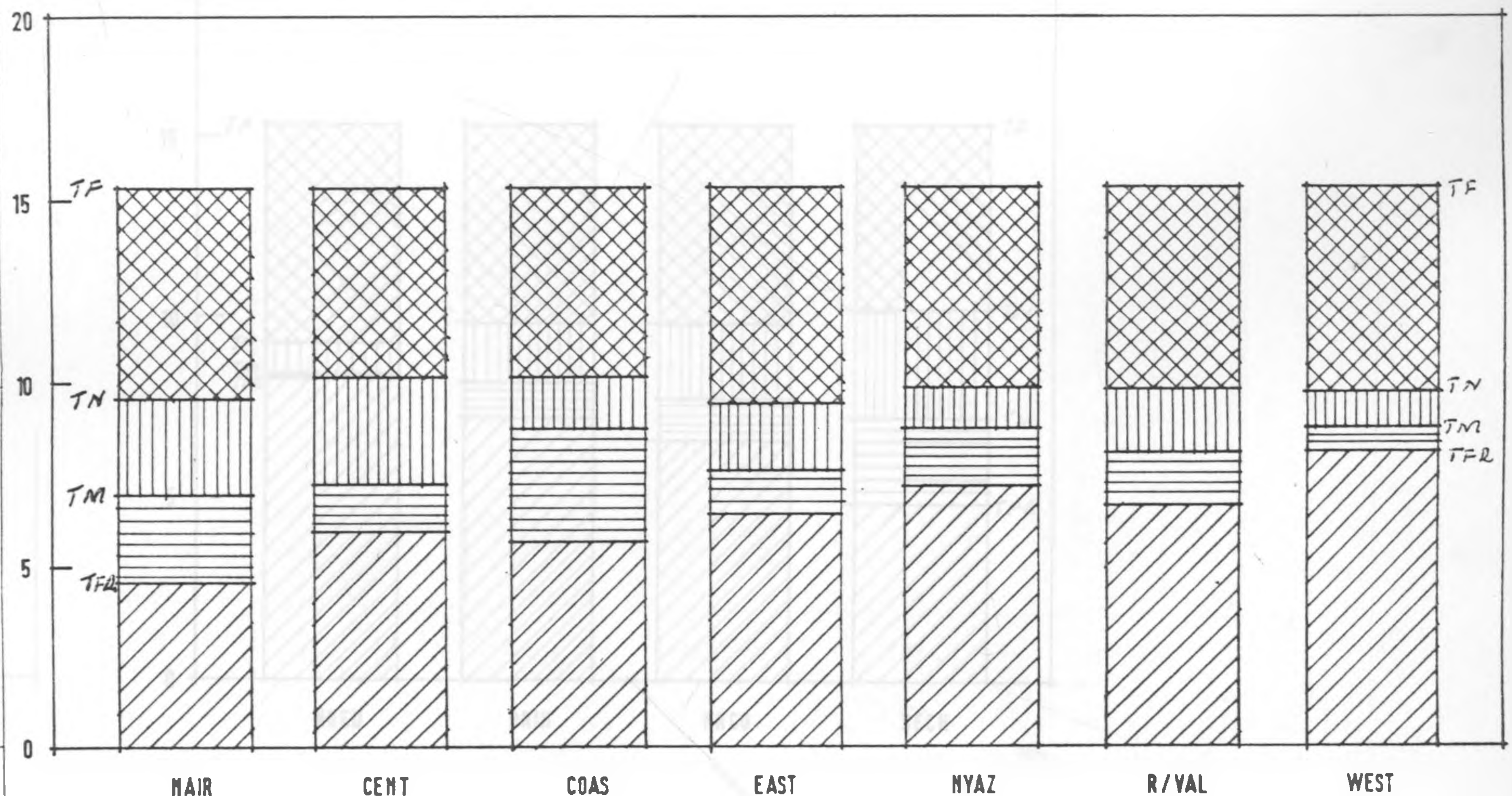


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FIGURE 2 : The effects of lactation, non-marriage & contraception on fertility by level of education.

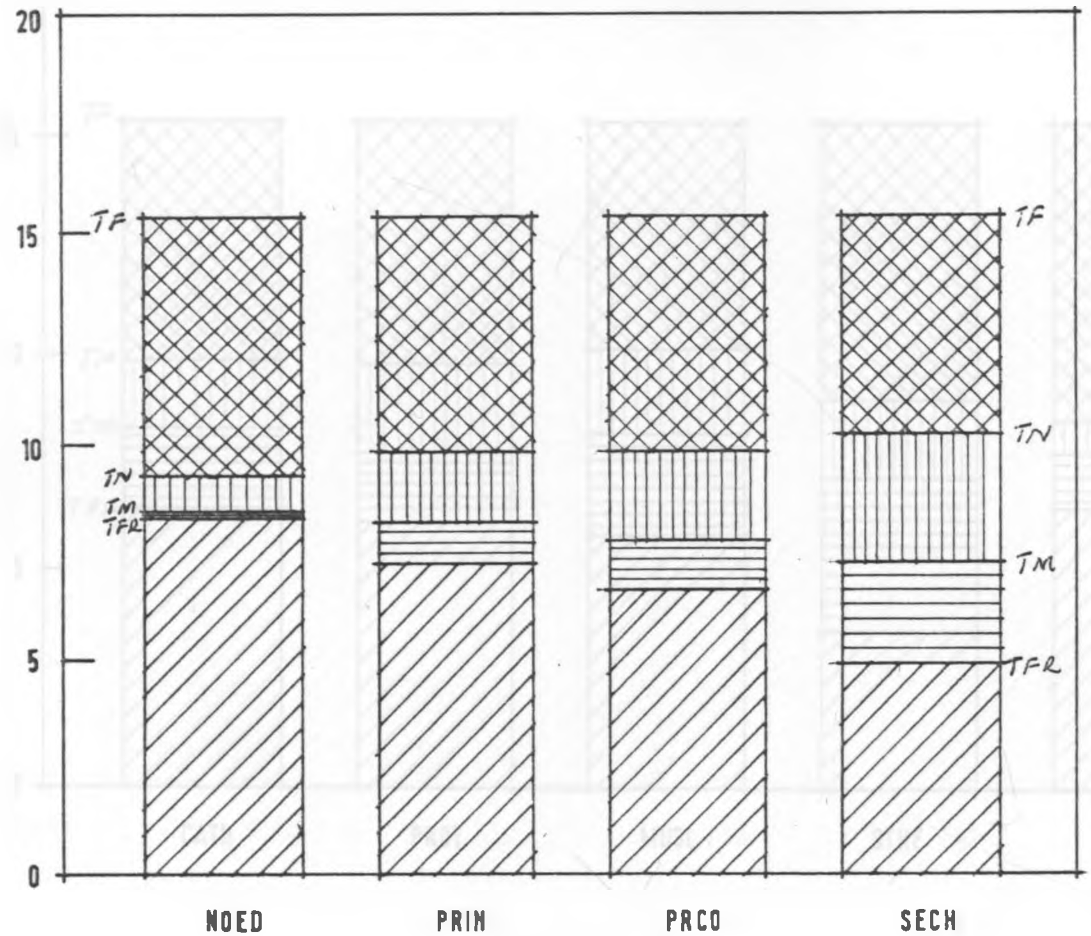

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FIGURE 3 : The effect of lactation, non-marriage & contraception on fertility by religion.

