

**"THE INFLUENCE OF SELECTED DEMOGRAPHIC FACTORS ON  
FERTILITY IN KENYA: EVIDENCE FROM THE KENYA DEMOGRAPHIC  
AND HEALTH SURVEY DATA OF 1989".**

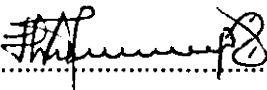
**BY**

**LOCHOLA, PHILIP ALANDO.**

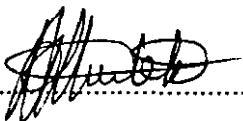
**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN  
POPULATION STUDIES AT THE POPULATION STUDIES AND  
RESEARCH INSTITUTE, UNIVERSITY OF NAIROBI**

## DECLARATION

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

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This thesis has been submitted for examination with my approval as a University Supervisor.

SIGNATURE .....  ..... 26/10/94  
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## **DEDICATION.**

To the Alando Family who sacrificed and endured a lot to see me through the long and rigorous process of education.

## **A C K N O W L E D G E M E N T**

Many people contributed in one or another to make this work a success. First and foremost, I am greatly indebted to the University of Nairobi for granting me a scholarship which enabled me to take up a full time study at the Population Studies and Research Institute.

I am also greatly indebted to my supervisor Prof. J.A.M Ottieno for his constructive criticism and advice during the course of this work. Without his relentless support and encouragement, the completion of this work could not have been easy.

Similarly, the cooperation and support given to me by my friends, fellow students and the entire staff of Population Studies and Research Institute, cannot go unrecognised. Their support, which is highly appreciated, was a great source of inspiration and encouragement during the course of this work.

Finally, I would like to thank God for the life and strength that I have enjoyed throughout this work.

## **A B S T R A C T**

Low ages at first intercourse, first birth and first marriage pose a problem which is highly prevalent in Kenya. This is one of the contributing factors to the persistent high fertility prevailing in Kenya. Ages at first intercourse, first birth and first marriage have an influence on fertility since they affect the length of the fecund period for women. If they are experienced early in a woman's life, then her fertility is bound to be high since she will be exposed to the risk of child bearing for a longer period of time. On the other hand, when they are experienced late, then a woman's fertility is bound to be low since she will have a shorter period of exposure to the risk of child bearing.

The main objective of this study was to examine the influence of selected demographic variables on fertility in Kenya using the Kenya Demographic and Health Survey Data of 1989. The study will confine itself to the following demographic variables: age at first birth; age at first marriage and age at first intercourse. The study will also confine itself to the following differentials: religion; ethnicity; regions; education and place of residence. Specifically, the study intends to investigate the following objectives:

- i). To investigate the variations in mean ages at first marriage, first birth and first intercourse by socio-cultural and socio-economic differentials in Kenya.
- ii). To estimate fertility levels in Kenya, using Coale-Trussel P/F Technique, by ages at first intercourse, first birth and first marriage.
- iii). To examine the effect of ages at first marriage, first birth and first intercourse on fertility in Kenya.
- iv). To establish the relationship existing between ages at first marriage, first birth and first intercourse and fertility in Kenya.

The Kenya Demographic and Health Survey of 1989 was a national survey which was carried out by the National Council for Population and Development (NCPD) in collaboration with the Central Bureau of Statistics (CBS) and the Institute for Resource Development (IRD).

Both statistical and Demographic Techniques were used in data analysis. The main statistical techniques used are Mean, Median, Mode (which were derived by cross tabulation technique using a computer) and the Multiple Regression Technique. The only Demographic technique used is the Coale-Trussell P/F technique.

The Coale-Trussell P/F technique was used in calculating Total Fertility Rates (TFR) by the various ages at first intercourse, first marriage and first birth. Mean, Median and Mode are summary measures which were used to show the variations in ages at first marriage, first birth and first intercourse by the selected regional, socio-cultural as well as socio-economic differentials. Multiple Regression analysis was used to establish the nature of the relationship existing between ages at first intercourse, first birth and first marriage, on one hand, and fertility on the other hand.

The findings of this study indicate that the mean ages at first intercourse, first birth and first marriage vary by ethnicity, religion, regions, place of residence and education. Specifically, urban places recorded higher means than rural areas. Similarly, those with higher levels of education recorded a higher mean than those with lower levels and no education. Total fertility rates were also found to vary by the various ages at first marriage, first birth and first intercourse. Those who experienced them at early ages recorded higher total fertility rates than those who experienced them at later ages.

The regression results showed that the selected demographic factors (ages at first marriage, first birth and first intercourse) have a significant effect on the fertility index (total children ever born). Generally, the study established that ages at first marriage, first

birth and first intercourse are inversely related to fertility (total children ever born). Specifically, age at first marriage was found to have the highest association with fertility. On the other hand, age at first birth was found to have higher association with fertility, after age at first marriage, while age at first intercourse was found to have low association with fertility.

From the above findings, female education should be encouraged and emphasised at least up to secondary level. This would raise the various ages at first marriage, first intercourse and first birth which would eventually lead to a decline in fertility level. This should, however, be coupled with appropriate incentives where necessary. Similarly, women should be encouraged and assisted to be involved in income generating activities, both in the urban and rural areas. Sex education should also be given freely to the youth. This will assist them in knowing the risks of being involved in irresponsible sex. Contraceptives should also be made available to both the youth and adults. This should, however, be coupled with appropriate contraceptive education on both the merits and demerits of the available methods. These are very useful in reducing both adolescent and marital fertility.

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# CHAPTER ONE

## GENERAL INTRODUCTION

### 1.1. INTRODUCTION

Kenya's population has been increasing rapidly since the colonial days. In 1948, Kenya's population was 4.5 million with an estimated annual growth rate of 3.0 percent. In 1969, Kenya's population had reached 10.9 million with a growth rate of 3.3 percent per annum. The 1979 population census recorded a total population of 16.1 million with an estimated growth rate of 3.85 percent per annum. The 1989 census provisional results have revealed the total population of Kenya to be about 22 million with an intercensal growth rate of about 3.4 percent (PSRI Chart, 1986, CBS, 1979; Ominde, 1984; CBS 1989).

As a result of this trend of population growth, Kenya's total fertility rate rose from 5.3 in 1962 to 6.6 in 1969; 8.0 in 1977, 7.9 in 1979, 7.7 in 1984 and to 6.7 in 1989 (1962 census, 1969 census, 1977 NDS, 1979 census, 1984 KCPS, and 1989 KDHS).

Studies which have been done in Kenya and other parts of the world reveal that fertility is affected by a multiplicity of factors. Bongaarts' (1978) Fertility model indicates that fertility is influenced directly by biological and behavioural factors through demographic factors such as starting, spacing and stopping of childbearing. This forms the basis of this study. Mwobobia (1982), has reported that regional fertility differentials are influenced by; female education, urbanization, age at marriage and child mortality. Gaitta (1982) has documented that working women are generally more educated, urbanized, desire smaller family sizes, experience late age at marriage and have the highest use of contraceptives. Ang'awa (1988) has indicated that ages at first marriage and first birth are inversely

related to fertility. He has observed that total fertility rates decrease as ages at first birth and first marriage increase. Most of such studies have often considered socio-cultural, socio-economic, environmental, demographic as well as biological and behavioural factors, in some cases together. However, this study concentrates on the impact of selected demographic factors on fertility by selected socio-cultural, socio-economic and regional background characteristics in Kenya using the 1989 KDHS data.

The selected demographic factors being considered in this study include; age at first intercourse, age at first birth and age at first marriage. The socio-economic factors selected include; education, work status and place of residence. On the other hand, the socio-cultural factors under consideration include; ethnicity and religion, while the regions considered are the various provinces of Kenya.

This chapter presents; problem statement, objectives of the study, justification of the study, scope and limitations of the study, literature review, theoretical framework, theoretical statement, conceptual model, definition of key analytical concepts, operational model, definition of operational concepts and operational hypotheses.

## **1.2. STATEMENT OF THE PROBLEM**

Low ages at first intercourse, first birth and first marriage pose a problem which is highly prevalent in Kenya. This is one of the contributing factors to the persistent high fertility prevailing in Kenya. Ages at first intercourse, first birth and first marriage have an influence on fertility since they affect the length of the fecund period for women. If they are experienced early in a woman's life, then her fertility is bound to be high since she will be exposed to the risk of child bearing for a longer period of time. On the other hand, when they are experienced late, then a



woman's fertility is bound to be low since she will have a shorter period of exposure to the risk of child bearing.

This study was, therefore, set to examine the influence of ages at first intercourse, first birth and first marriage on fertility in Kenya by selected socio-cultural, socio-economic and regional differentials. Since the 1989 population census data has not been released officially, it is, therefore, necessary to undertake a study of this kind using the most recent data available - the Kenya Demographic and Health Survey data of 1989.

### **1.3. GENERAL OBJECTIVE OF THE STUDY**

The main objective of this study is to examine the influence of selected demographic factors on fertility in Kenya, by various socio-cultural, socio-economic and regional differentials, using the Kenya Demographic and Health Survey Data of 1989.

### **1.4. SPECIFIC OBJECTIVES**

Specifically, the study intends to investigate the following objectives:

- i). To investigate the variations in mean ages at first marriage, first birth and first intercourse by socio-cultural and socio-economic differentials in Kenya.
- ii). To estimate fertility levels in Kenya, using Coale-Trussel PAF Technique, by ages at first intercourse, first birth and first marriage.
- iii). To examine the effect of ages at first marriage, first birth and first intercourse on fertility in Kenya.

iv). To establish the relationship existing between ages at first marriage, first birth and first intercourse and fertility in Kenya.

## **1.5. JUSTIFICATION OF THE STUDY**

This study was set to investigate the contribution of the selected demographic factors to the fertility situation in Kenya in 1989 - an area which is very important in understanding the prevailing fertility situation in Kenya. The selected demographic factors include; ages at first marriage, first birth and first intercourse. These are very important in determining the fertility of women, since they affect the length of the reproductive period.

It is, therefore, hoped that this study adds knowledge useful in understanding the fertility situation in Kenya and at the same time acts as a reference material to scholars and policy makers. This is because Kenya Demographic and Health Survey data of 1989, is the most recent data available at the national level in Kenya, at the moment.

## **1.6. SCOPE AND LIMITATIONS OF THE STUDY**

This study is an attempt to understand the contribution of selected demographic variables on fertility in Kenya by various socio-cultural, regional and socio-economic background characteristics using the 1989 KDHS data. The selected demographic variables to be considered are age at first birth, age at first marriage and age at first intercourse.

Kenya currently consists of eight large administrative units called provinces. It is further subdivided into lower administrative units called districts followed by

Divisions, then locations and lastly sub-locations. However, this study will only concentrate at the national level.

The Kenya Demographic and Health Survey covered 24 rural clusters in 13 districts, namely; Kilifi, Machakos, Nyeri, Meru, Muranga, Kirinyaga, Kericho, Uasin Gishu, South Nyanza, Kisii, Siaya, Kakamega and Bungoma in which a total of about 10,000 rural households were selected and nearly 1000 households in urban areas. The survey, therefore, had some kind of urban-rural bias.

The survey, though national in coverage, excluded North Eastern Province and four northern districts, which together account for about 5% of Kenya's total population. Thus the survey was biased against North Eastern Province. Besides this, the sample size was very small at the district level. As a result of this, it may not be representative of all the sub-groups at the district level. The study may therefore overgeneralize from a small sample.

Despite the above limitations of the secondary data used, the researcher is convinced that the study will yield valuable information as this is the most reliable data source currently available at the national level in Kenya. However, a similar study can be conducted when the 1989 census data is released, to confirm the findings of this study.

## **1.7.0. LITERATURE REVIEW**

### **1.7.1. INTRODUCTION**

In this section, an attempt is being made to review a few works which have dealt with the relationship between demographic variables and fertility, which are relevant to this study, all over the world.

### **1.7.2. THE REST OF THE WORLD**

Deschamps and Valentine (1978), studied adolescent fertility in European countries. They found that fertility rates of teenage women in Bulgaria varied from .73 percent for younger teenagers (aged 10-14), to 72.4 Percent for older teenagers (aged 15-19). While in Switzerland, the rates varied from .02 percent to 17.4 percent for younger and older teenagers respectively. Finland and France were, however, noted for their low teenage fertility.

Bloom (1981), in his study of age patterns 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 no-white cohorts respectively. He also observed that non-white cohorts have an appreciable number of first births at earlier ages than their white counterparts, as well as a lower mean age at first birth. Lastly, he noted that the mean age at first birth is increasing across cohorts of white women, but is stable across cohorts of non-white women.

Larson (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 20s to mid 20s. In Japan, he noted that, the average age at first marriage among all women who marry is 24 years; while in northern Europe, it ranges from 24.2 in Finland to 27.1 in Sweden.

Barchrach (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.

Trussell (1980), studied age at marriage in Sri Lanka and Thailand using data drawn from the World Fertility Survey. He documented that period age specific first birth rates are much more regular than cohort 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 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 sub-fecundity and the artefact of data, that older women tend to omit reporting a first birth if it dies.

Goldman and Corman (1980), from their analysis of nuptial data using the Colombia National Fertility Survey, found that there are urban-rural differences in ages at first marriage with a higher proportion of the ever married in rural areas, with a decline in the proportion of the ever married in the 15-19 year age group. 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 (1969), in his study on the 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 done in Calcutta, among middle class urban population, showed that females marrying between 10 and 14 years 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 (1983), in his case study of education, information and counselling for adolescent fertility matters found that in Malaysia, out-of-wedlock pregnancy is regarded both as sinful and a 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.

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 the relative advantage and disadvantage of marriage compared with the available alternatives.

Leisure (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 crude birth rate declined from 50 to 33, or by about 34 percent.

Goldman (1980), from a 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 Korean population that contributed to this reduction in fertility are; a 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 practised contraception or resorted to induced abortion.

### **1.7.3. THE REST OF AFRICA**

Gaisie (1984), in a study on Ghana using data drawn from World Fertility Survey. He noted that 75 percent of Ghanaian women have their first birth before their 23rd birthday, 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 and above 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 (1968), conducted a demographic sample survey in Sudan for the purpose of examining the effect of nomadism and settlement on fertility. He noted that early age at marriage characterized the settled population, where about 60 percent of women were married by age 20 while only 25 % were married among the nomads. 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 and Piotrow (1979), noted 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 aged 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 (1982), has 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, Coalle (1961), demonstrated that postponement of marriage can contribute substantially to the 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.

Herold and others (1988) in their study on Sexual Experience and Contraceptive Use Among Young Adults in Guatemala City, report that more young men had premarital sexual intercourse than young women. They report that the proportion reporting premarital intercourse increases with age. They also report that current marital status among women is strongly associated with premarital sexual experience, a finding which suggests that intercourse is a precursor to marriage. They reported that only 6% of the never-married women had had premarital intercourse, whereas 56% of the ever-married women had had such experience.

#### **1.7.4. KENYA**

King'ori (1976), 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 being 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 (1981), 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 (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. Other variables were also found to influence fertility strongly, but indirectly through their 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 1962-69 and 1969-79.

