EFFECT OF INFANT AND CHILD MORTALITY ON FERTILITY: EVIDENCE FROM KENYA DEMOGRAPHIC AND HEALTH SURVEY, 1989.

BY

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DECLARATION

THIS IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR A DEGREE IN ANY OTHER UNIVERSITY.

SIGNATURE ____________

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THIS THESIS HAS BEEN SUBMITTED FOR EXAMINATION WITH OUR APPROVAL AS UNIVERSITY SUPERVISORS.

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DEDICATION

This Thesis is Dedicated to my Parents Boaz Bwuzu Muyoma and Sivira W. Bwuzu who denied themselves so much to see me where l have reached.

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As this thesis stands, it has taken many man hours to complete. First and foremost l would like to thank God for having given me life and good health which were extremely vital ingredients in the success of this study. I would like to thank the University of Nairobi, through the Director Population Studies and Research Institute for awarding me a two year full time scholarship to undertake this Degree course. I am greatly indebted to my two supervisors Dr. Z.S. Muganzi and Prof. J.A.M. Ottieno whose guidance, thought provoking questions and intellectually stimulating suggestions, led to the successful conclusion of this study. I thank most heartedly Messrs B. Koyugi and M. Kimani, for their encouragement and their help in computer programming in the course of this study. I would also like to thank Martha Wangari for her encouragement and moral support all through the time of writing this work. Thanks are also due to my classmates for the standards of working they set, which kept me constantly on my toes resulting in the early completion of this work. Not to be forgotten is Peter Ochuka for his help in data analysis.

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ABSTRACT

This study had three objectives. The first objective was to find the effect of some selected socio-economic and demographic factors on fertility. The factors were education, residence, husbands occupation, age at attained parity, and elapsed duration since last birth. The tools of analysis were Chi-Square and Regression analysis.

Second objective was to find the effect of infant and child mortality on subsequent fertility. Multiple classification analysis was used in this case. The last objective was to estimate the degree of replacement in Kenya by calculating the ratio of additional births to additional deaths.

The Kenya Demographic and health survey data carried out in 1989 was used in this study. Tools of analysis employed in this study were Chi-square analysis, Multiple regression analysis and Multiple Classification analysis. The sample size utilized in this study was 2651 women.

To isolate the effect of infant and child mortality on fertility, other factors that affect fertility were to be controlled. Our control variables were thus the selected socio-economic and demographic variables. We controlled for this variables (education,residence, husbands occupation,age at attained parity,elapsed duration since last birth) through the process of Multiple Classification Analysis. With the application of both

Chi-square and regression analysis, the results showed that all the socio-economic and demographic factors had a significant relationship with fertility.

When we controlled for the other factors that affect fertility by use of multiple classification analysis, we found that at each given parity, women who had suffered child losses went on to have a higher number of births in order to replace the dead ones. For example, Women with two child losses had a higher mean number of children ever born than those with one or no child loss.

It was also found that replacement effect was more effective in cases of women who ever use contraception than those who do not. The degree of replacement was also found to be less than complete. Replacement is said to be complete when a child death induces same child birth.

On the basis of the research findings, it was reccommended that, women should be encouraged to attain higher levels of education, involve themselves in economic activities that would raise their social economic status, improvement in maternal and child health should be emphasized, and non reversible family planning methods be encouraged.

CHAPTER ONE

BACKGROUND TO THE PROBLEM

1.1.0 GENERAL INTRODUCTION

A great deal of attention has been given to the relationship between infant and child mortality and fertility since the 1960s. This has been so because the study of this relationship is considered an important area of policy oriented population research. Scholars have examined this relationship at both macro and micro levels. The findings have always been different. This, however, was expected because societies differ in the case of factors that influence both infant and child mortality and fertility.

The macro level analysis dominated the scene in the years after world war two and its discussion was specifically in the context of the Less Developed Countries (LDCs). Among the LDCs fertility was observed to be high and so was infant and child mortality. Among the More Developed Countries (MDCs) fertility was observed to be low and also infant and child mortality. Aggregate studies have indicated that there is a positive correlation between level of child mortality and fertility. This led social scientists to postulate that a reduction in infant and child mortality is a necessary condition for fertility decline.

In recent years the analysis has shifted to individual level analysis. This has been made possible by the availability of large scale fertility surveys that have been carried out. These are the

World Fertility and the Contraceptive Prevalence Surveys. These surveys have contained detailed birth history of women and hence has made it possible for the analysis of the effect of infant and child mortality on fertility at individual level.

This study presents an empirical analysis of the effect of child mortality on fertility in a country dubbed as having the highest fertility rate in the world. To be incorporated in the study are the effect of some socio-economic and demographic variables on fertility. These variables will form our control variables. We recognize that it is not possible to control for all the factors that affect fertility, and thus the results obtained will not show the precise effect of infant and child mortality on fertility.