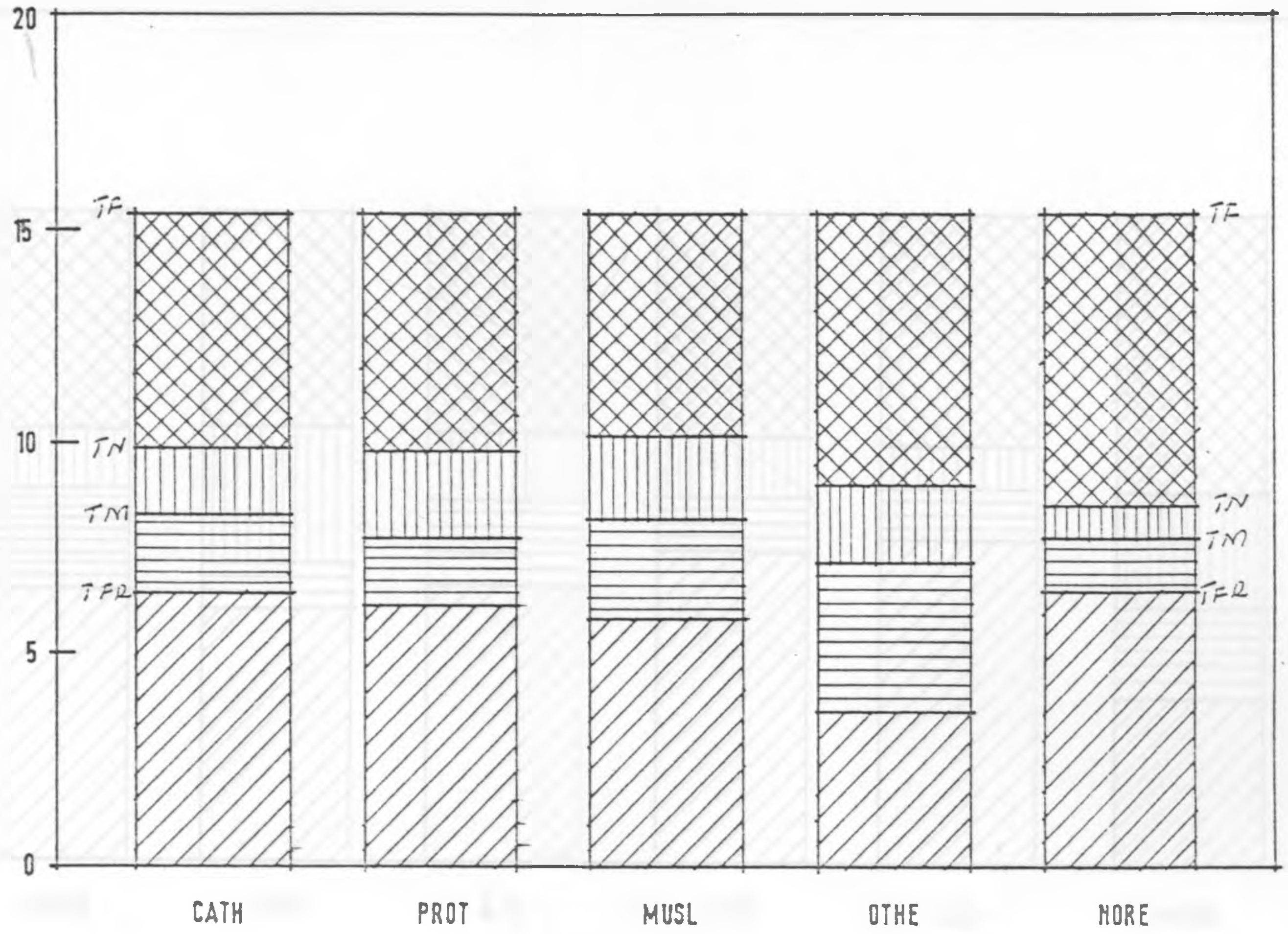

FIGURE 4 : The effect of lactation, non-marriage & contraception on fertility by ethnicity.

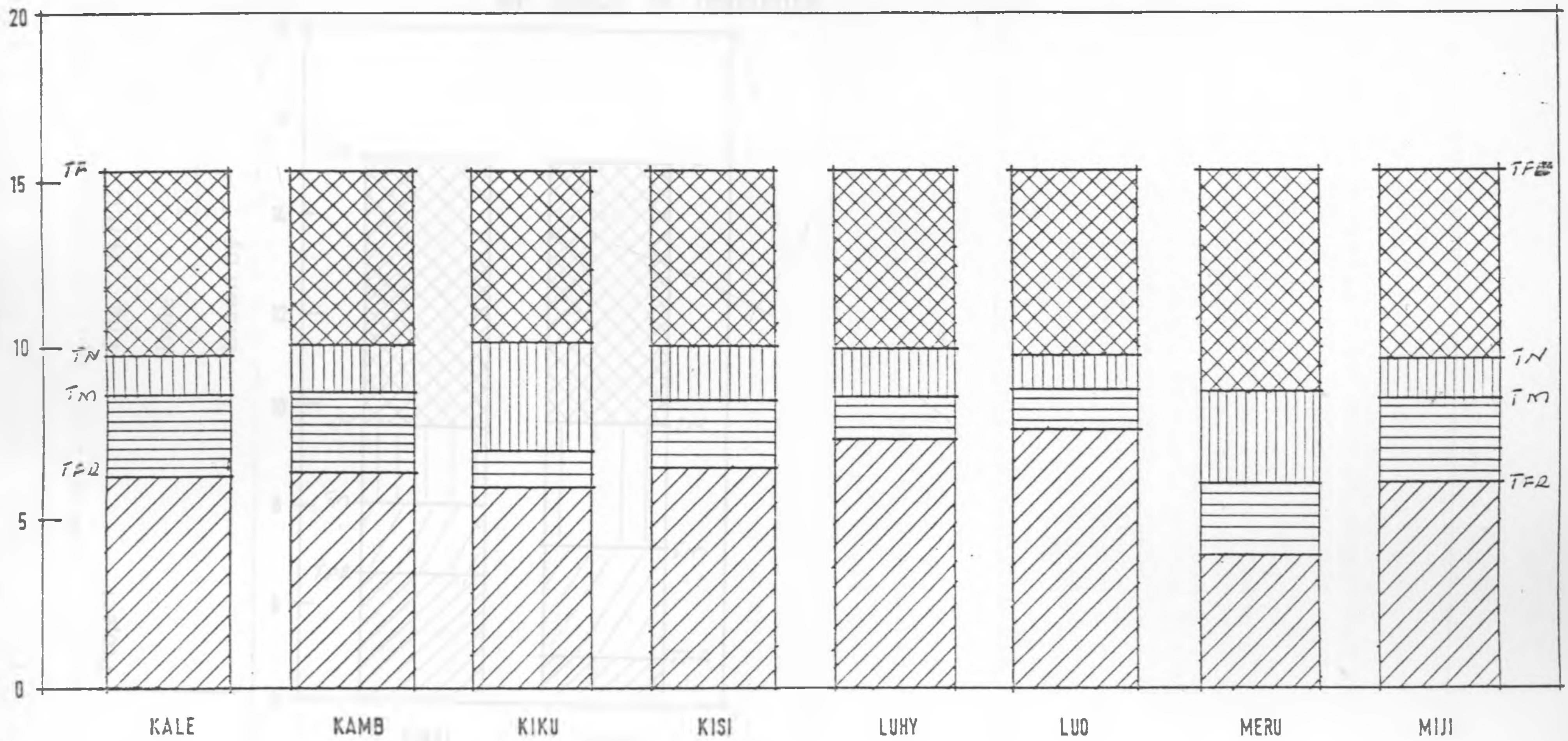

FIGURE 5 : The effect of lactation , non-marriage & contraception on fertility by place of residence.

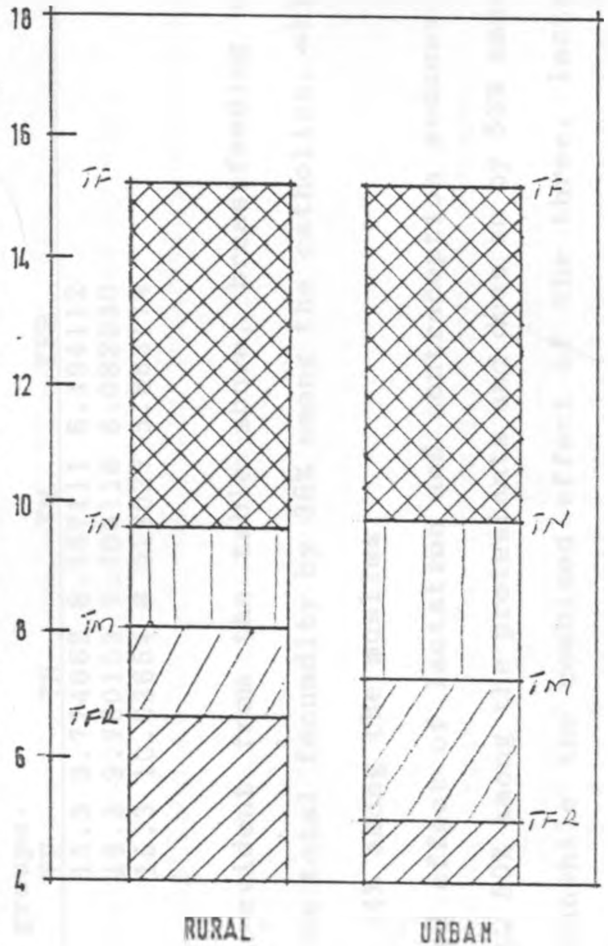

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Table 4.29 The four measures of fertility for the three religious groups.

	TF	TN	TM	TFR
Catholic	15.3	9.774662	8.367111	6.494112
Protest.	15.3	9.760153	7.706116	6.082030
Muslim	15.3	10.03654	8.018037	5.663174

As is evident from the table above, breastfeeding alone, depresses the total fecundity by 36% among the catholics, while it does so by 34% among the muslims.

The combined effect of lactation and contraception reduces total fecundity by 50% among the protestants and does so by 53% among the muslims. Meanwhile the combined effect of the three, lactation, non-marriage and contraception has the greatest effect on the total fecundity among the protestants as it reduces the it by 60% and the least effect on the total fecundity among the catholics as the total fecundity is reduced by 58%.

Table 4.30 The four measures of fertility for the ethnic groups.

	TF	TN	TM	TFR
Kalenjin	15.3	9.843035	8.757111	6.383507
Kamba	15.3	9.843035	8.581743	6.264472
Kikuyu	15.3	10.05210	6.711422	5.788531
Kisii	15.3	10.02506	8.378251	6.378607
Luhya	15.3	9.843838	8.566806	7.366477
Luo	15.3	9.598180	8.614180	7.521155
Meru	15.3	8.608508	5.857654	3.878574
Mijikenda	15.3	9.589104	8.479175	6.043841

Of all the eight ethnic groups, breastfeeding has the greatest effect on fertility among the kikuyu, where it reduces the total fecundity by 34% compared to the meru where it depresses it by about 44%.The combined effect of breastfeeding and contraception has the greatest effect on fertility among the Kikuyu and the meru, as the total fecundity is reduced by about 56% in both ethnic groups, compared to the luo where it is reduced by 44%.

Lastly, the combined effect of the three intermediate variables is most felt among the Luo and the Luhya as the total fecundity is reduced by 51% and 52% respectively.

Table 4.31 The four measures of fertility for the women in the rural areas and for those in the urban areas.