Khasiani (1985), in her study of adolescent fertility in Kenya, reported that more adolescents were engaging in premarital sex at younger ages, yet very few of them practiced contraception to prevent conception despite knowing about them. This reluctance among the youth to practice contraception partly reflects the reluctance

on the general population to provide contraceptive information and services to the youth.

Ang'awa (1988), in his study on the impact of age at first birth and first marriage on fertility in Kenya, using the Kenya Contraceptive Survey Data of 1984, found out that there is a decline in fertility with an increase in age at first birth and first marriage. He noted that ages at first birth and first marriage have a significant effect on fertility. He also observed that regional differences in fertility still persist in Kenya.

#### **1.7.5. FERTILITY DIFFERENTIALS**

In this section, an attempt is made to review a few studies which have dealt with the fertility differentials which are used in this study as background characteristics. Such fertility differentials, which are discussed here below include; education, religion, ethnicity, work status, place of residence and regions.

Education appears to be the most important - single variable commonly cited in association with variations in fertility. Higher levels of educational achievement are commonly reported to be negatively related to fertility (Ghana: Caldwell 1967 a, 1969b, tropical Africa: Okediji, 1973, Lagos, Nigeria: Ohadike, 1968 b, Sierra Leone: Dow, 1971: Nigeria: Caldwell and Igun, 1970; Kenya; Ejiogu 1972)

Education acts as a fertility depressant in part because it tends to increase knowledge of, favourable attitudes toward and practice of family planning. Morgan's (1972) report on Lagos, like others cited, indicate that educational level is positively associated with family planning clinic attendance. In all these reports, it is contended that not only do educated women show greater knowledge of

modern family planning methods, but they do tend to be more favourably disposed to using these methods and they practice family planning more effectively.

Olusanya (1969a) identified certain cultural barriers to the acceptance of modern techniques of fertility regulation among the Yoruba in Western Nigeria (namely; sex preference, fears about promiscuity and marital infidelity and misunderstandings about modern contraceptives), but felt that education would erode these traditional barriers.

Studies based on the relationship between education and fertility are also inconsistent in their findings. Pool (1971) and Gaisie (1969) present convincing evidence for Ghana on the existence of a negative relationship between educational achievement and fertility levels. Studies done in Nigeria are, however, not conclusive on this issue.

A 1964 study in Lagos found that educational levels of both wives and husbands were negatively related to fertility levels (Ohadike, 1968). Similar findings have been reported for Ibadan by Okediji (1973) and parts of Sierra Leone by Dow (1971). However, Olusanya's report (1969b) on a study of rural and urban areas of the former western region of Nigeria indicates a general tendency for reported average number of children born alive to be higher among educated than uneducated women. This finding may not, however, contradict other reports since his analysis is based on a limited classification of educational attainment (no education and primary and above), whereas other studies have attempted to relate fertility levels to varying degrees of educational attainment.

Indeed, Arowolo (1976), in a study of Ibadan, showed that women with high school education appeared to have slightly lower fertility than primary school educated women; and University educated women reported a lower level of fertility than high

school graduates. But, primary education by exposing the recipients to rudimentary rules of hygiene and better dietary habits, may result in higher fertility without changing traditional attitudes toward family size.

Easterlin (1969) has argued that education reduces the desired family size and the cost of regulating fertility. He says that education initially increases fertility for a society as a whole and for the individuals with certain levels of education.

Some scholars have found that the level of educational attainment is positively related to age at first marriage. A higher age at first marriage means that a married woman has a shorter reproductive life or years in marriage, hence she has less opportunity to have more children than if she married early unless she is contracepting.

In a study in Western Nigeria (MOH, 1976), it was found that a lower proportion of women 15-19 with some education were married compared to those with no education, the proportion being 33 and 70 respectively.

Bogue (1969) concludes from his elaborate consideration of the impacts of education on fertility that:

"Rising education levels, increased school attendance and elimination of early marriage, are much more powerful in promoting fertility reduction than simple urbanization and rising income".

A similar study conducted in Kenya by Anker and Knowles (1982) provides a straight forward confirmation of the effects of the wife's education on age at first marriage. However, little is known about the influence of religion on fertility in many countries in Africa. The general contention is that religious group differences in fertility are due to differences in contraceptive practice, religiousness, type of

education (secular verses religious), socio-economic status, ethnicity, and minority status. Although research reports elsewhere seem to confirm this general hypothesis, the multiplicity of religious groups with different religious philosophies sets a limit on the extent to which findings from one region can be extrapolated to another with similar religious orientation, (Arowolo and Mabogunje, 1978).

One specific hypothesis that has been tested in parts of Africa relates to the implications of religion on contraceptive use. Given the pronatalist position of certain religious groups (such as, Catholics and Muslims) and the varying degrees of permissiveness on the issue of family planning among others, (e.g. Jews, Protestants,) the explanation of differential fertility lies mainly, other factors being the same, on religious group differentials in knowledge of, attitudes toward and practice of family planning.

In Mauritius, the catholic church is reported to give active encouragement to "approved methods" of family planning. Even in the predominantly Muslim countries of Africa, it has been shown that the adoption of family planning has little to do with religion. The real obstacle to family planning programmes in sub-Saharan Africa, as born out by Caldwell's work, are social and economic - lack of finance, shortage of trained personnel, insufficient publicity, uncertainty of government support, the difficulty of supplying remote and rural areas, rural illiteracy, and suspicion on the part of those holding more traditional attitudes.

In Kenya, Ocholla-Ayayo and Osiemo (1989) report that there is no significant difference in fertility between Catholics and Muslims. Those who are neither Muslims nor Christians fall in between. These findings are similar to those of Henin (1979) for Tanzania. According to Henin, the low fertility for Muslims in Tanzania was due to a high proportion of childlessness. Muslims are also reported to be associated with less secular education and a high level of polygyny.

Ocholla-Ayayo and Muganzi (1986) reported that fertility levels among Christians could be high because they ignore most traditional norms, beliefs and practices as well as the use of modern contraceptives.

Anker and Knowles (1982) rightly stated that the analysis of fertility differentials in Kenya would be incomplete if ethnic groups were not considered. This is because in African society, children belong to the lineage or patterns of marriage which affect fertility.

Mosley et al. (1982) reported that the highest levels of fertility were observed among the Kalenjin and Kisii, while the Mijikenda had the lowest fertility because they had the longest intervals of birth and breast-feeding periods. They also found that polygamy was prevalent among the Luhya, Kisii, Luo and Mijikenda while it was lowest among the Kikuyu.

Ocholla-Ayayo and Ottieno (1987) reported that the Kikuyu married much later than the Luo, but there was no much difference in the fertility of the two ethnic groups as would have been expected. They argued that this was because the Luo married early and stopped giving birth early whereas the Kikuyu married late and stopped giving birth late. Ocholla-Ayayo and Osiemo (1989), on the other hand, have argued that this is so because Luos are more polygamous than the Kikuyu, who, on the other hand, have higher single fertility. They also reported that the Luhya and Kisii showed almost similar fertility levels and the same proportions of women currently married between ages 15-19. They were also the groups with high fertility levels. The Kamba with almost the same proportion of women not married between ages 15-19 as the Kisii and Luhya and with a low proportion of women in polygamous unions had a lower fertility than the two other groups. This phenomena is due to ecological conditions. The Luhya and Kisii come from the

fertile western part of Kenya, while the Kamba are in the semi-arid Eastern part of Kenya.

The Luo and the Mijikenda have the highest proportion of women currently married in polygamous unions. Their total fertility rates are however different, with the mijikenda having the lowest fertility of all the ethnic groups considered. This could be due to relatively low educational level, high divorce rate, long breast-feeding duration and possibly the same religious norms.

The fertility of the Kalenjin is also among the highest along with that of the Kisii and Luhya. This is due to improved nutrition conditions, low age at marriage, negative attitude towards small family size, and low child mortality rate. The Kalenjin like the Mijikenda, observe a longer period of breast-feeding than most Kenyan ethnic groups today.

It has been argued that no population is ignorant about birth control methods even where there is absence of modern methods of contraception. Hence each population tries to limit its fertility in one way or the other and this affects its level of fertility. Women who practice birth control techniques tend to have fewer-births. The Kenya contraceptive prevalence survey (CBS,1984) showed that the use of contraception had a depressing effect on fertility.

Ocholla-Ayayo and Osiemo (1989), reported that most users of contraceptives only did so to terminate childbearing rather than to space births. However, they observed that the termination takes place when fertility is already too high. The average number of children normally expressed is but a desire which is not actually achieved. They found a total fertility rate (TFR) of about 6.4, 7.4 and 8.1 in 1962, 1969 and 1979 respectively, while in 1984 it stood at 8.6.

Celade (1972) has argued that contraceptive use is influenced by education which affects knowledge, attitude and motivation and, perhaps to a lesser extent, access to family planning through higher income.

Michael (1973), has stressed the role of schooling in creating access to fertility control information as well as approval and more extensive use of contraceptive technology.

#### **1.7.6. THEORETICAL FRAMEWORK**

Several theories have been developed by various scholars to explain the changes in fertility levels in different parts of the world. Some of the theories which are relevant to this study include: demographic transition theory; natural theory (biological theory); socio-economic theory; socio-psychological theory and social structure or cultural theory;

Demographic transition theory refers to the transition in developed countries from a situation of high death and birth rates to one of current low birth and low death rates. It is argued that in countries of early industrialization, the process of demographic change or modernization was spread over a few centuries. Before industrialization, these countries were characterised by high death and high birth rates. As a result of improved living conditions such as better nutrition, better public health and other aspects, death rates in these countries began to decline. By the end of the 19th Century, these countries had moved to a situation of low mortality and low fertility.

By way of contrast, population growth in the less developed countries was around 0.3% per annum at the beginning of the 20th century. In a number of less



developed countries, mortality began to decline. After World War II, mortality decline gathered momentum but fertility remained relatively high. Since then death rates have declined rapidly and in a few cases, death rates are not comparable to those in the more developed countries.

The demographic transition theory is quite relevant to the study of fertility. The theory argues that there are three stages of demographic change namely: the first stage of high death and birth rates; the second stage of relatively high birth rate and low death rate and the third and last stage of low birth and low death rates.

Kenya is in the second stage of demographic transition with relatively high birth rate and low death rate. This has come about as a result of improved health facilities and better nutrition. As a result of this, more children are able to survive and reach the reproductive ages hence increasing fertility. Nowadays, girls realize menarche at a very early age. For instance, a nine year old girl has been reported to have given birth in Kenya. If early age at menarche is coupled with early age at first intercourse, first marriage and first birth, then fertility has no option but to increase.

The concept of 'natural fertility' as explained in the natural theory of fertility behaviour, was started by the classical school of environmental determinism. This theory explains that human fertility behaviour is primarily determined by inherent biological levels of fecundity as argued by Henry (1961) and United Nations (1974). The biological processes are regarded as the most important determinants of age pattern of reproductive risk because biological forces influence the age of entry into and exit from the reproductive mechanism, Meuken (1975). This theory of natural fertility sees reproductive potentiality of human population and that of other animals to be determined solely by natural forces, which also partially determine the nature of environment, health and nutrition.

The natural theory explains further that there is no conscious or unconscious application of socio-economic and cultural forces which could affect exposure to intercourse, conception and gestation. These forces are conceptualised as determinants of the degree of reproductive risk regardless of the mother's age. These exogenous forces are significant intermediary variables, rendering the concept of natural fertility as embodied in the natural theory of fertility behaviour too idealistic.

This theoretical model is inadequate in the sense that it disregards the conscious and unconscious application of fertility control methods or measures. Man is rational and this rationality affects his reproductive behaviour. He is able to decide when to have a child and the means to achieve it. Man's decision is affected by the socio-economic and socio-cultural environment. Even though the model is idealistic, it has some relevance to this thesis in the sense that a biological process like age at menarche, is one of the determinants of fertility.

The socio-economic theoretical models are based on cost-benefit analysis. The models assume rationality in human behaviour towards achieving the desired family size as argued by Nerlove (1974), Schultz (1973), Easterlin (1969) and Becker (1960). The theory argues that, maximization of household welfare, or potential earnings of the household members accrue from direct or indirect labour efforts. The cost-benefit approach subjects the household welfare to financial constraints or costs generated from investment on children's welfare. This means that family size is presumed to increase to the point at which marginal benefits of an additional child is equal to or approximately zero.

The economic theory is quite relevant to this study. Economically independent girls usually marry late, and have first intercourse as well as first birth late.

The socio-psychological theory of fertility explains that fertility is a function of income and social status of the family and normative pressures impinging upon the family. Bagozzi (1978) and Burr and Wesley (1973). This theory regards taste, family decision processes and socio-economic variables as important factors in fertility analysis. The theory asserts that the noted factors affect fertility only through their impact on the attitude of the family members and the specific social exchanges that occur within the family.

The socio-psychological theory has major shortcomings concerning its application to single adolescent fertility analysis. It stresses that family decision making, especially the communication between husband and wife, is a major determinant of fertility. Adolescent fertility or pregnancy, however, usually occurs accidentally with neither of the two parties involved having discussed. The theory emphasises further that individual decision making in fertility behaviour and knowledge of environmental factors could influence fertility control. This argument is relevant to this study since an individual can decide when to have first intercourse, first marriage and first birth, when to use contraceptives and who to discuss sex related issues with, just to mention a few.

In general, the biological and behavioural factors through which socio-economic, socio-cultural and demographic variables affect fertility are called intermediate fertility variables. The primary characteristic of an intermediate variable is its direct influence on fertility. For example, as the prevalence of contraception changes, the fertility necessarily changes (assuming the other intermediate fertility variables remain constant), while this is not necessarily the same with indirect determinants such as income or education.

Davis and Blake (1956) have provided a list of intermediate variables which are important for conception and births to occur. They classify the variables as follows:

1. Those governing the formation and dissolution of marital unions in the reproductive period;
  - a) Age of entry into sexual unions
  - b) Permanent celibacy
  - c) Amount of reproductive period spent after or between unions. This is determined by divorce and unions broken by death of husband.
  
2. Those governing the exposure to intercourse within unions;
  - a) Voluntary abstinence.
  - b) Involuntary abstinence (from illness or impotence).
  
3. Factors affecting exposure to contraception;
  - a) Fecundity or desertion.
  - b) use or non use of contraception.

As Davis and Blake have indicated, different combinations of values for these intermediate variables may produce identical fertility levels. Other factors can affect fertility only through one or more of these intermediate variables, for example education of women might have some influence on age at marriage, use of contraceptives etc. These factors, include programme factors such as contraceptive use and non-programme factors such as sterility.

Davis and Blake proposed the classification of these factors in 1956, but Bongaarts (1978) later reclassified them as follows:

- I Exposure Factors
  - 1) Proportion of women who are married

## II. Deliberate Marital Fertility Control Factors

- 2) Contraception
- 3) Induced abortion

## III. Natural Marital Fertility Control Factors

- 4) Lactation infecundibility
- 5) Frequency of intercourse
- 6) Spontaneous intra-uterine mortality
- 7) Duration of fertile period

He argued that variations in fertility results from variations in one or more of the above factors. The degree of influence of these factors on fertility, however, varies from one society to another and also differs over time within societies. The influence of these factors on fertility is discussed below.