1.1.1 STATEMENT OF THE PROBLEM

The problem in kenya pertains to high level of fertility. Fertility is determined by a myriad of factors, social economic, cultural, demographic, et cetera. One of the factors that has been postulated as affecting fertility is infant and child mortality. There is a consensus that high infant and child mortality will lead a couple to have more children either to replace the dead ones or to hoard (having more children in order to ensure that some survive to maturity). Thus there is need to understand and measure this effect in kenya.

Kenya has one of the highest population growth rates in the world. It is evident that fertility together with mortality are high. Osiemo (1986) applied Relational Gompertz model to 1979 census data and found Total fertility rate to be 6.54 but when he fitted the coale trussel model he found TFR to be 8.03. This indicates that TFR was considerably high. Ong'uti (1987) using the Kenya Contraceptive prevalence survey data calculated TFR using both models. The CTM yielded 8.6 while the GRM gave 8.1. This means that there has been a substantial increase in TFR in recent times.

Mortality levels especially Infant and Child mortality are still high. Kibet (1981) found child mortality to be high estimated to be 125 per 1000 using the 1979 census results. Ondimu (1987) using the KCPS data showed that infant and child mortality was still high even though it had dropped from previous levels, that is, 93/1000 for infant and 64/1000 for childhood mortality. The foregoing discussion indicates that both fertility and mortality particularly infant and child mortality are still high. Thus the fact that these are still high in the face of improved socio-economic conditions, the need to investigate the influence of some of these socioeconomic and demographic factors on fertility heightens. It is also important to find out the contribution of infant and child mortality to fertility. Thus, this study sets out to investigate if there is any effect of Infant and child mortality on fertility.

1.1.2 RESEARCH JUSTIFICATION.

In order to understand the factors that lead to high population growth rate one has to study the link between socio-economic and demographic factors on the one hand and fertility on the other.

If policy makers have to develop effective policies aimed at reducing fertility, then they need to have information about the factors that cause couples to go for many children. One of the factors that has been hypothesized as affecting fertility is infant and child mortality. It is thus reasonable to explore and find out whether or not infant and child mortality affects fertility in Kenya.

Studies that have been done in Kenya have dwelt mostly on fertility differentials and on family planning, it is only Ongor (1990) who made a serious attempt to study this effect using the 1978 Kenya fertility survey data. This study uses the most current data, the Kenya Demographic And Health Survey (1989) to investigate this relationship.

This study will go a step further than the others in that it will examine the couples response to a prior child loss at each parity. It thus adopts a sequential rather than a static fertility measure.

1.1.3 OBJECTIVES OF THE STUDY

1. To examine the effect of selected socio-economic and demographic factors on fertility.

2. To examine the effect of infant and child mortality on subsequent fertility .

3. To measure the replacement rate in Kenya.

4. To make recommendation for policy formulation.

1.1.4 SCOPE AND LIMITATION

This study focuses on all the 13 districts that were covered by the KDHS. However, the study will focus on the fecund married women aged between 15 and 49. This age group is considered to be demographically fertile.

As in the other studies that have attempted to establish this relationship, there will be the problem of isolating behavioural and biological factors that influence this relationship.

The study will also be limited in that it utilizes secondary data which was collected by a different organization . For example, there may be the existence of both content and coverage errors which are beyond the scope of the author.

1.1.5 LITERATURE REVIEW

In this section we look at the works that have been done on the relationship between infant and child mortality and fertility and the contribution of the other socio-economic and demographic factors. We shall examine the works that have been done in the rest of the world and then look at those that have been carried out in Africa. However, before we look into the literature review, we shall examine the type of studies that have been done on this relationship. There are two types of studies that have been carried out on this relationship. Aggregate and Individual level studies.

Further we shall review some of the fertility theories that have been advanced.

Aggregate Studies

Most aggregate studies have used infant mortality rate or life expectancy at birth as a measure of mortality. None of these variables, however, measure the variation in childhood risk of death across countries. Notice that the distribution of deaths by age during childhood years may vary among countries at similar levels of life expectancy. In addition within a given overall level of mortality, relatively high infant mortality will provide a relatively more favourable setting for parents interms of the predictability of the child survival after a certain age.

Many of the studies that have explored the mortality -

fertility relationship using aggregate data have provided only a broad evidence of the overall relationship. When you look at the results, the measured effects are usually statistically significant but the size of the measured effects and their implications for population growth vary enormously due to the analytical and data deficiencies.

Individual Level Studies

Most researches that have been done in recent years on the topic of Mortality - fertility relationship have been based on fertility survey data. There has been in recent times an increase in such data.

The data used mostly was drawn from the world fertility survey and contraceptive prevalence survey. The data is of relatively high quality and provide many new analytical possibilities. These surveys provide complete birth histories of reproductive age women, the pace of child bearing and thus achieved fertility can be related to a womans actual experience with child deaths. In effect therefore, certain behavioral responses which are predicted to result from a child death that is "physiological effect" and the "replacement effect" can be measured with these data.