	TF	TN	TM	TFR
Rural	15.3	9.694132	8.105044	6.655860
Urban	15.3	9.876184	7.315798	4.993911

Women in the rural areas have a longer mean duration of breastfeeding and that is essentially why they have a lower total natural fertility rate. This is as a result of breastfeeding reducing the total fecundity among these women by 37% compared 35% among those in urban areas. The combined effect of lactation and contraception has the effect of reducing the total fecundity by 47% for the women in the rural areas and 52% for those women in the urban areas. These proximate determinants when put together, have the effect of reducing the total fecundity by 56% and 67% among women in the rural areas and urban areas respectively.

CHAPTER FIVE

SUMMARY AND CONCLUSION.

5.1 Introduction.

In this thesis, the study of the contribution of the proximate determinants of fertility on fertility in Kenya, using the Kenya Demographic and Health Survey has been carried out.

The indices of non-marriage, non-contraception and lactational infecundity were computed as they were necessary as a pre-condition, to fulfil the objective of determining the possible causes of fertility differences among populations in Kenya. This was done by estimating the effect of the Bongaarts' proximate determinants of fertility on fertility in each of the sub-group looked at. Prior to estimating the effect of these proximate determinants of fertility on fertility, we estimated the duration of breastfeeding using the Prevalence-Incidence method and also estimated total fertility rates using the Coale-Trussell P/F technique to determine the validity of the Bongaarts' model.

A summary of total fertility rates and indices measures has been made in table 5.1 by various sub-groups.

Table 5.1 The total fertility rates obtained using the Bongaarts' model, the three indices of fertility, the proportions contracepting and the mean durations of breastfeeding for all the subgroups.

Region	TFR (Bongaarts')	CM	CC	Ci	U	B/F	TFR (P/F)
Nairobi	4.5	.66	.72	.62	.29	19.99	4.2
Central	5.97	.84	.71	.66	.30	17.90	6.5
Coast	5.64	.65	.86	.66	.14	17.96	5.9
Eastern	6.42	.85	.81	.61	.20	20.70	7.3
Nyanza	7.08	.81	.90	.64	.11	19.21	7.7
R.Valley	6.66	.83	.83	.64	.19	19.22	7.4
Western	8.10	.93	.90	.63	.10	19.58	8.4
No educ.	8.29	.99	.90	.61	.10	20.94	8
Pri. Inc.	7.32	.90	.83	.64	.18	18.99	7.9
Pri. Com.	6.51	.85	.78	.64	.23	19.36	6.4
Sec.& Hig	4.85	.68	.70	.66	.31	17.81	5
Catholic	6.49	.78	.86	.64	.15	19.18	6.9
Protestan	6.08	.79	.79	.64	.22	19.23	6.6
Muslim	5.66	.71	.80	.66	.23	18.23	6.2
Other	3.59	.51	.79	.58	.23	22.74	5.1
No rel.	6.41	.83	.91	.55	.08	25.03	7.5
Kalenjin	6.38	.73	.89	.64	.12	19.72	6.5
Kamba	6.26	.73	.87	.64	.13	18.92	6.7
Kikuyu	5.79	.86	.67	.66	.34	18.17	6.5
Kisii	6.38	.76	.84	.66	.18	18.27	6.6
Luhya	7.37	.86	.87	.64	.14	18.92	7.8
Luo	7.52	.87	.90	.63	.10	19.84	7.4
Meru	4.14	.66	.73	.56	.29	24.05	5.2
Mijikenda	6.04	.71	.88	.63	.13	19.87	5.4
Rural	6.66	.82	.84	.63	.17	19.47	7.7
Urban	4.99	.68	.74	.65	.27	18.80	4.6
National	5.87	.74	.82	.64	.19	19.36	7.1

5.2 Summary of the fertility estimates.

The first objective of estimating fertility levels using the Bongaarts' model and the second one of comparing these results with those obtained using the Coale-Trussell technique were achieved since it has been shown that apart from some isolated cases, the total fertility rates obtained using the Bongaarts' model are not very different from those obtained using the Coale-Trussell P/F ratio technique. The differences between the two measures of fertility as observed from the above table, range from 0.1 to 1.2 and are lowest among the women with completed primary education and among the Luo, where they are 0.1. These differences are highest among women of Meru ethnic group and at the national level, where they are 1.1 and 1.2 respectively.

Clearly, the earlier conclusion that proportions married, contraception and lactational infecundability are the most important intermediate fertility variables is supported by this findings. These results also confirm the general validity of the model. Variance in fertility that is not explained by the three principal intermediate variables is due to several factors, including:

(1) The fact that the intermediate variables are just but estimates.

(2) The assumption that the total fecundity is 15.3 is only an approximation otherwise the normal range of total fecundity is from 13 to 17 births per woman.

(3) There are many assumptions made when relating the total fertility rate to the intermediate variables to form the Bongaarts' model.

(4) The Coale-Trussell P/F ratio technique has its own shortcomings and there is not a perfect measure of fertility.

(5) The assumption that in Kenya induced abortion does not exist is quite misleading, and may yield an error while computing the total fertility rate using the Bongaarts' model.

5.3 Summary of the contributions of the intermediate fertility variables on fertility.

The second third and fourth objectives of this study of establishing the contribution of contraception, non-marriage and breastfeeding on fertility were also achieved since it was shown the difference in fertility levels among the various subgroups are reflected in variations in the intermediate variables. For instance, the fertility differentials (thus the total fertility rates) among the regions (provinces)and among the residential, ethnic and educational groups are inversely related to variations in the effect of breastfeeding (Ci) and are positively related to the variations in the proportions currently married (Cm). In other words, the longer the duration of breastfeeding the lower the total fertility rates and the total marital fertility rates. The higher the proportion of currently married women the higher the fertility rate. The inverse relationship is also reflected in the proportion of women using atleast one modern method of contraception. It can be clearly seen from the tables elsewhere, that the higher the proportion of women using atleast one method of contraception the lower the fertility rate.

Among the regions breastfeeding has the greatest effect on fertility in Eastern province where the total fecundity is reduced by 39% from 15.3 to a total natural fertility of 9.36. Effective use of contraception is relatively more marked (index of

contraception is lower) in Central province as the total natural fertility is reduced by 29% from 10.1 to a total marital fertility of 7.15, followed by Nairobi with Western province making very little use of contraceptives. The index of non-marriage is highest in Western province (thus 0.961) and it declines to 0.64 in Coast province. In the latter, non-marriage depresses total marital fertility rate by 35% from 8.74 to a total fertility rate of 5.6 while in western province it does so by only 14%
The combined effect of breastfeeding and contraception has the greatest effect on fertility in Central province, where the total fecundity is reduced by 53% to a total marital fertility of 7.15 and the least effect on fertility in Nyanza province as it reduces the total fecundity by only 43%.
Meanwhile, the combined effect of breastfeeding, contraception and non-marriage has the greatest effect on total fecundity in Nairobi, where the total fecundity is reduced by 71% to a total fertility rate of 4.5 and the least effect in Western.

Women with no education, experience the longest duration of breastfeeding, with breastfeeding reducing total fecundity by 39% to a total natural fertility of 9.31, while contraception has a sustained depressing effect on fertility levels among women with secondary education and higher as it reduces the total natural fertility by about 30% to a total marital fertility of 7.14.
The combined effect of breastfeeding and contraception has the greatest effect on fertility among these same women with secondary education and higher as the total fecundity is reduced by 53% to

a total marital fertility of 7.14 and the least effect among the women with no education as is expected.

Lastly, the combined effect of breastfeeding, contraception and non-marriage has the greatest effect among the women with secondary education and higher, where the total fecundity of 15.3 is reduced by 68% to a total fertility rate of 4.5.

Among the religious groups looked at by the Kenya Demographic and Health Survey, breastfeeding had the greatest effect on fertility among the protestants, since the total fecundity was reduced by 36% while the combined effect of breastfeeding and contraception had the greatest effect on fertility among the protestants among whom the total fecundity is reduced by 50% to 7.71 and it has the least effect among the catholics where total fecundity is reduced by 36% to a total natural fertility of 9.8. Meanwhile, the combined effect of breastfeeding, contraception and non-marriage affects fertility most among the protestants once more as total fecundity is reduced by 60% to 6.1 compared to the protestants where the total fecundity is reduced to 7.7, a reduction by 50%.

Since they have the longest mean duration of breastfeeding, breastfeeding has the greatest effect on fertility among the Meru as the total fecundity is reduced by 44% to a total natural fertility of 8.6 compared to the Kikuyu whose total fecundity is reduced by only 34%. Contraception on the other hand has the greatest effect on fertility among the Kikuyu as it reduces the total natural fertility from 10.1, by 33%, to a total marital

fertility of 6.7, meanwhile, it does so by only 10% among the Luo. This findings support the fourth hypothesis of the study.
The combined effect of breastfeeding and contraception has the greatest effect on total fecundity among the Meru where the total fecundity is reduced by 62% to a total marital fertility of 5.9 compared to the Luo where the combined effect reduces the total fecundity by only 44%, while the effect of breastfeeding, contraception and non-marriage combined had the greatest effect on total fecundity among the same Meru, as the total fecundity is reduced by 73% to a total fertility rate of 4.1.

We note that Luhya achieve their total fertility rate with a comparatively high mean duration of breastfeeding coupled with a fairly high proportion of married women and very little use of contraception. Among the Luo, we have a protracted duration of breastfeeding which is compensated for by virtual non-use of contraception and, once again a relatively high proportion of married women.