Marriage has, for along time, been recognized by demographers as one of the principal intermediate determinants of fertility. Bongaarts argues that marriage affects fertility through the number who marry, the proportions of those who stay in stable unions and the age at which they marry. Women who marry late have less time to produce and their fertility is lower.

Prolonged lactation is associated with longer periods of post partum amenorrhea, which is the period of infertility following birth. In developing countries prolonged lactation is common and hence birth intervals are longer. Therefore, one can conclude that, in developing countries natural fertility is lower than in developed countries where prolonged lactation is not common.

Proportion of couples who are sterile is an important determinant of fertility. Despite the scarcity of data on sterility, it is, however, known to have a significant depressing effect on fertility in some developing countries.

Fertility is also influenced directly by coital frequency. Fecundity, the power to produce, has been observed to increase with an increase in coital frequency. A survey in U.S.A. showed that fecundity increases with an increase in coital frequency (Louis, 1976).

Within marriage, contraceptive use is currently responsible for the wide range in the levels of fertility. In developing countries, contraceptive practice is virtually absent and marital fertility is comparatively high. In developed countries, on the other hand, about half of married women in the reproductive ages are users of contraceptives (Bongaarts, 1978).

Bongaarts, (1982), noted that it is not necessary to devote the same effort to analyzing and measuring each of these variables because they are not of equal interest in studies of fertility levels and differentials. He found the four principal intermediate variables to be:

- a) proportion of married women;
- b) breast-feeding;
- c) induced abortion; and
- d) Contraception (programme and non-programme).

#### **1.7.7. SUMMARY OF THE LITERATURE REVIEW**

In summary, we note that in more developed countries, women were noted for their late entry into first union, delayed first birth and low fertility. A comparison between age at marriage and fertility rates shows that for Asian countries, 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

before 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. Trends towards late marriage and late first birth were noted in Latin America and Asia, where women who got married early have a higher fertility than those who got married late. Low age at first marriage, education 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 have focused on the adolescents (King'ori 1976; 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, this study is interested in selected demographic factors namely; age at first birth, age at first intercourse and age at first marriage and considers their effect on fertility, as well as the factors that account for their variation.

It is due to the contradictory findings of the previous studies on fertility differentials that this study has been deemed necessary. Similarly, the findings of various studies on fertility differentials have been inconclusive. The general criticism levied on such global scale studies (discussed above) is that they fail to apply empirical case studies. Such macro-level studies conceal regional and local differences, in population, education and resource relationships and fail to take account of short term socio-economic conditions. It is in recognition of this that a number of studies (like this one) have been carried out in Africa.

Davis and Blake (1956) have developed a theoretical model by which fertility levels and differentials can be predicted. Their model identifies eleven intermediate variables namely: age at first sexual intercourse; frequency of intercourse; permanent celibacy; broken unions by divorce, separation or desertion

and unions broken by death of husband; voluntary abstinence; involuntary abstinence (from impotence, illness, unavoidable but temporary separation); fecundity or desertion as affected by involuntary causes; fecundity or desertion as affected by voluntary causes; use or non-use of contraceptive methods; foetal mortality from involuntary causes; and foetal mortality from voluntary causes.

Bongaarts (1982) has modified the version into only seven important intermediate variables namely: proportion married among females; contraception; induced abortion; duration of postpartum desertion; spontaneous intrauterine mortality; fecundability (frequency of intercourse) and prevalence of sterility. The intermediate variables are assumed to determine the degree of risk of exposure throughout the different stages of biological reproductive cycle designated as intercourse, conception and gestation. The intermediate variables are the only factors through which social, economic and cultural conditions can affect fertility. This study has adopted the Bongaarts proximate determinants of fertility framework since it is the most refined, recent as well as the most commonly used.

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 existing between fertility and the selected demographic factors in particular, and other differentials in general - in the rest of the world, Africa and Kenya, in particular.

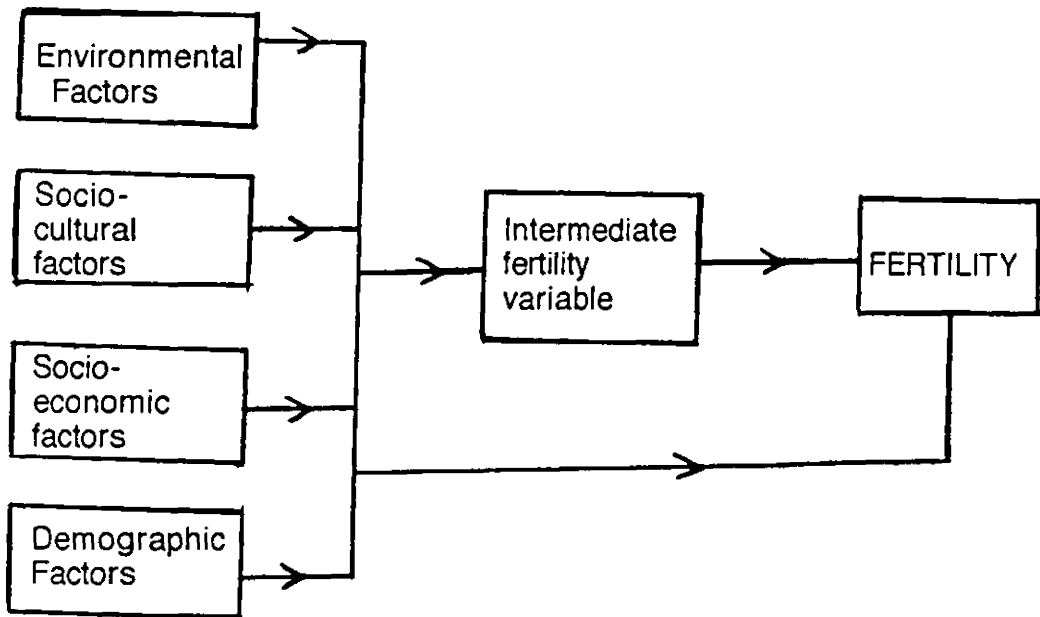


### 1.8.0. THEORETICAL STATEMENT

From the foregoing literature review on theoretical frameworks, the following theoretical statement can be developed:

"Ages at first marriage, first birth and first intercourse are likely to influence the fertility of any given society by various socio-economic, socio-cultural and environmental factors".

**Figure 1: CONCEPTUAL MODEL**



**Source:** Adopted from Bongaarts (1978).

**Note:** Some elements will not be analysed due to lack of sufficient data.

The socio-economic, socio-cultural and environmental variables do not affect fertility directly, but they do so indirectly through the proximate determinants such as, age at first intercourse, first birth and first marriage which are considered in this study. For example, a woman's level of education does not affect her fertility directly. Educated women spend more time in school hence they marry late, have first intercourse and at the same time have their first birth late, hence reducing their

fertility. This is because they will have a shorter fecund period of exposure. An educated woman is also able to purchase any contraceptives since she has an income. She is also well informed about contraceptive methods and can, therefore, use any suitable one.

Socio-cultural variables such as religion cannot affect fertility directly but do so through the proximate determinants such as, age at first marriage, first birth and first intercourse. Certain religions, such as the Roman Catholic do not approve the use of contraception. This means that the women who uphold such beliefs are exposed to high fertility since they are not using any contraceptive to prevent pregnancy. This example shows clearly how fertility is affected by non-contraceptive use.

Demographic factors such as age at first intercourse, age at first birth and age at first marriage do affect fertility directly. If they are experienced early in a woman's life, her fertility is bound to be high since she will have many fecund years of exposure. The opposite of this implies low fertility, assuming other factors are constant.

The above three examples explain how fertility is affected by socio-economic, socio-cultural and environmental variables through the proximate determinants such as, contraceptive use, frequency of intercourse and ages at first marriage, first birth and first intercourse. The above argument was adopted by Bongaarts in 1978. He argued that the intermediate fertility variables (proximate determinants) affect fertility directly and if they change, then fertility necessarily changes also (assuming the other intermediate variables remain constant). However, this is not necessarily so for the indirect determinants such as income or education.

## 1.9.0. DEFINITION OF KEY ANALYTICAL CONCEPTS

### **SOCIO-CULTURAL FACTORS:**

These are factors which govern a people's way of life in a society. In this study the socio-cultural factors considered as influencing fertility include: religion and ethnicity.

### **SOCIO-ECONOMIC FACTORS:**

These are the indices of socio-economic status. The socio-economic variables considered in this study include; levels of education, place of residence and work status.

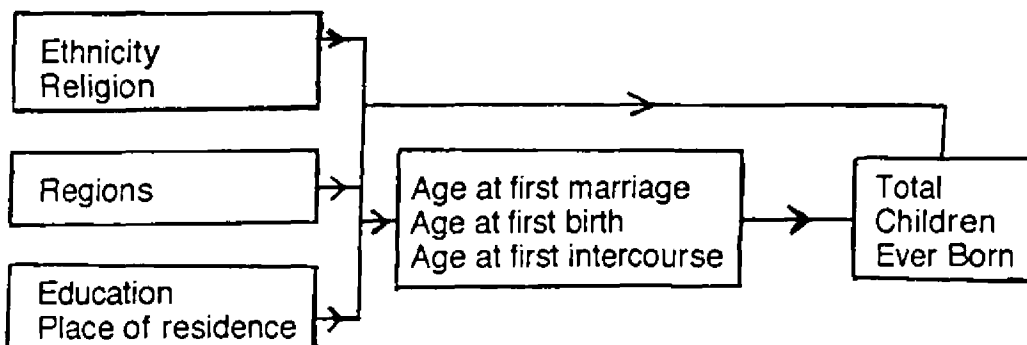
### **DEMOGRAPHIC FACTORS:**

These include age, age at first marriage, age at first birth, and age at first intercourse. In this study, these variables are considered as direct determinants of fertility.

### **TOTAL FERTILITY RATE:**

This refers to the average number of children that would be born to a woman during her reproductive life span conforming to the prevailing age specific fertility rates at a given time.

**Figure 2: OPERATIONAL MODEL**



## **1.10.0 DEFINITION AND JUSTIFICATION OF OPERATIONAL CONCEPTS**

### **EDUCATION**

Here, education is defined as formal schooling and the level of educational attainment of women aged 15-49 years is considered. Educational attainment of the respondents is important because it influences attitudes towards family size. Formal education is measured by the number of years of formal schooling and the highest standards of education achieved. In this study, education is categorized into: no education; primary education and secondary and above.

### **REGIONS**

Regions are specifically delineated geographic regions in a country. The regions considered in this study are the various provinces of Kenya namely: Nairobi; Central; Coast; Nyanza; Eastern; Western and Rift Valley.

### **RELIGION**

Religion refers to peoples spiritual relationship with God. In this study, religion is categorized into; Catholics, Protestants, Muslims and others. These are used as the comparison units in this study.

### **ETHNICITY:**

An ethnic group is a group of people having common origin. Such a people share a common language and cultural practices and they usually reside at a common place. In this study ethnicity is categorized into; Luhya, Luo, Kalenjin, Kikuyu, Kamba, Kisii, Meru/Embu, Mijikenda/Swahili and others. These are used as the units of analysis for comparison purposes.

## **MARRIAGE:**

Marriage refers to a union between persons of the opposite sex, which involve rights and obligations fixed by customs or law. The spouses are called husband and wife or a couple. A marriage in which a person is married to only one person of the opposite sex is called monogamous, while a marriage in which a person is married to several persons of the opposite sex is called polygamous.

The specific aspect of marriage which is of importance in this study is age at first marriage. This a major determinant of the completed family size, since it affects the span of life a married woman spends in bearing children. It is going to be measured by calculating the mean age at first marriage of women by various socio-cultural and socio-economic background characteristics for comparison purposes.

## **BIRTH**

This refers to the act of bearing a child by a woman. The bearing of a live child is what we are concerned with since it is what determines the actual reproductive performance (fertility). The particular aspect of birth which is of importance to this study is age at first birth.

## **INTERCOURSE**

This refers to sexual interaction between a man and a woman. The specific aspect of intercourse which is useful in this study is a woman's age at first intercourse.

## **WORK STATUS**

This is a classification of people or groups on the basis of their involvement in wage employment. The specific aspects of work status which are of importance in this study, is whether an individual is working or not.

## **PLACE OF RESIDENCE**

This refers to classification of people or groups on the basis of where they reside. The particular aspects of place of residence which are useful in this study is whether an individual is residing in an area classified as urban or not urban (rural). According to the 1979 census, an urban centre is defined as a place with a population of at least 2000 or more. On the other hand, a rural area is a place which is not classified as urban.

## **CONTRACEPTIVE USE**

Use of contraception refers to the conscious efforts of women to avoid pregnancy or conception through methods such as; rhythm, withdrawal, oral pills, IUD, injection and others. It is generally believed that the use of contraception has a negative impact on fertility or family size. It is used to space or to terminate births.

### **1.10.1. OPERATIONAL HYPOTHESES**

Scholars have established that fertility is affected by a multiplicity of factors, with some acting directly and others indirectly. In response to this, the study intends to test the following hypotheses:

1. Mean age at first marriage is likely to vary by provinces, ethnicity, religion, levels of education and place of residence.
2. Mean age at first intercourse is likely to vary by provinces, ethnicity, religion, levels of education and place of residence.
3. Mean age at first birth is likely to vary by provinces, ethnicity, religion, levels of education and place of residence.

4. Age at first intercourse is inversely related to total fertility rate.
5. Women who marry early are likely to have a higher total fertility rate than women who marry late.
6. Women who commence childbearing at an early age are likely to have a higher total fertility rate than their counterparts who commence childbearing late.

## **CHAPTER TWO**

### **SOURCES OF DATA AND METHODS OF DATA ANALYSIS**

#### **2.0 INTRODUCTION**

This chapter addresses itself to the sources of data used in the study, quality of the data, as well as the techniques used in data analysis. Both statistical techniques and Demographic Techniques are used in the study. The main statistical techniques used include; Mean, Median, Mode which are derived by cross tabulation technique and the Multivariate Regression Model. The only Demographic technique used in the study is the Coale-Trussell P/F technique.

The Coale-Trussell P/F technique is used in calculating the Total Fertility Rates (TFR). Mean, Median and Mode are summary measures used to show the variations in ages at first marriage, first birth and first intercourse by selected regional, socio-cultural as well as socio-economic differentials. Multivariate Regression is employed to confirm the findings obtained using the Coale-Trussell P/F technique.

#### **2.1. SOURCES OF DATA.**

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

The Kenya Demographic and Health Survey sample was designed to produce completed interviews with 7,500 women aged between 15 and 49 years and a



sub-sample of 1000 husbands of these women on a defacto basis. A total of 9,836 households were selected and only 8,343 of them were identified as occupied households during the fieldwork. However, only 8,173 of them were successfully interviewed. In the interviewed households, 7,424 eligible women were identified and 7,150 of them were successfully interviewed. In addition, 1,116 husbands were interviewed out of a total of 1,397 eligible ones.