Some Fertility Theories

In his early work Leibenstein (1957) laid the ground work for what became to be known as economic theory of fertility. The basic core of the theory was to formulate a theory that explained factors that determined the desired number of births per family. The family size as he identified depends on the number of surviving births. He contented that people actually applied rough calculation to the problem of determining the number of births they desire. Such calculations depended on balancing of the satisfaction or utilities to be desired from an additional births against the "costs" both monetary and psychological of having an additional child. He categorized three types of utilities; that is utility to be derived from a child as a consumption good, utility to be derived from a child as a productive agent and utility to be derived from the perspective of a potential source of security. He further divided the cost of having a child into direct and indirect costs where direct cost were expenses incurred in maintaining the child and indirect cost as opportunities forgone due to having an additional child.

Becker (1960) added to this theory the notion of child quality. He said that the number of children a couple will have depend upon the constraints faced by the household (the constraints include income and time), their relative preference for children as compared to other goods. Parents are assumed to behave rationally in determining the number of children they want. They act in such a way as to maximize satisfaction subject to constraints. Shultz (1973) contented that fertility is determined by the opportunity for employment, income of the mother and child labour. He said also the incidence of death affect family size by forcing couples to set a number of birth that will provide desired number of surviving children on the basis of the recent and expected death rate.

Leibnestein in his later papers added what he called social influence groups (SIG's). He said that family units fell in particular group which were based on historical-cultural and economic factors. The effect of (SIG) he found was independent of income. He noticed that moving from one SIG to another was likely to lower fertility desires. Interestingly he noted that increasing income within a SIG had the effect of increasing understanding fertility behaviour. He said the determinants of fertility were acting through one or more of the following: demand for children - the number of surviving children parents would want if fertility was costless; the potential output of children - the number of surviving children parents would have if they did not deliberately control fertility; the cost of fertility regulation including both objective and subjective. Easterlin also said that the demand for children is dependent or is affected by background characteristics such as religion, education, residence and family type. When he introduced the concept of "relative income" he reached conclusion which were similar to leibnestein. That is income in excess leads to higher fertility.

All versions of the economic theories of fertility emphasize one thing that fertility results from a rational decision made by the household based on effort usually to maximize the economic payoff subject to direct and also indirect opportunity cost with income resource constraint and also in the light of other possible payoffs from alternative uses of resources.

The key variables in this theory are, expected utilities to be gained from acquiring a child; in the cost of obtaining it including resources available to the household.

The economic theory was however criticized as being beset by a number of unresolved issues.

Those who subscribed to the social determinants theory argue that families differ fundamentally in the value they place on their children (Shultz, 1976). They further add that biological constraints of fertility should also be considered. Even though the process through which fertility is influenced is complex. In most cases fertility is determined by such factors as age, mortality levels and health status.

__Studies in the Rest of the World__

In the study done by Francine van de Walle (1986) no evidence of systematic association between fertility and mortality levels were found in the various European populations before, during or after the demographic transition.

Hobcraft and his co-workers (1985) using the world fertility survey data to find out the relationship for different countries, after controlling for birth interval and maternal education concluded that there is nothing to suggest higher mortality as maternal education increases. The effect of birth order except for first birth was found not to be very important.

Chodhury et al (1976) analyzed child spacing in Pakistan and

Bangladesh using household data. They tried to isolate the biological influences and compared the median birth intervals between parities i and i+1 for women with different experience of child loss. The findings were interpreted as evidence that there are no behavioural effects, in that previous child loss had no impact between i and i+1.

Based on data from india, Potter et al (1965) found on average, the length of a birth interval was about 30 months and postpartum sterility following a surviving breastfed baby exceeded that following an infant death by about 9 months.

Pebley, Delgado and Brieman (1979) examined if fertility desires are shaped by familial and personal experience with child mortality (deaths of siblings and ones own children). They also set out to find if fertility desires are based on perceptions of mortality conditions. They used data from rural Guetamala. The study assumed that fertility decisions are made sequentially and it may vary at different life cycle stages, Thus the analysis was done at different parities. Child loss was analyzed together with the socioeconomic control variables such as education, residence, and housing quality index and by using logit method. The results were that women who desired additional children are likely to be younger and more educated than those who do not. This was observed within each parity group. They too also were found to have more experience with child deaths, both their own and siblings. The logit coefficient analyzed suggested that education appears to increase the probability of wanting additional children. Experience with child mortality, own child deaths and siblings death was found to be strongly and positively related to the desire for additional children at parity three and above. The conclusion was that child mortality experience affecting a womans fertility decisions are both of her own and her mothers children and these are manifested at different life stages as is represented by parity levels.

MahaDevan K. (1981) in a study done in south central India, found that the number of infants and child deaths showed that a definite direct relationship with fertility existed in all the three cultural groups, Muslims, Harijans, and caste Hindus. This trend was found to persist without change even when age of the mother was controlled in all the three groups and also separately in the categories of infants and children. This finding confirmed that higher incidence of infants and child mortality increases fertility and thereby mortality influences fertility as a major pronatalist force.