From the analysis, therefore, all the hypothesis advanced were confirmed and all the objectives were achieved.

5.4 Conclusion.

Kenya's fertility may have dropped as indicated by the Kenya Demographic and Health Survey but the fertility rates remain among the highest in the world. This study has found striking differences in fertility according to women's level of education and place of residence. Women who have not attended school have a total fertility rate of 8.3 whereas women with secondary education and higher have a rate of only 4.9. Women in rural areas have a rate of 6.7 versus 5.0 for women in urban areas. By region, fertility is lowest in Nairobi (4.5), and highest in Western province (8.1). Catholics have the highest total fertility rate of 6.5 while Muslims have the lowest total fertility of 5.7. Among the various ethnic groups Luo have the highest the highest total fertility rate of 7.5 while Meru have the lowest (4.1).

Of the various proximate determinants of fertility, three have been identified by this study as of particular relevance for fertility levels and trends in Kenya: the proportions married among women of reproductive age, the length of time following each birth during which the woman is not susceptible to a new pregnancy (i.e, the non-susceptible period resulting from lactation, the resort of contraception).

Not much of Kenya's capacity for reproduction is lost through women being unmarried. Marriage is universal and, generally, early as over a half of all women marry before the age 20.
This is essentially why non-marriage reduces the total marital fertility rate by 24% in Kenya. Child-spacing, achieved primarily by prolonged lactation remains the major restraint on fertility levels in most of the sub-groups, particularly in Eastern province,among the women with no education, protestants and among the Meru. Breastfeeding durations vary between regions, ethnic groups and religious groups. But at the national level it is 19.5 months. This translates into a 13.1 months or slightly longer

period of postpartum amenorrhea.

It is known that duration of breastfeeding generally declines both with the increasing availability of suitable substitutes for breastmilk and with the increase in the proportion of women employed in formal sector jobs that are incompatible with prolonged full breastfeeding.

In Kenya, use of contraceptives is still very limited, with the exception of Central province where about 30% of the married women use atleast a modern method of contraception. At the national level only 19% of the married women use atleast one modern method of contraception. Moreover, the Kenya Demographic and Health Survey may have overestimated the actual use contraception.

Generally, we can conclude that Eastern province among the regions, women with no education, protestants and Meru experience the longest durations of breastfeeding, while Central, women with secondary education and higher, muslims and Kikuyu experience the shortest durations of breastfeeding. Contraception, on the other hand, is practiced most by women in Central province, women with secondary education and higher, protestants and Kikuyu and is practiced least by women in Western province, women with no education, by muslims and Luo.

Lastly, non-marriage is least common in Western province, among women with no education, protestants and Luo.

Women in rural areas, also have a higher index of non-marriage, a higher index non-contraception and a lower index of lactational infecundability compared to their urban counterparts.

We have already seen in chapter two that there are three major studies that have used the Bongaarts' model to explain the variations in fertility among the subgroups in Kenya. According to Ferry and Page (1984), Coast had the greatest combined fertility-reducing impact for the two variables; post-partum period and contraception (0.52), greater than that of Nairobi and Rift Valley (0.56). Coast achieved this, like Rift Valley, mainly through a long post-partum period, whereas Nairobi does it also through its significantly greater use of contraception. When C_m is included in addition to C_c and C_i, then the combined impact is clearly stronger for city dwellers and those who live in Nairobi, with relatively small differentials otherwise. Overall, lactational infecundability played a dominating role. This findings are not very different from our findings in this study.

FURTHER RESEARCH.

We recommend further research to be done in these areas:

(i) A study to explain the variations in the intermediate variables among the sub-groups.

(ii) A study to explain the variation in fertility levels among the districts in Kenya.

(iii) A study to estimate the present fertility levels in north eastern province which was not covered by the Kenya Demographic and Health Survey.

RECOMMENDATIONS.

Using the findings of this study, we strongly recommend the following:

1. Since the governments of developing countries like Kenya emphasize the importance of reducing fertility as part of their overall strategy for improving standards of living, family planning programs aimed at increasing the use of effective contraception should be intensified especially in Western and Nyanza provinces.

2. Women in Coast province and those of the Meru ethnic group have a low fertility essentially because of non-marriage and lactational infecundability respectively. This is bound to change with modernization. We therefore recommend that family planning programmes should also give special attention to such sub-groups

3. This study has shown that the use of effective contraception is among the women with secondary education and higher. We therefore strongly recommend to the government of Kenya facilitate the proper implementation of the policy of universal education especially for girls.
4. The formation of the government policies must take into account the culture of the society if policies are to have the impact intended.
5. Lastly, the government should educate women on the importance of breastfeeding as a method of contraception. This is because this study has shown that the effect of breastfeeding on fertility has been playing a major role in suppressing fertility in Kenya and this is not going to remain so as more and more women acquire secondary education and higher.

BIBLIOGRAPHY

Anker, R. and J.C. Knowles (1980). Human fertility in Kenya, *World Employment Programme Research, Draft Geneva*: ILO.

Anrudh K. J. (1985). Impact of Development and Population Policies on Fertility in India the *Studies in Family Planning*. *Studies in Family Planning*. Vol. 16. No.4

Bongaarts J. and J. Menken (1977). Reproduction Models in the Study of Nutrition-fertility inter-relationships in *Center for Policy Studies, Working Papers*, The population Council, New York.

Bongaarts J. and R.G Potter (1983), An analysis of the proximate determinants in Behavior, Biology and Fertility Behavior, Studies in Population (New York:Academic press).

Bongaarts J. and C. Tietze (1977). The efficiency of 'menstrual regulation' as a method of fertility control, *Center for Policy Studies, Working Papers*, The Population Council.

Bongaarts J. (1978). A framework for analyzing the proximate determinants of fertility in *Population and Development review 4*, No.1: Pg.105-132.

----------- (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.

------------ (1980). The Fertility-Inhibiting Effects of the Intermediate Fertility Variables in *Center for Policy Studies, Working Papers, No. 57*, The population Council, New York.

------------ (1982). The Fertility-Inhibiting Effects of the Intermediate Fertility Variables in *Studies In Family Planning*, VOL.13, NO.6/7.

Caldwell J.C. and P. Caldwell (1977). The roll of Marital Sexual Abstinence in Determining Fertility: a Study of Yoruba in Nigeria. *Population Studies* 31: 343-69.

Davies K and J. Blake (1956). Social Structure and Fertility: an Analytic Framework. *Economic Development and Cultural Change.* 4: 211-53.

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, Netherlands: Internal Statistical Institute.

Gaisie S.K.(1984) The proximate determinants of fertility in Ghana, *Scientific Reports* No.53. Voorburg, Netherlands: Internal Statistical Institute.

Gaslonde S. (1977). The Impact Of Some Intermediate Variables on Fertility: Evidence From The Venezuela National Fertility Survey, 1977.

Goldscheider C. and W.D. Mosher (1988). Religious affiliation and contraceptive usage:changing American patterns, 1955-82 in *Studies In Family Planning*, Vol. 19, No.1.

Henri L. and J. Menken (1977). Patterns and Determinants of Natural Fertility: Proceedings of a seminar on International Union for the Scientific Study of Population in *Natural Fertility*, IUSSP.

Hilary Page (1986). Fertility and Family Planning in Sub-saharan Africa, University of Ghent.

Hobcraft J. and R.J.A Little (1985). *Population studies*, Vol.38, No.1.

Kalule-Sabiti (1984). Proximate Determinants of Fertility Applied to Data From The Kenya Fertility Survey (1977/78); *Journal of Biological Science 16 WFS*, International statistical institute, London.

Komba A.S and Kamuzora C.L (1988). Fertility Reduction Due to Non-marriage and Lactation: A Case Study Of Kibaha District, Tanzania, in *Africa Population Conference*, vol. 1, Dakar, IUSSP, UAPS.

Laing E.John (1984). Natural Fertility in Philippines *Studies In Family Planning*, Vol.15, No.2,June 1978.

Mosley, Henry, W. Linda and S. Backer (1982). The dynamics of birth spacing and marital fertility in Kenya, *WFS Scientific Reports* No.30, Voorburg, Netherlands: Internal Statistical Institute.

Mwobobia, I.K.(1982).Fertility differentials in Kenya: Across regional study. M.A thesis, Population Studies and Research Institute, University of Nairobi.

NCPD (1989). Kenya Demographic and Health Survey (KDHS), National Council for Population and Development, Nairobi.

Nortman L. D., R. G. Potter, S. W. Kirmeyer and J. Bongaarts (1978). Birth rates and birth control practices: Relations Based on the Computer Models TABRAP and CONVERSE, the population council, New York.

Ocholla-Ayayo A.B.C and Osiemo J.A.O (1989). Socio-cultural dynamics of fertility change and differential in kenya in the *Kenya Journal of Science Series C.*

Ocholla-Ayayo A.B.C and Z. Muganzi (1986). Field report in Nyanza and Western Provinces ongoing research on marital patterns as fertility determinants with differential effects among ethnic groups in Kenya.

Omagwa (1986). The influence of socio-economic and demographic factors on fertility levels in Nairobi. M.Sc thesis, Population Studies and Research Institute, (PSRI), University of Nairobi.

Osiemo, J.A.O. (1986). Estimation of fertility levels and differentials in Kenya: An Application of Coale-Trussell and Gomperz Relational Models, M.Sc thesis, PSRI, University of Nairobi.