Data collection was done in two stages, stratified by urban-rural residence and within the rural stratum, by individual districts. In the first stage, 1979 census enumeration areas were selected with a probability proportional to size. The selected enumeration areas were segmented into the expected number of standard-sized clusters, one of which was selected at random to form the NASSEP cluster. The selected clusters were then mapped and listed by CBS field staff. In rural areas, household listings made between 1984 and 1985 were used to select the Kenya Demographic and Health Survey households, while Kenya Demographic and Health Survey pretest staff were used to relist households in the selected urban clusters. It was felt that in the Kenya Demographic and Health Survey, reliable estimates of certain variables could be produced for the rural clusters in 13 districts which had initially been targeted by the National Council of Population Development. The 13 districts include; Kilifi, Machakos, Meru, Nyeri, Murang'a, Kirinyaga, Kericho, Uasin Gishu, South Nyanza, Kisii, Siaya, Kakamega and Bungoma. Thus all the 24 rural clusters in the NASSEP were selected for inclusion in the Kenya Demographic and Health Survey sample in these 13 districts.

About 450 rural households were selected in each of these districts and only just over 100 rural households in the other remaining districts. About 3000 households were selected in urban areas to make a total of 10,000 households altogether.

Sample weights were used to compensate for the unequal probability of selection between strata and the weighted figures are used in data analysis in chapter 3.

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

The field staff for the survey consisted of nine teams, each of which was fluent in one of the major indigenous languages. The interviewers and the data entry staff were recruited in October, 1988 and trained in November, 1988. The training included practice interviewing both in the classroom and in the field. The actual data collection started on 1st of December, 1988 and was completed during the last week of May, 1989. Lastly, the distribution of women in the Kenya Demographic and Health Survey fits the pattern established by the 1977/78 Kenya Fertility Survey and the 1984 Kenya Contraceptive Prevalence Survey. The distribution of all women by province indicates only minor differences among the 3 sources of data.

## **2.2. LIMITATIONS OF THE KDHS DATA**

Though national in coverage, the KDHS excluded the North Eastern Province and four northern districts which together account for about 5% of Kenya's population. Besides this, the KDHS selected 6,850 rural households and only about 3,000 households in urban areas for a total of about 10,000 households altogether. This implies that most of the women who were interviewed were from rural areas. The KDHS also failed to obtain information on environmental factors and induced

abortion, an important intermediate variable affecting fertility. Similarly, the KDHS sample size at the district level was very small. As a result of this, it may not be representative of all the sub-groups at the district level. The study may therefore have the problem of overgeneralising from a small sample.

## **2.3 THE COALE-TRUSSELL P/F TECHNIQUE**

### **(a) The rationale of the method**

Currently, there are quite a number of Demographic Techniques which can be used in fertility analysis. However, we chose the Coale-Trussell P/F technique among them because it is the most refined and the most commonly used at the moment.

The Coale-Trussell P/F technique seeks to adjust the level of observed age-specific fertility rates, which are assumed to represent the true age pattern of fertility, to agree with the level of fertility indicated by the average parities of women in age groups lower than ages 30 and 35, which are assumed to be accurate. Measures of average parity equivalents,  $F$ , comparable to reported average parities,  $P$ , are obtained from period fertility rates by cumulation and interpolation (these measures are effectively averages of the cumulated fertility schedule over age groups). Ratios of average parities ( $P$ ) to the estimated parity equivalents ( $F$ ) are calculated by age group, and an average of the ratios obtained for younger women is used as an adjustment factor by which all the observed period fertility rates are multiplied. Note that P/F ratios are generally calculated for the entire age range from 15 to 49, even though not all the ratios are used for adjustment purposes. This is recommended because the pattern of the ratios with age may reveal data errors or fertility trends.

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

### **(b) Data Required**

- (1) Total children ever born classified by five-year age-groups of mothers (women aged 15-49).
- (2) Total births in the last one year classified by five-year age-groups of mothers (women aged 15-49).
- (3) Total female population in each of the five-year age-groups (irrespective of marital status).

### **(c) Computational Procedure**

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

#### **STEP 1: Calculation of reported average parities.**

The reported average parity of the women in the age group  $I$  is denoted by  $P(I)$ . It's 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).

$$P(i) = \text{CEB}/F_{\text{pop}} \text{ in the } i\text{th age group.}$$

**STEP 2: Calculation of Age Specific Fertility Rates.**

The Age Specific Fertility Rates denoted by  $f(I)$  is calculated by dividing the total births to women in the age group  $I$  in the year preceding the census by the total number of women in that age group.

$$f(i) = \text{BLY}/F_{\text{pop}} \text{ in the } i\text{th age group.}$$

**STEP 3: Calculation of cumulated fertility schedules.**

This Schedule is denoted by  $Q(I)$ , it is calculated by adding the age specific fertility rates in step 2 from  $f(1)$  to  $f(I)$ . The value of this sum multiplied by five, is an estimate of cumulated fertility up to the upper limit of age group  $I$ . The formal definition of  $Q(i)$  is :-

$$Q(i) = 5 \{ \sum f(i) \} \dots \dots \dots 1$$

**STEP 4: Estimation of average parity equivalents.**

The average parity equivalents, denoted by  $F(I)$ , are estimated by interpolation using the age specific fertility rates  $f(I)$  and the cumulated fertility values  $Q(I)$  calculated in step 3.

Coale and Trussel proposed fitting a second degree polynomial to three consecutive values of  $Q(i)$  and estimating the average parity of a woman of an age group within the range by evaluating the integral of the polynomial in an actual application. The equation is:

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

For  $i = 1, 2, 3, \dots, 6$ .

$$F(7) = Q(6) + a(7)f(6) + b(7)f(7) \dots \dots \dots 2$$

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

**Table 2.1 Coefficients for interpolation between fertility rates to estimate parity equivalents.**

Age group (1)	index (i) (2)	a(i) (3)	b(i) (4)	c(i) (5)
15-19	1	2.531	-0.188	0.0024
20-24	2	3.321	-0.754	0.0161
25-29	3	3.265	-0.627	0.0145
30-34	4	3.442	-0.563	0.0029
35-39	5	3.518	-0.763	0.0006
40-44	6	3.862	-2.481	-0.0001
45-49	7	3.828	2.602	-0.0002

Source UN Manual X. 1983 P.34.

When age specific fertility rates have been calculated from births in a 12-year month period, classified by age of mother at the end of the period, they are specific for unorthodox age groups that are shifted by six months. A fertility schedule for conventional five year age groups,  $f+(i)$ , can be estimated by weighting the rates referring to unorthodox age according to the equations 2 and 3 and using the coefficients in table 2.2. However when fertility rates have been calculated from births classified by age of mother at the time of delivery, this step is not necessary.

3.  $f+(i) = (1-W(i))x(i)+W(i)x(i+1) \dots \dots \dots$  equation 3

where  $f(i)$  and  $f^*(i)$  are the unadjusted and the adjusted age specific fertility rates respectively. The weighting factor  $W(i)$  is calculated as:

$$4. \quad W(i) = X(i)+y(i)x(i)/Q(7)+z(i)x(i+1)/q(7) \dots \text{equation 4}$$

Table 2.2 Coefficients for the calculation of weighting factors to estimate fertility rates for conventional age groups of fertility schedules

age group (1)	index (i) (2)	x(i) (3)	y (4)	z (5)
15-19	1	0.031	2.287	2.114
20-24	2	0.058	0.999	0.211
25-29	3	0.094	1.219	0.677
30-34	4	0.120	1.139	1.131
35-39	5	0.160	1.739	1.624
40-44	6	0.270	3.454	2.472

Source: UN Manual X, 1983 p.34.

#### Step 6: Adjustment of period fertility schedules.

This is done using the  $P(i)/F(i)$  ratios which are also computed. Ideally, these ratios should be fairly similar for different values of  $i$ , although, as children ever born are increasingly omitted by older women, the ratios will tend to decrease as age increases (especially over ages 30-35). In practice, however, they are often far from being constant, even below age 35. 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 the women are believed to have been pushed up or down, then the mean of all the  $P(i)/F(i)$  ratios can be used.

Once the adjustment factor ( $K$ ) has been chosen, an adjusted fertility schedule is then computed by multiplying the fertility rates for conventional age groups,  $f^*(i)$

the rates were originally for age groups shifted by six months, but  $f(i)$  if rates were originally shifted for conventional age groups, by  $K$  to yield adjusted  $f^*(i)$  values.

$$f^*(i) = Kf(i) \dots \dots \dots 5$$

The total fertility rate is then calculated as follows:-

$$TFR = 5 \left( \sum_{i=1}^7 f^*(i) \right) \dots \dots \dots 6$$

**2.4 CROSS-TABULATION.**

In order to study the association and distribution between two variables in any research, cross-tabulation is the most readily available technique to be used. In this study, cross-tabulation technique is used to derive or estimate the mean, median, minimum and modal ages at first intercourse, first birth and first marriage by the selected socio-cultural, socio-economic and regional differentials.

However, cross-tabulation technique only gives us the distribution of various variables but does not tell us anything about the relationship between the two variables. In order to show this, regression analysis is necessary.



## 2.5. MULTIVARIATE REGRESSION ANALYSIS.

This technique of data analysis is used to estimate the coefficients of fertility determinants by the variable of interest when some other variables are controlled.

The multivariate regression equation is expressed as;

$$F_{ij} = A + B_i \cdot X_{ij} + E_i.$$

where;

A = the constant term.

B<sub>i</sub> = the regression coefficient for the independent variable i.

E<sub>i</sub> = the error term assumed to be normally distributed (after weighting by the number of births) with a mean of zero.

X<sub>ij</sub> = variable.

F<sub>ij</sub> = fertility index for the ith woman in the jth category.

The computation of the regression coefficients of the equation and the correlation coefficients can be accomplished by using either the matrix techniques or a computer. Because of the greater amount of data it is necessary to use computer facilities. Hence the SPSS (statistical package for social scientists) available in the computers at the Population Studies and Research Institute - University of Nairobi, is used to obtain regression coefficients and other statistical measures needed in the analysis. The package also produces the best relationship for variables when step-wise regression is used.

In constructing the regression equation it is assumed that all variables, both criterion and predictor, jointly follow a multivariate normal distribution. Strictly speaking, no real data can follow a multivariate normal distribution exactly, since this is a mathematical model of prediction. Where significant interaction effects are present, the use of the linear model yields predicted values of the dependent variable which in effect do not "fit" any of the cases. Several methods have been

proposed for handling such cases. Stepwise regression can help identify this problem and improve the model to be developed.

## 2.6 VARIANCE OF THE ESTIMATORS

The variability of the estimated regression coefficients must also be considered in evaluating the relative importance of the independent variables. The coefficients with large standard errors are unreliable and may differ markedly from sample to sample. It is a dangerous practice to identify variables as important for prediction based on their individual significant t-values.

When the independent variables are correlated among themselves, the parameter estimates are correlated as well. High inter-correlation among the variables can affect the regression estimates in several ways. For example, the coefficients can become unreliable. The estimated variance of the regression coefficient for the  $i^{\text{th}}$  independent variable is;

$$S^2_{B_i} = \frac{S^2}{(1-R_i^2)(N-1)S_i^2}$$

Here,  $R_i^2$  is the squared multiple correlation when the  $i^{\text{th}}$  independent variable is considered the dependent variable and the regression equation between it and the other independent variables is calculated. A large value of  $R_i^2$  indicates that the  $i^{\text{th}}$  independent variable is almost a linear function or a combination of the independent variables. The proportion of variability not explained by the other variables is as before,  $1-R_i^2$ . This quantity is usually called the TOLERANCE.

As can be seen from the equation above, for a fixed sample and standard error  $S$ , the smaller the tolerance the larger the standard error of the coefficient. However,

small tolerance values can also cause computational problems for the regression solutions.

## 2.7. TESTING FOR STATISTICAL SIGNIFICANCE: T-TEST.

This technique is used to determine the goodness of fit between the sample mean and the population mean. The t-statistic is calculated as follows;

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n-1}}$$

where;

•  $s$  = is the sample standard deviation.

•  $n$  = sample size

•  $n-1$  = degrees of freedom.

In order to use the t-test, the following conditions must be fulfilled:

- (1) The variable should be an interval measure.
- (2) The form of the distribution should be normal. The null hypotheses for t-statistic is:

$$H_0: \beta_0 = \beta_1 = \beta_2 = \beta_3 = \dots = \beta_n = 0.$$

$$H_1: \beta_0, \beta_1, \beta_2, \beta_3, \dots, \beta_n \neq 0.$$

If the computed t-value is greater than the table value at a given number of degrees of freedom and level of significance, then you reject  $H_0$  and accept  $H_1$ .

From the computer printout, however, one can directly test the hypotheses with the following conditions:

- (i) If the observed level of significance is less than the test level (usually 0.01, 0.05, 0.1 etc.) we reject  $H_0$  and accept  $H_1$ .
- (ii) If the observed significance is greater than the test levels, we reject  $H_1$  and accept  $H_0$ .

## **2.8 PROBLEMS OF MULTIPLE REGRESSION.**

The basic problem of multiple regression is multi-collinearity which is defined as the inter-correlation of the independent variables. This situation usually arises when the independent variables overlap. In such cases, the individual influence and effect of the independent variables on the dependent variable, therefore, become unreliable. The greater the overlap of the independent variables, the lower the reliability of the regression coefficients.

The inter-correlation of the explanatory variables is measured by the simple correlation coefficient between the variables. The assumptions of the ordinary least squares method are that the error terms are (i) normally distributed with zero expectation and (ii) homoscedastic i.e. they have the same variance or violation.

## **2.9 SOLUTIONS TO PROBLEMS OF MULTIPLE REGRESSION IN THIS STUDY**

In our case, multi-collinearity could arise where the dummy variables, each representing the presence or absence of a characteristic, are all included in the regression and the dummy

include all possibilities. For example, suppose the regression includes the dummy variables representing education of mother i.e. where dummy is 1 when mother has no education and 0 if otherwise, so that no education = 1, std 1-4 = 0, std 5-8 = 0, form 1-2 = 0, form 3-4 = 0 and higher = 0. If all these dummy variables of education are included in the regression, then there will be perfect multi-collinearity. In such a case, one of the dummy variables must be dropped to avoid this problem of linear dependence.

## 2.10. THE DUMMY REGRESSION.

A dummy variable is any variable in an equation that takes on finite number of values for the purpose of identifying different categories of a nominal variable.

In general, multiple regression requires that variables are measured on interval or ratio scale and the relationship among the variables are linear and additive (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 independent or exploratory variables used in this study consist of scaled continuous variables namely; age at first marriage, age at first birth and age at first intercourse. These are categorised to become categorical variables which are introduced into the regression process by means of dummy variables as shown in table 2.3.

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

- a. Age at first marriage (AFM).
- b. Age at first intercourse (AFI).
- c. Age at first birth (AFB).