Lehrer (1984) examined the impact of child mortality on spacing and its variation across parities using Malaysia family life survey. Using hazards model he found that deaths of a child before the first birthday had a substantial negative impact on spacing but that the effects associated with the deaths of an older child were small and thus concluded that most of the decrease in the interval were due to biological factors.

Nur (1985) used Jordanian fertility survey data with retrospective pregnancy history of currently married women with no record of marital dissolutions. His dependent variable was the number of births subsequent to i parity, Women were grouped according to their previous experiences with infant and child deaths. The relationship between infant and child mortality was then examined at each parity using multiple classification analysis (MCA) which controlled for selected socio-economic and demographic variables. He expressed the number of additional children born as a deviation from the mean at each parity according to the number of infants deaths among children already born. The results showed that women with prior experience of infant death tended to have a greater number of CEB compared to those without experience. The study also revealed that women who had experienced more than two infant deaths tended to have a greater number of additional live births than those who had experienced only one. The relationship between infant deaths and subsequent fertility deaths was found to weaken as parity increased. This however, was expected given the known effects of age on reproductive performance.

Rustein (1974) in a study done in Taiwan using data collected in sample surveys in 1967 and 1969, applied multiple classification analysis and made the conclusion that couples with a child deaths or fear of a child death go on to have more births than other couples. He also noted that the sex of the child was not an important factor in replacement motivation. He also found out that child mortality experience had a slight effect on the average birth interval and that it delayed use of contraception. Using an index designed to measure fear of mortality, he found out that the fear of child mortality resulted in a slightly increased probability of having an additional birth at each parity level and that the fear of child mortality had little effect on the timing of the first contraceptive use.

For the republic of Korea, Park et al (1979) analyzed parity progression ratios for three subsamples according to whether the last child was born before 1955, from 1955 to 1964 or from 1965 to 1971. It was found that the differences in parity progression ratios between those whose previous child had survived and those whose previous child had died were negligible for previous birth occurring in the first period, small in the second period and greater in the last period. This would suggest the strengthening of the volitional replacement effect as family planning practice becomes more widespread.

Mensch (1985) Tried to distinguish the intentional "replacement effect" from the "physiological effect" by analyzing the birth interval associated with a particular parity according to the child deaths experience occurring prior to the preceding parity. For example the probability of giving birth within the five years after the third birth is related to whether or not the woman experienced the death of her first or second child using a hazard model and all appropriate control. This analysis was restricted only to women whose child, opening the birth interval had survived. Thus the impact of child deaths on the post partum infecundable period is removed from the analysis. When the behaviour of contraceptors is compared to the behavior of non contraceptors, no volitional replacement was found among non contraceptors. The replacement effect among contraceptors was apparent in the third birth interval for Costa Rica, the fourth birth interval for the republic of Korea and not at all in Columbia. Korea showed a mixed strategy (replacement and insurance), Costa Rica showed replacement behaviour even in the rural areas and Columbia showing insurance strategy.

African Studies

Cantrelle et al (1978) using African data failed to find any relationship at an aggregate level between total fertility rate and infant mortality rates. Results derived from the world fertility survey suggest that the relationship between fertility and mortality is not easy.

Hannington (1966) using three sets of data from upper volta, Niger and Ghana indicated that the proportion of women having subsequent pregnancy was greater at each parity if the previous child died before age one than if the child survived.

Bothania El Deeb (1988) used the world fertility survey data for Egypt, Sudan, Kenya and Lesotho to quantify the effects of infant and child mortality on both fertility behaviour and fertility attitudes in the selected countries. He used CEB as his dependent variable. In order to identify the rank of the effect of child mortality on life time fertility, some other important factors such as duration of marriage, wives education level, wives work status, husbands occupation, place of residence and religion were introduced in the analysis. Applying multivariate analysis (regression technique), the results demonstrated that if the duration of marriage which highly affects the life time fertility is excluded, the effect of child mortality on lifetime fertility has the first rank in Egypt, Sudan and Lesotho, while it has the third rank in Kenya. In its endeavour to quantify the effects of child mortality on lifetime fertility, the study showed that the substitute effect of child mortality was lower than unity in all the countries under study except among Egyptian women having only one child ever born alive. Women who lost 100% of CEB had a higher average number of CEB of 1.6 in Egypt, .9 in Lesotho, .5 in Kenya and .4 in Sudan as compared to the average number of CEB among women who did not suffer from any child loss. The analysis however showed that the highest effects of child mortality on lifetime fertility is shown in Egypt and the lowest in Sudan and Kenya while that of Lesotho came in between.

Farooq (1984) found that while socio-economic factors like education and work status are important determinants in fertility decision making among the Nigerian household, infant and child mortality was found also to be important in determining the number of children ever born.

