

THE IMPACT OF AGE AT FIRST BIRTH AND AGE AT FIRST
MARRIAGE ON FERTILITY IN KENYA. //

BY

FRANCIS ANG'AWA PETER'S

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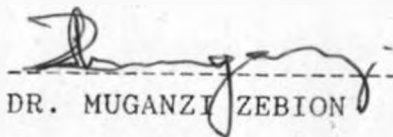
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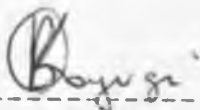


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ABSTRACT

This study examines the impact of age at first birth and age at first marriage on fertility in Kenya, using the data drawn from Kenya Fertility Survey file. The mean ages at first birth and first marriage, total fertility rate based on women's ages at first birth and first marriage were estimated and fertility levels by various socio-economic and socio-cultural variables.

Fertility levels have been estimated by applying the Coale Trussell P/F ratio method. A multivariate regression analysis was used to examine the relationship between the selected variables and ages at first birth and first marriage which were considered as dependent variables.

The findings on fertility indicates that, ages at first birth and first marriage have a significant impact on fertility, as there was a decline in fertility with the increasing ages at first birth and first marriage. It was also found that differences in fertility in Kenya between regions also still persist.

Multivariate results show that, 51.5 per cent of the total variation in age at first birth was explained by age at first marriage and age at menarche. 91.3 per cent of the total variation in age at first marriage was found to be explained by work status, education, age at menarche, religion and place of residence.

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CHAPTER ONE

THE GENERAL INTRODUCTION

1.1 INTRODUCTION

Demographic studies have shown that differences in ages at first birth and first marriage can account for substantial variation in the fertility of different populations, and that changes in both ages at first birth and first marriage have had a dramatic influence on the level of fertility in many populations (United nations, 1983).

The assertion that age at first marriage signals a very important increase in the probability that a woman will start childbearing is particularly relevant to African societies in which marriage is contracted as some legalized starting point for reproduction. Many studies have also suggested that age at first marriage in the so called natural fertility societies of tropical Africa is very low and that women in these societies start childbearing soon after menarche (Caldwel, J.C. 1977).

The 1974 Bucharest World Population Plan of Action also stressed the need for studies in environmental, biological, social, economic and demographic factors which account for differences in fertility levels within a population. According to the plan of action researches dealing with the relationship between demographic variables and socio economic factors should be strongly encouraged

especially in the less developed countries where fertility is still high.

The study of ages at first birth and first marriage patterns with respect to socio economic, cultural, regional and demographic variables, and their relationship with fertility in Kenya is an important aspect of demographic research that this study is addressed to. This is because the ages at which women get their first birth and marry, in combination with other factors have an important bearing upon the number of children born. Early age at first birth and early age at first marriage are positively correlated to high fertility (Casterline, J.B. 1984).

Bongaarts (1978), Fertility model also indicates that, fertility is influenced directly by biological and behavioral factors, and the influence of these factors is through either the starting, spacing or stopping of childbearing. This study only aims at examining the influence of the starting on fertility in Kenya. The starting is a factor of age at menarche, age at first birth and age at first marriage.

The gap of knowledge this study specifically intends to fill, is to give the estimate of the mean ages at first birth and first marriage, and also to identify their impact on completed fertility in Kenya. This study also attempts to investigate the factors that account for variation in ages at first birth and first marriage at national level.

The study is based on data from the 1977/78 Kenya Fertility Survey (KFS). This source has information on birth history on fertility from which ages at first birth and first marriage patterns can be estimated.

1.2 STATEMENT OF THE PROBLEM.

Kenya's population growth rate has been on increase as is evidenced from the previous estimates of 3% per annum from 1962 census, 3.3% per annum from 1969 census, and about 4% per annum in 1980 (Mosley). This increasing rate of growth has made Kenya have a decreasing doubling time which has been 30 years according to 1948 census, 23 years according to the 1962 census, and 21 years according to 1979 census.

Total Fertility Rate which is also a good indicator of fertility trend has also been on the increase in Kenya as Blacker (1971), using the 1969 census, found the total fertility rate to be 7.6 births. The National Demographic Survey (1977) and the Kenya Fertility Survey (1977/78) found total fertility rate to be 8.1 births. Mwobobia (1982) used 1979 census and estimated it at 8.2 births. Fertility in Kenya has therefore been rising over time.

Teenage fertility is a global problem that neither the developed nor the developing countries of the world are effectively dealing with. Childbearing, more particularly among the adolescents, is emerging as a serious problem in many countries because of a number of undesirable consequences that are associated with the age at first birth and age at first marriage, and these problems include, health problems for mothers and infants, low educational attainment, child abuse and neglect, low earnings, high rates of marital disruption, rapid subsequent fertility and high levels of completed fertility. Teenage fertility has also a direct effect in society as it shortens periods between generations and doubling time for a population.

When important roles like that of motherhood are assumed early or out of the usual sequence, the individual may experience undesirable consequences because of conflicting role demands, or premature departure from developmental roles, or premature entry into roles for which one is not prepared, as it makes an individual face major life change without the social and institutional supports ordinarily present when such transitions are made.

This study however, is set to achieve basically six specific objectives which are outlined in section 1.3.

1.3 OBJECTIVES OF THE STUDY.

The main objectives of the study are as follows:-

1. To estimate the mean age at first birth with differentials (socio-economic, socio-cultural and regional).
2. To estimate the mean age at first marriage with differentials (socio-economic, socio-cultural and regional).
3. To examine the relationship between age at first birth and total fertility rate from the 1977/78 Kenya Fertility Survey data.
4. To examine the relationship between age at first marriage and total fertility rate from the 1977/78 Kenya Fertility Survey data.
6. To examine the determinants of ages at first birth and first marriage in Kenya from Kenya Fertility Survey data.

1.4 JUSTIFICATION OF THE STUDY.

The importance of age at first child birth in determining the average rate of population growth over a long period of time has been recognized by demographers (Coale 1974).

Age pattern of women at first birth and first marriage are important components of overall fertility as first birth signals the entry of a woman into the state of motherhood. This change in status, in turn, influences other demographic, social and economic phenomena and therefore renders the first birth and first marriage events that are worthy of careful study, as they are important indicators for population growth and development. As such, they are important for public policy makers in understanding the connection between Kenya's population and developmental problems. They are also useful for researchers who are interested in projecting rates of fertility, population growth, labour force participation and short term prospects for development.

An understanding of the mechanism involved in initiating the onset of female reproductive capability is necessary if we are to understand the determinants of fertility levels in Kenya where contraception is not widely used. Such an understanding can help in the formulation of policies to reduce both fertility and mortality. On the other hand trends in age specific rates

of first births to teenagers will help in judging the impact of efforts to prevent such pregnancies.

1.5 LITERATURE REVIEW.

1.5.1 Introduction.

In most developing countries of Asia and Africa marriage is universal and women also enter into marital unions early, and the level of fertility, given physiological maturity also tends to be related to age at first marriage. However, in more developed countries, with their current level of modernization, it has been observed that the impact of ages at first birth and first marriage on fertility weakens as a result of widespread use of contraception and elective nature of childbearing (United Nations, 1983)

1.5.2 More Developed countries

Deschamps and Valantin (1978), studied adolescent fertility in European countries. They found that fertility rates of teenage women in Bulgaria varies from .73 per cent for younger teenagers (aged 10-14), to 72.4 percent for older teenagers (aged 15-19). While in Switzerland the rates vary from .02 percent to 17.4 percent for younger and older teenagers respectively. Finland

and France were noted for their low teenage fertility.

Bloom, D.E. (1980), in his study of age pattern of women at first birth in the United States fitted in his analysis Coale-McNeil marriage model to the age distribution of first birth frequencies for a number of recent white and non-white cohorts. He found that the proportion of women who will ever have a first birth is declining across cohorts and can be expected to be as low as .70 and .80 for recent white and non-white respectively, and also that non-white cohorts have an appreciable number of first births at earlier ages than their white counterparts as well as lower mean age at first birth, and lastly that the mean age at first birth is increasing across cohorts of white women but is stable across cohorts of non-white women.

Larson, A. (1981), in his study of fertility and status of women found that, in developed countries most women marry for the first time in their early to mid-20s. In Japan, he noted that, the average age at first marriage among all women who marry is 24 years; in northern Europe, it ranges from 24.2 in Finland to 27.1 in Sweden.

Burchinal, C. (1985), also found from the 1982 US Survey of marriage and Family Growth, that only

one-quarter of women aged 20-24 had been married before age 20. Engle (1978), from his study of Guatemala, found that in peri-urban areas, women who gave birth before age 17 were generally living in poor dwellings and had less work experience than those who gave birth later.

1.5.3 Latin America And Asian Countries

Trussell, J. (1980), studied age at marriage in Sri Lanka and Thailand using data drawn from World Fertility Survey. He found that period age specific first birth rates are much more regular than cohorts rates. He estimated also the mean age at first birth which he found to have been on a larger increase in Sri Lanka than in Thailand. From both countries he found also that the interval between first marriage and first birth appears to have shortened over time. The explanation for the contraction of the interval was given as lessened adolescent subfecundity and artifact of data, that older women tend to omit reporting a first birth if it died.

Noreen, G. and Corman, E.F. (1980), from their analysis of nuptial data using the Colombia National Fertility Survey, found that there is urban-rural differences in ages at first marriage with a higher proportion of ever married in rural areas, with a decline in

proportion of ever married for 15-19 years age groups. The values for the mean ages at first marriage were found to be 21.9 and 20.7 years for urban and rural areas respectively.

Agarwala (1964), in his study of effect of age at marriage on fertility in India, established an approximate, though not consistent, relationship between females age at marriage and completed fertility. He found that females marrying between the ages 14 and 17 gave birth to 5.9 children, while those marrying between 18 and 21 years eventually gave birth to 4.7 children. A study of Calcutta among a middle class urban population, showed that females marrying below age 15 gave birth to 6.3 children, those marrying between 15 and 19 gave birth to 5.1 children and those marrying between 20 and 24 gave birth to only 3.7 children.

Sinnthuray (1974), in his study case of education, information and counselling for adolescent fertility matters, found that in Malaysia out-of-wedlock pregnancies is regarded as sinful and disgrace to the young girl and her entire family, views that may lead to forced early marriages or illegal abortion and sometime may cause the pregnant girl to commit suicide as a last resort.

A comparison between age at marriage and fertility rates shows that for countries of Asia,

the range is from early marriage -high fertility to late marriage -low fertility patterns. In Asia as a whole the mean total fertility rate for countries where few women marry before age 20 is about three, while for countries where many women marry after age 20, it is slightly over five. In Indian sub continent , except for Sri Lanka , early marriage is common and the total fertility rate is high.

Ruth Dixon (1971), in her study of cross-cultural variations in age at marriage , noted that age at marriage for women is affected by three important factors which she described as the availability of marriage partners , which is influenced by age and sex ratios in the marriage market ; the feasibility of marriage, which is influenced, in large part, by financial opportunities and constraints ; and the desirability of marriage in terms of how each partner sees relative advantage and disadvantage of marriage compared with the available alternatives.

William Leasure (1963), showed that when the mean age at marriage in Bolivia rose from 22.5 to 27.2 years , the birth rate declined from 41 to 30, or by about 27 percent, and that in Turkey, when the female age at first marriage rose from 19.7 to 27.2 years, the birth rate declined from 50 to 33 , or by about 34 percent.

Goldman,N.(1980), from his study of estimation of recent trends in fertility and mortality in Korea, noted that between 1960 and 1975 there was a decline in fertility by about 50 percent as total fertility fell from 6.0 to 3.1 . The changes in the experience of Korea population that contributed to this reduction in fertility are decline in the proportion married among women of 15 to 30 years old due to increased age at first marriage and secondly because of increased age at first birth as more women practiced contraception or resorted to induced abortion.

1.5.4 Some African Countries

Gaisie,S.(1984), did a study in Ghana using data drawn from World Fertility Survey . He found that 75 percent of Ghanaian women have their first birth before their 23rd birth day , with nearly all those who do bear children experiencing their first birth before they are 26 years old. He estimated the average age at first birth as 19.7 years with a spread of five years , while the median age at first birth was 20 years for all ethnic groups. He also found that women in the urban centres have their first birth about a year later than those in rural areas, and also women with secondary education or more formal education experience their first birth at a median

age of 25 years , while those with middle and primary education have their first birth at a median age of 20 and 19 years respectively.

Henin,R.(1968), conducted a demographic sample survey in Sudan for the purpose of examining the effect of nomadism and settlement on fertility . He found that early age at marriage characterized the settled population , where about 60 percent of women were married by age 20 and only 25 percent were married among the nomads. And the mean age at first marriage of those women who first married before age 20 was 15.2 years according to 1978/79 Sudan Fertility Survey.

Henry,A. and Piotrow,P.T. (1979), found from their analysis of age at marriage and fertility in Africa that , in the 11 countries with Contraceptive Prevalence Survey (CPS) or World Fertility Survey data, two-thirds or more of all women age 20-24 married before age 20. In Islamic countries , especially the Sahel states of Mali , Chad , Mauritania and Niger, young women have traditionally married shortly after menarche , when menstruation begins.

McCarthy,J.(1982), also noted from his study of differentials in age at first marriage that , in most African countries rural women marry 1.5 to 2 years earlier than urban women . Urban women are more likely to go to school and to work outside home.

This may help to account for later marriage, he argued.

Using a stable population model, Coale (1961), demonstrated that postponement of marriage can contribute substantially to reduction in birth rate and population growth. This contribution is potentially large in those countries which have high fertility and low ages at first marriage and first birth.

1.5.5 Kenya

Kingori (1984), did a study in Kenya on adolescent fertility and found that about 40 percent of the girls who entered high school in 1984 dropped out before graduation, a large proportion of them because of unwanted premarital pregnancy. Many of these girls were found to have abandoned their babies or badly neglected them while others sought dangerous abortions.

Omondi, A. (1980), did a study on the relationship between the event of age at first birth and first marriage among adolescent women using data drawn from Kenya Fertility Survey (1977/78). He used chi-square as the main statistical technique to determine the relationship between the variables and also proportions and means for comparison of various distributions of phenomena. He found the average age at menarche as 14.4 years and the average age at first marriage as 15.8

years and average age at first birth as 16.6 years. All these had variations largely based on region, education and ethnic grounds.

Ayiemba, E. (1983), in his study of nuptial determinants of fertility in Western Kenya found, that socio-economic and situational variables are relatively more important in determining lifetime total fertility rate. Child mortality rate and contraceptive use among women was also found to exert direct impact on total fertility. Other variables were also found to influence fertility strongly, but indirectly through the impact on age at first marriage, marital stability and frequency of marriage.

Nyarango (1985), from her study of estimation of Nuptiality using census data for Kenya, found that marriage is universal for Kenyan females who also tend to marry at earlier ages than males. The marriage timing for females was found to be increasing, as it increased from .74 to 1.1 years while that of males reduced from 1.22 to .26 years over the period 1962-1969 and 1969-1979.

Khasiani (1985), in her study of adolescent fertility in Kenya, found that more adolescents are engaging in premarital sex at younger age, yet very few of them practice contraception to prevent conception despite knowing about them. This reluctance among the

youth to practice contraception partly reflects the reluctance in the general population to provide contraceptive information and services to youth.

In conclusion, it can be said that, the literature review is not exhaustive, but it has given a clear picture of some of the relationships between fertility and some of the socio-economic, socio-cultural and demographic factors in the more developed countries, Latin America and Asia, other African countries and also in Kenya.

In more developed countries, women were noted for their late entry into first union, delayed first birth and low fertility. Trends towards later marriage and first birth was noted in Latin America and Asia, where women who got married early also have a higher fertility than those who got married late. Low age at first marriage, educational and rural-urban differences in fertility were noted in other African countries. In Kenya, marriage is universal and early and most studies that have been carried out focused on the adolescents (Kingori 1978; Omondi 1981 and Khasiani 1985). Other studies in Kenya have also concentrated on the effect of education, marital status and place of residence on fertility (Osiemo 1986; Onguti 1987 and Mwobobia 1982). In addition to some of these, the present study includes other factors namely; age at first birth and age at first marriage and consider their effect on fertility and the factors that account for their variations.

1.6 THEORETICAL FRAMEWORK

The level of fertility in a population is directly influenced by a set of biological and behavioral factors called the intermediate variables (Davis and Blake, 1956). These intermediate variables include three major groups of factors directly connected with intercourse, conception and gestation and parturition. These factors are, in turn, a function of socio-economic, socio-cultural and environmental variables which are the direct determinants of fertility.

Bongaarts (1980), in his framework for analysing the proximate determinants of fertility, which is applied in this study, also found that biological and behavioral are factors through which socio-economic, socio-cultural and environmental variables affect fertility as intermediate fertility variables. The primary characteristic of an intermediate fertility variable is its direct influence on fertility. Fertility differences among populations and trends in fertility over time can always be traced to variations in one or more of the intermediate fertility variables.

A generalized relationship among the determinants of fertility can therefore be summerized in the following model according to Bongaats framework :

INDIRECT DETERMINANTS

socio-economic
cultural and
enviromental
variables

DIRECT DETERMINANTS

intermediate
fertility
variables

FERTILITY

There are eight factors of these intermediate variables, which can be grouped into three broad groups according to the above shown Bongaarts model namely, exposure factors which cover proportion married, deliberate marital fertility factors which include,contraception and induced abortion and natural fertility factors which cover lactational infecundability, frequency of intercourse, sterility, spontaneous interuterine mortality and duration of fertile period.