Page H.J., Lesthaeghe R.J. and I.H Shah (1982). Illustrative Analysis: Breastfeeding in Pakistan. *WFS, Scientific reports No. 37,* Voorburg, Netherlands: Internal Statistical Institute.

Potter R.F. (1963): Birth Intervals: Structure & Change. *Population Studies 17.*

Sheps M. and J. Menkents (1973) . *Mathematical models of Contraception and Birth.* Chicago: University of Chicago Press.

Sheps C. M. (1964). Applications of Probability Models to the Study of Patterns of Human Reproduction in *Public Health and Population Change*, IUSSP.

Silva N. Do Valle, Maria Helena F.T., De Souza A., Singh S., Casterline B. and Cleland J.G (1985). *Population Studies*, Vol.39 No.1.

Tietze C. (1964). History and Statistical evaluation of Intrauterine Contraceptive Device in *Public Health and Population Change*, University of Pittsburg press.

United Nations, Manual X, (1983): Indirect techniques for Demographic Estimation, New York.

APPENDICES

APPENDIX 1: Computation of the total fertility rate using the Coale-Trussell P/F technique.

Nairobi

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	11	35	12	.3097345	.1061947
20-24	2	139	181	36	1.302158	.2589928
25-29	3	104	244	23	2.346154	.2211538
30-34	4	75	280	9	3.733333	.12
35-39	5	47	222	6	4.723404	.1276596
40-44	6	32	162	0	5.0625	0
45-49	7	14	71	0	5.071429	0
		524				4.170005

Nairobi (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2300961	.0963219	.1311414	1.346109	.1322261
.5309735	1.291476	.1176894	.2600736	1.008272	.2622248
1.825937	2.533230	.1305339	.2107905	.9261512	.2125340
2.931707	3.284967	.1059073	.1178560	1.136490	.1188309
3.531707	3.983315	.2152374	.1141395	1.185797	.1150836
4.170005	4.169588	.27	0	1.214149	0
4.170005	4.170005		0	1.216169	0

Kmean= 1.114505 TFR= 4.204497
K1= 1.008272
K2= .9261512 Ka= .9672114

Western

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	198	62	30	.3131313	.1515152
20-24	2	174	305	54	1.752874	.3103448
25-29	3	162	623	59	3.845679	.3641975
30-34	4	137	812	57	5.927007	.4160584
35-39	5	100	698	27	6.98	.27
40-44	6	102	782	9	7.666667	.0882353
45-49	7	65	545	0	8.384615	0
		938				8.001756

Western (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.3443442	.0787263	.1759475	.9093555	.1836886
.7575758	1.642454	.0961409	.3209268	1.067228	.3350465
2.309300	3.353562	.0986824	.3702409	1.146745	.3865303
4.130288	5.433556	.1275634	.4094429	1.090816	.4274570
6.210580	7.097917	.1810694	.2515346	.9833871	.2626013
7.560580	7.900544	.3080872	.0722586	.9703973	.0754377
8.001756	8.339521		0	1.005407	0

Kmean= 1.043997 TFR= 8.353807
K1= 1.067228
K2= 1.146745 Ka= 1.106986

Kalenjin

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	108	29	15	.2685185	.1388889
20-24	2	88	170	39	1.931818	.4431818
25-29	3	149	560	53	3.758389	.3557047
30-34	4	72	418	18	5.805556	.25
35-39	5	72	441	13	6.125	.1805556
40-44	6	57	431	13	0	0
45-49	7	37	289	1	0	0
		583				6.841655

Kalenjin (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2846296	.0848118	.1764759	.9433964	.1674970
.6944444	2.008201	.1205983	.4484922	.9619648	.4256734
2.910354	4.014183	.1216766	.3432265	.9362774	.3257635
4.688877	5.467565	.1212160	.2414671	1.061817	.2291815
5.938877	6.578176	.2078933	.1586693	.9311091	.1505964
6.841655	6.840971	.27	0	0	0
6.841655	6.841655		0	0	0

Kmean= .6485281 TFR= 6.493559
K1= .9619648
K2= .9362774 Ka= .9491211

Luo

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	207	93	37	.4492754	.1787440
20-24	2	208	403	74	1.9375	.3557692
25-29	3	169	583	43	3.449704	.2544379
30-34	4	159	825	50	5.188679	.3144654
35-39	5	125	786	28	6.288	.224
40-44	6	84	635	9	7.559524	.1071429
45-49	7	52	458	3	8.807692	.0576923
		1004				7.461258

Luo (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.4038864	.0897056	.2106585	1.112380	.2080348
.8937198	2.006616	.1066885	.3510003	.9655559	.3466288
2.672566	3.417122	.0943824	.2569723	1.009535	.2537718
3.944755	4.923230	.1219900	.3121112	1.053918	.3082240
5.517082	6.227957	.1626113	.2140969	1.009641	.2114304
6.637082	6.906968	.1563187	.0987386	1.094478	.0975089
7.172797	7.583863		.0486739	1.161373	.0480677

Kmean= 1.049083 TFR= 7.368332
K1= .9655559
K2= 1.009535 Ka= .9875455

Meru/Embu

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	93	24	9	.2580645	.0967742
20-24	2	61	75	15	1.229508	.2459016
25-29	3	93	304	24	3.268817	.2580645
30-34	4	57	285	14	5	.2456140
35-39	5	61	345	10	5.655738	.1639344
40-44	6	35	252	5	7.2	0
45-49	7	50	402	0	8.04	0
		450				5.051444

Meru/Embu (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2108294	.0688987	.1137165	1.224044	.1177633
.4838710	1.187258	.0920026	.2527019	1.035586	.2616947
1.713379	2.475206	.0924760	.2570353	1.320624	.2661823
3.003702	3.771459	.1112044	.2411309	1.325747	.2497118
4.231772	4.811524	.2036686	.1457042	1.175457	.1508893
5.051444	5.050939	.27	0	1.425478	0
5.051444	5.051444		0	1.591624	0

Kmean= 1.312419 TFR= 5.231207
K1= 1.035586
K2= 1.320624 Ka= 1.178105

Mijikenda/Swahili

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	50	7	2	.14	.04
20-24	2	43	50	11	1.162791	.2558140
25-29	3	46	169	7	3.673913	.1521739
30-34	4	65	334	14	5.138462	.2153846
35-39	5	50	297	9	5.94	.18
40-44	6	27	238	1	8.814815	.0370370
45-49	7	20	161	1	8.05	.05
		301				4.652048

Mijikenda/Swahili (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.0643119	.0569333	.0545643	2.176891	.0628363
.2	1.009717	.1153128	.2587972	1.151601	.2980311
1.479070	1.908326	.0886409	.1537182	1.925202	.1770220
2.239939	2.893444	.1134960	.2167220	1.775898	.2495772
3.316862	3.924634	.2006890	.1670036	1.513517	.1923215
4.216862	4.235384	.0664500	.0329266	2.081231	.0379183
4.402048	4.544625		.0466775	1.771323	.0537538

Kmean= 1.703129 TFR= 5.357301
K1= 1.151601
K2= 1.925202 Ka= 1.538401

Catholic

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	504	131	59	.2599206	.1170635
20-24	2	400	642	119	1.605	.2975
25-29	3	409	1479	127	3.616137	.3105134
30-34	4	321	1568	93	4.884735	.2897196
35-39	5	316	2016	61	6.379747	.1930380
40-44	6	240	1801	31	7.504167	.1291667
45-49	7	148	1562	7	10.55405	.0472973
		2338				6.921493

Catholic (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2569693	.0745801	.1392511	1.011485	.1540702
.5853175	1.450624	.1004862	.3065147	1.106421	.3391342
2.072817	3.005351	.1077918	.3105405	1.203233	.3435884
3.625385	4.533992	.1249772	.2826156	1.077359	.3126917
5.073983	5.658689	.1434673	.1874438	1.127425	.2073917
6.039173	6.419978	.1875599	.1195065	1.168877	.1322245
6.685006	7.180213		.0384262	1.469880	.0425156

Kmean= 1.192199 TFR= 7.658081
K1= 1.106421
K2= 1.203233 Ka= 1.154827

Protestant

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	820	241	96	.2939024	.1170732
20-24	2	752	1212	241	1.611702	.3204787
25-29	3	749	2552	226	3.407210	.3017356
30-34	4	529	2688	130	5.081285	.2457467
35-39	5	482	3133	115	6.5	.2385892
40-44	6	356	2611	36	7.334270	.1011236
45-49	7	247	2128	5	8.615385	.0202429
		3935				6.724950

Protestant (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2522021	.0762466	.1415086	1.165345	.1490224
.5853659	1.530439	.1051533	.3277718	1.053098	.3451759
2.187759	3.116355	.1129921	.2977746	1.093332	.3135859
3.696438	4.427474	.1073048	.2435810	1.147671	.2565147
4.925171	5.691406	.1696834	.2301464	1.142073	.2423668
6.118117	6.457761	.2572295	.0891717	1.135729	.0939065
6.623735	7.011160		.0150358	1.228810	.0158342

Kmean= 1.133452 TFR= 7.082032
K1= 1.053098
K2= 1.093332 Ka= 1.073215

Muslim

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	41	5	2	.1219512	.0487805
20-24	2	45	51	11	1.133333	.2444444
25-29	3	42	128	12	3.047619	.2857143
30-34	4	50	233	11	4.66	.22
35-39	5	29	165	6	5.689655	.2068966
40-44	6	17	118	0	6.941176	0
45-49	7	18	124	0	6.888889	0
		242				5.029179