Abdul Aziz Farah (1981) in his study in Greater Khartoum using simple classification analysis found that given a certain number of children ever born, the proportion of mothers desiring no more children consistently declined with the number of dead children. This shows that the occurrence of death among children affects positively the mothers desires to replace after a child loss has occurred. When he investigated the effect of sex combination after controlling for the total number of living children, he found that the greater the number of living male children the higher the proportion of women willing to have more children.

When multivariate analysis was applied (when a number of socio-economic and demographic variables are considered with the control variables being living male child, living female child, age of women, children ever born, female education, female occupation, husbands occupation, place of birth of women and the number of children dead, with dependent variable being desire for additional children born, it was shown that the number of dead children has a powerful and significant partial coefficient. Further, it was found that living female children (LFC) were found to be significant though the coefficient of living male children (LMC) was greater than LFC coefficient, meaning that a unit of increase in the number of male living children evidently brings a woman close to her desired configuration of children than does an increase in LFC.

In case of the effect of child loss experience on contraceptive use and thus on fertility behaviour, the simple classification analysis showed that at each number of children ever born, the percentage using contraceptives was consistently lower with the increasing number of dead children indicating that the occurrence of child loss results in a reduction of contraceptive prevalence. After controlling for the total number of living children, the greater the number of female living children than male children the higher the percentage using contraception, and the higher the latter, the lower the percentage using contraception.

Chanaka (1987) studied this relationship within the broad scope of replacement, biological, and insurance effects. He studied Egypt, Ghana and Lesotho using the WFS. He used desired family size, additional children wanted and use of contraceptives as proxies for insurance effect. Child loss was taken as independent variable. Using Multiple classification analysis (MCA) he found that women who had experienced loss of at least a child had a larger desired family size than those who did not have in all the three countries. Given a certain child loss however, the pattern of desired family size and duration of marriage was not clear but a positive relationship was established in the case of the number of living children and level of education. On the use of contraception he found that differential child mortality had a role to play in the past, present and future use rates. He drew the conclusion that the larger the desired family size and the less intention to use contraception among the Egyptian and Ghanaian women who experienced death of their children seemed to suggest the existence of insurance effect.

Ongor (1990) using the KFS data studied some factors that influenced fertility attitude and outcome. His specific objective was to look into the effect of personal infant or child loss on fertility attitude and outcome.

In his analysis he used cross tabulation and stepwise regression technique. He found that direct infant and child loss experience had some influence on the mean children ever born. He also found that duration of marriage gave an increasing CEB at specific loss levels. Women of longer duration of marriage were found to have higher CEB and living children. It was found still that the effect of infant/child loss further increases the CEB by duration of marriage.

In the case of additional children wanted, duration of marriage showed a positive relationship although insignificant for women in the age group 25-34 years implying that these women are not very enthusiastic about having additional children.

It was also found that additional children wanted is higher irrespective of current age for women who have a lower number of living children. It was demonstrated that living children are important determinant of additional children wanted.

Applying the regression model, it was noted that infant/child loss support the hypothesis that a positive relationship exist between CEB and direct infant/child loss.

1.1.6 <u>THEORETICAL AND CONCEPTUAL FRAMEWORK.</u>

In order to have a clear and precise understanding of the relationship between infant and child mortality and fertility, one needs to understand and identify the mechanisms or channels through which child loss influences reproductive behaviour. Theoretically and conceptually, the impact of child deaths on fertility has both biological and behavioural effects (CICRED, 1975).

1) Physiological or Biological effect operates through shortening of the duration of lactation which in turn leads to a shortened period of post-partum infecundability and faster return of ovulation following an infant death. This results in compressed birth interval in the absence of birth control. This effect, however, is much stronger and significant in communities that breastfeed for long durations.

2) Behavioural effect operate through parents motivation to compensate or not for the dead child. This response is further subdivided into two;

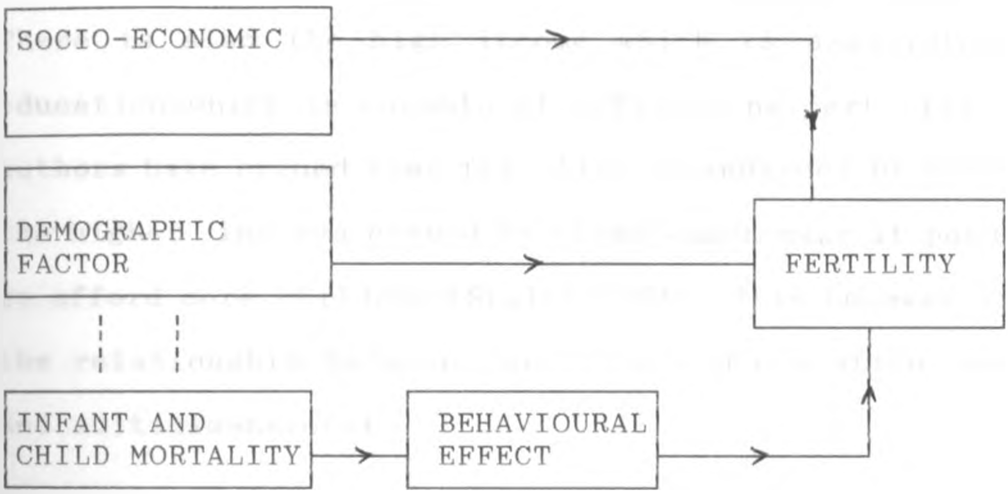
i) The replacement effect, this is the behavioural mechanism and a sequential response resulting in additional births to make up for actual child loss. The replacement effect is only possible in society that practice some form of fertility control. Couples stop child bearing after attaining the number of surviving children they consider sufficient.