This study however, does not look directly into the influence of these factors on fertility, but indirectly through age at first marriage and age at first birth, and through such background variables as education, region, place of residence, religion and ethnicity.

With respect to the relationship between ages at first birth and first marriage and fertility in societies where family planning is not widely practised within or outside marriage, the parity of women is likely to be affected by the woman's age at first birth and age at first marriage as those who begin childbearing at an earlier age and those who marry early tend to live through a longer period of exposure to conception during their most fecund period which leads to shorter interval before the next generation is born.

In developing countries socio-economic and socio-cultural factors usually account for a large part of biological and behavioral intermediate variables in determining ages at first birth and first marriage which , inturn, are likely to influence the birth interval which can be used to explain total fertility rate within any society.

A theoretical statement for this study may then be stated this:- Socio-economic and socio-cultural factors usually influence biological and behavioral factors which , inturn , influence demographic factors, which are likely to influence the fertility of any given society. A conceptual model is then given as follows:-

CONCEPTUAL MODEL

Socio-economic
factors

Socio-cultural
factors

Biological and
behavioral factors

Age at First Birth
Age at First Mariage

FERTILITY

1.7 DEFINITION OF CONCEPTS

Biological processes: these refer to age at menarche, fecundity, conception, gestation and parturition and birth interval.

Cultural factors: these are the factors that govern the way of life of the people in a society. They include, family norms, marriage customs, initiation rites, values and institutions.

Demographic factors: these include variables such as age, age at first marriage, age at first birth, duration of marriage and marital status.

Socio-economic factors: these refer to indices of economic status, such as education, place of residence, occupation and income.

Parity : this refers to the number of children previously born alive to a woman .

Total fertility rate : this is the average number of children born to women during their entire reproductive life span. It can be either a period or cohort measure .

Urban : urban centres were defined as places with a population of 2,000 or over in the 1979 census .

Independent variables used in the regression.

(education, work status, place of residence)

1.6.1 Operational Hypotheses

The following hypotheses will be tested :-

1. The mean age at first birth for women in urban areas is likely to be higher than the mean age at first birth for women in rural areas.
2. The mean age at first birth for women with low education is likely to be lower than the mean age at first birth for women with higher education (secondary +)
3. The mean age at first marriage for women in rural areas is likely to be lower than the mean age at first marriage for women in urban areas.
4. The mean age at first marriage for women with low education is likely to be lower than the mean age at first marriage for women with higher education (secondary +)
5. Women who begin childbearing early are likely to have more children than women who begin childbearing late.
6. Women who marry early are likely to have more children than women who marry late.
7. Total fertility rate is likely to be higher in regions where the mean age at first birth is low, than in regions where the mean age at first birth is high.
8. Total fertility rate is likely to be higher in regions where the mean age at first marriage is low, than in areas where the mean age at first marriage is high.

1.8 SCOPE AND LIMITATION OF THE STUDY

This study focuses on women in the reproductive age groups (15-50) as is given in the survey. The study was done at micro level.

Given that data on age at first birth and first marriage are based on retrospective reports, they are susceptible to biases resulting from the failure to report first births (omission) and the misreporting of the data of first birth and first marriage (misplacement). It is well recognized that such errors are common in maternity history data from most developing countries of the world. Such errors threaten cross regional comparison if the resulting biases differ in nature and in extent among regions.

Among the older women nevertheless, there is a tendency to omit first births (particularly if the child subsequently died), or to place dates of first birth and first marriage nearer to the survey date in time. Estimates of ages at first birth and first marriage for older cohorts thus tend to be biased up wards.

These shortcomings of data should be taken into account in the interpretation of our results.

CHAPTER TWO

2.0 DATA SOURCE AND METHODOLOGY

2.1 Introduction

In this chapter the secondary data source used in this study which is the 1977/78 Kenya Fertility Survey (KFS), will be discussed and the various methods of data analysis for estimating the mean ages at first marriage, first birth and total fertility.

2.2 DATA SOURCE

The source of data used in this study is the Kenya Fertility Survey (KFS) of 1977/78, which was a component of National Intergrated Sample Survey Programme (NISSP) for 1974-79. The objectives of the survey was to collect information on fertility levels, trends and determinants among Kenya's heterogeneous population. It was also to provide demographic data which could be used for socio-economic planning and policy making purposes.

Individual questionnaire was designed to collect more detailed information on the respondent's background in terms of age, ethnicity, education, work status, religion, contraceptive use and knowledge, place of residence and maternity history among others. A target population

of about 10,000 women between ages 15 and 50 years old was to be interviewed. The coverage of the sample excludes the entire North Eastern Province, the districts of Isiolo and Marsabit in the Eastern Province and the districts of Samburu and Turkana in the Rift Valley Province. The regions which were left out are large in terms of area, but they had only about five percent of the total population of Kenya.

The sample frame of Kenya Fertility Survey was the complete listing of households carried out as part of the National Demographic Survey (NDS) in January and February 1977. The sampling procedure adopted was a stratified multi-stage cluster design. In rural areas 64 administrative locations served as the primary sampling units and in the urban areas 80 primary sampling units were selected. These selected primary units covered one percent and two percent of the rural and urban population respectively. A two -area-stage sampling procedure was adopted for the rural portion, where after stratification by province and ecological or crop zone, a sample of primary sampling units was selected with probability proportional to the estimated population size. Each of the selected primary sampling units was first divided into smaller manageable segments called chunks.

On average about 10 chunks were formed from each selected units and two chunks were then selected from each primary sampling unit with probability proportional to the estimated chunk population size expressed in terms of expected number of clusters.

In urban areas a single-area-stage sample procedure was used where about 80 urban clusters were selected out of which 53 were in Nairobi and Mombasa. Urban areas were stratified on the basis of economic zones, homogeneous in terms of household income levels.

From the total population of the sampled households, 9,576 eligible women were identified and 8,891 were interviewed for a response rate of 95.8 per cent. The major cause of non-response was failure to find the respondent at home. Eligibility of the individual interviewed was defined on a defacto basis for all the women aged 15 to 50 years who stayed in the house the previous night.

The information collected from individual questionnaire included the background characteristic of the respondent: education level, place of residence, tribe, religion, marital status and work status. Respondents were also asked their age at menarche, age at first birth, age at first marriage and contraceptive use and availability. The other useful information

collected included children ever born, date of the first birth, number of children alive by sex, births in the last 12 months and the desire for more children.

2.3 QUALITY OF DATA

In designing the Kenya Fertility Survey sample and in actual data collection, emphasis was laid upon obtaining high quality and reliable data. The measures which were undertaken in a bid to achieve these include: the selection of the sample that was adequately representative and administratively manageable; using a multi-stage probability sampling technique, accurate mapping of the households, and use of the high quality personnel (Central Bureau of Statistics, KFS. First Report (1980)).

Inspite of the fact that alot of complex statistical exercises were undertaken to ensure that the data collected was of high quality and reliable, a few shortcomings of KFS data should be noted. A comparison of the Kenya Fertility Survey data and the model population derived from National Demographic Survey of 1977 revealed that there was underreporting of children aged 0-4 years, girls aged 15-19 years, women aged 30-34 and 50-59 years. Overreporting was noted on children aged 10-14 years (Central Bureau of Statistics, KFS. First Report (1980)).

As regards the intermediate age groups, the data exhibit age heaping in the age group 25 to 29 and in

particular at age 25, with corresponding short falls of women in adjacent age groups. However, the fertility data reveal no concomitant distortions, and therefore this form of error does not appear to be serious.

There was also a general problem of under coverage revealed by the comparison of the listed and the expected population of the selected clusters. It was found that the drawn sample fell short of the expected sample size by about 20 per cent. This was attributed to poor implementation. A recheck of the suspected clusters was carried out and corrective measures were undertaken (Central Bureau of Statistics, KFS. First Report (1980)).

In conclusion, Kenya Fertility Survey data is of high quality and is reasonably reliable.

2.4 THE MARRIAGE MODEL

The marriage model developed by Coale (1971) and Coale and McNeal (1972), relates observed distribution of first marriage frequencies to a standard schedule, where first marriage frequencies is defined as the number of first marriage in an age interval divided by the number of women (regardless of marital status) in the interval. The standard schedule represents the the recorded distribution (by age) of first marriage frequencies for Sweden in (1865-1869). The development of this model proceeded from Coale's (1971) demonstration that age distributions of first marriage frequencies

are structurally similar in populations with widely varying marriage customs. These distributions are smooth, unimodal, skewed to the right and have no appreciable value below age fifteen or above age fifty. Further more, Coale showed that by adjusting the origin, the vertical scale and horizontal scale of an observed distribution, it could be made to conform closely to the Swedish standard.

Subsequent efforts made by Coale and McNeal led to their discovery that the standard schedule was close fit to the closed-form expression for the convolution of an infinite number of mean-corrected exponential distributions with parameters in arithmetic sequence (equation (2.4.1)). They also found that the standard schedule was closely fit by the convolution of the two (or three) exponential distributions with the largest exponentials in the infinite sequence and a normal distribution. This finding gives rise to a behavioral interpretation of marriage model according to which the normal distribution characterize the waiting times between successive premarital stages and engagement.

In formal terms, the marriage model can be expressed as follows:-

$$g(x) = 0.194 \text{Exp}(-.174(x-6.06) - \text{Exp}(-.2881(x-6.06))) \dots 2.4.1$$

$$G_s(x) = \int_{-x}^x g_s(x') dx' \dots\dots\dots 2.4.2$$

$$G_s(a) = CG_s(a - a_o)/K \dots\dots\dots 2.4.3$$

$$dG_s(a)/d(a) = g_s(a) = C/K g_s(a - a_o)/K \dots\dots\dots 2.4.4$$

Where

a = age

$g_s(x)$ = first marriage frequency in the standard Swedish population at exact age x ,

$G_s(x)$ = proportion ever married in the standard population by exact standardized age x ,

$G(a)$ = proportion ever married by age a in the observed population,

$g(a)$ = first marriage frequency at age a in the observed population,

a_o = the origin of the observed distribution or the youngest age at which an appreciable number of first marriages occur; approximately the first percentile of the distribution.

K = the rate at which first marriages occur in the observed population relative to the Swedish standard ; proportional to the standard deviation of the frequency distribution of the observed first marriages.

$C =$ The proportion of women in the observed population ever having a first marriage, and

$(a - a_0)/K =$ Standardized age.

The mean of the standard schedule model is given by

$$E(x_s) = \int_{-\infty}^{\infty} x_s g_s(x_s) dx_s = 11.36 \quad \dots\dots\dots 2.4.5$$

While the variance of the standard schedule is

$$\text{Var}(x_s) = \int_{-\infty}^{\infty} (x_s - E(x_s))^2 g_s(x_s) dx_s = 43.34 \quad \dots\dots\dots 2.4.6$$

Therefore since $a = Kx_s + a_0$, the mean and standard

deviation of any fitted schedule are given by

$$E(a) = a_0 + 11.36K \quad \dots\dots\dots 2.4.7$$

$$\text{SD}(a) = 6.56K \quad \dots\dots\dots 2.4.8$$

2.5 APPLICATION OF MARRIAGE MODEL TO FIRST BIRTH DATA

Trussell, Menken, and Coale (1979) , found that the convolution of the marriage model and an exponential distribution does indeed fit the distribution of first birth frequencies well. Like distributions of first marriage frequencies, distributions of first birth frequencies are also structurally similar in different populations, as they are smooth, unmodal, skewed to the

right and have no appreciable value below age fifteen or above age fifty. It is therefore a natural extension of the research on first marriage distribution to propose a model for the waiting time between first marriage and first birth, and to model the distribution of first birth frequencies as the convolution of the marriage model and the model for the delay between first marriage and first birth. The distribution that characterizes the waiting time from first marriage to first birth is an exponential distribution. Bloom (1980), in his study of applicability of the marriage model to first birth data, found that in the absence of major temporal disturbances, the marriage model provides an excellent fit to distributions of cohort first birth frequencies.

Fitting the marriage model to observed first birth distributions involves choosing the values of C , K , and a which satisfy some fitting criterion. In this case, minimizing the sum of squared residuals between the observed and fitted distributions is the fitting criterion.

2.6 HAJNAL'S SINGULATE MEAN AGE AT MARRIAGE (SMAM).

The Singulate mean age at marriage (SMAM), introduced by Hajnal in 1953, measures the mean number of years spent single among women ultimately marrying, and as such provides a good summary measure and indirect

estimate of the mean age at first marriage. It is derived basically from the proportion single of a given population in the following way:-

Let $U(a)$ = the number of single persons at age a
and

$P(a)$ = total number of persons (all marital status)
at age a .

Then the proportion single at age a is

$$S(a) = U(a)/P(a)$$

Thus, the proportion ever married at age a is

$$G(a) = 1 - S(a).$$

Let $g(a)$ be the first marriage rate.

$$\text{Then } G(a) = \int_0^a g(x) dx.$$

The first marriage frequency can then be constructed as

$$\begin{aligned} f(a) &= \frac{g(a)}{\int_0^a g(x) dx.} \\ &= \frac{g(a)}{1 - S(a)}, \quad 0 < a < A \end{aligned}$$

and

$$f(a) = 0, \quad \text{otherwise.}$$

$$\therefore \text{SMAM} = E(a) = \int_c^A a f(a) da$$

$$= \int_c^A a g(a) da \text{ -----}$$

$$1 - S(A)$$

Where A is the greatest age of the first marriage.

Integrating by parts, we use the formula,

$$\int U dv = UV - \int V du.$$

Letting

$$U = a, \quad \text{and} \quad dV = g(a) da$$

we have

$$dU = da, \quad \text{and} \quad V = \int g(a) da = G(a).$$

$$\begin{aligned} \therefore \int_c^A a g(a) da &= a G(a) \Big|_c^A - \int_c^A G(a) da \\ &= A G(A) - \int_c^A (1 - S(a)) da \\ &= A G(A) - (A - \int_c^A S(a) da) \\ &= A (1 - S(A)) - (A - \int_c^A S(a) da) \\ &= \int_c^A S(a) da - A S(A). \end{aligned}$$

$$\therefore \text{SMAM} = \frac{\int_c^A S(a) da - A S(A)}{1 - S(A)}$$

Now, let d be the earliest age at marriage.

then

$$SMAM = \frac{\int_0^d S(a)da + \int_d^A S(a)da - A S(A)}{1-S(A)}$$

But

$$S(a) = 1 \quad \text{for} \quad 0 < a < d.$$

$$\text{Therefore } SMAM = \frac{d + \int_d^A S(a)da - A S(A)}{1-S(A)}$$

Now, in particular, as with our case where we assume that people get married in Kenya between ages 15 and 50, then

$$d = 15, \quad \text{and} \quad A = 50.$$

then

$$SMAM = \frac{15 + \int_{15}^{50} S(a)da - 50 S(50)}{1-S(50)}$$

Therefore for application, this is expressed in the discrete form as

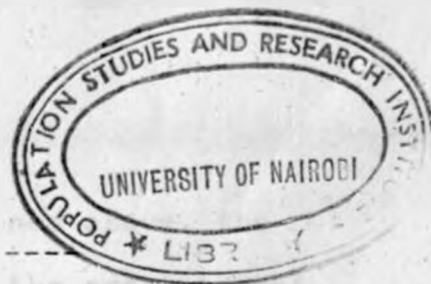
$$SMAM = \frac{15 + \sum_{i=15}^{50} S_i - 50S(50)}{1- S(50)}$$

$$SMAM = \frac{15 + 5(\sum_{i=1}^7 S_i) - 50S(50)}{1- S(50)}$$

Where

$i = 1, 2, \dots, 7.$ age groups.

S_i = proportion single at i .