The first broad group (age at first marriage) considered in the study includes:

- (1) AFM1- Maternal age at first marriage considered as ages <14.
- (2) AFM2- Maternal age at first marriage considered as ages 14-16.
- (3) AFM3- Maternal age at first marriage considered as ages 17-18.
- (4) AFM4- Maternal age at first marriage considered as age 19+.

The second broad group (age at first intercourse) considered in the study includes:

- (1) AFI1-Maternal age at first intercourse considered as <14
- (2) AFI2-Maternal age at first intercourse considered as ages 14-16.
- (3) AFI3- Maternal age at first intercourse considered as ages 16-18.
- (4) AFI4- Maternal age at first intercourse considered as ages 19+.

The third broad group (age at first birth) considered in the study includes:

- (1) AFB1- Maternal age at first birth considered as ages <14.
- (2) AFB2-Maternal age at first birth considered as ages 14-16.
- (3) AFB3-Maternal age at first birth considered as ages 17-18.
- (4) AFB4-Maternal age at first birth considered as ages 19+.

**Table 2.3: Values of the dummy variables used in the regression model.**

AFM1	1	0	0	0	0
AFM2	0	1	0	0	0
AFM3	0	0	1	0	0
AFM4	0	0	0	1	0
AFB1	0	0	0	0	1
AFB2	0	0	0	0	0
AFB3	0	0	0	0	0
AFB4	0	0	0	0	0
AFI1	0	0	0	0	0
AFI2	0	0	0	0	0
AFI3	0	0	0	0	0
AFI4	0	0	0	0	0
AFB2	1	0	0	0	0
AFB3	0	1	0	0	0
AFB4	0	0	1	0	0
AFI1	0	0	0	1	0
AFI2	0	0	0	0	1
AFI3	0	0	0	0	0
AFI4	0	0	0	0	0
AFI3	1	0			
AFI4	0	1			

Table 2.3 above shows, for example, that when AFM1, is taken as an indicator or dummy variable, it assumes the value 1, while all the other dummy variables; AFM2, AFM3 to AFM4 take the value 0.

Little (1980) reported that, for a K-category variable, one category is selected and called the reference category. For each of the (K-1) other categories, a dummy or indicator variable is defined taking the value 1 for individuals falling in that category and zero otherwise. For example; if we choose those who got married first at age 20 and above, as the reference category and define k-1 = 4 then;

$$\begin{aligned} \text{AFM } <14 \\ \text{(AFM1)} \end{aligned} = \begin{cases} 1 & \text{Age at 1st marriage} = <14 \text{ years.} \\ 0 & \text{otherwise.} \end{cases}$$

$$\begin{aligned} \text{AFM } 14-16 \\ \text{(AFM2)} \end{aligned} = \begin{cases} 1 & \text{Age at 1st marriage} = 14-16 \text{ years.} \\ 0 & \text{otherwise} \end{cases}$$

$$\begin{aligned} \text{AFM } 17-18 \\ \text{(AFM3)} \end{aligned} = \begin{cases} 1 & \text{Age at 1st marriage} = 17-18 \text{ years.} \\ 0 & \text{otherwise} \end{cases}$$

In the above example, age at first marriage is represented in the regression model by a set of dummy variables defined in this case as; AFM1, AFM2 and AFM3. To see the effect of these, note that the fitted values for this regression are;

$$Y_i = b_0 + b_1 \cdot \text{AFM1}(i) + b_2 \cdot \text{AFM2}(i) + b_3 \cdot \text{AFM3}(i).$$

where;

AFM1<sub>i</sub>, AFM2<sub>i</sub> and AFM3<sub>i</sub> are the values of AFM1, AFM2 and AFM3 for the respondent <sub>i</sub>.

For individuals who got married first at ages <14;

$$\text{AFM1}_i = \text{AFM2}_i = \text{AFM3}_i = 0.$$

Hence the predicted mean;

$(Y/AFM = 1) = b_0$  which is the intercept of the regression. For individuals who got married first at age LOW-13 years,  $AFM1=1$  while  $AFM2=AFM3=0$  Hence, the predicted mean is  $(Y/AFM = 2) = b_0 + b_j$ .

Similarly, we obtain the predicted means for the other categories of age at first marriage as follows;

$$(Y/AFM = 3) = b_0 + b_2$$

Hence, the intercept  $b_0$  is the fitted mean for the reference category and the slope  $b_j$  is the difference in the fitted mean between category  $j+1$  and the reference category. Two or more factors can be included with each factor having a reference category.

## 2.11 DEFINITION OF THE VARIABLES IN THE REGRESSION ANALYSIS

The following categories of the different variables considered were found to significantly affect the fertility index when considered with the reference categories.

### INDEPENDENT VARIABLES

- 1) **AFM1**-Maternal age at first marriage considered as ages <14.
- 2) **AFM2**-Maternal age at first marriage considered as ages 14-16.
- 3) **AFM3**- Maternal age at first marriage considered as ages 17-18.
- 4) **AFM0**- Maternal age at first marriage considered as age 19+. It is considered as the reference category with a dummy variable 0.
- 5) **AFB0**- Maternal age at first birth considered as age 19+. It is considered as the reference category with a dummy variable 0.
- 6) **AFB1**- Maternal age at first birth considered as ages <14.



- 7) **AFB2**- Maternal age at first birth considered as ages 14-16.
- 8) **AFB3**- Maternal age at first birth considered as ages 17-18.
- 9) **AFI0**- Maternal age at first intercourse considered as age 19+. It is considered as the reference category with a dummy variable 0.
- 10) **AFI1** -Maternal age at first intercourse considered as ages <14
- 11) **AFI2**-Maternal age at first intercourse considered as ages 14-16.
- 12) **AFI3**-Maternal age at first intercourse considered as ages 17-18

**DEPENDENT VARIABLE.**

- 13) **CEB** - Total children ever born to each women aged 15-49.

**2.12 STEPWISE REGRESSION ANALYSIS**

A stepwise regression procedure is an option that enters variables into the regression equation on the basis of their order of importance. It explains the amount of additional variation in the regression equation. This procedure is stopped when the F-value or t-value for the inclusion of an additional variable is no longer significant.

In this study, the various ages at first intercourse, first birth and first marriage (which are independent variables) are regressed against the total children ever born, which is a dependent variable. The independent variables are entered in the multiple regression equation and a stepwise regression analysis is then carried out. The model used is as follows:

$$Y_i = b_0 + b_1 * X_1 + ..... + b_k * X_k + e ..... (5.17)$$

where,

$Y_i$  is the dependent variable,

$X_i$ 's are the independent variables in the equation

and,

$b_1$ 's' are the regression coefficients.

They indicate the association between the dependent variable and the independent variables.

## CHAPTER THREE

### ESTIMATION OF MEAN, MEDIAN, MODAL AND MINIMUM AGES AT FIRST BIRTH, FIRST MARRIAGE AND FIRST INTERCOURSE.

#### 3.0 INTRODUCTION

In this chapter, mean, median, modal and minimum ages at first birth, first marriage and first intercourse are estimated by direct statistical techniques by various differentials. Total fertility Rate (TFR) is also estimated by the various ages at first marriage, first birth, and first intercourse using the Coale-Trussell Technique.

#### 3.1.0. MEAN, MEDIAN AND MODAL AGES AT FIRST BIRTH

In this section, we present the mean, median, modal and minimum ages at first birth by differentials. The results obtained are presented in the table, given below.

#### 3.1.1 BY PLACE OF RESIDENCE

**Table 3.1 Mean, Median, and modal ages at first birth by place of residence**

Place of residence	Mean age at first Birth	Median age at first Birth	Modal age at first Birth
Rural	18.1	18	17
Urban	18.7	18	18

From the above table, it is evident that women living (residing) in rural areas have a lower mean age at first birth, of 18.1 years, than women living in urban areas with a mean age at first birth of 18.7 years. However, both rural and urban women were found to have a similar median age at first birth of 18 years each.

Based on modal age at first birth, most rural women were found to have had their first birth at the age of 17 years. Most urban women, on the other hand, were found to have had their first birth at age 18.

Mean age at first birth is higher in urban areas as opposed to rural areas since urban women are usually more educated than their rural counterparts. Educated women spend more years preoccupied with books hence they have little time, if any, to think about giving birth. They also fear role conflict hence they suspend giving of birth until they complete their education. However, there are some exceptional cases. Similarly, urban women are more advantaged in terms of contraceptive awareness, knowledge, accessibility and use. Urban women are therefore able to use contraceptives to control conception.

Similar findings have been noted by other scholars. McCarthy (1982), from his study on differentials in age at first marriage noted that in most African countries, rural women marry 1.5 to 2 years earlier than urban women. He argued that urban women marry late because they are more likely go to school and work outside home. Gaisie, S. (1984), in his study in Ghana, using data drawn from world fertility survey, found that women in urban centres have their first birth about a year later than those in rural areas. Engle (1978), from his study in 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.

### 3.1.2. BY RELIGION

Table 3.2 Mean, Median, and Modal ages at first birth by religious groups.

Religious Groups	Mean age at first Birth	Median age at first Birth	Modal age at first Birth
Catholic	18.192	18	18
Protestant	18.243	18	17
Muslim	18.284	18	15
Others	19.865	19	15
No religion	18.181	18	17

From the above results, Catholics, Protestants, Muslims and people with no religion were found to have a similar median age of 18 years. Only people belonging to other religious sects, not considered individually, were found to be odd with a median age of 19 years.

Muslims and others were found to have the lowest modal age at first birth of 15 years each. They are followed by people with no religion and Protestants both with a similar modal age of 17 years each. Catholics were found to have the highest modal age at first birth of 18 years.

Based on mean age at first birth, people with no religion were found to have the lowest mean age of 18.18 years. They are followed by Catholics with 18.19 years and then by Protestants with 18.24 years. Muslims are next with a mean age at first birth of 18.28 years, while those belonging to other religious sects have the highest mean age at first birth of 19.86 years.

### 3.1.3. BY ETHNICITY

Table 3.3 Mean, Median and Modal ages at first birth by ethnic groups.

Ethnic groups	Mean age at first birth	Median age at first birth	Modal age at first birth
Kalenjin	18.02	18	18
Kamba	18.72	19	18
Kikuyu	18.67	18	17
Kisii	17.92	18	17
Luhya	18.17	18	18
Luo	17.31	17	17
Meru/Embu	18.74	18	19
Mijikenda/Swahili	17.99	18	19
Others	19.26	19	17

From the results presented in the above table, Luos were found to have the lowest median age at first birth of 17 years. They are followed by the Kikuyu, Kalenjin, Kisii, Luhya, Meru/Embu and the Mijikenda/Swahili each with a median age at first birth of 18 years. The Kamba and others were found to have the highest median age at first birth of 19 years each.

Based on modal age at first birth, the Kikuyu, Kisii, Luo and others were found to have the lowest modal age at first birth of 17 years. The Meru/Embu and the Mijikenda/Swahili were found to have the highest modal age at first marriage of 19 years each.

However, Luos were found to have the lowest mean age at first birth of 17.31 years. They are followed by the Kisii with 17.92 years and then the Mijikenda/Swahili with 17.99 years. Next are the Kalenjins with a mean age at first birth of 18.02 years. They are followed by the Luhya with 18.17 years and then the Kikuyu with 18.67. The Kamba are next with 18.72 while the Meru/Embu and others have the highest mean age at first birth of 18.74 and 19.26 years respectively.

Similar ethnic variations in age at first birth have been noted in other countries. Bloom (1981), in his study on the age pattern of women at first birth, for Whites and Non-whites, in the United States, 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 .7 and .8 for Whites and non-whites respectively. He observed that non-white cohorts have an appreciable number of first births at earlier ages, coupled with a lower mean age at first birth than their white counterparts. He also noted that mean age at first birth is increasing across cohorts of white women while it is stable across cohorts of non-white women.

**3.1.4. BY WORK STATUS**

Table 3.4 Mean, Median and Modal ages at first birth by work status.

Work status	Mean age at first birth	Median age at first birth	Modal age at first birth
Working	19.28	19	20
Not working	18.09	18	17

From the above table, it is worth noting that those who were not working at the time of the survey have a lower median age at first birth of 18 years compared to 19 years for those who were working.

Consequently, most of those who were not working were found to have had their first birth at a modal age of 17 years. On the other hand, most of those who were working were found to have had their first birth at a modal age of 20 years.

Based on mean age at first birth, those who were not working were found to have a lower mean age at first birth of 18.01 years compared to 19.28 years for those who were working.

### 3.1.5. BY LEVELS OF EDUCATION

Table 3.5 Mean, Median and Modal ages at first birth by educational levels.

Educational levels	Mean age at first birth	Median age at first birth	Modal age at first birth
No educ.	17.86	17	16
Primary educ.	17.90	18	17
Secondary educ.	19.65	19	20
Higher educ.	24.65	24	27

From the above table, it can be observed that those with no education were found to have the lowest median age at first birth of 17 years. They are followed by those with primary education with 18 years. Next are those with secondary education with 19 years. Those with higher levels of education were found to have the highest median age at first birth of 24 years.

Similarly, those with no education were found to have the lowest modal age at first birth of 16 years, followed by those with primary education with 17 years. Next are those with secondary education with a modal age at first birth of 20 years. Those with higher levels of education were found to have the highest modal age at first birth of 27 years.

Consequently, those with no education were found to have the lowest mean age at first birth of 17.86 years. They are followed by those with primary education with a mean age at first birth of 17.90 years. Next are those with secondary education with 19.65 years. Those with higher levels of education were found to have the highest mean age at first birth of 24.65 years.

Similar variations have also been noted by other scholars. Gaisie (1984), in his study in Ghana, using data drawn from world fertility survey, found that women with



secondary education and above do 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.

### 3.1.6. BY REGIONS (PROVINCES)

Table 3.6 Mean, Median and Modal ages at first birth by regions.

Provinces	Mean age at first birth	Median age at first birth	Modal age at first birth
Nairobi	18.70	18	18
Central	18.68	18	18
Coast	18.30	18	18
Eastern	18.67	18.5	19
Nyanza	17.41	17	17
Rift Valley	18.26	18	18
Western	18.01	18	18

From the results presented in the above table, Nyanza province was found to have the lowest median age at first birth of 17 years. Eastern has the highest median age at first birth of 18.5 years while the remaining provinces have 18 years each.

Similarly, Nyanza province was found to have the lowest modal age at first birth of 17 years. Nairobi, Central, Coast, Rift-Valley and Western provinces were next with 18 years each. Eastern province was found to have the highest modal age at first birth of 19 years.

Based on mean age at first birth, Nyanza province had the lowest of 17.41 years. It is followed by Western province with a mean age at first birth of 18.01 years. Next are Rift-Valley and Coast provinces with 18.26 and 18.67 years respectively. They are followed closely by Central province with 18.68 years. Nairobi province was found to have the highest mean age at first birth of 18.70 years.