ii) Insurance (or hoarding) effect. The effect operate in anticipation of prospective high child mortality in the family. Hoarding is considered an effort by couples to bear more children because they anticipate that some children will die in the future. This strategy assumes that couples have some knowledge about the community level of infant and child mortality that is independent of their fertility with this risks in mind.

From the literature review we noted the incorporation of socioeconomic and demographic factors in understanding this relationship. Thus likewise we shall incorporate the said variables in our study to act as control variables. This is shown in the figure below;

1.1.7 <u>CONCEPTUAL MODEL</u>

figure: 1.1.7(a)



Source: Adapted from CICRED, 1975.

Some of the determinants used in the model are discussed below

Age

Age is an important factor in determining fertility especially the age structure of the community. Age is associated with marriage, frequency of intercourse and the onset of menses. Usually reproduction also tends to be concentrated in certain age groups. In this analysis we shall examine the age of the women at attaining a given parity prior to some given level of child loss.

Education

Education affects fertility in various ways: It exerts pressure on fertility through changes in attitudes, values, and beliefs about family size. It also operates through other variables to have an effective interaction with fertility levels. Some authors have pointed out that education affects fertility indirectly through a process of restructuring family relationship. There is also the high income which is associated with higher education which is capable of influencing fertility. Some other authors have argued that fertility is enhanced by education in that the higher incomes earned by these women make it possible for them to afford more children (Shultz 1973). This however indicates that the relationship between fertility and education is both complex and multidimensional.

Residence

Many factors that affect individual decision making are at least affected by place of residence of the individual - community in which he lives in. Some of these factors include the presence of community contraceptive service, schooling opportunities and costs etc. All this tend to vary between urban and rural areas. Generally it is expected that an individual will be influenced by the norms and expectation of their neighbours. This study thus focus on current place of residence categorized as urban and rural.

Husbands Occupation

Husbands occupation is usually taken to indicate the socioeconomic status of the family. The higher the occupation of the husband the higher the income. The higher the income the lower the demand for children. Usually the excess income is channelled into the purchase of alternative durable goods. People of higher occupation category tend to go for fewer children but of high quality. In contrast people of low occupational category go for many children whom they regard as wealth. Thus occupational categories are expected to affect fertility.

Duration of Exposure(Elapsed Time Since Last Birth).

Among Women at a given parity, those whose most recent child died are more likely to be exposed to the risk of an additional pregnancy sooner than those whose most recent child survived, especially where breastfeeding is prevalent and of long duration. We thus expect a higher fertility in the case where elapsed duration since the birth of the last child is longer than to shorter duration. If this is not controlled for it may lead to overestimation of intentional replacement behaviour.

1.1.8 CONCEPTUAL HYPOTHESIS

1. SOCIO-ECONOMIC FACTORS ARE LIKELY TO AFFECT FERTILITY

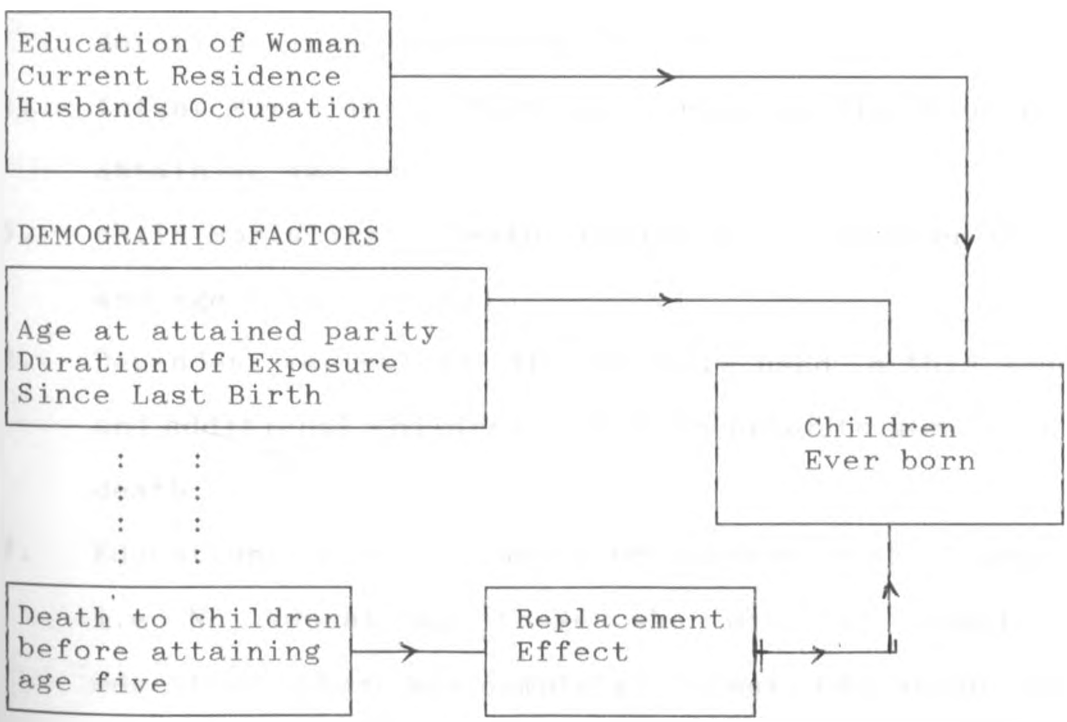
2. DEMOGRAPHIC FACTORS ARE LIKELY TO AFFECT FERTILITY