2.7 DERIVATION OF MEAN AGE AT FIRST BIRTH AND MEAN AGE AT LAST BIRTH

Suchindran and Horne (1984) and Horne (1985) derived formulae for mean ages at first birth and last birth which require only that age-specific fertility rates be available. The formulae are derived below as follows :-

2.7.1 Mean Age at First Birth

Let $m(x)dx$ denote the probability that a woman of age x will have a birth in the age interval $(x, x+dx)$. The probability of not having a birth before age x is

$$\exp\left(-\int_a^x m(t)dt\right), \quad a \text{ is the lower age of child-bearing.}$$

Recall, this is analagous to the probability of surviving up to age x which is equivalent to the probability of not dying before age x which is

$$p(x) = \exp\left(-\int_a^x u(t)dt\right)$$

The probability of dying between age x and $x+dx$ is the same as the probability of surviving up to age x and then dying at age x , which is

$$= u(x) p(x)$$

$$= u(x) \exp\left(-\int_a^x u(t)dt\right).$$

Thus, using the same argument as mentioned above, the probability of having the first birth in the age interval $(x, x+dx)$ is the probability of not giving birth before age x and then giving birth between age x and $x+dx$

$$\text{i.e. } g_1(x) = m(x) \exp\left(-\int_a^x m(t)dt\right) \quad \text{for } a < x < \beta$$

Thus, the probability that a new-born girl will ever become

a mother is :-

$$S_1 = \int_0^b g(x) dx.$$

i.e.

$$S_1 = \int_0^b (m(x) \exp - \int_0^x m(t) dt) dx$$

But

$$\begin{aligned} d/dx (\exp - \int_0^x m(t) dt) &= \exp - \int_0^x m(t) dt \cdot d/dx (- \int_0^x m(t) dt) \\ &= - m(x) \exp - \int_0^x m(t) dt \end{aligned}$$

$$\begin{aligned} \therefore S_1 &= - \int_0^b [d/dx \exp - \int_0^x m(t) dt] dx \\ &= - \int_0^b d[\exp - \int_0^x m(t) dt] \\ &= - [\exp - \int_0^b m(t) dt] \\ &= - [\exp - \int_0^b m(t) dt - \exp - \int_0^0 m(t) dt] \\ &= - [\exp(-TFR) - 1] \end{aligned}$$

$$S_1 = 1 - \exp(-TFR)$$

Then, mean maternal age at first birth (MAFB) is given by

$$\begin{aligned} \text{MAFB} &= \frac{\int_0^b x g(x) dx}{S_1} \\ &= \frac{\int_0^b x g(x) dx}{1 - \exp(-TFR)} \end{aligned}$$

But

$$\int_0^b x g_1(x) = - \int_0^b x d[\exp - \int_0^x m(t) dt]$$

Integrating by parts, let

$$\begin{aligned} u = x &\Rightarrow du = dx \quad \text{and} \quad dv = d[\exp - \int_0^x m(t) dt] \\ &\Rightarrow v = \exp - \int_0^x m(t) dt \end{aligned}$$

$$\begin{aligned} \therefore \int_0^b x g_1(x) dx &= -x \exp - \int_0^x m(t) dt \Big|_0^b + \int_0^b [\exp - \int_0^x m(t) dt] dx \\ &= [-b \exp(-TFR) + 1] + \int_0^b [\exp - \int_0^x m(t) dt] dx \end{aligned}$$

$$\therefore \text{MAFB} = \frac{\alpha - \beta \exp(-\text{TFR}) + \int_0^{\text{TFR}} \left[\exp - \int_0^x m(t) dt \right] dx}{1 - \exp(-\text{TFR})}$$

Suppose $\alpha = 15$ and $\beta = 50$

$$\therefore \text{MAFB} = \frac{15 - 50 \exp(-\text{TFR}) + \int_0^{\text{TFR}} \left[\exp - \int_0^x m(t) dt \right] dx}{1 - \exp(-\text{TFR})}$$

But

$$\begin{aligned} & \int_0^{\text{TFR}} \left[\exp - \int_0^x m(t) dt \right] dx \\ &= \int_{15}^{26} \left[\exp - \int_{15}^x m(t) dt \right] dx + \int_{26}^{30} \left[\exp - \int_{15}^x m(t) dt \right] dx + \int_{30}^{32.5} \left[\exp - \int_{15}^x m(t) dt \right] dx \\ &+ \int_{32.5}^{35} \left[\exp - \int_{15}^x m(t) dt \right] dx + \int_{35}^{42.5} \left[\exp - \int_{15}^x m(t) dt \right] dx + \int_{42.5}^{47.5} \left[\exp - \int_{15}^x m(t) dt \right] dx \\ &+ \int_{47.5}^{50} \left[\exp - \int_{15}^x m(t) dt \right] dx. \\ &= \int_{15}^{26} \exp - 5 \int_{15}^x m(t) dt + \int_{26}^{30} \exp - 5 \int_{15}^x m(t) dt + \int_{30}^{32.5} \exp - 5 \int_{15}^x m(t) dt + \int_{32.5}^{35} \exp - 5 \int_{15}^x m(t) dt \\ &+ \int_{35}^{42.5} \exp - 5 \int_{15}^x m(t) dt + \int_{42.5}^{47.5} \exp - 5 \int_{15}^x m(t) dt + \int_{47.5}^{50} \exp - 5 \int_{15}^x m(t) dt \\ &= \exp \left[-5 \left(2.5m_1 + (5m_1 + 2.5m_2) + 5(m_1 + m_2) + 2.5m_3 + 5(m_1 + m_2 + m_3) + \right. \right. \\ &2.5m_4 + 5(m_1 + m_2 + m_3 + m_4) + 2.5m_5 + 5(m_1 + m_2 + m_3 + m_4 + m_5) + 2.5m_6 + 5(m_1 + m_2 + \\ &\left. m_3 + m_4 + m_5 + m_6) + 2.5m_7 \right) \end{aligned}$$

where
 m_i 's for $i=1,2,\dots,7$ are age specific fertility rates for
 age groups 15-19 to 45-49
 For computation purposes we have the following table.

TABLE 2.1 INFORMATION REQUIRED FOR ESTIMATION OF MAFB

| AGE GROUP (1) | X (2) | ASFR m _i (3) | CUM. m _i (4) | 5CUM+2.5m _i (5) | 5(5CUM +2.5m _i) (6) |
|------------------|----------|-------------------------------|--------------------------------|-------------------------------|------------------------------------|
| 15-19 | 17.5 | m ₁ | 0 | 5.0+2.5m | |
| 20-24 | 22.5 | m ₂ | m | 5 \sum m _i +2.5m | |
| 25-29 | 27.5 | m ₃ | m ₁ +m ₂ | 5 \sum m _i +2.5m | |
| 30-34 | 32.5 | m ₄ | \sum m _i | 5 \sum m _i +2.5m | |
| 35-39 | 37.5 | m ₅ | \sum m _i | 5 \sum m _i +2.5m | |
| 40-44 | 42.5 | m ₆ | \sum m _i | 5 \sum m _i +2.5m | |
| 49-49 | 47.5 | m ₇ | \sum m _i | 5 \sum m _i +2.5m | |
| | | | \sum m _i | 5 \sum m _i +2.5m | |

2.7.2 Mean Age at Last Birth (MALB)

Let $g_L(x)$ be the probability that a woman will have her last child at age x . Then $g_L(x)$ is equal to the probability of having a birth at age x and not having a birth beyond age x . Thus

$$g_L(x) = m(x) \exp - \left[\int_x^h m(t) dt \right]$$

Therefore, the mean maternal age at last birth (MALB) can be written as :-

$$\text{MALB} = \frac{\int_a^h x g_L(x) dx}{\int_a^h g_L(x) dx}$$

Now

$$\begin{aligned} \int_a^h g_L(x) dx &= \int_a^h \left[m(x) \exp - \left(\int_x^h m(t) dt \right) \right] dx \\ &= \int_a^h d/dx \left[\exp - \left(\int_x^h m(t) dt \right) \right] dx \end{aligned}$$

$$\begin{aligned}
 g_L(x) &= \int_x^\beta d \left[\exp - \left(\int_m(t) dt \right) \right] \\
 &= \left[\exp - \left(\int_m(t) dt \right) \right]_x^\beta \\
 &= \exp - \left(\int_m(t) dt \right) - \exp - \left(\int_m(t) dt \right) \\
 &= 1 - \exp (-TFR)
 \end{aligned}$$

Next for

$$\int_x^\beta x g_L(x) dx$$

Let $u=x \Rightarrow du=dx$ and $dv=g_L(x)dx \Rightarrow v = g_L(x)$

$$\begin{aligned}
 \therefore \int_x^\beta x g_L(x) dx &= x \exp - \left(\int_m(t) dt \right) \Big|_x^\beta - \int_x^\beta \exp - \left(\int_m(t) dt \right) dx \\
 &= \beta - \alpha \exp (-TFR) - \int_x^\beta \exp - \left(\int_m(t) dt \right) dx
 \end{aligned}$$

$$\text{MALB} = \frac{\beta - \alpha \exp(-TFR) - \int_x^\beta \exp - \left(\int_m(t) dt \right) dx}{1 - \exp(-TFR)}$$

Let $\alpha = 15$ and $\beta = 50$, then

$$\begin{aligned}
 \int_x^\beta \exp - \left(\int_m(t) dt \right) dx &= \int_{15}^{50} \exp - \left(\int_m(t) dt \right) dx \\
 &= \int_{15}^{20} \exp - \left(\int_m(t) dt \right) dx + \int_{20}^{25} \exp - \left(\int_m(t) dt \right) dx + \dots + \\
 &\quad \int_{40}^{45} \exp - \left(\int_m(t) dt \right) dx + \int_{45}^{50} \exp - \left(\int_m(t) dt \right) dx \\
 &= 5 \left[\exp - \left(\int_m(t) dt \right) + \exp - \left(\int_m(t) dt \right) + \dots + \right.
 \end{aligned}$$

$$\begin{aligned}
 &\quad \left. \dots + \exp - \left(\int_m(t) dt \right) + \exp - \left(\int_m(t) dt \right) \right] \\
 &= 5 \left[\exp - \left(2.5m + 5 \left(\sum_{i=1}^1 m_i \right) \right) + 2.5m + 5 \left(\sum_{i=1}^2 m_i \right) + 2.5m + \right. \\
 &\quad \left. 5 \left(\sum_{i=1}^3 m_i \right) + 2.5m + 5 \left(\sum_{i=1}^4 m_i \right) + 2.5m + 5 \left(\sum_{i=1}^5 m_i \right) + 2.5m + \right. \\
 &\quad \left. 5 \left(\sum_{i=1}^6 m_i \right) + 2.5m + 5 \left(\sum_{i=1}^7 m_i \right) \right].
 \end{aligned}$$

The marriage model is used to estimate the K parameter, while the Hajnal's method is used as indirect estimate of the mean age at first marriage for the comparison of pattern in results.

2.8 BRASS MODIFIED FERTILITY SCHEDULE.

Brass assumed that fertility schedule should always be uniform provided that the age at the onset of marriage is given. He considered the fertility at any age to be a function of a standard fertility schedule but mathematically (Sullivan, 1972)

$$f(x) = k f_s(x, y) \quad \dots\dots\dots 2.8.1$$

Where $f(x)$ is the probability of a woman age x bearing a child, $f_s(x, y)$, is a standard fertility schedule containing one parameter, y , the age at onset of childbearing, k is a scale factor. Algebraically Brass, et al. (1968) gave it as

$$\begin{aligned} f(x) &= k(x-s)(s+33-x) ; & s < x < s+33 \\ &= 0 & \text{elsewhere} \end{aligned} \quad \dots\dots\dots 2.8.2$$

Where s is the earliest age of childbearing to represent fertility. Moreover, changing s will only slide the pattern of fertility up or down the x axis. k is a scale factor that determine the total number of children ever born by the end of childbearing.

Trussel, (1975), later improved on the foregoing works of Brass using the functional schedule developed

by Coale and McNeil. The frequency of age at first marriage function can be represented by a three parameter family:

$$g(a) = E/K \int_{a_0}^a g(a-a_0) / K \dots\dots\dots 2.8.3$$

Where g_s is the density function for standard Swedish population with origin at zero. E is the proportion who will marry. a_0 is the earliest age at marriage. K is a parameter indicating the rate at which marriage takes place relative to the standard Swedish population. Hajnal (1971), did show that the intergral of $g(a)$ will be equal to the proportion who are currently married at age a, and marital fertility is a function of the degree of control exercised by the couple and the natural fertility. Coale (1971), discovered that marital fertility depends on two parameters:

$$f(a) = M.n(a)\exp.v(a).m \dots\dots\dots 2.8.4$$

Where
M is a scale factor
m is the degree of fertility control
n(a) is the natural fertility as defined by Henry (1961).

2.9 P/F RATIO METHOD.

2.9.1 Introduction

The P/F ratio method has come to be widely used for the comparison of cohort and current fertility measures obtained from questions on childbearing asked at survey or census enquiry. The $P(i)$ are the mean number of children everborn per woman in the standard five year age groups. The $F(i)$ are the parity equivalent values obtained from period fertility rates by cummulation and interpolation.

2.9.2 BASIS OF P/F METHOD AND ITS RATIONALE.

The P/F ratio method seeks to adjust the level of observed age specific fertility rates, which are assumed to represent the true age pattern of the average parities of women in age groups lower than ages 30 or 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 cummulation and interpolation. Ratios of average parities ($P(i)$) to the estimated parity equivalents ($F(i)$) are calculated age group by age group, and an average of the ratios obtained for younger women and for women in all the age groups, are used as 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. However, where the ages of women are pushed up or down, a wide range (recommendably the entire age range) is applicable. This pattern is recommended because the pattern of ratios with age may reveal data errors. Hence the mean of the ratios will take care of up and down pushing of the ages of women.

2.9.3 Data Required

- (i) The number of children ever born classified by five year age group of mothers;
- (ii) The number of children born during the year preceding the survey classified by five year age group of mother;
- (iii) The total number of women in each five year age group (irrespective of marital status) ;
- (iv) The total population for the calculation of the birth rate.

2.9.4 Computational Procedure

Step 1: Calculation of reported average parities:

The reported average parity of women in age group i is denoted by $P(i)$. Its value is obtained by dividing the total number of children ever born to women in age group i by the total

number of women in that age group (whether married or single, fertile or not).

Step 2: Calculation of preliminary fertility schedule from information on births in the past year: The fertility rate of women in age group i denoted by $f(i)$. This value is computed for each i by dividing the number of births occurring to women in age group i during the year preceding the interview by the total number of women (whether childless or not, ever married or not) in that age group.

Step 3: Calculation of cumulated fertility schedule for a period: To calculate this schedule, denoted by $Q(i)$, the fertility rates computed in step 2 are added, beginning with $f(1)$ and ending with $f(i)$. The value of this sum multiplied by five is an estimate of cumulated fertility up to the upper limit of group i . The formal definition of $Q(i)$ is

$$Q(i) = 5 \left(\sum_{j=1}^i f(j) \right) \quad \dots\dots\dots 2.9.4.1$$

Step 4: The estimation of average parity equivalent for a period:

Average parity equivalents, $F(i)$, are estimated by interpolation using the period fertility rates $f(i)$ and the cumulated fertility values $Q(i)$ calculated in the previous steps. Coale and Trussel propose fitting a second - degree polynomial to

three consecutive values of $Q(i)$ and estimating the average parity of women of an age group within the range by evaluating the integral of the polynomial; in actual application, $F(i)$ is obtained as

$$F(i) = Q(i-1) + a(i)f(i) + b(i)f(i+1) + c(i)Q(7) \quad \text{for} \\ i=1, \dots, 6 \quad \dots\dots\dots 2.9.4.2$$

and

$$F(7) = Q(6) + a(7)f(6) + b(7)f(7) \quad \dots\dots\dots 2.9.4.3$$

Values of the parameters a, b and c were estimated by using least square regression to fit equation (2.9.4.2) to a large number of model cases constructed using the Coale-Trussel fertility model (1974). Table 2.2 shows the values of the coefficients required for the use of equation 2.9.4.2 and 2.9.4.3

TABLE 2.2 COEFFICIENTS FOR INTERPOLATION BETWEEN
CUMMULATED FERTILITY RATES TO ESTIMATE PARITY
EQUIVALENTS:

| Age group(1) | index (2) | a(i) (3) | b(i) (4) | c(i) (5) |
|-----------------|--------------|-------------|-------------|-------------|
| 15-19 | 1 | 2.531 | -0.188 | 0.0024 |
| 20-24 | 2 | 3.321 | -0.754 | 0.0161 |
| 25-29 | 3 | 3.265 | -0.627 | 0.0145 |
| 30-34 | 4 | 3.442 | -0.563 | 0.0029 |
| 35-39 | 5 | 3.518 | -0.763 | 0.0006 |
| 40-44 | 6 | 3.862 | -2.481 | -0.0001 |
| 45-49 | 7 | 0.392 | 2.608 | |

SOURCE: UN, MANUAL X, 1983, P.34.

Step 5: Calculation of fertility schedule for conventional five year age groups :

When age specific fertility rates have been calculated from births in a 12- 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 conventional five-year age groups, $f^+(i)$, can be estimated by weighting the rates referring to unorthodox age groups according to equation (2.9.4.4) and (2.9.4.5) and using the coefficients displayed in table (2.2).

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.

$$f^+(i) = (1-w(i-1))f(i) + w(i)f(i+1) \quad \dots\dots\dots 2.9.4.4$$

Where $f(i)$ and $f^+(i)$ are , respectively , unadjusted and adjusted age specific fertility rates; and the weighting factor, $w(i)$ is calculated as :

$$w(i) = x(i) + y(i)f(i)/Q(7) + z(i)f(i+1)/Q(7) \quad \dots\dots 2.9.4.5$$

The values of $x(i)$, $y(i)$ and $z(i)$ were obtained by fitting equation (2.9.4.5) by least square regression to the same model cases used in deriving the coefficients presented in table (2.2). No weighting factor is needed for $i=7$, as childbearing is assumed

to cease after age 50; and $f^+(7)$ is therefore taken to be :

$$f^+(7) = (1 - w(6)) f(7) \dots\dots\dots 2.9.4.6$$

TABLE 2.3 COEFFICIENTS FOR CALCULATION OF WEIGHTING FACTORS TO ESTIMATE AGE SPECIFIC FERTILITY RATES FOR CONVENTIONAL AGE GROUPS FROM AGE GROUPS SHIFTED BY SIX MONTHS.

| Age group(1) | index (2) | coefficients | | |
|--------------|-----------|--------------|-------------|-------------|
| | | x(i) (3) | y(i) (4) | z(i) (5) |
| 15-19 | 1 | 0.031 | 2.287 | 0.114 |
| 20-24 | 2 | 0.068 | 0.999 | -0.233 |
| 25-29 | 3 | 0.094 | 1.219 | -0.977 |
| 30-34 | 4 | 0.120 | 1.139 | -1.531 |
| 35-39 | 5 | 0.160 | 1.739 | -3.592 |
| 40-44 | 6 | 0.27 | 3.454 | -21.497 |

SOURCE: UN, MANUAL X, 1983, P.34.