Muslim (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.0895779	.0587237	.0631352	1.361399	.0776702
.2439024	.9212436	.1033196	.2596096	1.230221	.3193772
1.466125	2.333965	.1205144	.2827076	1.305769	.3477928
2.894696	3.550038	.1068411	.2155919	1.312662	.2652257
3.994696	4.725576	.2335411	.1847915	1.204013	.2273344
5.029179	5.028676	.27	0	1.380319	0
5.029179	5.029179	0	1.369784	1	0

Kmean= 1.300461 TFR= 6.187002
K1= 1.230221
K2= 1.305769 Ka= 1.267995

Urban

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	257	75	27	.2918288	.1050584
20-24	2	306	408	85	1.333333	.2777778
25-29	3	245	510	57	2.081633	.2326531
30-34	4	166	524	25	3.156627	.1506024
35-39	5	105	475	12	4.523810	.1142857
40-44	6	61	268	1	4.393443	.0163934
45-49	7	37	185	2	5	.0540541
		1177				4.754124

Urban (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.2250904	.0881998	.1295583	1.296496	.1263224
.52529	1.348913	.1149680	.2800255	.9884503	.2730314
1.91418	2.648300	.1227047	.2243850	.7860260	.2187807
3.077446	3.545264	.1192774	.1457545	.8903785	.1421141
3.830458	4.222859	.1914182	.1037920	1.071267	.1011997
4.401887	4.330615	.0374909	.0152820	1.014508	.0149003
4.483854	4.547473		.0520275	1.099512	.0507281

Kmean= .9750236 TFR= 4.635383
K1= .9884503
K2= .7860260 Ka= .8872382

Rural

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	1156	323	137	.2794118	.1185121
20-24	2	932	1562	300	1.675966	.3218884
25-29	3	1023	3787	331	3.701857	.3235582
30-34	4	783	4110	220	5.249042	.2809706
35-39	5	755	4995	174	6.615894	.2304636
40-44	6	593	4504	68	7.595278	.1146712
45-49	7	394	3038	10	7.710660	.0253807
		5636				7.077224

Rural (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.25642	.0744821	.1424870	1.089645	.1559245
.592560	1.531532	.1027845	.3311702	1.094306	.3624017
2.202003	3.184871	.1109430	.3214731	1.162326	.3517901
3.819793	4.677667	.1153634	.2763860	1.122150	.3024509
5.224647	5.952170	.1604284	.2222730	1.111510	.2432348
6.376964	6.756147	.2488710	.1025912	1.124203	.1122662
6.950320	7.389688		.0190642	1.043435	.0208621

Kmean= 1.109655   TFR= 7.744651
K1= 1.094306
K2= 1.162326   Ka= 1.128316

No education

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	67	39	16	.5820896	.2388060
20-24	2	106	230	43	2.169811	.4056604
25-29	3	231	920	68	3.982684	.2943723
30-34	4	353	1899	122	5.379603	.3456091
35-39	5	364	2456	82	6.747253	.2252747
40-44	6	332	2382	40	7.174699	.1204819
45-49	7	273	2027	3	7.424908	.0109890
		1726				8.205967

No education (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.5478481	.1031907	.2806664	1.062502	.2735865
1.194030	2.451387	.1090270	.3958945	.8851361	.3859081
3.222332	4.085747	.0965810	.2956571	.9747750	.2881991
4.694193	5.780747	.1259412	.3406012	.9306069	.3320095
6.422239	7.127751	.1570014	.2158192	.9466174	.2103752
7.548612	7.985829	.2919248	.1047741	.8984288	.1021311
8.151022	8.612402		.0077810	.8621181	.0075848

Kmean= .9162804   TFR= 7.99
K1= .660211
K2= .9747750   Ka= .929

Secondary and Higher

AGE GROUP	INDEX	FPOP	CEB	BLY	P(i)	f(i)
15-19	1	302	41	19	.1357616	.0629139
20-24	2	431	472	114	1.095128	.2645012
25-29	3	357	990	105	2.773109	.2941176
30-34	4	163	596	24	3.656442	.1472393
35-39	5	87	427	12	4.908046	.1379310
40-44	6	31	151	1	4.870968	.0322581
45-49	7	11	46	0	4.181818	0
		1382				4.694805

Secondary and Higher (cont.)

Q(i-1)	F(i)	w(i)	f(i)+	P/F	f(i)*
0	.1207764	.0680702	.0809185	1.124074	.0859310
.3145695	1.046800	.1096859	.2787571	1.046167	.2960244
1.637075	2.573125	.1397264	.2824303	1.077720	.2999251
3.107664	3.550421	.1107415	.1419407	1.029861	.1507331
3.843860	4.307305	.1884103	.1287341	1.139470	.1367084
4.533515	4.657626	.2937325	.0261803	1.045805	.0278020
4.694805	4.818289		0	.8679052	0

Kmean= 1.034488 TFR= 4.985620
K1= .660211
K2= 1.077720
Ka= 1.061944

APPENDIX 2: Computation of the total fertility rates using the Bongaarts' model.

Nairobi

1.Computation of the index of non-marriage.

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.2692308	.2300885	.4369592
20-24	.3604651	.6187050	.5826122
25-29	.2739726	.7019231	.3903171
30-34	.1636364	.7333333	.2231405
35-39	.15625	.6808511	.2294922
40-44	0	.78125	0
44-49	0	.7142857	0
	1.223555		1.862521

$$Cm = \Sigma f(a) / \Sigma(f(a)/m(a))$$
$$= .6569347$$

Computation of the index of non-contraception.

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.1201299	.9	.1081169
IUD	.0811688	.95	.0771104
STER.	.0487013	1	.0487013
OTHER	.038961	.7	.0272727
U=	.288961		.2612013

Cc = 1-1.08*u(m)*e(m)
= .7179026 E= .9039326

Computation of the index of infecundability.

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.99165 (see table 3.2.5)
i= 13.51754
Ci= .6246576

Nyanza.

Computation of the index of no-marriage.

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.2708333	.2375	.4315714
20-24	.424	.7368421	.5754286
25-29	.2873563	.9405941	.3055051
30-34	.3216783	.9395604	.3423711
35-39	.3220339	.8917197	.3611380
40-44	.0853659	.8165138	.1045492
44-49	.0689655	.88	.0783699
	1.780233		2.198933

Cm=Σf(a)/Σ(f(a)/m(a))
= .8095894

Computation of the index of non-contraception.

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0308725	.9	.0277853
IUD	.009396	.95	.0089262
STER.	.0401606	1	.0401606
OTHER	.0281124	.7	.0196787
	U= .1085415		.0965507

Cc=1-1.08*u(m)*e(m)
= .8957252 E= .8895282

Computation of the index of infecundability
Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.20637 (see table 3.2.5)
i= 12.83256
Ci= .6383136

Western.

Computation of the index of non-marriage.

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.5483871	.1919192	.3672608
20-24	.3658537	.7471264	.4896811
25-29	.3629963	.8333333	.4355956
30-34	.4545455	.8832117	.5146506
35-39	.2643678	.87	.3038710
40-44	.1184211	.7524752	.1573754
44-49	0	.7538462	0
	2.114571		2.268435

Cm=Σf(a)/Σ(f(a)/m(a))
= .9321721

Computation of the index of non-contraception.

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0418006	.9	.0376205
IUD	.0144695	.95	.0137460
STER.	.0305466	1	.0305466
OTHER	.0160772	.7	.0112540
U=	.1028939		.0931672

Cc=1-1.08*u(m)*e(m)
= .8993794 E= .9054687

Computation of the index of infecundability.
Using median number of months of breastfeeding (B) as measure infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.58442 (see table 3.2.5)
i= 13.16167

Ci= .6316787

No education.

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.5217391	.4029851	.3533333
20-24	.4	.8490566	.4711111
25-29	.3125	.9004329	.3470553
30-34	.3774834	.9150142	.4125438
35-39	.2380952	.8763736	.2716823
40-44	.1278195	.8704819	.1468376
44-49	.0148515	.7912088	.0187706
	1.992489		2.021334

Cm=Σf(a)/Σ(f(a)/m(a))
= .9857295

Computation of the index of non-contraception.

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0227439	.9	.0204695
IUD	.0132062	.95	.0125459
STER.	.0381511	1	.0381511
OTHER	.0264123	.7	.0184886
U=	.1005135		.0896551

Cc=1-1.08*u(m)*e(m)
 = .9031725 E= .8919708

Computation of the index of infecundability.

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 20.94118 (see table 3.2.5)
i= 14.35048

Ci= .6088191

Secondary education and higher

Computation of the index of non-marriage.