### 3.2.0 MEAN, MEDIAN AND MODAL AGES AT FIRST INTERCOURSE

In this section, we present the mean, median, modal and minimum ages at first intercourse by differentials. The results obtained are presented in the tables given below.

#### 3.2.1. BY PLACE OF RESIDENCE

Table 3.7 Mean, Median and Modal ages at first intercourse by place of residence

Place of residence	Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
Rural	15.729	15	14
Urban	16.381	16	15

From the above table, those residing in the rural areas have a lower median age at first intercourse of 15 years while their counterparts in urban areas have a median age of 16 years.

Consequently, those living in rural areas have a lower modal age at first intercourse of 14 years. Their counterparts in urban areas have a higher modal age at first intercourse of 15 years.

Similarly, those living in the rural areas have a higher mean age at first intercourse than those living in the urban areas. They have a mean age at first intercourse of 15.73 and 16.38 years respectively.

**RELIGION:**

Mean, Median and Modal ages at first intercourse by religious groups.

Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
15.828	17	15
15.947	16	15
16.143	17	15
16.868	16	14
15.407	15	15

As presented in the above table, those with no religion have the lowest age at first intercourse of 15 years. They are followed by Muslims with a median age of 16 years each. Catholics and those of other religious sets have the highest median age at first intercourse of

17 years each. And, those belonging to other religious sects have a low modal age at first intercourse of 14 years. The other remaining religious sects; Catholics, Protestants and those belonging to no religion, have a modal age at first intercourse of 15 years each.

As for the mean age at first intercourse, those with no religion have the lowest of 15.407 years. Catholics and Protestants are next with 15.828 and 15.947 years respectively. They are followed by the Muslims with a mean of 16.143 years while those of the other religious sets have the highest mean age at first intercourse of 16.868 years.

### 3.2.3. BY ETHNICITY

Table 3.9 Mean, Median and Modal ages at first intercourse by ethnic groups

Ethnic groups	Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
Kalenjin	16.027	16	15
Kamba	15.525	15	15
Kikuyu	16.687	17	15
Kisii	15.738	16	15
Luhya	16.139	16	15
Luo	14.748	15	15
Meru/Embu	15.742	15	15
Mijikenda/Swahili	15.526	15	15
Others	17.118	16	15

The above table shows that the Kamba, Luo, Meru/Embu, and the Mijikenda/Swahili were found to have the lowest median age at first intercourse of 15 years each. The Kikuyu have the highest median age at first intercourse of 17 years. All the ethnic groups reported a modal age at first intercourse of 15 years each.

Based on mean age at first intercourse, Luos were found to have the lowest of 14.748 years. They are followed by the Kamba, Mijikenda/Swahili and the Kisii with 15.525, 15.526 and 15.738 years respectively. The Kikuyu were found to have the highest mean age at first intercourse of 16.687 years.

### 3.2.4. BY WORK STATUS

Table 3.10 Mean, Median and Modal ages at first intercourse by work status.

Work status	Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
Working	17.087	17	15
Not working	15.718	15	15

From the above results, those who were not working have a lower median age at first intercourse than those who are working. They have 15 and 17 years respectively. However, they have the same modal age at first intercourse of 15 years each.

Those who are not working were also found to have a lower mean age at first intercourse compared to those who are working. Those who are not working have a mean of 15.718 while those who are working have 17.087.

### 3.2.5 BY EDUCATIONAL LEVELS

Table 3.11 Mean, Median & Modal ages at first intercourse by levels of education.

Educational levels	Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
No educ.	15.133	15	15
Primary educ.	15.64	15	15
Secondary educ.	17.361	17	18
Higher educ.	21.182	21	20

From the results presented in the above table, those with primary education have the lowest median age at first intercourse of 15 years each. They are followed by those with secondary education with 17 years. Those with higher levels of education have the highest median age at first intercourse of 21 years.

Consequently, those with no education were found to have the lowest mean age at first intercourse of 15.133 years. They are followed by those with primary education with a mean age at first intercourse of 15.64 years. Next are those with secondary education with 17.361 years. Those with higher levels of education were found to have the highest mean age at first intercourse of 21.182 years.

### 3.2.6. BY REGIONS (PROVINCES)

Table 3.12 Mean, Median and Modal ages at first intercourse by regions.

Provinces	Mean age at first intercourse	Median age at first intercourse	Modal age at first intercourse
Nairobi	16.358	16	15
Central	16.797	17	15
Coast	15.898	15	15
Eastern	15.415	15	15
Nyanza	14.832	15	14
Rift Valley	16.114	16	15
Western	16.134	16	15

From the above results, Nyanza, Eastern and Coast provinces were found to have the lowest median age at first intercourse of 15 years each. Nairobi, Rift Valley and Western provinces are next with 16 years each. Central province was found to have the highest median age at first intercourse of 19 years.

Based on modal age at first intercourse, Nyanza province was found to have the lowest of 14 years. The other remaining provinces have a mode of 15 years each.

Similarly, Nyanza provinces was found to have the lowest mean age at first intercourse of 14.832 years. It is followed by Eastern province with a mean age at first intercourse of 15.415 years. Next are Rift Valley and Coast provinces with 15.898 and 16.114 years respectively. Western province is next with 16.134 followed by Nairobi with a mean of 16.358 years. Central province was found to have the highest mean age at first intercourse of 16.797 years.

### 3.3.0. MEAN, MEDIAN AND MODAL AGES AT FIRST MARRIAGE

In this section we present the mean, median and modal ages at first marriage by differentials. The results obtained are presented in the tables given below. Kendal

(1979) reports that mean age at first marriage is a useful gauge for comparing marriage patterns across societies or across groups within a given society.

### 3.3.1. BY PLACE OF RESIDENCE

Table 3.13 Mean, Median and Modal ages at first marriage by place of residence.

Place of residence	Mean age at first marriage	Median age at first marriage	Modal age at first marriage
Rural	17.43	17	17
Urban	18.24	18	19

The above table shows that women residing in rural areas have a lower median age at first marriage of 17 years compared to women residing in urban areas with 18 years.

Consequently, rural women were also found to have a lower modal age at first marriage compared to urban women. Most of rural women were found to have engaged in first marriage at age 17, while most urban women had it at 19.

Based on mean age at first marriage, women residing in rural areas were also found to have a lower mean compared to their counterparts residing in urban areas. Rural women had a mean age at first marriage of 17.43 while urban women had 18.24 each. Similar findings have also been noted by other scholars. Goldman and Corman (1980) in their analysis of nuptial data using the Colombia National Survey, observed that there exists urban-rural differences in ages at first marriage with a higher proportion of the ever married in rural areas. They found the mean ages at first marriage to be 21.9 and 20.7 years for urban and rural areas respectively. McCarthy (1982) from his study on differentials in age at first marriage reported that, in most African countries, rural women marry 1.5 to 2 years earlier than urban women.

### 3.3.2 BY RELIGION

Table 3.14 Mean, Median and Modal ages at first marriage by religious groups.

Religious Groups	Mean age at first marriage	Median age at first marriage	Modal age at first marriage
Catholic	17.67	18	18
Protestant	17.72	17	16
Muslim	17.14	17	15
Others	18.8	18	18
No religion	16.18	16	15

From the results presented in the above table, those with no religion were found to have the lowest median age at first marriage of 16 years. They are followed by Protestants and Muslims with 17 years each. Catholics and those belonging to other religious sects were found to have the highest median age at first marriage of 18 years each.

Those with no religion and Muslims were found to have the lowest modal age at first marriage of 15 years each. They are followed by the Protestants with a modal age at first marriage of 16 years. Catholics and other religious sects had the highest modal age at first marriage of 18 years each.

Based on mean age at first marriage, those with no religion have the lowest of 16.18 years. Muslims are the next with 17.14, followed by Catholics with 17.67 years. Protestants had a higher mean age at first marriage of 17.72 years, while those belonging to other religious sects had the highest mean of 18.8 years.



### 3.3.3. BY ETHNICITY

Table 3.15 Mean, Median and Modal ages at first marriage by ethnic groups.

Ethnic groups	Mean age at first marriage	Median age at first marriage	Modal age at first marriage
Kalenjin	17.2	17	17
Kamba	18.45	18	18
Kikuyu	18.76	19	18
Kisii	17.31	17	17
Luhya	17.59	17	16
Luo	16.46	16	16
Meru/Embu	18.54	18	18
Mijikenda/Swahili	15.95	16	15
Others	18.24	18	19

From the above table, Luos and the Mijikenda/Swahili were found to have the lowest median age at first marriage of 16 years each. They are closely followed by the Luhya, Kisii and Kalenjin with 17 years each. Next are the Kamba, Meru/Embu and others with 18 years each. The Kikuyu were found to have the highest median age at first marriage of 19 years.

On the other hand, the Mijikenda/Swahili were found to have the lowest modal age at first marriage of 15 years. They are followed by the Luhyas and Luos with 16 years each. Next are the Kalenjins and the Kisii with 17 years each, followed by the Kamba, Kikuyu and the Meru/Embu with 18 years each. Those belonging to other ethnic groups had the highest modal age at first marriage of 19 years.

Based on mean age at first marriage, the Mijikenda/Swahili had the lowest of 15.95 years. They are followed by the Luo and the Kalenjin with 16.46 and 17.2 years respectively. Next are the Kisii, Luhya and others with 17.31, 17.59 and 18.24 years respectively. They are followed by the Kamba and the Meru/Embu with

18.45 and 18.54 years respectively. However, the Kikuyu were found to have the highest mean age at first marriage of 18.76 years.

### 3.3.4. BY WORK STATUS

Table 3.16 Mean, Median and Modal ages at first marriage by work status.

Work status	Mean age at first marriage	Median age at first marriage	Modal age at first marriage
Working	19.26	19	20
Not working	17.41	17	17

From the results given in the above table, those who were not working also had a lower median age at first marriage of 17 years compared to the 19 years for those who were working.

Consequently, those who were not working had a lower modal age at first marriage of 17 years. On the other hand, those who were working had a higher modal age at first marriage of 20 years.

Based on mean age at first marriage, those who were working had a higher mean of 19.26 years compared to 17.41 years for those who were not working.

### 3.3.5. BY LEVELS OF EDUCATION:

Table 3.17 Mean, Median & Modal ages at first marriage by levels of education.

Educational levels	Mean age at first marriage	Median age at first marriage	Modal age at first marriage
No educ.	16.58	16	15
Primary educ.	17.44	17	16
Secondary educ.	19.82	20	19
Higher educ.	24.58	24	22

From the above table, it is clearly evident that those with no education had the lowest median age at first marriage of 16 years. They are followed by those with primary and secondary education with 17 and 20 years respectively. Those with higher levels of education had the highest median age at first marriage of 24 years.

Consequently, those with no education had the lowest modal age at first marriage of 15 years. They are followed by those with primary and secondary education with 16 and 19 years respectively. Those with higher levels of education have the highest modal age at first marriage of 22 years.

Similarly, those with no education had the lowest mean age at first marriage of 16.58 years. Those with primary education were next with a mean of 17.44 years, followed by those with secondary education with 19.82 years. Those with higher levels of education had the highest mean age at first marriage of 24.58 years.

### 3.3.6. BY REGIONS (PROVINCES):

Table 3.18 Mean, Median and Modal ages at first marriage by regions.

Provinces	Mean age at first marriage	Median age at first marriage	Modal age at first age
Nairobi	18.61	18	18
Central	18.8	19	18
Coast	16.5	16	15
Eastern	18.45	18	18
Nyanza	16.57	16	16
Rift Valley	17.39	17	17
Western	17.4	17	17

From the above table, it can be observed that, Coast and Nyanza provinces have the least median age at first marriage of 16 years each. They are closely followed by Rift-Valley and Western provinces with a median age of 17 years each. Nairobi and Eastern provinces are next with a median age of 18 years each, while Central province has the highest median age of 19 years.

Coast province was found to have the least modal age at first marriage of 15 years, followed by Nyanza with 16 years. Rift Valley and Western provinces are next with 17 years each. Eastern, Central and Nairobi provinces have the highest modal age at first marriage of 18 years each.

Based on mean age at first marriage, Coast province had the lowest of 16.50 years. It is followed by Nyanza and Rift Valley provinces with a mean of 16.57 and 17.39 years respectively. Western and Eastern provinces are next with 17.4 and 18.45 years respectively, followed by Nairobi with 18.61 years. Central province was found to have the highest mean age at first marriage of 18.8 years.

Table 3.19 Proportion of women marrying at exact ages

Age	Percentage of Married women	Cumulative Percent
<15	17.7	17.7
15	9.7	27.4
16	11.8	39.1
17	12.1	51.2
18	12.1	63.4
19	10.7	74.1

The above table shows that women are experiencing early marriages in Kenya. About three quarters of the women covered in the survey in 1989 were married by age 19.

Table 3.20 Proportion of women who are mothers at exact ages

Age	Percentage of Women Who are Mothers	Cumulative Percent
<15	10.6	10.6
15	7.7	18.3
16	11.0	29.3
17	14.1	43.4
18	14.1	57.5
19	12.5	70.1

The table above shows that women are experiencing early births in Kenya. 70 percent of the women covered in the survey in 1989 were married by age 19. This is an exhibition of a very young age at motherhood which should be checked. This shows that adolescent fertility is alarmingly high in Kenya.

Table 3.21 Proportion of women experiencing intercourse at exact ages

Age	Percentage of Women Experiencing intercourse	Cumulative Percent
<15	33.2	33.2
15	16.8	50.1
16	10.9	61.0
17	8.8	69.8
18	8.8	78.6
19	4.2	82.8

The above table shows that most Kenyan women are experiencing sexual intercourse at very young ages. By age 15, 50 percent of the women had experienced sexual intercourse. This is one of the factors contributing to the high fertility which is persistent in Kenya.

### 3.4 SUMMARY

In summary, we observe that the selected demographic variables (ages at first marriage, first birth and first intercourse) vary by levels of educational attainment, ethnicity, religion, place of residence and work status.

Specifically, ages at first birth, first marriage and first intercourse were found to be inversely related to educational levels. They are also positively related to urban residence and employment and negatively related to rural residence and unemployment.

## **CHAPTER FOUR**

### **FERTILITY LEVELS IN KENYA BY AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE.**

#### **4.0 INTRODUCTION.**

In this chapter, the fertility levels prevailing in Kenya based on ages at first intercourse, first birth and first marriage, are estimated using the Coale-Trussel P/F technique. The ages at first marriage, first birth and first intercourse have been categorised into six categories on the basis of the mean, median and modal ages at first marriage, first birth and first intercourse which fall between ages 14 and 19.

#### **4.1 ESTIMATION OF FERTILITY LEVELS IN KENYA IN 1989 BY AGE AT FIRST INTERCOURSE.**

In this section, the total fertility rates of women are estimated based on their reported ages at first intercourse. The various ages at first intercourse were grouped into six categories covering all women aged 15-49. The six categories are as follows:

- i. Women who had first intercourse at ages <15.
- ii. Women who had first intercourse at age 15.
- iii. Women who had first intercourse at age 16.
- iv. Women who had first intercourse at age 17.
- v. Women who had first intercourse at age 18.
- vi. Women who had first intercourse at age 19+.