Step 6: Adjustment of period fertility schedule:

With the equations computed in step 1-4 ,the ratios $P(i)/F(i)$ are calculated . Ideally,these ratios should be fairly similar for different values of i , although if children ever born are increasingly omitted by older women,the ratios tend to decrease as age increases.

If $P(2)/F(2)$ and $P(3)/F(3)$ are reasonably consistent, either of them can be used as an adjustment factor for the period fertility rates. If they are not very similar, a weighted average of the two can be used. However, if the ages of women are believed to have been pushed up or down, then the mean of all the $P(i)/F(i)$ ratios can be used.

Step 7: Once an adjustment factor has been chosen (one may denote it by k), an adjusted fertility schedule is computed by multiplying the fertility rates for conventional age groups, $f^+(i)$, by k to yield adjusted age specific fertility rates for conventional age groups, $f^*(i)$:

$$f^*(i) = k f^+(i) \quad \text{.....2.9.4.7}$$

Once all the $f^*(i)$ values are available, the total fertility rate is calculated as :

$$TFR = 5 \left(\sum_{i=15}^{45} f^*(i) \right) \quad \text{.....2.9.4.8}$$

2.10 REGRESSION MODEL

2.10.1 Introduction

Linear regression analysis helps inferences to be made about how changes in one or more independent variables are related to changes in the dependent variable. The basic types of linear regression analysis are the simple and multiple. In the former, one deals

with only two variables ;the dependent and the independent variable. The latter calls for two or more independent variables.

2.10.2 Simple Linear Regression

By using simple regression one can only study the relationship between a dependent variable Y and an independent variable X. In a simple regression model it is assumed that the variability in a dependent variable is accounted for partly by a single explanatory variable and partly by a disturbance or error term that might result from the data or partly by the effect of unconsidered variables. In the formula form, it is expressed as :

$$Y = a + bx + e$$

Where

Y = dependent variable

a = intercept

b = slope

x = independent variable

e = error term

The two parameters of the regression equation a and b , indicate the form of relationship between Y and X , but say nothing about the accuracy of the estimates of Y that are given by the regression line. For this an associated parameter, the correlation coefficient

will be used as it actually measures the degree of association between the variables.

2.10.3 Multiple Linear Regression

In most demographic studies more than one independent variable is involved. When this is the case the simple linear regression model is found insufficient to handle a variety of variables. Usually a group of interrelated variables have to be considered in order to explain fully the variability in the dependent variable. This calls for the use of a multiple regression model which is an extension of the simple linear.

The multiple linear regression model is expressed as:

$$Y_i = b_0 + b_{1i}x_{1i} + b_{2i}x_{2i} + \dots + b_{ni}x_{ni} + e_i \quad i=1,2..n.$$

Where

Y_i = dependent variable

b_0 = constant

b_i = partial regression coefficient

x_1, x_2, \dots, x_n = independent variables

e_i = error term

The computation of regression coefficients of the equation together with correlation coefficients can be accomplished by using either matrix technique

or a computer . Because of greater amount of data it was found necessary to use computer facilities. Hence, ICL package programme SPSS (Statistical Package for Social Sciences) at the Central Bureau of Statistics (CBS) was used to obtain the regression coefficients and partial correlations. This program also produce the best linear relationship for the variables.

In constructing the regression equation , it is assumed that all variables i.e criterion and predictors together, jointly follow a multivariate normal distribution. But strictly speaking, no real data follow a multivariate normal distribution exactly, for this is a mathematical model of prediction.

The commonly used model in the prediction , is inappropriate for handling the relationship among variables like in our case where variables involved do not follow a multivariate normal function. The assumption of multivariate normal density function implies linearity in the parameter (the homogeneity of the error variance) and the additivity of effects i.e the covariance matrix for the independent variable employed is a constant function of the remaining variables of the system. When ever there is a regression of the criterion upon more predictors, this condition of additivity is not always met, and this automatically render the use of the linear regression model strictly inappropriate. The methods which are appropriate in

handling such cases , involves the introduction of estimable interaction term into the regression where by the criterion is expressed as a polynomial function in the predictors.

Multiple regression analysis gives the values of the estimates of the regression weights and also their standard errors. Hence, the predicted criterion, \hat{Y} , can be obtained and the relationship between the predicted value and the actual value gives us the multiple correlation coefficient, R . The sign of R indicates the direction of the relationship, whether positive or negative, while the absolute value of R can be used as an index of relative strength of the relationship.

From the relation R is obtained by :

$$R^2 = 1 - \frac{\sum (Y_i - \hat{Y}_i)^2}{\sum (Y_i - \bar{Y})^2}$$

Where R^2 is called the coefficient of determination.

The value of R^2 shows the proportion of the total variation in dependent variable, (Y) , explained by the independent variables (x_1, x_2, \dots, x_n) . Thus R^2 provide an overall index of how well Y can be explained by all the regressors.

The other way of obtaining a multiple correlation coefficient is as follows :

The first step is to compute a predictor matrix R .i.e the correlation matrix of the predictor variables. Then a vector K , which contains the correlation between the predicted variables and the criterion is computed. The required vector of beta weights B is then computed from the relationship

$$B = K R^{-1}$$

Where R^{-1} is simply the inverse of the matrix R . In practice, therefore , the multiple correlation coefficient R , is obtained from the relationship

$$R^2 = B \cdot K$$

The square root of the inner product of vector K and vector B gives a multiple correlation coefficient.

When additional regressors are added to this model, one can notice how helpful they are in explaining the variation in dependent variable, by noting how much change increase in R^2 . Since the inclusion of even an irrelevant regressor will increase R^2 somewhat, it is desirable to adjust for this by using the adjusted R^2 which is obtained by

$$R^{-2} = (R^2 - k/(n-1)) ((n-1)/(n-k-1))$$

Where R^{-2} is the adjusted R^2 , if there are k regressors.

2.10.4 Partial Correlations

Partial correlations are defined as correlations between two variables when all others are fixed. It is usually denoted by small r just like simple correlation and the multiple correlation by capital R .

To compute partial correlation coefficients, R is first defined as the symmetric matrix of simple correlations among a set of k variables x_1, x_2, \dots, x_k , none being labeled as dependent.

In general, R is given by :

$$R = \begin{pmatrix} 1 & r_{12} & r_{13} & \dots & r_{1k} \\ r_{21} & 1 & r_{23} & \dots & r_{2k} \\ \dots & \dots & \dots & \dots & \dots \\ r_{k1} & r_{k2} & r_{k3} & \dots & 1 \end{pmatrix}$$

The inverse of R is also symmetric; and can be written as:

$$R^{-1} = C = \begin{pmatrix} c_{11} & c_{12} & \dots & c_{1k} \\ c_{21} & c_{22} & \dots & c_{2k} \\ \dots & \dots & \dots & \dots \\ c_{k1} & c_{k2} & \dots & c_{kk} \end{pmatrix}$$

Now the partial correlation between x_i and x_j is defined by :

$$r_{i,j.1\dots i-1,i+1\dots j-1,j+1\dots k}$$

$$= \frac{c_{ij}}{\sqrt{c_{ii} c_{jj}}}$$

2.10.5 Testing of Statistical Significance

There are basically three ways that can be used to test the significance of a multiple correlation. The first is by calculating a variance ratio (F). The second is by t-distribution and the third is by using a chi-square.

In t-distribution, the t-value is obtained by:

$$t = \frac{R}{\sqrt{(1-R)^2 / n-2}}$$

and this is compared with the table value of t found in the normal manner for (n-2) degrees of freedom.

A chi-square is calculated by using an L criterion given by:

$$L = 1 - R^2$$

and the chi-square is then obtained by:

$$\chi^2 (r \text{ df}) = -n-1-1/2 (r+2) \log_e L.$$

where r is the the number of independent variables .

However, the variance ratio, F, is preferred to t or the

χ^2 -test . This variance ratio is defined as the ratio of predicted to non-predicted variance . The predicted variance has degrees of freedom r and non-predicted variance has n-r-1 degrees of freedom .

The variance ratio F, is therefore of the form :

$$F_{\frac{n-r-1}{r}} = \frac{\frac{R^2}{r}}{\frac{(1-R^2)}{(n-r-1)}}$$

The F- distribution is used for testing the equality of two estimated variances. This problem frequently occurs when two variances are independently estimated and one wishes to test whether they are equal or not. Thus the F-test suggests that there exist a relationship between multivariate analysis of variance and multiple regression models.

2.10.6 Assumptions of Linear Regression Analysis

The validity of the regression model lies in the fulfilment of several assumptions namely.

1. Regression analysis fits a straight line trend through a scatter of data points and correlation analysis test for goodness of fit of this line. Clearly if the trend cannot be repeated by a straight line, regression will not portray it carefully. But in cases when it is not linear it can be made linear by transforming the data by use of the logarithm.
2. Normality: it is widely assumed that the use of the linear regression model requires that the variables have a normal distribution. Infact the requirement is not that the raw data be normally distributed, it is the conditional distribution of residuals that are normal. The conditional

distributions are values of $(Y_1 - Y_i)$ for every value of X . If these conditional distributions are normal then, it is certain that the distributions of Y and of X known as marginal distributions are also normal, but the converse is not necessarily the case.

3. As regards the random error e_i , it is assumed :-

- (i) that e_i is uncorrelated with any of the independent variables.
- (ii) that e_i is normally distributed and
- (iii) that e_i 's are uncorrelated.

4. The independent variables should not be strongly interrelated.

5. The observation must be at least 20 or more . This is in order to allow for large number of degrees of freedom in testing the statistical significance of each independent variable.

2.10.7 DUMMY VARIABLES

In general, multiple regression requires that variables are measured on interval or ratio scale and the relationship among the variables are linear and additive (Jae-on Kim et.al.1970, SPSS, p.320). Where this is not the case, and categorical variables have to be used, then they have to be transformed into dummy variables.

The categorical data used in this study include,

work status, education, place of residence, religion, age at menarche, age at first birth and age at first marriage. The values of the dummy variables used in this study are shown in table 2.4.

The factors considered when assigning the dummy variables fall into four broad categories:-

- a. socio-economic characteristics,
- b. socio-cultural characteristics,
- c. Demographic characteristics,
- d. Biological characteristics.

The first broad group includes:- (i) Level of education which has been put into three categories ; namely no education (NOEDU); 1-4 years of education (1-4YREDU); and secondary plus education (SEC.EDU). (ii) work status, has been put into two categories; those who never worked before (NEWORK);and those currently on wage employment for some cash or wage labourous (WORK). (iii) place of residence has been put into two categories; rural residence (RURAL);and urban residence (URBAN).

The second group of socio-cultural include, religion that has been put into three categories; catholic (CATH); protestant (PROT);and muslim (MUSL).

The demographic characteristics include, (i) Age at first marriage (AFM); and (ii) Age at first birth (AFB).

The last group of biological characteristics considered is the Age at menarche (MENR).

The other variables are left out as the reference categories for the dummy variables are : 5-8 years of education (5-8YREDU); other work status (OTHWOR); other religion (OTH.RE); Nairobi and Mombasa (NRB.MBS).

TABLE 2.4 VALUES OF THE DUMMY VARIABLES USED IN THE REGRESSION MODEL.

| | AFB | AFM | NEWORK | WORK | NOEDU |
|----------|-----|-----|--------|------|-------|
| AFB | 1 | 0 | 0 | 0 | 0 |
| AFM | 0 | 1 | 0 | 0 | 0 |
| NEWORK | 0 | 0 | 1 | 0 | 0 |
| WORK | 0 | 0 | 0 | 1 | 0 |
| NOEDU | 0 | 0 | 0 | 0 | 1 |
| 1-4YREDU | 0 | 0 | 0 | 0 | 0 |
| SEC.EDU | 0 | 0 | 0 | 0 | 0 |
| CATH | 0 | 0 | 0 | 0 | 0 |
| PROT | 0 | 0 | 0 | 0 | 0 |
| MUSL | 0 | 0 | 0 | 0 | 0 |
| MENR | 0 | 0 | 0 | 0 | 0 |
| RURAL | 0 | 0 | 0 | 0 | 0 |
| URBAN | 0 | 0 | 0 | 0 | 0 |

| | 1-4YRE | SEC.ED | CATH | PROT | MUSL |
|----------|--------|--------|------|------|------|
| 1-4YREDU | 1 | 0 | 0 | 0 | 0 |
| SEC.EDU | 0 | 1 | 0 | 0 | 0 |
| CATH | 0 | 0 | 1 | 0 | 0 |
| PROT | 0 | 0 | 0 | 1 | 0 |
| MUSL | 0 | 0 | 0 | 0 | 1 |
| MENR | 0 | 0 | 0 | 0 | 0 |
| RURAL | 0 | 0 | 0 | 0 | 0 |
| URBAN | 0 | 0 | 0 | 0 | 0 |

| | MENR | RURAL | URBAN |
|-------|------|-------|-------|
| MENR | 1 | 0 | 0 |
| RURAL | 0 | 1 | 0 |
| URBAN | 0 | 0 | 1 |

Table 2.4 above shows for example that when NOEDU is taken as indicator or dummy variable, it assumes the value 1. All other dummy variables AFM, AFB to URBAN take on the value 0.

2.10.8 Some Problems of Multiple Regression

Ideally, it is not always possible for all these assumptions to be satisfied. In our case, for instance, the dependent variable (age at first birth /age at first marriage) is likely to have some influence on and at the same time be influenced by some of the independent variables.

There is also the problem of multicollinearity which is defined as the intercorrelation of the independent variables. Multicollinearity arises when independent variables are linear function of each other (Gujarati, 1976). Its consequences are that the standard errors are either infinite or high (Gujarati, 1976). The result is that the population values of coefficients cannot be estimated precisely.

An examination of the correlation coefficients of the independent variables may show multicollinearity in the data. Accordingly, the correlation coefficients of the variables used in this study is shown in APPENDIX 1

Since most of the correlation coefficients are less than 0.5 and hence low, multicollnearity does not seem to be a major problem in this study.

The limitations of Ordinary Least Square (OLS) methods in estimating the parameters of the linear regression model are :-

(i) it can yield probabilities outside the acceptable 0-1 interval.

(ii) the true probability relationship is more likely to be S-shaped than linear, approaching the probability value of zero and one asymptotically, and, that

(iii) OLS assumptions that the error terms are :-

(a) normally distributed with zero expectation.

(b) homoskedastic, i.e they have the same variance are violated.

CHAPTER THREE

ESTIMATES OF MEAN AGES AT FIRST MARRIAGE AND FIRST BIRTH AND FERTILITY LEVELS. -----

3.1 INTRODUCTION -----

In this chapter, the mean ages at first marriage and first birth are estimated by both direct statistical and indirect demographic methods by differential, and total fertility rate at national level. Total fertility rate is also estimated by various ages at first marriage and first birth, and lastly by various differentials.

3.2 MEAN AGE AT FIRST MARRIAGE. -----

Marriage is a socio-cultural variable which is important in determining the exposure and risk of of conception, and general fertility. This is because once marriage comes into a woman's life cycle, then her reproductive history is bound to change radically. In Kenya, marriage is universal, and on the whole, all cohorts exhibit the pattern of a young age at first marriage.

In this section, we present the estimates of the mean ages at first marriage and SMAM values and the parameter K estimated by Coale marriage (Nuptial) model. Mean age at first marriage is a useful gauge for comparing marriage patterns across societies or across groups within a given society (Kendall, 1979).

TABLE 3.1 SMAM, MEAN AGE AT FIRST MARRIAGE OF WOMEN
AND PARAMETERS ESTIMATED USING THE COALE
NUPTIAL MODEL.

| | SMAM | MEAN AGE AT FIRST MARRIAGE | Ao | K |
|-----------------------|-------|----------------------------------|----|------|
| KENYA | 20.12 | 17.28 | 13 | .377 |
| BY PROVINCE | | | | |
| NAIROBI | 21.46 | 18.00 | 14 | .352 |
| CENTRAL | 21.50 | 18.29 | 14 | .378 |
| COAST | 18.15 | 16.71 | 12 | .415 |
| NYANZA | 19.05 | 17.83 | 13 | .337 |
| RIFTVALLE | 20.14 | 17.26 | 14 | .287 |
| WESTERN | 19.13 | 18.07 | 13 | .358 |
| EASTERN | 21.47 | 18.17 | 14 | .367 |
| BY PLACE OF RESIDENCE | | | | |
| RURAL | 19.94 | 17.41 | 13 | .388 |
| URBAN | 20.67 | 17.53 | 15 | .223 |
| NRB.MBS | 20.84 | 17.66 | 14 | .322 |
| BY EDUCATION LEVEL | | | | |
| NONE | 17.79 | 17.08 | 13 | .359 |
| 1-4YRS | 19.58 | 17.27 | 14 | .288 |
| 5-8YRS | 19.73 | 17.79 | 14 | .334 |
| SEC.+ | 22.68 | 19.45 | 16 | .304 |

BY RELIGION

| | | | | |
|-----------|-------|-------|----|------|
| CATHOLIC | 20.2 | 17.46 | 16 | .305 |
| PROTSTANT | 20.28 | 17.59 | 14 | .316 |
| MUSLIMS | 17.95 | 16.59 | 13 | .316 |

BY MAJOR TRIBES

| | | | | |
|-----------|-------|-------|----|------|
| KALENJIN | 19.91 | 17.17 | 14 | .280 |
| KAMBA | 21.3 | 18.04 | 14 | .356 |
| KIKUYU | 21.33 | 18.19 | 14 | .369 |
| KISII | 20.32 | 17.55 | 13 | .401 |
| LUHYA | 19.28 | 17.13 | 13 | .364 |
| LUO | 18.56 | 16.59 | 13 | .316 |
| EMBU/MERU | 21.75 | 18.14 | 14 | .364 |
| MIJIKENDA | 17.74 | 16.37 | 12 | .385 |

As table 3.1 shows, it was found that, early first marriage is predominantly high in the coast province, among the mijikenda and muslim women, whose cultural and religious beliefs strongly favour early or child-marriage. Moderate mean age at first marriage was noted in Nyanza, Rift Valley and Western provinces, also among the Luo, Kalenjin and Luhya women. While women from Central province, Eastern and Nairobi were noted for their later age at first marriage. It was also found that women in the rural areas marry at an earlier age than their urban counter parts. This conforms to Ebanks' (1984), finding that in almost all developing countries young women in the rural areas marry earlier than women in the urban centres.