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.4	.0695364	.5706548
20-24	.3830846	.5034803	.7608731
25-29	.3208955	.8005618	.4008379
30-34	.175	.8282209	.2112963
35-39	.1643836	.8735632	.1881760
40-44	.0454545	.7741935	.0587121
44-49	0	.9090909	0
	1.488818		2.2190550

Cm= .6796550

Computation of the index of non-contraception

method	u(m)	e(m)	e(m)u(m)
pill	.1009818	.9	.0908836
Iud	.0995792	.95	.0946002
Ster.	.0504909	1	.0504909
Other	.056101	.7	.0392707
U=	.3071529		.2752455

Cc=1-1.08*u(m)*e(m)
= .7027349 E= .8961187

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 17.81152 (see table 3.2.5)
i= 11.63391

Ci= .6637041

Catholic

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.307692	.1686508	.4404723
20-24	.3817427	.65	.5872965
25-29	.3302752	.8533007	.3870561
30-34	.3268482	.8722741	.3747081
35-39	.2086614	.8860759	.2354893
40-44	.1398964	.8451883	.1655210
44-49	.057377	.8513514	.0673952
	1.752493		2.257938

Cm=Σf(a)/Σ(f(a)/m(a))
= .7761473

Computation of the index of non-contraception

method	u(m)	e(m)	e(m)u(m)
pill	.0454854	.9	.0409369
Iud	.0312288	.95	.0296674
Ster.	.0380177	1	.0380177
Other	.0353021	.7	.0247115
U=	.150034		.1333334

Cc=1-1.08*u(m)*e(m)
= .8559999

E= .8886878

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.17513 (see table)
i= 12.80543

Ci= .6388668

Protestant

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.4015748	.1733822	.4846198
20-24	.4124424	.6382979	.6461597
25-29	.32358	.8317757	.3890231
30-34	.2749392	.8638941	.3182557
35-39	.2638191	.8775934	.3006165
40-44	.1010101	.8848315	.1141574
44-49	.026738	.8097166	.0330214
	1.804104		2.285854

Cm=Σf(a)/Σ(f(a)/m(a))
= .7892472

Computation of the index of non-contraception

method	u(m)	e(m)	e(m)u(m)
pill	.0612413	.9	.0551172
Iud	.0427456	.95	.0406083
Ster.	.0628853	1	.0628853
Other	.0517879	.7	.0362515
U=	.2186601		.1948623

Cc=1-1.08*u(m)*e(m)
 = .7895487 E= .8911654

Computation of the index of infecundability
Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.228719 (see table 3.2.5)
i= 12.85197

Ci= .6379185

Muslim

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.4	.1219512	.5424108
20-24	.3214286	.4444444	.7232144
25-29	.3333333	.9268293	.3596491
30-34	.2702703	.82	.3295979
35-39	.2307692	.9310345	.2478632
40-44	0	.8823529	0
44-49	0	.8333333	0
	1.555801		2.202735

Cm=Σf(a)/Σ(f(a)/m(a))
 = .7063043

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0448718	.9	.0403846
IUD	.0320513	.95	.0304487
STER.	.025641	1	.025641
OTHER	.0448718	.7	.0314103
U=	.1474359		.1278846

Cc=1-1.08*u(m)*e(m)
= .8618846

E= .8673913

Computation of the index of infecundability

Using median number of months of breastfeeding (b) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B=18.22785 (see table 3.2.5)

i= 11.98860

Ci= .6559829

Kalenjin

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.625	.1481481	.7674418
20-24	.5	.4886364	1.023256
25-29	.4051724	.8255034	.4908186
30-34	.245614	.8611111	.2852292
35-39	.203125	.8888889	.2285156
40-44	.24	.9477368	.2532349
44-49	.03333333	.8108108	0
	2.218911		3.048496

Cm=Σf(a)/Σ(f(a)/m(a))
= .7278709

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0227848	.9	.0205063
IUD	.0075949	.95	.0072152
STER.	.035443	1	.035443
OTHER	.0556962	.7	.0389873
U=	.1215189		.1021518

Cc=1-1.08*u(m)*e(m)
= .8896760 E= .8406249

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)

B= 19.99165 (see table 3.2.5)

i= 13.51754

Ci= .6246576

Kikuyu

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.4642857	.0816901	.4106534
20-24	.3712121	.6779661	.5475378
25-29	.2956989	.8270677	.3575268
30-34	.1986755	.8294931	.2395143
35-39	.186747	.9282297	.2011862
40-44	.0806452	.8609272	.0936725
44-49	.0531915	.8376068	.0635041
	1.650456		1.913595

Cm=Σf(a)/Σ(f(a)/m(a))
= .8624895

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0817253	.9	.0735528
IUD	.0885358	.95	.0841090
STER.	.1055619	1	.1055619
OTHER	.0635641	.7	.0444949
	U= .3393871		.3077186

Cc=1-1.08*u(m)*e(m)
= .6676640 E= .9066890

Computation of the index of infecundability
Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)

B= 18.17266 (see table 3.2.5)

i= 11.94141

Ci= .6569997

Luhya

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.3636364	.2616034	.4278704
20-24	.4304636	.7545455	.5704939
25-29	.3771429	.8918919	.4228572
30-34	.3636364	.9310345	.3905724
35-39	.3027523	.9212598	.3286286
40-44	.0833333	.8907563	.0935534
44-49	0	.7575758	0
	1.920965		2.333976

Cm=Σf(a)/Σ(f(a)/m(a))
= .8598861

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0544489	.9	.0490040
IUD	.0146082	.95	.0138778
STER.	.0265604	1	.0265604
OTHER	.0438247	.7	.0306773
U=	.1394422		.1201195

Cc=1-1.08*u(m)*e(m)
= .8702710 E= .8614285

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 18.92135 (see table 3.2.5)
i= 12.58544
Ci= .6433881

Luo

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.3333333	.3429952	.3836627
20-24	.4057971	.7932692	.5115503
25-29	.2721088	.9408284	.2892226
30-34	.3650794	.9308176	.3922137
35-39	.2247191	.872	.2577054
40-44	.1060606	.8452381	.1254801
44-49	.075	.9230769	.0812500
	1.782098		2.041085

Cm=Σf(a)/Σ(f(a)/m(a))
= .8731133

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0447761	.9	.0402985
IUD	.0119403	.95	.0113433
STER.	.0328358	1	.0328358
OTHER	.0149254	.7	.0104478
U=	.1044776		.0949253

Cc=1-1.08*u(m)*e(m)
= .8974806

E= .9085714

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.83356 (see table 3.2.5)
i= 13.37925
Ci= .6273674

Meru/Embu

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.5	.0645161	.6630435
20-24	.3478261	.3934426	.8840581
25-29	.2647059	.7419355	.3567775
30-34	.3111111	.7894737	.3940741
35-39	.1818182	.9016393	.2016529
40-44	.1666667	.9428571	.1767677
44-49	0	.84	0
	1.772128		2.676374

Cm=Σf(a)/Σ(f(a)/m(a))
= .6621377

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.1048689	.9	.0943820
IUD	.1048689	.95	.0996255
STER.	.0074906	1	.0074906
OTHER	.0749064	.7	.0524345
	U= .2921348		.2539325

Cc=1-1.08*u(m)*e(m)
= .7257529

E= .8692307

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B=24.05 (see table 3.2.5)
i= 17.04622
Ci= .5626477

Rural residence

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.404908	.1558442	.4553705
20-24	.3967391	.6534335	.6071606
25-29	.3337364	.85826	.3888523
30-34	.3113208	.8939974	.3482346
35-39	.2472266	.8966887	.2757106
40-44	.1162325	.8952703	.1298295
44-49	.0316456	.8401015	.0376688
	1.841809		2.242827

Cm=Σf(a)/Σ(f(a)/m(a))
= .8211998

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.0452664	.9	.0407398
IUD	.0298096	.95	.0283191
STER.	.0516147	1	.0516147
OTHER	.0444383	.7	.0311068
U=	.171129		.1517804

Cc=1-1.08*u(m)*e(m)
= .8360772 E= .8869355

Computation of the index of infecundability

Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 19.4741 (see table 3.2.5)
i= 13.06549
Ci= .6336033

Urban

Computation of the index of non-marriage

AGE	f(a)	m(a)	f(a)/m(a)
15-19	.2786885	.2568093	.4702731
20-24	.3954802	.630719	.6270307
25-29	.2774566	.7786885	.3563127
30-34	.1826087	.7590361	.2405797
35-39	.1466667	.7714286	.1901234
40-44	.0243902	.6885246	.0354239
44-49	.08	.7297299	.1096296
	1.385291		2.029373

Cm=Σf(a)/Σ(f(a)/m(a))
= .6826201

Computation of the index of non-contraception

METHOD	u(m)	e(m)	e(m)u(m)
PILL	.1002994	.9	.0902695
IUD	.0853293	.95	.0810628
STER.	.0404192	1	.0404192
OTHER	.0404192	.7	.0282934
U=	.2664671		.2400449

Cc=1-1.08*u(m)*e(m)
= .7407515 E= .9008427

Computation of the index of infecundability
Using median number of months of breastfeeding (B) as measure of infecundability following live birth.

$$Ci = \frac{20}{18.5+i}$$

WHERE: i=1.753exp(0.1396*B-0.001872*B^2)
B= 18.8036 (see table 3.2.5)
i= 12.48363
Ci= .6455022

Appendix 3: Percentage distribution of women, children ever born and births in the last year.