The table below presents the proportions of women experiencing first birth, first marriage and first intercourse by the specific age categories presented above.

**Table 4.1 Proportions of women experiencing first birth, first marriage and first intercourse by specific age categories**

Age Category	% Women Married	% Women Experi Intercourse	% Women Who are Mothers
<14	12.0	23.5	5.8
14-16	28.2	38.1	24.5
17-18	24.3	17.0	28.8
19+	35.5	21.4	40.9

The total fertility rates of these women were then estimated, based on the above categories, using the Coale-Trussell P/F Technique. In order to estimate the total fertility rate (TFR) by age at first intercourse, for women who had their first intercourse between ages 10-14, in Kenya in 1989 using the Coale-Trussell P/F technique, the following information given by table 4.2 below was used.

**Table 4.2: Female population, children ever born and births in the past year by age group of the mother: Kenya, 1989.**

AGE GROUP (1)	INDEX (2)	FPOP (3)	CEB (4)	BLY (5)
15-19	1	13	25	7
20-24	2	38	106	9
25-29	3	134	617	41
30-34	4	145	903	27
35-39	5	108	795	19
40-44	6	122	920	6
45-49	7	44	384	2

From table 4.2 above, we use column (3) and column (4) to get average parities  $P(i)$  and age specific fertility rates  $f(i)$ . Average parity is computed by dividing the total number of children ever born by the female population i.e.:-

$$P(i) = \text{CEB}/\text{Fpop for the } i^{\text{th}} \text{ age-group.}$$

The full results are given in table 3.20 below. For example

$$P(1) = (25/13) = 1.923077$$

The age specific fertility rates ( $f(i)$ ), are obtained by dividing the number of births in the year preceding the survey by the female population. i.e.,

$$f(i) = \text{BLY}/\text{Fpop for the } i^{\text{th}} \text{ age-group}$$

For example,

$$f(2) = (9/38) = 0.236842$$

The full results are shown in table 4.2 given below

**Table 4.3: Average parities and unadjusted age specific fertility rates by age group of mother: kenya, 1989.**

AGE GROUP (1)	INDEX (2)	Average parity P(i) (CEB/FPOP) (3)	ASFR f(i) (BLY/FPOP) (4)
15-19	1	1.923077	0.538462
20-24	2	2.789474	0.23684
25-29	3	4.604478	0.30597
30-34	4	6.227586	0.186207
35-39	5	7.361111	0.175926
40-44	6	7.540984	0.04918
45-49	7	8.727273	0.045455
TOTAL			7.690207

The  $f(i)$  values obtained above are then used to estimate the cumulated fertility schedule  $Q(i)$  values. The  $Q(i)$  values are obtained by adding the values of  $f(i)$ , starting from  $i = 1$  and ending with  $i = j$  for  $j = 1, 2, 3, \dots, 7$ , and then multiplying this sum by five. The rationale behind multiplying by five is because the five-year-age-groups are being considered. The formula for estimating  $Q(i)$  values is as follows:

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

$$Q(4) = 5 (0.538462 + 0.236842 + 0.30597 + 0.186207) \\ = 5.406369$$

The full results of the  $Q(i)$  values are presented in table 3.21 given below.

The  $Q(i)$  values are then used to derive the current average parity equivalents  $F(i)$ .

The formula for computing the  $F(i)$  values is as follows:



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

$$F(7) = Q(6) + a(7) \times f(6) + b(7) \times f(7)$$

Here the coefficients for a(i), b(i), c(i) are shown on table 2.1. of chapter two.

example,

$$\begin{aligned} F(4) &= Q(3) + a(2) \times f(2) + b(2) \times f(3) + c(2) \times Q(7) \\ &= 3.876518 + (3.321) \times (0.108159) + (0.754) \times (0.144) + \\ &\quad (0.0161) \times (2.803304) \\ &= 5.970548 \end{aligned}$$

$$\begin{aligned} F(7) &= 7.217033 + (0.392) \times (0.027027) + (2.608) \times (0.0333330) \\ &= 7.651924 \end{aligned}$$

full results are shown in table 4.3 given below

Table 4.3: Cumulative fertility and average parity equivalents by age group of mother: Kenya, 1989.

AGE GROUP	INDEX (2)	Cumulative fertility Q(i-1) (3)	Parity equivalent F(i) (4)
15-19	1	0	1.336776
20-24	2	2.692308	3.371971
25-29	3	3.876518	4.870267
30-34	4	5.406369	5.970548
35-39	5	6.337403	6.9234
40-44	6	7.217033	7.293426
45-49	7	7.462935	7.651924

we are now considering a case in which births in the past year were related by age of mother at the time of census, the reported period fertility rates, need to be converted into a fertility schedule,  $f_+(i)$ , for the conventional age groups. Equation 2(a) and 2(b) are used to convert the  $f(i)$  values and the results obtained from the calculations are presented in table 3.22 given below. The converted  $f(i)$  is denoted by  $f_+(i)$  and is calculated as shown below:

$$f_+(i) = [1-w(i-1)] \times f(i) + w(i) \times f(i+1)$$

where,

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

and,  $w(i)$  is the weighting variable.

For example,

$$f+(1) = [1-w(0)] \times f(1) + [w(1) \times f(2)]$$

since,

$$\begin{aligned} w(1) &= x(1) + [y(1) \times f(1)/Q(7)] + [z(1) \times f(2)/Q(7)] \\ &= 0.031 + [2.287(0.072159)/7.462935] + \\ &\quad [-0.114(0.108159)/7.462935] \\ &= 0.194645 \end{aligned}$$

Therefore,

$$\begin{aligned} f+(1) &= (1-0) \times 0.538462 + 0.194645 \times (0.236842) \\ &= 0.584562 \end{aligned}$$

The full results of the calculated  $f+(i)$  values are shown in table 4.4 given below.

**Table 4.4: Weighting factors and the estimated parity equivalents: Kenya, 1989.**

Age group(i) (1)	Index (i) (2)	Weighting factors $W(i)$ (3)	Est. Parity equivalents $f+(i)$ (4)
15-19	1	0.194645	0.584562
20-24	2	0.089497	0.218125
25-29	3	0.118844	0.300716
30-34	4	0.112555	0.183879
35-39	5	0.178811	0.164919
40-44	6	0.165027	0.047888
45-49	7		0.037953

In order to select the adjustment factor,  $K$ , for adjusting the fertility rates  $f+$  values obtained above, the first step is to calculate the  $P/F$  ratios whose values are

presented in table 4.5 given below. The P/F ratios are then used to calculate the K values as shown below.

$$K_1 = P_2/F_2 = 0.827253$$

$$K_2 = P_3/F_3 = 0.945426$$

$$K_a = (P_2/F_2 + P_3/F_3)1/2 = 0.88634$$

$$K_{\text{mean}} = (P_1/F_1 + P_2/F_2 + \dots + P_7/F_7)1/7 = 1.008905$$

Hence,

$$K = ( K_1, K_2, K_a, K_{\text{mean}} )$$

The adjusted age-specific fertility rates  $f^*(i)$  are then obtained by multiplying the conventional age specific fertility rates,  $f_+(i)$ , by the chosen value of the adjustment factor K. In this study,  $K_a$  values have been used because they give more consistent results. The full  $f^*(i)$  results are presented in table 4.5 given below.

**Table 4.5: P/F ratios and adjusted fertility rates by age group of mother: Kenya, 1989.**

AGE GROUP (1)	INDEX (2)	P/F ratios $P(i)/F(i)$ (3)	Adjusted fertility rates $f(i)^*$ (4)
15-19	1	1.438593	0.55266
20-24	2	0.827253	0.206221
25-29	3	0.945426	0.284305
30-34	4	1.043051	0.173844
35-39	5	1.063222	0.155918
40-44	6	1.033943	0.045274
45-49	7	1.140533	0.035882
TOTAL			1.454104

The adjusted age specific fertility rates  $f^*(i)$  values are then used to calculate the total fertility rates (TFR) as shown below;

$$i=7$$

$$TFR = 5 \sum_{i=1} f^*(i) = 7.270523$$

$$i=1$$

The above procedure was repeated for women who had their first intercourse at ages; 15, 16, 17, 18 and 19 respectively and the results obtained are presented in table 4.6 given below.

**Table 4.6: Female Population, and adjusted Total Fertility Rates by Ages at First Intercourse: Kenya, 1989.**

Age at first Intercourse (1)	Index (2)	Female population (3)	Adjusted (TFR) (4)
<15	1	604	7.271
15	2	1178	7.078
16	3	754	6.814
17	4	589	6.748
18	5	572	6.517
19+	6	247	5.741

From the above table, it can be observed that women who experienced their first intercourse between ages 10-14 have the highest total fertility rate (TFR) of 7.271. Next are those who experienced their first intercourse at ages 15 and 16 with 7.078 and 6.814 respectively. They are followed by those who got their first intercourse at ages 17 and 18 with 6.748 and 6.517 respectively while those who experienced their intercourse at age 19 have the least total fertility rate of 5.741.

From these results, it is clearly evident that age at first intercourse has a remarkable influence on fertility. It can be observed that total fertility rate decreases with an increase in age at first intercourse. This trend can be explained by the fact that most adolescents who engage in pre marital sex are reluctant to practice contraception to prevent conception. This was observed by Khasiani (1985) in her study on adolescent fertility in Kenya. She reported that more adolescents are engaging in pre marital sex at younger ages yet very few of them practice contraception to prevent conception despite knowing about them.

## 4.2. AGE AT FIRST MARRIAGE AND TOTAL FERTILITY RATE

In this section, the total fertility rates of women are estimated based on their reported ages at first marriage. The various ages at first marriage were grouped into six categories covering all women aged 15-49. The six categories are as follows:

- i. Women who got married first at ages <15.
- ii. Women who got married first at age 15.
- iii. Women who got married first at age 16.
- iv. Women who got married first at age 17.
- v. Women who got married first at age 18.
- vi. Women who got married first at age 19+.

The total fertility rates of these women were then estimated, based on the above categories using the Coale-Trussell P/F Technique procedure as used in the case of age at first intercourse above. The results which were obtained are presented in the table given below.

**Table 4.7: Female Population and adjusted Total Fertility Rates by Ages at First Marriage.**

Age at first Marriage (1)	Index (2)	Female population (3)	Adjusted (TFR) (4)
<15	1	898	7.653
15	2	477	7.446
16	3	609	7.198
17	4	605	6.891
18	5	620	5.566
19+	6	536	4.457

From the above table, it is clearly evident that those who realised their first marriage at an early age have a higher fertility than their counterparts who realised

their first marriage late. Those who got married first at age 10-14 have the highest total fertility rate of 7.653, followed by those who got married first at age 15. Next are those who got married first at age 16 with 7.198 followed by those who got married first at age 17 and 18 with 6.891 and 5.566 respectively. Those who got married first at age 19 have the lowest total fertility rate of 4.457.

From these results, we realise that total fertility rate decreases with an increase in age at first marriage. This trend is similar to that observed by other scholars. Ang'awa (1988), using the Kenya Contraceptive Prevalence Survey data of 1984, found out that women who marry at an early age have a higher total fertility rate than those who marry late. For instance, he found that women who got married first at ages 14 and 19 had an estimated total fertility rate of 10.57 and 7.58 respectively. However, his results are much higher than the ones of this study.

Similarly, Abdullah (1980) in a study on Indonesia, found out that women who got married first at ages less than 15 had 4.0 children ever born, while those who got married at age 20 and above had 2.7 children ever born. Coalle (1961), while using a stable population model, reported that postponement of marriage can contribute substantially to a reduction in birth rate and population growth. He noted that this contribution is potentially large in those countries with high fertility and low ages at first marriage and first birth. Agarwala (1964), in his study on the effect of age at marriage on fertility in India, found that females marrying between ages 14 and 17 gave birth to 5.9 children, while those marrying between ages 18 and 21 eventually gave birth to 4.7 children. Among the middle class urban population of Calcutta, he reported that females marrying between 10 and 14 years gave birth to 6.3 children, those marrying between 15 and 19 gave birth to 5.1 children while those marrying between 20 and 24 years gave birth to only 3.7 children.

Leisure (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. 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.

#### **4.3 AGE AT FIRST BIRTH AND TOTAL FERTILITY RATE.**

In this section, the total fertility rates of women are estimated based on their reported ages at first birth. The various ages at first birth were also grouped into six categories covering all women aged 15-49. The six categories are as follows:

- i. Women who got their first birth at ages <15.
- ii. Women who got their first birth at age 15.
- iii. Women who got their first birth at age 16.
- iv. Women who got their first birth at age 17.
- v. Women who got their first birth at age 18.
- vi. Women who got their first birth at age 19+.

The total fertility rates of these women were then estimated, based on the above categories using the Coale-Trussell P/F Technique procedure as used in the case of age at first intercourse above. The results which were obtained are presented in the table given below.

**Table 4.8: Female Population and adjusted Total Fertility Rates by Ages at First Birth: Kenya, 1989**

Age at first Birth (1)	Index (2)	Female population	Adjusted (TFR)
<15	(1)	307	9.487
15	(2)	391	8.421
16	(3)	606	7.278
17	(4)	748	6.755
18	(5)	774	6.626
19+	(6)	663	4.639

From the above table, it is clearly evident that age at first birth also has a remarkable influence on fertility. It can be observed that women who got their first birth at an early age have the highest total fertility rate of 9.487 followed by those who got their first birth at age 15 with 8.421. Next are those who got their first birth at ages 16, 17 and 18 with 7.278, 6.755 and 6.626 respectively. Those who got their first birth at age 19 have the lowest total fertility rate of 4.639.

From the above results, it can be observed that total fertility rate decreases with an increase in age at first birth, just like we observed in the cases involving age at first marriage and first intercourse. A similar pattern was also observed by Ang'awa (1988) who found out that total fertility rate decreases as age at first birth increases. He noted, for example, that women 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 only 6.92. However, his results (rates) are higher than the ones of this study.

#### **4.4.0 REGRESSION ANALYSIS**

This section discusses the regression results of the various ages at first marriage, first birth and first intercourse by fertility (the total number of children ever born). The main reason for this is to help in establishing the association existing between the independent variables and the dependent variable. However, the findings of



this analysis cannot be discussed firmly since the proximate determinants that affect fertility directly were not controlled for. It has however succeeded in showing the degree of association between the independent variables and fertility.

#### **4.4.1 ANALYSIS AND PRESENTATION OF THE RESULTS**

Step-wise regression procedure was used to analyze the data and every variable was put into the equation in some sequence. The order of inclusion of the variables into the equation was determined by the package. Each of the additional variables was brought into the equation at separate stages on the merits of the association with the fertility index.