Age at first marriage was also found to vary by level of education. Women with no education and those with 1-4 years of primary education were found to marry first at an earlier age than those with more formal years of education. This finding is similar to Kendall's (1979) finding in Latin America, where he found that women with secondary education marry, on average, about two years later than women with only primary school education.

3.3 MEAN AGE AT FIRST BIRTH.

It is necessary to note here that while menarche is a purely physiological variable, birth is a bio-social variable. Birth is subject to certain restraints imposed by both biological and social dimensions. We also know that reproductive efficiency is a function of age, while conception without contraception, is a function of sexuality which in turn is also a socio-cultural variable.

In Kenya, like in any other developing countries young women are sexually active, and they are beginning sexual activity at young ages (Diverker and Natarajan, (1979)). Most of premarital pregnancies lead to early childbearing in Kenya, except a few that may lead to illegal abortion or foetal loss.

From table 3.2 , which shows the values for mean age at first birth, we observe that first birth pattern

also show similar characteristic as first marriage variable of women in table 3.1. By region, Western and Nyanza have low mean ages at first birth. Late first birth is evident in Central, Eastern and Nairobi province. Women in rural areas were found to have a slightly higher mean age at first birth than women in urban areas. This difference can be explained by the high prevalence of illegal abortion and the breakdown in African traditional culture in the urban areas. Women with no education and those with 1-4 years of education also tend to show high prevalence of early first birth. By major ethnic groups, the Kikuyu and Kamba were noted for their high mean age at first birth. Most of the other ethnic groups fall into mean averages age at first birth , although at different degrees.

TABLE 3.2 MEAN AGES AT FIRST BIRTH OF THE WOMEN
ESTIMATED BY DIRECT METHOD AND PARAMETERS
ESTIMATED USING THE COALE NUPTIAL MODEL.

| | MEAN AGE AT FIRST BIRTH | Ao | K |
|-----------------------|-------------------------------|----|------|
| KENYA | 18.07 | 15 | .268 |
| BY PROVINCE | | | |
| NAIROBI | 18.17 | 16 | .191 |
| CENTRAL | 18.66 | 16 | .234 |
| COAST | 18.09 | 14 | .325 |
| NYANZA | 17.82 | 15 | .248 |
| RIFT VALLEY | 17.95 | 15 | .260 |
| WESTERN | 17.77 | 15 | .244 |
| EASTERN | 18.44 | 16 | .215 |
| BY PLACE OF RESIDENCE | | | |
| RURAL | 18.07 | 15 | .270 |
| URBAN | 17.94 | 16 | .171 |
| NRB.MBS | 18.14 | 15 | .276 |
| BY EDUCATION LEVEL | | | |
| NONE | 17.93 | 15 | .258 |
| 1-4 YEARS | 17.92 | 16 | .257 |
| 5-8 YEARS | 18.11 | 16 | .186 |
| SECONDARY + | 19.10 | 16 | .273 |
| BY RELIGION | | | |
| CATHALICS | 18.07 | 15 | .270 |
| PROTESTANTS | 18.12 | 15 | .275 |
| MUSLIMS | 17.99 | 15 | .228 |
| BY MAJOR TRIBES | | | |
| KALENJIN | 17.92 | 15 | .257 |
| KAMBA | 18.42 | 15 | .301 |
| KIKUYU | 18.53 | 16 | .222 |
| KISII | 18.24 | 15 | .285 |
| LUHYA | 17.83 | 15 | .249 |
| LUO | 17.43 | 15 | .214 |
| EMBU-MERU | 18.14 | 16 | .188 |
| MIJIKENDA | 18.03 | 15 | .232 |

TABLE 3.3 ESTIMATES OF REPRODUCTIVE BEHAVIOR IN KENYA
USING INDIRECT METHODS.

| | MEAN AGE AT LAST BIRTH (MALB) | MEAN AGE AT FIRST BIRTH (MAFB) | MEAN REPRO- DUCTIVE SPAN (MRSPAN) | MEAN INTERVAL |
|-----------------------|--|---|--|------------------|
| KENYA | 43.36 | 19.94 | 23.42 | 3.21 |
| BY PROVINCE | | | | |
| NAIROBI | 41.39 | 19.64 | 21.75 | 3.63 |
| CENTRAL | 43.79 | 20.31 | 23.48 | 2.93 |
| COAST | 40.26 | 20.62 | 19.64 | 3.76 |
| WESTERN | 43.29 | 19.38 | 23.91 | 3.18 |
| NYANZA | 43.66 | 19.22 | 24.44 | 3.10 |
| RIFT VALLEY | 43.66 | 19.21 | 24.45 | 3.10 |
| EASTERN | 43.49 | 20.15 | 23.34 | 3.12 |
| BY PLACE OF RESIDENCE | | | | |
| RURAL | 43.51 | 19.37 | 24.14 | 3.20 |
| URBAN | 41.53 | 19.24 | 22.29 | 3.65 |
| NRB.MBS | 40.03 | 19.70 | 20.33 | 3.78 |
| BY MAJOR TRIBES | | | | |
| KALENJIN | 43.61 | 19.05 | 24.56 | 3.09 |
| KAMBA | 43.13 | 19.88 | 23.25 | 3.34 |
| KIKUYU | 43.43 | 19.98 | 23.45 | 3.11 |
| KISII | 43.67 | 19.20 | 24.47 | 3.11 |
| LUHYA | 43.33 | 19.13 | 24.20 | 3.16 |
| LUO | 43.34 | 19.28 | 24.06 | 3.26 |
| MERU/EMBU | 42.99 | 19.24 | 23.75 | 3.37 |
| MIJIKENDA | 39.71 | 20.02 | 19.69 | 3.01 |
| BY EDUCATION | | | | |
| NONE | 43.40 | 19.07 | 24.33 | 3.15 |
| 1-4 YEARS | 43.90 | 19.37 | 24.53 | 2.93 |
| 5-8 YEARS | 42.94 | 19.60 | 23.34 | 3.18 |
| SECONDARY + | 41.72 | 21.06 | 20.66 | 3.23 |
| BY RELIGION | | | | |
| CATHOLIC | 43.36 | 19.66 | 23.68 | 3.17 |
| PROTESTANT | 43.32 | 19.21 | 24.13 | 3.10 |
| MUSLIM | 39.09 | 19.27 | 19.82 | 3.50 |

3.4 ESTIMATION OF TOTAL FERTILITY AT NATIONAL LEVEL

TABLE 3.4 CHILDREN EVER BORN AND BIRTHS IN THE PAST YEAR
BY AGE GROUP OF MOTHER,

| AGE GROUP (1) | NUMBER OF WOMEN (2) | CHILDREN EVER BORN (3) | BIRTHS IN THE PAST YEAR (4) |
|------------------|---------------------------|------------------------------|-----------------------------------|
| 15-19 | 1930 | 652 | 368 |
| 20-24 | 1505 | 2702 | 428 |
| 25-29 | 1515 | 5636 | 320 |
| 30-34 | 991 | 5491 | 243 |
| 35-39 | 892 | 6090 | 253 |
| 40-44 | 596 | 4521 | 185 |
| 45-49 | 596 | 4699 | 135 |

Values of the reported average parities, $P(i)$, are obtained by dividing the numbers listed in column (3) (children ever born) of table 3.4 by those appearing in column (2) (number of women). The results are shown in table 3.5. The values of $P(4)$ for example are calculated as $P(4) = (5491/991) = 5.540867$. While the preliminary fertility schedule $f(i)$ values are computed by dividing the entries in column (4) (births in the past year) of table 3.4 by those in column (2) (number of women). For example the value of $f(4)$ is calculated as

$$f(4) = (243/991) = 0.245206$$

The values of cumulated fertility schedule $Q(i)$ are obtained by adding the values of $f(i)$, beginning with $j=1$ and ending with $j=i$, and then multiplying this sum by five. As an example, $Q(4)$ is calculated as:

$$Q(4) = 5 (.195854 + .283056 + .211221 + .245206) = 4.676696$$

TABLE 3.5 AVERAGE PARITIES, PERIOD FERTILITY RATES AND CUMMULATED FERTILITY, BY AGE GROUP OF MOTHER.

| Age group (1) | Index (2) | Average parity per woman $P(i)$ (3) | period fertility rate $f(i)$ (4) | Cummulated fertility $Q(i)$ (5) |
|------------------|--------------|---|--|---------------------------------------|
| 15-19 | 1 | .337823 | .195854 | .979274 |
| 20-24 | 2 | 1.795348 | .283056 | 2.394557 |
| 25-29 | 3 | 3.720132 | .211221 | 3.450662 |
| 30-34 | 4 | 5.540867 | .245206 | 4.676696 |
| 35-39 | 5 | 6.827354 | .283632 | 6.094858 |
| 40-44 | 6 | 7.585570 | .310402 | 7.646871 |
| 45-49 | 7 | 7.884223 | .226510 | 8.779422 |

For the estimation of fertility schedule for conventional five year age groups, $f(i)$ when age specific fertility rates have been computed from births in the last 12 months period classified by age of the mother at the end of the period, a weighting factor $w(i)$ is required for the calculation of age specific fertility

rates. The weighting factors shown in table 3.6 are obtained by using the coefficients displayed in table 2.3 (chapter 2. p.48). $w(i)$ is obtained by ;

$$w(i) = X(i) + Y(i)f(i)/Q(7) + Z(i)f(i+1)/Q(7).$$

As an example $w(1)$ is computed as :

$$w(1) = .031 + (2.287)(.195854)/8.779422 + (.114)(.283056)/8.77942$$

$$w(1) = .085694$$

And age specific fertility rates are then computed as

$$f(i) = (1 - w(i-1))f(i) + w(i)f(i+1). \text{ As an example}$$

$f(2)$ is calculated as :

$$f(2) = (1 - .0856694)(.283056) + (.094602)(.211211)$$

$$f(2) = .278782$$

and $f(7)$ is obtained by $(1 - w(6))f(7)$.

$$f(7) = (1 - .946743)(.226510) = .012063.$$

TABLE 3.6 THE WEIGHTING FACTORS FOR THE ESTIMATION OF AGE SPECIFIC FERTILITY RATES FOR CONVENTIONAL AGE GROUPS SHIFTED BY SIX MONTHS AND AGE SPECIFIC FERTILITY RATES.

| Age group (1) | Index (2) | Weighting factor (3) | Age specific fertility rates $f(i)$ (4) |
|------------------|--------------|-------------------------|--|
| 15-19 | 1 | .085694 | .22011 |
| 20-24 | 2 | .094602 | .278782 |
| 25-29 | 3 | .095481 | .214651 |
| 30-34 | 4 | .107378 | .252250 |
| 35-39 | 5 | .091183 | .281479 |
| 40-44 | 6 | .946743 | .496546 |
| 45-49 | 7 | | .012063 |

For estimation of average parity equivalent, $F(i)$, coefficients from table 2.2 (Chapter 2 p.46) are used, the results are shown in table 3.7. The values of $F(i)$ are obtained as :

$$F(i) = Q(i-1) + a(i)f(i) + b(i)f(i+1) + c(i)Q(7) \text{ and}$$

$$F(7) = Q(6) + a(7)f(6) + b(7)f(7). \text{ As an example,}$$

$$F(1) = 0 + (2.531)(.22011) + (-.188)(.278782) + (.0024)(8.779422)$$

$$F(1) = .504690$$

TABLE 3.7 ESTIMATED PARITY EQUIVALENTS, AVERAGE PARITIES AND P/F RATIOS.

| Age group (1) | Index (2) | Estimated parity equivalent $F(i)$ (3) | Average parity $P(i)$ (4) | P/F ratio (5) |
|------------------|--------------|---|------------------------------|------------------|
| 15-19 | 1 | .504690 | .337823 | .669367 |
| 20-24 | 2 | 1.884611 | 1.795348 | .952636 |
| 25-29 | 3 | 3.064535 | 3.720132 | 1.21393 |
| 30-34 | 4 | 4.185894 | 5.540867 | 1.323689 |
| 35-39 | 5 | 5.293346 | 6.827335 | 1.289789 |
| 40-44 | 6 | 7.981712 | 7.585570 | .95961 |
| 45-49 | 7 | 12.03772 | 7.884228 | .64740 |

The mean of the P/F ratio values is calculated to obtain an adjustment factor K which is used to obtain adjusted age specific fertility rates for conventional age groups. $f(i)$, $f(i)$ values are obtained by multiplying

⁺
f (i) values by the adjustment factor $K = .945311$. The values of f (i) are shown in table 3.8 . Total Fertility Rate is then estimated by multiplying the sum of the adjusted age specific fertility rates by five.

TABLE 3.8 ADJUSTED AGE SPECIFIC FERTILITY RATES AND
TOTAL FERTILITY .

| Age group (1) | Index (2) | Adjusted fertility rates f(i) (3) | Total fertility (4) |
|---------------------|--------------|--|---------------------------|
| 15-19 | 1 | .208073 | 1.040368 |
| 20-24 | 2 | .263535 | 2.358048 |
| 25-29 | 3 | .202912 | 3.372612 |
| 30-34 | 4 | .238454 | 4.564885 |
| 35-39 | 5 | .266086 | 5.895316 |
| 40-44 | 6 | .469390 | 8.242270 |
| 45-49 | 7 | .011403 | 8.299287 |

3.5 AGE AT FIRST MARRIAGE AND TOTAL FERTILITY RATE.

In this section women who reported to have been married before age 20 were grouped into seven categories according to their ages at first marriage. The groups considered are those women who got married first when they were less than 14 years old, those who got married at ages 14, 15, 16, 17, 18 and 19 .

The estimation of total fertility of women according to their ages at first marriage was done and the results are shown in table 3.9 below.

TABLE 3.9 FERTILITY BY AGES AT FIRST MARRIAGE.

| (ADJUSTED) A S F R | | | | |
|--------------------|-----------------------|-------|-------|-------|
| age group | AGE AT FIRST MARRIAGE | | | |
| | <14 | 14 | 15 | 16 |
| 15-19 | .4015 | .3429 | .4226 | .4178 |
| 20-24 | .2422 | .2141 | .2316 | .1810 |
| 25-29 | .3038 | .3140 | .3622 | .2305 |
| 30-34 | .3322 | .3066 | .4508 | .3075 |
| 35-39 | .3650 | .3253 | .1401 | .3228 |
| 40-44 | .4564 | .5948 | .3591 | .3902 |
| 45-49 | .0456 | .0152 | .0394 | .0399 |
| T F R | 10.73 | 10.57 | 10.02 | 9.45 |

| (ADJUSTED) A S F R | | | |
|--------------------|-----------------------|--------|--------|
| ----- | | | |
| age group | AGE AT FIRST MARRIAGE | | |
| | 17 | 18 | 19 |
| ----- | | | |
| 15-19 | .4509 | 0.5128 | 0.3353 |
| 20-24 | .1813 | 0.1997 | 0.2423 |
| 25-29 | .1336 | 0.1369 | 0.1426 |
| 30-34 | .2060 | 0.1883 | 0.2004 |
| 35-39 | .2360 | 0.2349 | 0.2284 |
| 40-44 | .4831 | 0.344 | 0.3382 |
| 45-49 | .0095 | 0.0334 | 0.0295 |
| ----- | | | |
| T F R | 8.5 | 8.25 | 7.58 |
| ----- | | | |

From table 3.9 above, it can be observed that, those who got married early have a high total fertility than those who got married late. For example, those who got married first at ages 14 and 19 have an estimated total fertility rate of 10.57 and 7.58 respectively. We therefore, found specifically in this study that total fertility rate decline with the increasing age at first marriage. This observation is similar in pattern to Abdullah (1980), finding in Indonesia, where he found that those who got married at ages less than 15 had 4.0 children ever born and those married at ages 15 to 19 had 3.3 children ever born, while those married at age 20 and above had 2.7 children. However, it can also be observed that,

those who got married before age 14 do not experience a very high completed fertility, and this could possibly be explained by their reduced fecundability during their early period of marriage because of their closeness to menarche.

3.6 AGE AT FIRST BIRTH AND TOTAL FERTILITY RATE.

Age at first birth was also found to have a significant influence on completed fertility. Just like age at first marriage, those who got their first birth early have a high total fertility than those who got their first birth late. This decline in fertility as age at first birth increases can be observed from table 3.10 below, where for example, it is evident that, those who got their first birth at age 15 have a total fertility rate of 9.59, while those who got their first birth at age 19 have a total fertility rate of 6.92.