3. INFANT AND CHILD MORTALITY IS LIKELY TO AFFECT FERTILITY THROUGH BEHAVIOURAL EFFECT.

1.1.9 OPERATIONAL MODEL

figure: 1.1.9(a)

SOCIO-ECONOMIC FACTORS



Definition of Terms:

1. Determinant: A determinant of fertility is a variable that would change a population fertility level if it's own value is altered: This include socio - economic and demographic factors.
2. Socio- Economic determinants; This refer to indices of Economic status like Education, (place of residence) and occupation of husband.
3. Demographic determinants: This include age, parity, duration of marriage, birth interval, elapsed duration since last birth, age at marriage. This study will use infant and child mortality, age of the woman at attained parity, elapsed duration since last birth.
4. Infant Mortality: Death occurring to children on or before attaining age one.
5. child Mortality; Death occurring to children between age 1 and age 5 (inclusive).
6. Dependent variables: The variable used in this study is CEB, and additional children ever born prior to some level of child death.
7. Education: This is classified interms of the levels attained. i.e No education, those who did not complete primary education, those who completed primary education and those who attained secondary and above level of education.

service and those in professional/clerical jobs.

10. Exposure duration: is defined as the time that has elapsed since last birth. It is classified into those whose elapsed duration since last birth is between (in months) 0-23, 24-36, 36-60 and over 60.
11. Age is defined as age at which a woman attains a given parity.
12. Fertility is defined as the actual birth performance.
13. Replacement effect: Having more births in order to compensate for the children who have died.
14. Contraceptive use: Use of any method of birth control.

OPERATIONAL HYPOTHESIS.

1. There is no significant relationship between CEB and educational level attained.
2. Women who have suffered a child loss are likely to attain a given parity at an earlier age than those who have not.
3. There is no significant relationship between CEB and Elapsed duration since last birth.
4. There is no significant relationship between CEB and place of residence.
5. There is no significant relationship between CEB and husbands occupation.
6. Women who have experienced a child loss are likely to have a higher number of additional births at each parity.
7. Women who consciously limit fertility by use of contraceptives are likely to display a consistent replacement pattern than

those who do not.

8. Replacement rate is likely to be far much less than unity in Kenya.

CHAPTER TWO.

DATA AND METHODOLOGY

2.1.0 INTRODUCTION:

In this chapter we intent to examine the source of data used in this analysis and also look at its quality. In addition we shall discuss the methods of data analysis.

2.1.1 DATA SOURCE.

Kenya demographic and health survey was tailored to provide Population and health data for use by policy makers and the research community in the country. In 1988 on behalf of the Kenya government , the national council for population and development signed an agreement with the institute for resource development to carry out the Kenya demographic and health survey. The survey was conducted between december 1988 and may 1989. The survey covered women aged 15-49 and a subsample of husbands of those women.

The kdhs used three questionnaires: A household questionnaire, a womans questionnaire and a husbands questionnaire. The first two were based on the DHS programmes mode 'B' questionnaire that was designed for low contraceptive prevalence countries. The most important questionnaire, however, was the womans. The questionnaire was divided into seven sections that is:

section one: respondents background characteristics.

section two: respondents history.

section three: contraceptive practice.

section four: health and breastfeeding.

section five: marriage.

section six: fertility preference.

section seven: husbands background characteristics and womans work.

The husbands questionnaire on its part was divided into two parts namely:

section H1: respondents background.

section H2: contraception.

The household schedule in the KDHS collected information about all members of the household as well as those who slept in house the previous night. This allows for the estimation of the population on both the defacto and dejure basis.