#### **4.4.2 DISCUSSION OF THE RESULTS**

All the variables considered in the regression were significant. The equation finally obtained from the regression can be summarized as follows;

$$\text{CEB} = 0.686 + 1.460 (\text{AFM1}) + 1.127(\text{AFM2}) + 0.833(\text{AFM3}) + 3.187(\text{AFB1}) + 2.607(\text{AFB2}) + 2.098(\text{AFB3}) + 1.204(\text{AFI1}) + 0.993(\text{AFI2}) + 0.418(\text{AFI3}).$$

It is clearly evident from the above equation that demographic factors (ages at first marriage, first birth and first intercourse) have a significant influence on the total children ever born between ages 15-49 years. All the variables showed a positive effect on the total children ever born when compared with the reference categories (AFM4, AFB4 and AFI4 defined above).

The results show that women who got married first at ages <14 have the highest association with total children ever born, hence they have the highest fertility. This is because they have the highest positive association in relation to the reference

category, in terms of the total children ever born. This finding could be attributed to the fact that women who marry early have a longer reproductive span within which to produce children unlike their counterparts who marry later.

Women who got married at ages 14-16 are next with a higher association with total children ever born, hence they have a higher fertility. They have a higher positive association with the total number of children ever born, in relation to the reference category. However, their fertility is lower than that of those who got married before them at ages <14.

Those who got married at ages 17-18 are next with a high association with total children ever born, hence they have a higher fertility. This is because they have a positive association with the total number of children ever born, in relation to the reference category. However, their fertility is lower than the one for those who got married before them at ages <14 and 14-16.

From these results, we observe that age at first marriage is inversely related to fertility. This is because as we move from the reference category (AFM4 = women who married first at age 19+) we note that there is a positive association between children ever born and age at first marriage. Those who got married earliest, at ages <14, have the highest positive association with children ever born. This positive association decreases as we approach the reference category (AFM4).

Based on ages at first birth, women who got their first birth at ages <14 have the highest association with total children ever born, hence they have the highest fertility. This is because they have the highest positive association with the reference category, in terms of the total children ever born. This finding could be attributed to the fact that women who get their first birth early have a longer

reproductive span within which to produce children unlike their counterparts who experience their first birth later.

Those who got their first birth at ages 14-16 are next with a higher association with total children ever born, hence they have a higher fertility. This is because they have a higher positive association with the total number of children ever born, in relation to the reference category. However, their fertility is lower than the one for those who got their first birth before them at ages <14.

Women who got their first birth at ages 17-18 are next with a high association with total children ever born, hence they have a higher fertility. This is because they have a high positive association with the total number of children ever born, in relation to the reference category (AFB4). However, their fertility is lower than the one for those who got their first birth before them at ages <14 and 14-16.

From these results, we observe that age at first birth is also inversely related to fertility. This is because as we move from the reference category (AFB4=women who had first birth at age 19+) we note that there is a positive association between children ever born and age at first birth. Those who got their first birth earliest, at ages <14, have the highest positive association with children ever born. This positive association decreases as we approach the reference category (AFB4).

Based on ages at first intercourse, women who experienced their first intercourse at ages <14 were found to have no significant influence on the total children ever born. However, women who experienced their first intercourse at ages 14-16 have a higher association with of total children ever born, hence they have a higher fertility. This is because they have a higher positive association with the reference category, in terms of the total children ever born. This finding could be attributed to the fact that women who experience their first intercourse early have a longer

reproductive span within which to produce children unlike their counterparts who experience their first intercourse later.

Women who experienced their first intercourse at ages 17-18 have a high association with of total children ever born, hence they have a high fertility. This is because they have a higher positive association with the total number of children ever born, in relation to the reference category (AFI4). However, their fertility is lower than the one for those who experienced their first intercourse before them at ages 14-16.

From these results, we observe that age at first intercourse is also inversely related to fertility. This is because as we move from the reference category (AFI4 = women who experienced first intercourse at age 19+) we note that there is a positive association between children ever born and age at first intercourse. Those who experienced their first intercourse earlier, at ages 14-16, have the highest positive association with children ever born. This positive association decreases as we approach the reference category (AFI4).

Generally, we realise from these results that ages at first marriage, first birth and first intercourse are inversely related to the fertility index (total children ever born). Specifically, age at first marriage was found to be the highest association with fertility. Age at first birth was found to be the second important variable, after age at first marriage, in explaining the observed variations in total children ever born (fertility). On the other hand, age at first intercourse was found to be the least important variable in explaining the observed variations in total children ever born (fertility).

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.0 INTRODUCTION**

This chapter summarises the main findings of this study. It also draws conclusions from the findings and, at the same time, makes recommendations for policy and further work as well.

#### **5.1 SUMMARY OF THE MAIN FINDINGS OF THE STUDY**

The main objective of this study was to examine the influence of selected demographic variables on fertility in Kenya by differentials, using the Kenya Demographic and Health Survey Data of 1989. Specifically, the study was set to achieve the following objectives:

- i). To investigate the variations in mean ages at first marriage, first birth and first intercourse by socio-cultural and socio-economic differentials in Kenya.
- ii). To estimate fertility levels in Kenya, using Coalle-Trussel PAF Technique, by ages at first intercourse, first birth and first marriage.
- iii). To examine the effect of ages at first marriage, first birth and first intercourse on fertility in Kenya.
- iv). To establish the relationship existing between ages at first marriage, first birth and first intercourse and fertility in Kenya.

The source data used in this study is the Kenya Demographic and Health Survey of 1989. This is a national survey which was carried out by the National Council for Population and Development (NCPD) in collaboration with the Central Bureau of Statistics (CBS) and the Institute for Resource Development (IRD).

Both statistical and Demographic Techniques were used in data analysis. The main statistical techniques used are Mean, Median, Mode (which were derived by cross tabulation technique using a computer) and the Multiple Regression Model. The only Demographic technique used is the Coale-Trussell P/F technique.

The Coale-Trussell P/F technique was used in calculating Total Fertility Rates (TFR) by the various ages at first intercourse, first marriage and first birth. Mean, Median and Mode are summary measures which were used to show the variations in ages at first marriage, first birth and first intercourse by the selected regional, socio-cultural as well as socio-economic differentials. Multiple Regression analysis was used to establish the nature of the relationship existing between ages at first intercourse, first birth and first marriage, on one hand, and fertility on the other hand.

## **5.2 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY ETHNICITY**

Mean ages at first intercourse, first birth and first marriage were found to vary by ethnicity as is summarised here below. Based on mean age at first intercourse, in an ascending order, Luos were found to have the lowest. They are followed by the Kamba, Mijikenda/Swahili and the respectively, while the Kikuyu were found to have the highest. Similarly, Luos were found to have the lowest mean age at first birth, followed by the, Mijikenda/Swahili, Kalenjin and the Luhya respectively. Next are the Kikuyu followed by the Kamba, while the Meru/Embu were found to have the highest mean age at first birth. However, the Mijikenda/Swahili were found to have the lowest mean age at first marriage. They are followed by the Luo, Kalenjin,, and the Luhya respectively. Next are the Kamba and the Meru/Embu while the Kikuyu were found to have the highest mean age at first marriage.

### **5.3 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY PLACE OF RESIDENCE**

Based on age at first intercourse, women living in the rural areas have a lower mean age at first intercourse than those living in the urban areas. Similarly, women residing in rural areas were also found to have a lower mean age at first birth than their urban counterparts. Consequently, women residing in rural areas were also found to have a lower mean age at first marriage compared to their counterparts residing in urban areas.

### **5.4 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY RELIGIOUS GROUPS**

Based on mean age at first birth, in an ascending order, women with no religion were found to have the lowest. They are followed by the Catholics and then the Protestants while the Muslims have the highest mean age at first birth. Similarly, women with no religion were found to have the lowest mean age at first intercourse. They are followed by Catholics and Protestants while Muslims were found to have the highest. Consequently, women with no religion were found to have the lowest mean age at first marriage. They are followed by Muslims and then Catholics while Protestants have the highest mean age at first marriage.

### **5.5 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY WORK STATUS.**

Based on mean age at first birth, women who were not working were found to have a lower mean age at first birth compared to those who were working. Similarly, women who were not working were also found to have a lower mean age at first

intercourse than the ones who were working. Consequently, women who were not working were also found to have a lower mean age at first marriage compared to their counterparts who were working.

#### **5.6 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY LEVELS OF EDUCATION**

Based on mean age at first intercourse, in an ascending order, women with no education were found to have the lowest followed by those with primary education. Next are women with secondary education, while those with higher levels of education were found to have the highest mean age at first intercourse.

Similarly, women with no education were found to have the lowest mean age at first birth followed by those with primary education. Next are women with secondary education while those with higher levels of education were found to have the highest mean age at first birth. Women with no education were also found to have the lowest mean age at first marriage followed by those with primary education. Women with secondary education are next while those with higher levels of education were found to have the highest mean age at first marriage.

#### **5.7 MEAN AGES AT FIRST INTERCOURSE, FIRST BIRTH AND FIRST MARRIAGE BY REGIONS/PROVINCES**

Based on mean age at first intercourse, in an ascending order, Nyanza province was found to have the lowest followed by Eastern, Rift Valley and Coast provinces respectively. Western province is next followed by Nairobi while Central province was found to have the highest mean age at first intercourse.



On the other hand, Nyanza province was found to have the lowest mean age at first birth, followed by Western, Rift-Valley and Coast provinces respectively. Central province is next while Nairobi province was found to have the highest mean age at first birth.

Based on mean age at first marriage, Coast province was found to have the lowest followed by Nyanza, Rift Valley and Western provinces respectively. Eastern and Nairobi provinces are next while Central province was found to have the highest mean age at first marriage.

### **5.8 AGES AT FIRST INTERCOURSE AND TOTAL FERTILITY RATES**

It was found that total fertility rate varies by the various ages at first intercourse. In a descending order, women who experienced their first intercourse between ages 10-14 were found to have the highest total fertility rate followed by the ones who experienced their first intercourse at ages 15, 16, 17 and 18 respectively. Women who experienced their first intercourse at age 19 were found to have the least total fertility rate. From these results, it is clearly evident that age at first intercourse has a remarkable influence on fertility. It can be observed that total fertility rate decreases with an increase in age at first intercourse.

### **5.9 AGES AT FIRST MARRIAGE AND TOTAL FERTILITY RATES**

Age at marriage was also found to influence total fertility rates. Women who realised their first marriage at an early age have a higher fertility than their counterparts who realised their first marriage late. In a descending order, women who got married first at ages 10 - 14 were found to have the highest total fertility rate. They are followed by those who got married first at ages 15, 16, 17 and 18 respectively. Women who got married first at age 19 were found to have the lowest

total fertility rate. From these results, we realise that total fertility rate decreases with an increase in age at first marriage.

### **5.10 AGES AT FIRST BIRTH AND TOTAL FERTILITY RATES**

Age at first birth was also found to have a remarkable influence on fertility. In a descending order, women who got their first birth between ages 10-14 were found to have the highest total fertility rate followed by the ones who experienced their first birth at ages 15, 16, 17 and 18 respectively. Women who got their first birth at age 19 were found to have the least total fertility rate. From these results, we realise that total fertility rate decreases with an increase in age at first birth, just like we observed in the cases involving ages at first marriage and first intercourse.

### **5.11 SUMMARY OF REGRESSION RESULTS**

From the regression results, we realise that the selected demographic factors (ages at first marriage, first birth and first intercourse) have a significant influence on the fertility index (total children ever born). All the variables showed a positive association with the total children ever born when compared with the reference categories ( AFM4, AFB4 and AFI4 defined in chapter two).

Generally, the study established that ages at first marriage, first birth and first intercourse are inversely related to fertility (total children ever born). Specifically, age at first marriage was found to have the highest association with fertility (total children ever born). On the other hand, age at first birth was found to have a higher association with fertility, after age at first marriage, while age at first intercourse was found to have the lowest association with fertility.

From the above findings, we observe that the study has achieved all its objectives.

## **5.12 CONCLUSIONS**

From the above results, it is clearly evident that socio-economic and socio-cultural variables play an important role in determining the various ages at first marriage, first intercourse and first birth. Variations in the socio-cultural and socio-economic variables lead to variations in ages at first intercourse, first birth as well as first marriage. Similarly, it is also evident that ages at first intercourse, first birth and first marriage are important determinants of fertility levels. The variations in ages at first marriage, first birth and first intercourse lead to changes in fertility. Thus changes in the socio-economic and socio-cultural variables lead to changes in ages at first marriage, first birth and first intercourse, which eventually lead to a change in fertility level.

## **5.13 RECOMMENDATIONS FOR POLICY**

From the above findings, the following recommendations are deemed as necessary for policy makers:

- 1) Female education should be encouraged and emphasised at least up to secondary level. This would raise the various ages at first marriage, first intercourse and first birth which would eventually lead to a decline in fertility levels. This should, however, be coupled with appropriate incentives where necessary.
- 2) Similarly, women should be encouraged and assisted to be involved in income generating activities, both in the urban and rural areas.

- 3) Sex education should be given freely to the youth both in school, by teachers, and at home, by parents, relatives and friends. This will assist the youth in knowing the risks of being involved in irresponsible sex.
- 4) Contraceptives should be made available to both the youth and adults. This should be coupled with appropriate contraceptive education on both the merits and demerits of the available methods. This will help in reducing both adolescent and marital fertility.

#### **5.14 RECOMMENDATIONS FOR FURTHER RESEARCH**

This study focused mainly on the influence of ages at first intercourse, first birth and first marriage on fertility as well as the socio-economic, socio-cultural and regional differentials of ages at first intercourse, first birth and first marriage. Further research is therefore recommended in the following areas.

A study should be done to establish the relationship existing between ages at first intercourse, first marriage and first birth, on one hand, and the socio-cultural, socio-economic and regional differentials, on the other hand.

A study on the influence of ages at first intercourse, first birth and first marriage on fertility should also be done at the micro-level since this study was macro-based.

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**APPENDIX 1:**

**Mean and standard deviations of the variables in the regression.**

VARIABLE	MEAN	STD. DEVIATION
AFM1	0.208	0.406
AFM2	0.258	0.437
AFM3	0.184	0.387
AFB1	0.190	0.393
AFB2	0.320	0.467
AFB3	0.220	0.414
AFI1	0.210	0.408
AFI2	0.214	0.410
AFI3	0.313	0.464

**Equations in the regression.**

VARIABLES	1	2	3	4	5	6	7	8
AFM1	1.956	2.545	3.282	2.724	2.133	1.469	1.531	1.460
AFM2		1.811	2.548	2.694	2.088	1.107	1.157	1.127
AFM3			2.145	2.315	2.247	0.900	0.864	0.833
AFB1				1.778	2.423	3.454	3.357	3.187
AFB2					1.353	2.657	2.648	2.607
AFB3						2.332	2.146	2.098
AFI2							0.819	0.993
AFI3								0.418
CONSTANT	3.272	2.683	1.946	1.655	1.390	0.902	0.770	0.686
ADJ. R <sup>2</sup>	0.120	0.228	0.332	0.410	0.462	0.540	0.558	0.564
STD ERROR	3.149	3.058	2.966	2.895	2.848	2.775	2.757	2.752
F-VALUE	432.86	437.31	453.12	440.65	410.332	420.07	378.46	335.43

These coefficients are significant at level 0.05.