TABLE 3.10 FERTILITY BY AGES AT FIRST BIRTH.

| (ADJUSTED) A S F R | | | | |
|--------------------|-------|-------|-------|-------|
| AGE AT FIRST BIRTH | | | | |
| Age group | <14 | 14 | 15 | 16 |
| 15-19 | .5945 | .5966 | .4744 | .5853 |
| 20-24 | .2064 | .2280 | .1801 | .1313 |
| 25-29 | .2800 | .2096 | .2180 | .2301 |
| 30-34 | .3035 | .2356 | .2469 | .1914 |
| 35-39 | .4656 | .4142 | .3020 | .2466 |
| 40-44 | .2132 | .2321 | .4582 | .3360 |
| 45-49 | .0370 | .0363 | .4582 | .0332 |
| TFR | 10.50 | 9.76 | 9.59 | 8.77 |

(ADJUSTED) A S F R

AGE AT FIRST BIRTH

| Age group | 17 | 18 | 19 |
|--------------|-------|-------|-------|
| 15-19 | .6501 | .6930 | .5494 |
| 20-24 | .1393 | .1485 | .1930 |
| 25-29 | .1389 | .0977 | .1011 |
| 30-34 | .2163 | .1698 | .1482 |
| 35-39 | .1847 | .1633 | .1214 |
| 40-44 | .3714 | .3173 | .2395 |
| 45-49 | .0170 | .0335 | .0321 |
| TFR | 8.59 | 7.70 | 6.92 |

3.7 PROPORTION EVER MARRIED.

Table 3.11 presents the cumulative proportion ever married by single years of age, for each five-year age cohort. On the whole, it was observed that all cohorts exhibit a pattern of young age at first marriage. For example, by age 18 more than 50 percent were already married in all cohorts except cohort aged (15-19). Among women aged 30-34 about 31.4 percent entered into the first union by exact age 15 and about 10.9 percent among women in the age group 15-19.

It was also observed that a trend towards later marriage among the younger cohorts existed, as is evidenced from table 3.11, where one sees a systematic decrease in the proportions married at exact ages by successive birth cohorts over the last 15 years before the survey. The older cohorts aged 40-44 and 45-49 portray low values for the proportions ever married at each specified age. This could

be explained by the fact that, most women in those age groups were not aware of exact dates, since their first entry into the union had occurred in the distant past.

TABLE 3.11 CUMMULATIVE PROPORTION EVER MARRIED BY SPECIFIED AGES ACCORDING TO CURRENT AGE GROUPS.

| Specified age | Current age group. | | | | |
|---------------|--------------------|-------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 |
| 13 | .025 | .066 | .110 | .143 | .104 |
| 14 | .060 | .126 | .158 | .200 | .189 |
| 15 | .109 | .202 | .241 | .314 | .326 |
| 16 | .173 | .311 | .362 | .425 | .432 |
| 17 | .228 | .425 | .485 | .545 | .547 |
| 18 | .262 | .528 | .593 | .647 | .659 |
| 19 | .277 | .626 | .683 | .750 | .752 |
| 20 | | .697 | .758 | .826 | .824 |
| 21 | | .741 | .761 | .878 | .871 |
| 22 | | .763 | .803 | .906 | .902 |
| 23 | | .772 | .832 | .938 | .928 |
| 24 | | .774 | .862 | .952 | .939 |
| 25 | | | .867 | .963 | .956 |
| 26 | | | .875 | .973 | .963 |
| 27 | | | .880 | .978 | .969 |
| 28 | | | .881 | .981 | .976 |
| 29 | | | | .983 | .981 |
| 30 | | | | .984 | .984 |
| 31 | | | | | .988 |
| 32 | | | | | .988 |
| 33 | | | | | .989 |
| 34 | | | | | .990 |
| 35 | | | | | .990 |
| 36 | | | | | .990 |
| 37 | | | | | .991 |

3.8 PROPORTION OF MOTHERS.

Another way of studying fertility trends is to examine age at first birth of cohorts over time, as this reveals the proportions who are mothers at each age for different cohorts. Table 3.12 shows the cumulative proportions who are mothers by exact ages. It can be seen from table 3.12 that, the cohort aged 30-34 shows the earliest fertility. The proportions who are mothers among these women are highest of all the cohorts. For example, by age 18 about 52.4 percent of the women in that age group were mothers. While by the same age, cohorts aged 20-24, 25-29 and 35-39 had the following percentages respectively 47.7, 49.4 and 47.6.

TABLE 3.12 CUMMULATIVE PROPORTIONS WHO ARE MOTHERS BY
SPECIFIC AGES ACCORDING TO CURRENT AGE GROUPS.

| Specified age | Current age group. | | | | |
|------------------|--------------------|-------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 |
| 14 | .027 | .045 | .059 | .082 | .077 |
| 15 | .060 | .105 | .128 | .169 | .147 |
| 16 | .125 | .205 | .228 | .268 | .247 |
| 17 | .187 | .347 | .350 | .399 | .351 |
| 18 | .234 | .477 | .494 | .524 | .476 |
| 19 | .250 | .591 | .616 | .638 | .572 |
| 20 | | .681 | .714 | .741 | .657 |
| 21 | | .727 | .781 | .817 | .720 |
| 22 | | .760 | .836 | .866 | .780 |
| 23 | | .771 | .867 | .882 | .816 |
| 24 | | .774 | .888 | .902 | .850 |
| 25 | | | .905 | .915 | .868 |
| 26 | | | .914 | .925 | .880 |
| 27 | | | .916 | .934 | .889 |
| 28 | | | .920 | .939 | .896 |
| 29 | | | | .939 | .906 |
| 30 | | | | .942 | .909 |
| 31 | | | | .943 | .914 |
| 32 | | | | | .922 |
| 33 | | | | | .924 |
| 34 | | | | | .924 |
| 35 | | | | | .930 |

3.9 FERTILITY LEVELS AND DIFFERENTIALS IN KENYA.

3.9.1 Introduction

In this section fertility levels by various differentials is estimated by the procedure outlined in chapter two. The fertility situation in Kenya in 1977/78 according to Kenya Fertility Survey is seen to have been high. The explanation is basically four fold. The first is

the early and stable marriages. The second is low age at first birth. The third is the low expectation of life at birth and the fourth is the low usage of the modern contraceptives. At the same time Kenya has consistently shown significant variations in fertility by region, education, ethnicity, religion and by place of residence.

3.9.2 Regional and Ethnic Variations in Fertility

On regional basis fertility was found to be highest, 9.0 in Central province, 8.9 in Rift Valley and Nyanza, and lowest, 6.2 in Coast province. The other remaining regions were found to show intermediate fertility of 8.5 in Western and Eastern provinces and 7.0 in Nairobi as can be observed from table 3.13.

The ethnic variations in fertility follows the same pattern as regional variations as various ethnic groups tend to be clustered in different regions. For example, Central province is basically occupied by the Kikuyus and Western province by the Luhya. The ethnic variation in fertility is also shown on table 3.14.

TABLE 3.13 REGIONAL VARIATION IN FERTILITY

| PROVINCE | TFR |
|-------------|------|
| NAIROBI | 6.99 |
| CENTRAL | 9.01 |
| COAST | 6.22 |
| WESTERN | 8.51 |
| NYANZA | 8.89 |
| RIFT VALLEY | 8.90 |
| EASTERN | 8.47 |

TABLE 3.14 ETHNIC VARIATION IN FERTILITY.

| MAJOR TRIBES | TFR |
|--------------|------|
| KALENJIN | 8.95 |
| KAMBA | 7.96 |
| KIKUYU | 8.54 |
| KISII | 8.87 |
| LUHYA | 8.65 |
| LUO | 8.39 |
| EMBU-MERU | 8.05 |
| MIJIKENDA | 7.55 |

In Central province early marriage and early first birth are relatively less common now but it has a higher fertility than other regions like, Coast and Nyanza where early marriage and early first birth are most frequent. Social transformations associated with development that have resulted in reduced sterility and spontaneous foetal mortality can be said to explain the high fertility in Central province among the Kikuyu women. This high fertility can also be explained by the breakdown of

cultural traditions and practices such as breastfeeding, postpartum abstinence and polygamy. The period of infertility following child birth is prolonged biologically by practice of breastfeeding and it can be extended further by abstinence, Caldwell (1977). The practice of breastfeeding and abstinence have shown a tendency to decline in Central province, particularly as women's education, women's participation in modern work force and as adoption of western values advance since a higher proportion of these women are metropolitan residents, Mosley (1980).

The high fertility here can also be explained by the longer reproductive span of about 23.48 years in Central province and 23.45 years among the kikuyu ethnic group as can be observed from table 3.3.

The high fertility in Central province can also be said to have been contributed by the older cohorts who married early and also got their first births early while the contraceptive practice among the same cohorts was relatively low. For example, by exact age 19, the 30-34 age cohort, a higher proportion (.702) had entered into the union and also (.602) proportion had got their first birth as can be observed from tables 3.14 and 3.15.

TABLE 3.15 CUMMULATIVE PROPORTION EVER MARRIED BY EXACT
AGE 19 ACCORDING TO CURRENT AGE GROUP

| PROVINCE | Age group | | | |
|-------------|-----------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 |
| NAIROBI | .249 | .439 | .507 | .486 |
| CENTRAL | .129 | .365 | .573 | .702 |
| COAST | .551 | .653 | .596 | .662 |
| NYANZA | .344 | .714 | .706 | .744 |
| RIFT VALLEY | .288 | .645 | .632 | .700 |
| WESTERN | .286 | .749 | .715 | .778 |
| EASTERN | .114 | .426 | .532 | .638 |

TABLE 3.16 CUMMULATIVE PROPORTION WHO ARE MOTHERS BY
EXACT AGE 19 ACCORDING TO CURRENT AGE GROUP
BY PROVINCE.

| PROVINCE | Age group. | | | |
|-------------|------------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 |
| NAIROBI | .239 | .425 | .521 | .500 |
| CENTRAL | .163 | .450 | .624 | .602 |
| COAST | .271 | .597 | .575 | .492 |
| NYANZA | .258 | .661 | .625 | .668 |
| RIFT VALLEY | .299 | .604 | .596 | .595 |
| WESTERN | .234 | .694 | .672 | .698 |
| EASTERN | .201 | .488 | .536 | .544 |

The high fertility in Rift Valley which is basically occupied by the Kalenjins can be explained by various reasons. First, the level of modern contraceptive use is low, less than three percent, while their mean ages at first birth and first marriage are low, at the same time their mean age at last birth is high, with the result that they have a longer reproductive span of 24.56 years as can be observed from tables 3.1, 3.2 and 3.3.

The Kalenjins also breastfeed for an average of 16 months, resulting in only nine months of postpartum ammenorrehea, they also have a short menstrual interval of only six months Mosley (1980). In migration of people from the high fertility regions like Central province towards this region can also be said to have contributed to this high fertility. Just like Central province, Rift Valley is also noted for having a higher proportion (.700) of ever married women by exact age 19 and also a high proportion (.595) of women who got their first birth by exact age 19 among the older age cohort 30-34 as can be observed from tables 3.14 and 3.15.

Nyanza province which is basically occupied by the Luo and Kisii ethnic groups is also noted for being a high fertility region as is shown in tables 3.13 and 3.14. The high fertility here can be explained by low mean ages at first birth and first marriage, older mean age at last birth and consequently longer mean reproductive span among

the women together with the low level of contraceptive use. However, when the two ethnic groups are compared, the kisii exhibit a high fertility and the Luos exhibit a relatively low fertility. This variation can be explained by differences in geographic location, as kisii is situated at a high altitude area where prevalence of malaria is low, while the Luos occupy the low land region of the Lake Victoria basin where malaria is more prevalent. Malaria usually tend to lead to pregnancy interruptions, especially falciparum malaria parasite which causes predilection of placenta which consequently leads to pregnancy wastage Bompene (1954).

The Luhya, of Western province and the Kamba of Eastern province are also noted for their intermediate fertility level as is shown in tables 3.13 and 3.14. The relative high fertility among the Luhya can be possibly explained by their relative low mean ages at first birth and first marriage and also by a high proportion (.778) among older cohort aged 30-34 who had entered into the union by exact age 19 as can be observed from table 3.15. Low contraceptive practice can also be used to explain the fertility among the Luhya. While among the Kamba their reduced fertility can partly be explained by the prevalence of divorce and separation, which removes women from constant exposure to the risk of pregnancy. Henin (1973), found in the mainland of Tanzania that, women aged 40-49 who had separated or divorced at one time averaged two fewer live births, than

women of similar age who had married once and remained in stable union. The moderate fertility among the Meru-Embu can also be explained by their delayed ages at first marriage and first birth, and relatively low contraceptive practice.

The lower fertility in Coast province among the Mijikenda can be explained by a combination of prolonged breastfeeding which is about two years, leading to almost 18 months of lactational amenorrhea. This has resulted in a much longer birth interval and lower pregnancy progression ratio. The prevalence of malaria and foetal loss due to poor health conditions can also be said to explain this low fertility.

Additionally the prevalence of polygamy among the muslims, a factor that has been shown to reduce fertility Dorjahn, (1958), can also be said to explain this low fertility. Lastly this low fertility can also partially be explained by the shortest reproductive span which is about 19.69 years as these women were found to stop childbearing at slightly earlier ages due to the grand mother effect, where a potential mother in law is not suppose to be reproducing at the same time as the daughter.

3.9.3 Place of Residence Variations in Fertility

It is clearly shown, from table 3.17 below , that urban fertility is lower than that of rural.

TABLE 3.17 FERTILITY BY PLACE OF RESIDENCE

| Place of residence | TFR |
|--------------------|------|
| RURAL | 8.55 |
| URBAN | 7.09 |
| NAIROBI.MOMBASA | 6.34 |

Under the assumptions that coital frequency is inversely related to stress and assuming that urban settings are stressful than rural, then rural dwellers could be expected to have been more successful in their effort to conceive, and also more likely to have experienced unwanted conceptions. There may be also a difference in timing of pregnancies. Some of this differences in timing can doubtless be attributed to urban-rural differences in the three casually interrelated conditions that define one's ability to control fertility: knowledge about birth control, skill in its practice and degree of access to the most effective means. However, these three conditions must play their respective parts with in the larger framework of one's willingness to exercise control over fertility -something that will be influenced

together with their consistent trends towards later first birth and marriage, that have occurred in the context of urbanization and socio economic development. The socio-economic conditions that have provided the incentive to delay marriage and first birth have also provided incentive to control fertility. Other findings are also instructive. Kim. et. al.,(1974), for example, found the mean age at marriage to account for 10 percent of the variation in total fertility among the urban-rural and semi-rural women in Korea. Similarly, Kangi (1978), found average age at marriage as the most important factor in explaining fertility between rural Central province and Nairobi. The minimal difference in fertility between the urban and rural, however, can possibly be explained by improved nutritional status and good health facilities in urban areas, which have a positive effect on fertility, through increasing the capability to carry a pregnancy through to a live birth. It can also be explained by migration from the high fertility rural to urban areas and lastly by underreporting of live births in the rural areas.

3.9.4 Variation in Fertility by Education Level.

There is a significant variation in fertility by various levels of education . A decline in fertility by increasing level of education was observed, except that those with 1-4 years of primary education were found to

exhibit a higher fertility (9.4) than those with no education which have a total fertility of 8.7 as is shown in table 3.20 below.

TABLE 3.20 FERTILITY BY EDUCATION LEVEL.

| Level of education | TFR |
|-----------------------|------|
| NONE | 8.73 |
| 1-4 YEARS | 9.37 |
| 5-8 YEARS | 8.33 |
| SECONDARY + | 7.39 |

The explanation for high fertility among women with 1-4 years of education than those with no formal education is two fold. First primary education enables the women to reduce the pregnancy wastage through hygiene and other basic health requirements. The second reason is that women with primary education, may not be following the cultural norms of say birth spacing, while contraceptive practice is also low. This observation has tended to gain support from other researchers. Henin,(1979), considered female education level in Kenya and noted that women with primary education had the largest number of children.Cochrane,(1979),in a multiple regression analysis across regional studies among the developing countries, also noted that education was inversely related to family size when urbanization was held constant. She further observed that in some countries with low level of female

education, fertility tends to be higher among women with few years of schooling than those with no education at all. But for countries with high levels of female education, fertility rates tend to show an inverse association with education.

Women with higher level of education of secondary plus have a low fertility because they enter into the state of motherhood late and also marry late. High education brings a new set of values, new aspirations and new outlook of life as well as skills for taking advantage of new opportunities in labour market, as they are likely to work and at the same time take time to find suitable husbands. Secondary education plus is probably a prerequisite for a woman to change her attitude towards family size, as they are also likely to know about and adopt new methods of birth control.

The differences in the ever users of modern contraceptives reflected the education differences as can be observed from table 3.21 below. While only 26 percent of those with no education had ever used a modern contraceptive method, the percentage of ever users rises through each level of education attainment to 67 percent among those who had secondary education.

TABLE 3.21 PERCENTAGE OF EVER MARRIED WOMEN AGED 25-34
WHO HAD EVER USED A CONTRACEPTIVE METHOD BY
LEVEL OF EDUCATION.

| NONE | PRI.1-4 | PRI.5-8 | SECONDARY + |
|------|---------|---------|-------------|
| 26 | 34 | 47 | 67 |

SOURCE: CENTRAL BUREAU OF STATISTICS

KFS 1977/78

VOL.1

The variation in proportion of women who have had at least a first birth and proportion ever married by exact age 19 can also be said to explain variation in fertility by level of education. The proportion of women who have had at least a birth by exact age 19 was found to decrease with the increasing level of education as can be observed from table 3.22. While a high proportion (.416) of women aged 15-19 had had at least a birth by exact age 19 among those with no education, only (.159) proportion of women of the same age cohort had had a first birth by age 19 among those with secondary plus level of education.