By region

Region	FPOP	CEB	BLY
Nairobi	7.690050	4.839820	5.943331
Nyanza	17.24391	19.19323	19.62681
Coast	7.161726	6.091288	5.252246
Western	13.76578	15.49957	16.30961
Central	15.55621	14.66931	13.26883
R.Valley	20.63399	21.75692	22.32205
Eastern	17.94834	17.94986	17.27713
Total	6814	24691	1447
Total %	100	100	100

By level of education

Education	FPOP	CEB	BLY
No educ.	27.15972	40.32330	25.84658
Pri.incomp.	29.34697	32.40287	31.02972
Pri.comp	21.74666	17.45736	24.11887
Sec. & hig.	21.74666	9.816473	19.00484
Total	6355	24683	1447
Total %	100	100	100

By religion

Religion	FPOP	CEB	BLY
Protestant	60.39908	59.23621	61.16715
Catholic	35.88642	37.41256	35.80692
Muslim	3.714505	3.351228	3.025937
Total	6515	24588	1388
Total %	100	100	100

By ethnic group

Ethnicity	FPOP	CEB	BLY
Kalenjin	7.783883	6.647929	4.585007
Kisii	9.294872	11.42613	24.96653
Kamba	14.19414	13.78060	39.49130
Kikuyu	24.58791	22.62007	9.303882
Meru	6.868132	6.871970	2.576975
Luhya	17.35348	18.12701	9.404284
Luo	15.32357	15.41000	8.165997
Mijikenda	4.594017	5.116298	1.506024
Total	6552	24549	2988
Total %	100	100	100

By place of residence

Residence	FPOP	CEB	BLY
Rural	5636	22319	1260
Urban	1177	2445	209

Appendix 3: background of the women respondents

	National			Nairobi		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	20.73976	1.594342	11.31034	21.56489	2.928870	13.95349
20-24	18.17114	7.855830	26.68966	26.52672	15.14644	41.86047
25-29	18.61148	17.50579	26.68966	19.84733	20.41841	26.74419
30-34	13.92925	18.92831	16.89655	14.31298	23.43096	10.46512
35-39	12.62293	22.10501	12.82759	8.969466	18.57741	6.976744
40-44	9.599295	19.09214	4.758621	6.106870	13.55649	0
45-49	6.326141	12.91856	.8275862	2.671756	5.941423	0
Total	6813	25026	1450	524	1195	86
Total %	100	100	100	100	100	100

	Nyanza			Coast		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	20.51064	1.772526	13.02817	16.59836	.7978723	6.578947
20-24	17.78723	8.482802	27.46479	18.03279	8.111702	34.21053
25-29	17.19149	15.65731	20.07042	17.41803	18.48404	18.42105
30-34	15.48936	20.29964	18.30986	18.64754	29.18883	23.68421
35-39	13.36170	22.95843	16.54930	16.18852	25.86436	14.47368
40-44	9.276596	16.86010	3.169014	7.377049	10.83777	1.315789
45-49	6.382979	13.96919	1.408451	5.737705	6.715426	1.315789
Total	1175	4739	284	488	1504	76
Total %	100	100	100	100	100	100

	Western			Central		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	21.10874	1.620068	12.71186	22.64151	1.656543	11.97917
20-24	18.55011	7.969689	22.88136	19.52830	8.503589	28.64583
25-29	17.27079	16.27907	25	17.45283	15.95803	30.20833
30-34	14.60554	21.21766	24.15254	11.60377	16.23412	9.895833
35-39	10.66098	18.23883	11.44068	11.79245	22.05964	9.895833
40-44	10.87420	20.43376	3.813559	9.433962	20.15461	6.25
45-49	6.929638	14.24092	0	7.547170	15.43346	3.125
Total	938	3827	236	1060	3622	192
Total %	100	100	100	100	100	100

	R.Valley			Eastern		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	19.98578	1.433358	10.21672	21.09567	1.466606	9.2
20-24	15.64723	6.868950	23.21981	16.43500	6.385379	24.8
25-29	21.05263	21.09084	33.43653	19.13328	17.39621	27.6
30-34	14.22475	17.44229	15.78947	11.69256	15.65884	15.6
35-39	12.87340	22.35666	10.83591	13.98201	23.75903	15.6
40-44	10.24182	19.73194	6.191950	10.71137	21.32220	7.2
45-49	5.974395	11.07595	.3095975	6.950123	14.01173	0
Total	1406	5372	323	1223	4432	250
Total %	100	100	100	100	100	100

	No educ.			Pri.Incomp		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	3.881808	.3918417	4.278075	17.90885	1.787947	12.02673
20-24	6.141367	2.310861	11.49733	17.21180	8.339585	25.38976
25-29	13.38355	9.243444	18.18182	19.19571	18.40460	28.06236
30-34	20.45191	19.07967	32.62032	14.58445	17.64191	15.36748
35-39	21.08922	24.67598	21.92513	13.19035	20.46762	12.47216
40-44	19.23523	23.93248	10.69519	11.74263	21.44286	5.567929
45-49	15.81692	20.36572	.8021390	6.166220	11.91548	1.113586
Total	1726	9953	374	1865	7998	449
Total %	100	100	100	100	100	100

	Pri.Comp			Protestants		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	21.85239	4.014853	21.77650	20.83863	1.654652	11.30742
20-24	31.18669	13.85472	32.95129	19.11055	8.321318	28.38634
25-29	25.83213	22.95196	25.50143	19.03431	17.52146	26.61955
30-34	11.79450	18.65862	8.595989	13.44346	18.45520	15.31213
35-39	6.295224	23.09120	9.455587	12.24905	21.51047	13.54535
40-44	2.243126	11.78928	.5730659	9.047014	17.92654	4.240283
45-49	.7959479	5.639359	1.146132	6.277001	14.61037	.5889282
Total	1382	4309	349	3935	14565	849
Total %	100	100	100	100	100	100

	Sec & h.			Catholics		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	21.85239	1.505692	6.909091	21.55689	1.424068	11.87123
20-24	31.18669	17.33382	41.45455	17.10864	6.979019	23.94366
25-29	25.83213	36.35696	38.18182	17.49358	16.07783	25.55332
30-34	11.79450	21.88762	8.727273	13.72968	17.04533	18.71227
35-39	6.295224	15.68123	4.363636	13.51583	21.91543	12.27364
40-44	2.243126	5.545354	.3636364	10.26518	19.57822	6.237425
45-49	.7959479	1.689313	0	6.330197	16.98011	1.408451
Total	1382	2723	275	2338	9199	497
Total %	100	100	100	100	100	100

	Muslims			Kalenjin		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	16.94215	.6067961	4.761905	21.17647	1.776961	10.94891
20-24	18.59504	6.189320	26.19048	17.25490	10.41667	28.46715
25-29	17.35537	15.53398	28.57143	29.21569	34.31373	38.68613
30-34	20.66116	28.27670	26.19048	14.11765	25.61275	13.13869
35-39	11.98347	20.02427	14.28571	9.215686	13.60294	4.379562
40-44	7.024793	14.32039	0	6.274510	9.926471	0
45-49	7.438017	15.04854	0	2.745098	4.350490	4.379562
Total	242	824	42	510	1632	137
Total %	100	100	100	100	100	100

	Kisii			Kamba		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	14.12151	.6773619	1.340483	19.24731	1.300621	7.288136
20-24	11.00164	4.385027	2.949062	18.70968	7.153414	31.61017
25-29	13.79310	11.22995	3.619303	17.84946	15.54833	39.40678
30-34	8.538588	9.447415	1.206434	11.39785	14.27727	18.55932
35-39	28.07882	37.54011	5.227882	13.44086	23.61809	1.610169
40-44	21.51067	33.68984	2.412869	10.75269	21.57848	1.016949
45-49	2.955665	3.030303	83.24397	8.602151	16.52380	.5084746
Total	609	2805	746	930	3383	1180
Total %	100	100	100	100	100	100

	Kikuyu			Meru		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	22.03600	1.602737	12.94964	20.66667	1.422644	11.68831
20-24	18.31161	7.563479	26.97842	13.55556	4.445762	19.48052
25-29	16.57356	15.73924	26.97842	20.66667	18.02015	31.16883
30-34	13.46989	17.55808	12.23022	12.66667	16.89389	18.18182
35-39	12.97331	23.30272	12.58993	13.55556	20.45050	12.98701
40-44	9.373060	19.61102	6.474820	7.777778	14.93776	6.493506
45-49	7.262570	14.62273	1.798561	11.11111	23.82928	0
Total	1611	5553	278	450	1687	77
Total %	100	100	100	100	100	100

	Luhya			luo		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	20.84433	1.797753	11.74377	20.61753	2.458366	15.16393
20-24	19.34916	8.247191	25.62278	20.71713	10.65292	30.32787
25-29	19.52507	18.11236	29.18149	16.83267	15.41105	17.62295
30-34	12.75286	18.35955	17.79359	15.83665	21.80809	20.49180
35-39	11.16974	19.91011	12.81139	12.45020	20.77716	11.47541
40-44	10.55409	20.87640	2.846975	8.366534	16.78562	3.688525
45-49	5.804749	12.69663	0	5.179283	12.10679	1.229508
Total	1137	4450	281	1004	3783	244
Total %	100	100	100	100	100	100

	Mijikenda			Rural		
Age group	fpop	ceb	bly	fpop	ceb	bly
15-19	16.61130	.5573248	4.444444	20.51100	1.447197	10.87302
20-24	14.28571	3.980892	24.44444	16.53655	6.998521	23.80952
25-29	15.28239	13.45541	15.55556	18.15117	16.96761	26.26984
30-34	21.59468	26.59236	31.11111	13.89283	18.41480	17.46032
35-39	16.61130	23.64650	20	13.39603	22.38003	15.39683
40-44	8.970100	18.94904	2.222222	10.52165	20.18012	5.396825
45-49	6.644518	12.81847	2.222222	6.990774	13.61172	.7936508
Total	301	1256	45	5636	22319	1260
Total %	100	100	100	100	100	100

Urban

Age group	fpop	ceb	bly
15-19	21.83517	3.067485	12.91866
20-24	25.99830	16.68712	40.66986
25-29	20.81563	20.85890	27.27273
30-34	14.10365	21.43149	11.96172
35-39	8.920986	19.42740	5.741627
40-44	5.182668	10.96115	.4784689
45-49	3.143585	7.566462	.9569378
Total	1177	2445	209
Total %	100	100	100