TABLE 3.22 CUMMULATIVE PROPORTION WHO ARE MOTHERS BY EXACT
AGE 19 ACCORDING TO CURRENT AGE GROUP BY LEVEL
OF EDUCATION.

| Level of education | Age group | | | |
|-----------------------|-----------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 |
| NONE | .416 | .669 | .597 | .627 |
| 1-4 YEARS | .224 | .654 | .698 | .682 |
| 5-8 YEARS | .217 | .627 | .622 | .560 |
| SECONDARY | .159 | .316 | .370 | .286 |

The proportion of women ever married by exact age 19 was also found to decrease with the increasing level of education among the women of the same age cohort as is observed from table 3.23 . For example, among the women of age cohort 20-24, .729 proportion had entered into the union by exact age 19 among the women with no education, while only .263 proportion of women with secondary level of education had entered the union at that age.

TABLE 3.23 CUMMULATIVE PROPORTION EVER MARRIED BY EXACT
AGE 19 ACCORDING TO CURRENT AGE GROUP BY LEVEL
OF EDUCATION.

| Level of education | Age group | | | |
|-----------------------|-----------|-------|-------|-------|
| | 15-19 | 20-24 | 25-29 | 30-34 |
| NONE | .541 | .729 | .675 | .726 |
| 1-4 YEARS | .260 | .700 | .728 | .736 |
| 5-8 YEARS | .218 | .645 | .611 | .609 |
| SECONDARY | .110 | .263 | .303 | .381 |

3.9.5 Variation in Fertility by Religion.

There is a significant difference in fertility between the christians and moslems who have high and low fertility respectively. This variation in fertility is shown in table 3.24 below, where the muslims exhibit low fertility of 6.7 while the protestants and catholics have higher fertility of 8.8 and 8.5 respectively.

TABLE 3.24 FERTILITY VARIATION BY RELIGION.

| REIGION | TFR |
|-------------|------|
| CATHOLIC | 8.46 |
| PROTESTANTS | 8.76 |
| MUSLIMS | 6.67 |

The possible reason for this difference is that monogamy is prevalent among the christians, while polygamy is most prevalent among the moslems. On average women in monogamous marriages have more children than their polygamous counterparts Dorhajn,(1958). The explanation he gave for this difference is that, postpartum abstinence taboo is more closely observed in polygamous unions among the moslems than in monogamous unions among the christians.

Christianity has also encouraged erosion of traditional beliefs and practices that reduce fertility. For example, traditional sexual abstinence by husbands with lactating wives was supported by the belief that sexual

intercourse with a nursing mother harms the child. However, modern christianity tend to discard these traditional beliefs as mere superstitions. Variation in fertility by religion can also be explained by differences in the length of reproductive span which is shorter 19.82 years among the Muslim and longer 23.68 and 23.13 years among the Catholic and protestant respectively. This is because the muslim women show a pattern of early stoppage of childbearing at 39.09 years, while the catholic and protestant women appear to stop childbearing at slightly older ages of 43.36 and 43.32 years respectively.

Lastly it may be noted that, the family size is determined also by other various factors that range from the cost and benefits thought to be associated with childbearing, and differences in life style.

CHAPTER FOUR

4.0 DETERMINANTS OF AGE AT FIRST BIRTH AND AGE AT FIRST MARRIAGE-- A MULTIVARIATE ANALYSIS.

4.1 INTRODUCTION

The aim of this section is to examine the significance of the influence of the independent variables on the dependent and to study the coefficient of determination, for each variable and for the same variables combined.

The order of the inclusion of the independent variables in the multiple linear regression equation was determined by the computer. Each of the additional variables was brought into the equation at separate stages depending on the merit of the amount of the unexplained variation in the (age at first birth / age at first marriage) it accounted for. Thus the variable that explained most of the unexplained variation in the dependent variable by those already in the equation was the next to be entered into the equation.

4.2 AGE AT FIRST BIRTH MULTIVARIATE ANALYSIS RESULTS.

The results of the multivariate analysis between determinant variables and age at first birth are reported in table 4.1. This table shows simpler (r), R-square (R^2), R square change, B and constant value. The simpler (r) are indices of association between age at first birth and

each of the selected independent variables. The R^2 (R) values are the indices which show the total proportion of the variation in age at first birth explained by all the selected independent variables entered in the regression equation. The R-square change show the proportion of the variation explained by each variable. The regression coefficient B denotes the slope of the regression line, while the constant value is constant which shows where the regression line intercepts with the y-axis.

TABLE 4.1 SUMMARY OF THE MULTIPLE REGRESSION .

DEPENDENT VARIABLE AGE AT FIRST BIRTH

| INDEPENDENT VARIABLE | R-SQUARE | R SQ CHANGE | SIMPLE r | B |
|--------------------------|----------|-------------|----------|---------|
| Age at first marriage | .51525 | .51525 | .71781 | .715061 |
| Age at menarche | .51530 | 0.00005 | -0.05715 | 005876 |

constant 11.08542. standard error 2.71913

SOURCE:computer print out.

From the R-square in table 4.1, it can be inferred that the selected independent variables are fairly good predictors of age at first birth variation in Kenya, since they account for 51.530% of the variation. It further shows that age at menarche is not a strong indicator of age at first birth in Kenya. It account for only 0.005% of the total variation. This is a very low contribution indeed.

Age at first marriage takes up an upper hand in explaining the variation. The table 4.1 shows that it accounts for 51.525% of the total variation. Each variable is now considered individually.

4.2.1 Age at First Marriage and its influence on Age at

First Birth

The regression coefficient due to age at first marriage variable is 0.7150651 and positive as expected. The above regression coefficient, which can be seen from table 4.1 means that with a change in age at first marriage of one standard unit, the age at first birth increases positively by .7150651 units. Thus an increase in age at first marriage would increase age at first birth.

Age at first marriage was also tested to see whether it genuinely influenced age at first birth, or whether the apparent influence merely arose out of chance. The results are shown in table 4.2. The calculated F-value for this variable is 8552.414, while the table value is 3.84 at 95 % level of confidence, 6.63 at 99 % level of confidence and 7.888 at 99.5 % level of confidence. Since the calculated value of F-statistics is greater than the table value, the null hypothesis, age at first marriage does not influence age at first birth is rejected. The alternative hypothesis is accepted. Age at first marriage influences age at first birth.

Age at first marriage contributes the highest

variation in the dependent variable, hence it is the one that has the greatest explanatory power. It contributes R² value of .51525 as can be seen in table 4.1.

TABLE 4.2 TESTING THE CONTRIBUTION OF THE INDEPENDENT
VARIABLES.

| Variable | Regression Coefficient | standard Error | Calculated F |
|-----------------------------|---------------------------|-------------------|-----------------|
| Age at first Marriage | .7150651 | .00773 | 8552.4 |
| Age at Menarche | -.005876 | 0.00638 | .0848 |

Constant 11.08542. standard error 2.71894

SOURCE: computer print out.

4.2.2 Age at Menarche and its influence on Age at First

Birth

Age at menarche has a regression coefficient (B) which is equal to -0.005876 as can be seen from table 4.2 above. The inverse relationship between this variable and age at first birth comes as asurprise since the opposite was expected. The calculated F-statistic is 0.0848 while the table value is 3.8 at 95 % level of confidence, 4.61 at 99 % level of confidence and 5.3 at 99.5 % level of confidence. Since the calculated F-statistic is less than the table value, the null hypothesis is accepted. Age at menarche does not influence age at first birth.

The coefficient of determination, R^2 due to age at menarche variable done is 0.00005 or 0.005% . Thus this variable alone explains .005% variation in the dependent variable.

4.3 AGE AT FIRST MARRIAGE MULTIVARIATE ANALYSIS RESULTS.

In the foregoing section it has been shown that age at first marriage is a very important factor in the explanation of variation in age at first birth. In this section the factors that influence it are examined.

Age at first marriage is influenced by combined effects of socio-economic, socio-cultural and biological factors. Thus these factors are viewed as having had some independent underlying influences on the present age at first marriage study.

The results of the multivariate analysis between the age at first marriage and the selected independent variables are presented in table 4.3 below, which shows simple (r), R^2 , R-square change B and constant value.

TABLE 4.3 SUMMARY OF MULTIPLE REGRESSION-DEPENDENT VARIABLE AGE AT FIRST MARRIAGE

| Indepedent variable | R-square | R square simpler | r | B |
|---------------------|----------|------------------|---------|-----------|
| | change | | | |
| NEVER WORKED | 0.56426 | 0.56426 | -75117 | -64.6007 |
| WAGE LABOUR | 0.90931 | 0.34505 | -0.1712 | -63.98003 |
| SECT EDUCATION | .91062 | .00131 | .29921 | 2.46106 |

| | | | | |
|-----------------|--------|--------|---------|-----------|
| NO EDUCATION | .91126 | .00064 | -.35034 | -3.113715 |
| 1-4YRS EDUC | .91185 | .00060 | -.06027 | -2.42351 |
| AGE AT MENARCHE | .91234 | .00049 | -.07069 | .018956 |
| MUSLIM | .91240 | .00006 | -.06770 | -1.169691 |
| PROTESTANT | .91245 | .00005 | .040802 | .4430424 |
| RURAL | .91248 | .00003 | -.04918 | .7631155 |
| URBAN | .91252 | .00003 | .03641 | .843607 |

constant 82.7387

standard error 8.834

SOURCE:computer print out

From table 4.3 above it can be seen that, the selected socio-economic, socio-cultural and biological factors are good predictors of age at first marriage variation in Kenya. All the 10 independent variables entered in the regression equation explains 91.25 percent (R^2) of the total variation in the age at first marriage.

The corresponding F- statistics at (df(10,8089)) was 8437.283 which is found significant at 0.05, 0.01 and 0.001 levels. However, an unexplained variation of 8.75 % can be attributed to the other variables which were not considered in the regression.

Table 4.3 further shows that the work status, which only covers those who never worked and those on wage employment explains most of the variation of 90.93 percent in age at first marriage in Kenya. Education level, age at menarche, religion and place of residence account for the

remaining .32 percent of the total variation in age at first marriage. This shows that the latter variables are not very strong indicators of age at first marriage variation in Kenya. Each of these variables is now considered separately.

4.3.1 Work Status and its influence on Age at First Marriage

In this study two categories of work status were considered. These are the unemployed group who never worked before, and wage labourers who are simply employed for cash. This study set out to assess the influence of each category on age at first marriage in Kenya.

The 'never worked' status or unemployment status was found to be the major determinant of age at first marriage in Kenya. In the multiple regression equation this variable was entered first. It explains 56.43 percent of the variation in age at first marriage which is quite substantial. A strong computed negative correlation coefficient of ($r = -.75117$) shows that unemployment in Kenya is inversely related to age at first marriage. This implies that those who are unemployed tend to marry at an earlier age.

Wage employment in the multiple regression accounts for 34.5 percent in the total variation which in no uncertain terms shows that it is a very important variable among those considered in this study. A weak computed negative correlation coefficient $r = -.1712$ shows that it is also inversely related to age at first marriage. This also

implies that wage employment has a depressing effect on age at first marriage, although the results were not significant as for those of who never worked at all.

4.3.2 Education Level and its influence on Age at First ----- Marriage -----

In this study, three categories of educational levels were considered. These are zero years of education, 1-4 years of education and secondary plus level of education. This study was to examine the influence of each of the categories on age at first marriage in Kenya.

In a multiple regression equation, these categories of education secondary plus, zero years of education and 1-4 years of education were entered in different steps in this order. The relationship between educational level and the age at first marriage was found to be positive for the first category (secondary plus) and negative for the others. This is shown by computed correlation coefficient of $r = .2992$, -0.35034 , and -0.06027 respectively from table 4.5. These results confirm the hypothesis that high education level is positively related to age at first marriage. These education groups are found to explain .131 percent, 0.64 percent and .060 percent respectively of the total variation in age at first marriage in Kenya.

4.3.3 Age at Menarche and its influence on Age at First Marriage

On entering this variable in the regression equation, it was also found to be inversely related to age at first marriage, with a computed correlation coefficient $r = -.07069$. This variable accounts for 0.049 % of the total variation in age at first marriage in Kenya.

4.3.4 Religion and its influence on Age at First Marriage

In this study, three major religious groups in Kenya were considered. These are the Catholics, Muslims

and Protestants. This study was to examine the influence of these religions on age at first marriage.

From the multiple equation, the relationship between these religions and age at first marriage were found to be positive for catholic and protestant with a computed correlation coefficients $r = 0.0130$, 0.04802 for catholic and protestant respectively. while the muslim was noted for its negative relationship with age at first marriage as the computed correlation coefficient between them was $r = -.0677$. These results confirm that muslim is negatively related to age at first marriage. These religious groups are also found to explain very small variation of 0.006 % muslim, 0.005 % Protestant and that of the catholic is quite negligible in the total variation in age at first marriage in Kenya.

4.3.5 Place of Residence and its influence on Age at First Marriage

Two types of place of residence in this study namely rural and urban areas were considered. In the multiple regression equation, the relationship between rural areas and age at first marriage was found to be negative. This is shown by computed correlation coefficient of $r = -0.04918$. While the relationship between urban areas and age at first marriage is positive with the computed correlation coefficient being $r = 0.03641$. These results confirm the hypothesis that urban area as place of residence is positively related to age at first marriage and that rural area is negatively related to age at first marriage. These place of residence groups are found to explain 0.003 percent each of the total variation in age at first marriage in Kenya.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND POLICY IMPLICATIONS.

5.1 INTRODUCTION

The present study set out to achieve three main objectives. The first was to consider the impact of ages at first birth and first marriage on completed fertility in Kenya using the Coale Trussel models. The second was to estimate the various mean ages at first birth and first marriage and total fertility by various differentials and lastly to examine the relationship between the selected independent variables and how they explain national variations in ages at first birth and first marriage from data drawn from Kenya Fertility Survey of 1977/78. This Survey was rather detailed, thus enabling data on birth history, fertility and socio-economic, socio-cultural and demographic factors used in this study to be obtained. However, this study was faced with a few limitations on the data, namely:

1. lack of data on contraceptive use before first birth and first marriage.
2. misreporting of first birth and first marriage and omission of first birth.

In this chapter, an attempt will be made to show how far these objectives have been achieved by first presenting the summary and conclusion of the major findings. The second section presents some of policy recommendations

that emanate from the findings of this study. The last section highlights on a few areas recommended for further research.

5.2 SUMMARY AND CONCLUSION OF THE FINDINGS.

From the findings of this study, the estimates of mean age at first birth obtained by indirect demographic methods were found to yield higher values than the estimates obtained from direct statistical methods. Mean age at first birth was found to vary by region and the regions where it is low are Nyanza, western and Rift Valley provinces, which are basically occupied by the Luo, Kisii, Luhya and Kalenjin ethnic groups. The regions that were noted for their high mean age at first birth are Central, Eastern and Nairobi. The urban areas were also noted to exhibit a relatively low mean age at first birth than the rural areas, while the major cosmopolitan areas were found to have a high mean age at first birth.

By level of education, it was found that there is no significant difference in mean age at first birth between women with no education and those with 1-4 years of education; both have low mean age at first birth. Women with 5-8 years of education were found to have a moderate mean age at first birth, while those with secondary plus level of education were noted for their high mean age at first birth.

From the findings of this study, it was noted that both age at first birth and age at first marriage have a significant impact on fertility in Kenya as can be observed from table 5.2. The table shows that women who begin childbearing at an earlier age have a higher completed fertility than those who begin childbearing at a later age. Total fertility was found to decline with increasing age at first birth, for example, women who started childbearing at age 14 have total fertility of 9.7, while those who started at age 16 and 19 have a total fertility of 8.8 and 6.9 respectively.

It can also be observed from table 5.2 that total fertility declines with increasing age at first marriage. For instance, women who entered into the union at ages 14, 17 and 19 have 10.6, 8.5 and 7.6 total fertility respectively.

TABLE 5.2 TOTAL FERTILITY RATE BASED ON AGES AT FIRST BIRTH AND FIRST MARRIAGE.

| AGE AT FIRST BIRTH | TFR | AGE AT FIRST MARRIAGE | TFR |
|--------------------|------|-----------------------|------|
| <14 | 10.5 | <14 | 10.7 |
| 14 | 9.7 | 14 | 10.6 |
| 15 | 9.6 | 15 | 10.0 |
| 16 | 8.8 | 16 | 9.4 |
| 17 | 8.6 | 17 | 8.5 |
| 18 | 7.7 | 18 | 8.3 |
| 19 | 6.9 | 19 | 7.6 |

Appendix 2. also shows fertility differentials in Kenya. First it clearly shows that fertility levels are high, more particularly in the Nyanza, Central, Rift Valley and Western Provinces. However, Coast province was noted for its low fertility which can be attributed to high prevalence of malaria which causes subfecundity because of anaemia. The Kalenjin, Kikuyu, Kisii, Luo and Luhya are also noted for high fertility while the Mijikenda are noted for their low fertility.

The study also revealed that women with 1-4 years of primary education have a higher fertility level than those with no education and it also shows that women with secondary plus education have the lowest fertility level. The urban fertility is also lower than that of the rural and lastly by religious background, the Protestants and Catholics have a higher fertility than the Muslims.

The most important conclusion drawn from this study is that ages at first birth and first marriage and total fertility rates vary from one part of the country to the other and also by other differentials. There is a short interval between ages at first birth and first marriage which clearly shows that most of the marriages are taking place immediately after conception.

Coast province has a unique feature of high prevalence of early first marriage and first birth

together with the lowest fertility rate. This may be explained by the grandmother effect, where a potential mother-in-law is not supposed to be reproducing at the same time as the daughter. The other regions which are noted for their high mean ages at first birth and first marriage are Central, Nairobi and Eastern provinces. Of these three regions, it is only Nairobi that exhibit the expected pattern of high mean ages at first birth and first marriage and low fertility rate. The other regions, however, were noted for their high mean ages at first birth and first marriage and high total fertility.

Other inter-regional comparisons, show that Nyanza, Western and Rift Valley have relatively lower mean ages at first birth and first marriage and also high total fertility. Rural women have higher fertility than urban women. The lower urban fertility may be explained in terms of late first marriage and first birth and shorter length of reproductive span together with the constraints imposed by urban life, which place greater strains on parents in their effort to provide health care, housing, food and education for their children. Urban women also have greater availability and use of contraceptives compared to their rural counterparts. At the same time, most urban women are

employed by the public sector of the economy or engage themselves in self employed income generating activities. These activities also tend to encourage women to postpone their marriage and first birth and at the same time induce them to limit their fertility.

With educational level, women with no education and those with 1-4 years of education were found to have low mean ages at first birth and first marriage together with a high total fertility. Those with 5-8 years of education were noted for intermediate mean ages at first birth and first marriage and moderate fertility, while those with secondary plus education were also found to show a consistent pattern of high mean ages at first birth and first marriage and low total fertility.

In this study, the analysis of data using the multiple regression model has revealed that the selected socio-economic and biological factors, account for 51.5 per cent of the total variation in age at first birth in Kenya. 91.3 percent of the total variation in age at first marriage was explained by the selected socio-economic, socio-cultural and biological variables. The 48.5 percent and 8.7 percent of the unexplained variations in age at first birth and age at first marriage respectively may be attributed to the other factors and data not obtained from the Survey.

5.3 POLICY RECOMMENDATION

The study recommends that, for a meaningful and more workable policy on fertility reduction in Kenya, ages at first marriage and first birth timing must be taken into account. The greatest impact of such a policy is likely to be in regions where family planning is minimal within wedlock. Kenya being a country with early and universal marriage, the demographic effect of increasing the legal minimum age at marriage is very high. An increase of about two or three years, would not only reduce the legal period during which a woman is exposed to the risk of childbearing, but will also have a significant impact in reducing fertility.

In order to avoid unwanted early pregnancies, policies should be issued that concern family planning for adolescents. The availability of contraceptive services and family sex education should not be construed as promotion of adolescent sexual activity. The contraceptive information should be made available to the young people before they become sexually active.

Improvement of family planning programmes in the rural areas might have an effect by raising the ages at first birth and first marriage which has been shown to have a significant impact on completed fertility. Policy measures aimed at providing easy access and knowledge of modern contraceptive might contribute, therefore, towards increasing the ages at first birth and first marriage

which in turn will depress total fertility.

A policy geared towards the establishment of welfare scheme(s) for the elderly can be a means of reducing fertility. These schemes, can provide old age security rather than parents expecting old age security from their children. These schemes can be established by the government and Non-Governmental Organizations (NGOS).

Another measure that can enable fertility reduction in Kenya is that of increasing the education level of females. Post primary education of females influences the age at marriage by raising it, thereby reducing the reproductive period during which women are exposed to the risk of childbearing. More education will also make women become more conscious of modern ways of life and it will make them change their traditional values of large family size.

5.4 FURTHER RESEARCH.

The following are the areas recommended for further research:

1. Determinants of fertility of the youth in Kenya, as the youth contribute about 20-25 percent of the total birth rate in Kenya.
2. Another area for further research would be the study of the determinants of such changes in ages at first birth and first marriage overtime and also among regions.

APPENDIX 1 ZERO ORDER PARTIAL CORRELATION COEFFICIENTS
BETWEEN THE INDEPEDENT VARIABLES AND DEPEDENT
VARIABLES.

| VARIABLE | AFB | AFM | NEWORK | WALAB | NOED | 1-4YREDU | |
|----------|--------|--------|--------|--------|--------|----------|-------|
| AFB | 1.000 | | | | | | |
| AFM | .71178 | 1.000 | | | | | |
| NEWORK | -.5364 | .7512 | 1.000 | | | | |
| WALAB | -.1335 | -.1712 | -.4646 | 1.000 | | | |
| NOEDU | -.2723 | -.3503 | .3400 | -.0609 | 1.000 | | |
| 1-4YREDU | .1776 | .2245 | -.1977 | .0091 | -.5338 | 1.000 | |
| SEC.EDU | .2343 | .2992 | -.2873 | .0063 | -.3084 | -.2237 | |
| CATH. | -.0003 | .0130 | -.0053 | -.0047 | .0247 | -.0038 | |
| PROT. | .0357 | .0480 | -.0651 | .0331 | -.1780 | .0908 | |
| MUSL. | -.0341 | -.0677 | .0738 | .0738 | .1380 | -.0770 | |
| MENR. | -.0579 | -.0707 | .1165 | -.0668 | .2853 | -.1717 | |
| RURAL | .0493 | -.0492 | .0521 | -.0160 | .1418 | -.0452 | |
| URBAN | .0244 | .0354 | -.0375 | .0164 | -.0946 | .0437 | |
| ----- | | | | | | | |
| | SEC.ED | CATH. | PROT. | MUSL. | MENR. | RURAL | URBA |
| SEC.EDU | 1.000 | | | | | | |
| CATH. | -.0347 | 1.000 | | | | | |
| PROT. | .0831 | .8185 | 1.000 | | | | |
| MUSL. | -.2237 | -.1636 | -.2333 | 1.000 | | | |
| MENR. | -.1605 | -.0360 | -.0886 | .0774 | 1.000 | | |
| RURAL | -.2354 | -.0115 | .0412 | -.1281 | .1298 | 1.000 | |
| URBAN | .1270 | .0309 | -.0191 | .0289 | -.0862 | .5927 | 1.000 |

SOURCE: COMPUTER PRINT OUT.

APPENDIX 2. SUMMARY OF MEAN AGES AT FIRST BIRTH AND FIRST
MARRIAGE, SMAM LAST BIRTH AND TOTAL FERTILITY RATE

| | MEAN AGE AT FIRST BIRTH (DIRECT) | MEAN AGE AT FIRST BIRTH (INDIRECT) | MEAN AGE AT FIRST MARRIAGE | SMAM | MEAN AGE AT LAST BIRTH | TFR |
|--------------------|---|---|----------------------------------|-------|------------------------------|------|
| KENYA | 18.07 | 19.94 | 17.28 | 20.12 | 43.36 | 8.29 |
| PROVINCE | | | | | | |
| NAIROBI | 18.17 | 19.64 | 18.00 | 21.46 | 41.39 | 6.99 |
| CENTRAL | 18.66 | 20.31 | 18.29 | 21.50 | 43.79 | 9.01 |
| COAST | 18.09 | 20.62 | 16.71 | 18.15 | 40.26 | 6.23 |
| NYANZA | 17.82 | 19.22 | 16.83 | 19.05 | 43.66 | 8.89 |
| RIFTVALLE | 17.95 | 19.21 | 17.26 | 20.14 | 43.66 | 8.90 |
| WESTERN | 17.77 | 19.38 | 17.07 | 19.13 | 43.29 | 8.51 |
| EASTERN | 18.44 | 20.15 | 18.17 | 21.47 | 43.49 | 8.47 |
| PLACE OF RESIDENCE | | | | | | |
| RURAL | 18.07 | 19.37 | 17.41 | 19.94 | 43.51 | 8.55 |
| URBAN | 17.94 | 19.24 | 17.53 | 20.67 | 41.53 | 7.09 |
| NRB.MBS | 18.14 | 19.70 | 17.66 | 20.84 | 40.03 | 6.38 |
| EDUCATION LEVEL | | | | | | |
| NONE | 17.93 | 19.07 | 17.08 | 17.79 | 43.40 | 8.73 |
| 1-4 YEARS | 17.92 | 19.37 | 17.27 | 19.58 | 43.90 | 9.37 |
| 5-8 YEARS | 18.11 | 19.60 | 17.79 | 19.73 | 42.94 | 8.33 |
| SECONADRY | 19.10 | 21.06 | 19.45 | 22.68 | 41.72 | 7.39 |
| RELIGION | | | | | | |
| CATHOLICS | 18.07 | 19.66 | 17.46 | 20.20 | 43.36 | 8.46 |
| PROTESTAN | 18.12 | 19.21 | 17.59 | 20.28 | 43.32 | 8.76 |
| MUSLIMS | 17.92 | 19.27 | 16.59 | 17.95 | 39.09 | 6.67 |
| MAJOR TRIBES | | | | | | |
| KALENJIN | 17.92 | 19.05 | 17.17 | 19.91 | 43.61 | 8.95 |
| KAMBA | 18.42 | 19.88 | 18.04 | 21.30 | 43.13 | 7.96 |
| KIKUYU | 18.53 | 19.88 | 18.19 | 21.33 | 43.43 | 8.54 |
| KISII | 18.24 | 19.20 | 17.55 | 20.32 | 43.67 | 8.67 |
| LUHYA | 17.84 | 19.13 | 17.13 | 19.28 | 43.33 | 8.65 |
| LUO | 17.43 | 19.28 | 16.59 | 18.56 | 43.34 | 8.39 |
| EMBU.MERU | 18.14 | 19.24 | 18.14 | 21.75 | 42.99 | 8.05 |
| MIJIKENDA | 18.03 | 20.02 | 16.37 | 17.74 | 39.71 | 7.55 |

REFERENCES

Isulila, V. (1980): "Fertility and Family Planning in Indonesia".

Population Studies Quarterly Review, No.54, July/Sept.1980,
pp.54.

Inker, F and Knowles, J.C (1982): Fertility Determinants in
developing countries. A case study of Kenya; ILO,
Ordina edition, Liege (Belgium).

Agarwalla, S.N. (1969): Patterns of marriage in some ECAFE
countries. Proceedings of international population conference
London, 1969, Vol.III, IUSSP Liege, 1977 P.2106-2126.

Ayiemba, E.H.O. (1983): Nuptial Determinants of Fertility in
Western Kenya. PHD. Thesis University of Nairobi.

Arleen, L.M and Wineton, K.C. (1986): "An Economic model of Teenage
pregnancy Decision making". Demography Vol.23, NO.1
pp.67-78.

Barchrach, C. (1985): (US National Centre for Health Statistics)
Age at marriage in the United States; Sample size of never
married age 15-19, National Survey of Family Growth, Cycle III
Sep.1985.

Billy, J.G and McLaughlin (1986): " The effect of marital status
at first birth on marital Dissolution Among a dolescent
mothers". Demography Vol.23, No.3, pp.329-350.

Blacker, J.G.C. (1970): Populatuon Growth in Kenya; Report to the

Government of Kenya, Mimeo, Nairobi.

Bloom, D.E. (1981): What is happening to Age at first birth in the
United States? A study of recent white and non-white cohorts.
Working paper 81-4. April 1981, School of urban and public

affairs. Carnegie Mallon UNiversity.

Bloom, D.E and Reddy, P.H (1986): "Age patterns of women at first
marriage, cohabitation, and first birth in India".
Demography, Vol.23, No.4 pp.509-524.

Bongaart, J. (1978): A framework of Analysing the Proximate Determinants
of fertility. Population and Development Review.

Bulatao, R.A. and Lee, R.D (1983): Determinants of fertility in Developing
countries (Vol.1): Supply and Demand for children. New York.
Academic press.

Caldwel, J.C. (1977): " The economic rationality of high fertility:
An investigation illustrated with Nigeran Survey data".
Population Studies, Vol.31 No.1 March 1977.

Casterline, J.B (1984): Socio-economic differentials in recent fertility.
(World Fertility Survey Comparative Studies; Cross-National
Summaries No.33). Voorburg, Netherlands, International
Statistical Institute.

Central Bureau of Statistics (1980), Kenya Fertility Survey

1977-78, First Report, Nairobi; MInistry of economic

planning and Development.

- Central Bureau of Statistics (1984), Kenya Contraceptive

Prevalence Survey 1984, First Report, Nairobi; Ministry

of economic planning and Development.
- Davis, K and Blake, J. (1956): " Social structure and fertility:.
Economic Development and cultural change IV, pp.211-35.

- Deschamps, J.P and Valantin, G. (1978): " A dolescent pregnancy
in European countries". Journal of biological science

Supplement, No.5 pp.102-103.

- Diveker, S.A. and Natarajan, N.G. (1979): Abortion in un married girls.
Health and Population. Perspective issues 2(4). pp.308-321.

Oct/Dec. 1979.
- Ebank, G. (1984): Socio-economic differentials in age at first
marriage. (World Fertility Survey Comparative Sytudies: Cross
National Summary). Voorburg, Netherlands, International
Statistical Institute.
- Engle, P.L. (1978): " Consequences of mothers and children of
a dolescent childbearing in rural and urbanizing
Galatemala". Bartella PDP Working paper No.3, Washington,
D.C.
- Gaisie, S.K. (1984): " The proximate Determinants of fertility
in Ghana". WFS Scientific Report No.53.
- Hallam, H.E. (1985): Age at first marriage and age at Death in
the Lincolnshire Finland, Population Studies Vol.39(1)

March 1985, pp.55-69.

Hajnal, J (1953): Age at marriage and proption marrying.

Population studies . Vol.7(2) Nov.1953 pp.111-133.

Henin, R.A. (1979): Effect of Demographic on Fertility and

Mortality Trends in East Africa: Evidence from Kenya

and Tanzania. Population Studies and Research Institute

University of Nairobi.

Henin, R.A. (1968): "Fertility Differentials in Sudan".

Population Studies, No.22, London.

Henry, A. and Piotraw, P.T. (1979): Age at marriage and fertility.
Population reports, series M, No.4. Baltimore, John Hopkins
University, population information program, Nov.1979. pp.56.

Jeffrey, K. and Udry, J.R. (1986): " The Determinats of effective
fecundability based on the first birth interval".

Demography Vol.23, No.1, pp.53-66.

Kendal, M.(1979): Population reports. The world Fertility Survey:
Current status and findings.

Khasiani, S.A. (1985): A dolescent Fertility in Kenya with
special reference to high school teenage pregnancy and
childbearing. Population Studies and Research Institute,
University of Nairobi.

Kingori, D.B. (1976): View from Africa, Kenya in a dolescent
fertility. community and family study centre, University
of Chicago.

Larson, A.(1981): Fertility and status of women. Population reference
Bureau. May 1981. Washingtone, D.C.

- Mason, W.M. and Entwistle, B. (1985): Cross National Variability an age at first birth; Theory and evidence. University of Michigan Population Studies Centre, Research report No.85.
- McCathy, J. (1982): Differentials in age at first marriage. Voorburg, Netherlands, International Statistical Institute. World Fertility Survey, Comparative Studies; Cross National Summaries No.19
- Mosley, W.H. (1982): The Dynamics of Birth spacing and marital Fertility. WFS Scientific Report, No.30, August 1982

London.
- Mwobobia, I.K. (1982): Fertility Differentials in Kenya: A cross Regional study , A dissertation for M.A. in the Population Studies and Research Institute, University of Nairobi.
- Nyarango, M. (1985): The estimation of Nuptiality using census data for Kenya. M.A. thesis Population Studies and Research Institute, University of Nairobi.
- Noreen, G. and Cormen, E.F (1980): "Analysis of Nuptial data in Colombia". WFS Scientific Report, No.11, Voorburg, Netherlands; International Statistical Institute.
- Omondi, A. (1981): Age at first birth and age at first marriage in Kenya. M.A. thesis Population Studies and Research Institute, University of Nairobi.
- Repulic of Kenya (1981): Population census 1979; First Report, Vol.1, Ministry of economic planning and Development, Nairobi.

- Rizk,H. (1976): Trends in Fertility and Family Planning in Jordan, Studies in Family Planning, Vol.8, No.4, Population council, New York.
- Sinnathuray,T.A. (1983): Education,Information and counselling for a dolescent fertility mothers. Presented at the World Health Organization meeting on pregnancy and abortion in a dolescent, Geneva, June 1974.
- Suscheela,S. (1984): " Socio economic DIfferentials in Cummlative fertility in Guyana, Jamaica and Trinidad". WFS Scientific Report, No.57.

- Smith,D.P.(1980): Age at marriage. WFS Comparative Studies, No.7, 1980.
- Teachman,J.D. (1985): "The declining significance of first birth timing". Demography, Vol.22, No.2, pp.185-198.

- Trussel,J.(1980): " Illustrative Analysis: Age at first marriage in Srilanka and Thailand". WFS Scientific Report No.13, Voorburg, Netherlands: International Statistical Institute, London.
- United Nations;(UN) (1983): Department of International economic and social affairs. Population Division. Marital status and fertility: Comparative analysis of World Fertility Survey. New York.
- United Nations (1983): African Population Studies. Series No.5 (A comparative analysis of WFS data) Nuptiality and fertility. Litho in United States.

United Nations (1983): Manual X, Indirect Techniques
for Demographic estimation, New York.

Vatal statistics Division.(1975): Fertility differences in India,
New Delhi, India.

Zelnik,M. and Kantner,J.F. (1980): "Sexuality activity:
Contraceptive use and pregnancy Among Metropolitan
Area Teenagers; 1971-1979". Family Planning Perspective,
Vol.12, No.5, pp.230-238.