This study will use the information from the womans questionnaire. Information from section 1,2,3, and 7 will be utilized. This section will provide information on education infant and child mortality, contraceptive use, husbands occupation, age of woman, exposure to the risk of pregnancy, current place of residence and children ever born.

The KDHS sample was based on NASSEP frame. Since 1975 the CBS created a sample frame from which samples needed for government and other users have when need arises been drawn. This master sample since its inception has provided reliable and integrated socioeconomic data needed for the design, control, implementation and evaluation of development policies and programmes.

NASSEP is a two stage sample design stratified by urban -

rural residence and within the rural stratum by individual districts. In the first stage, 1979 census enumeration areas (EA's) were selected with probability proportional to size. The selected EA's were segmented into the expected numbers of standardized 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 listing made between 1984 and 1985 were used to select the KDHS households, while the kdhs pretest staff were used to relist household in the selected urban clusters. Because no reliable estimates could be produced from the 32 districts in NASSEP for the KDHS, it was felt that reliable estimates of certain variables could be produced for the rural areas in the 13 districts that had been initially targeted by the National council for population and development, that is Kilifi, Machakos, meru, Nyeri, Murang'a, Kirinyaga, Kericho, Uasin gishu, South Nyanza, Kisii, Siaya, Kakamega and Bungoma. Thus all 24 rural clusters in the NASSEP were selected for inclusion in the KDHS sample in these 13 districts. About 450 rural household were selected in each of these districts, just over 1000 rural households in other districts and about 3000 households in urban areas, for a total of almost 10,000 households. Sample weights were used to compensate for the unequal probability of selection between strata.

The KDHS excluded the north eastern province and four northern districts. These form about one half of kenya's land but accounts for only 5% of Kenya's population. Most of this areas are still predominantly inhabited by nomadic people who cannot be sampled out using a sample design involving a fixed geographical area.

The KDHS was designed to produce completed interviews with 7500 women aged 15-49 and with a sub sample of 1000 husbands of these women. A total of 9836 households were selected. Of these 8,343 were identified as occupied households during field work. 8,173 were successfully interviewed. The response rate was 98% for households and 96% for individual female respondents. In addition 1,116 husbands were out of a total of 1,397 eligible for a response rate of 81%.

The way the variables used in this study were obtained are discussed below;

Infant and Child Mortality Data

Infant and child mortality index is considered to reflect the countries level of socio-economic development. The higher the level, the country is considered to be of low socio-economic development. Infant and child mortality rates can influence a number of other processes. It can prompt the couples to respond to the child loss by eliciting a replacement response, it thus influences the family size. The data used here was derived from the birth histories. KDHS had a detailed questionnaire that required information about each ever born child, whether dead or alive. If dead, the age at death was also given. There could be the problem of recalling exactly at what age the child died. This problem was overcome by imputing dates. This was done especially when the full date of the event was not provided by the respondent or when the dates were found inconsistent.

Education

Education as one of the socio-economic variables is considered as one of the independent variables which will need to be controlled for. The KDHS posed a question about the highest level of schooling attained by all women interviewed. This question was further followed by another more specific question about the highest (standard,form,year) that was completed at that level. In the analysis education will be split into those who have never gone to school, those who did not complete primary level education, those who completed primary and finally those who have secondary and higher education.

Type of Place of Residence

This includes current place of residence classified as urban and rural. Residence was noted as per where the interview was conducted that is if the respondent was in urban or rural area.The bulk of the women interviewed were resident in the rural areas. The questionnaire also contained information on childhood place of residence. this study, however, will not utilize this variable.

Womans Age

Age of the woman is an important demographic factor that will be used in this study. This formed one of the background information question. There were two questions asked to elicit the age of the respondent. First the respondent was asked about the month and the year she was born and then was asked how old she was on her last birthday. This was to illuminate on the consistency of the age of the woman.

Husbands Occupation

This is one of the socio-economic variables that is taken to indicate the socio-economic status of the family. This question was posed to the wife. She was asked about the type of job her husband mainly does. This was then reclassified as will be seen in the study.

Duration of Exposure

This is to establish how long a woman was still exposed to risk of conception. It is considered a much more direct way to look at its' effects on fertility rather than looking at it interms of marital duration which is considered as an indirect measure. This variable if not controlled for will over estimate the replacement effect. The duration is given as the interval between last birth and the interview date.

Children Ever Born

This variable is calculated from the birth histories. This variable will enable us to categorize women by parity.

2.1.2 DATA QUALITY

Kenya Demographic and Health Survey was designed to provide high quality and reliable data. The questionnaires after being reliably designed were translated into the language of the communities to be surveyed. The quality test of the translation were conducted by pretesting them on the respective communities. Use of highly trained personnel was also aimed at enhancing the quality of the data.

Results of the Sample Surveys Usually suffer from two types of errors that is:

1) Non Sampling errors;

2) Sampling errors.

Non Sampling error is due to mistakes made in carrying out field activities such as failure to locate and interview the correct household, errors in the way the questions are asked, misunderstanding of the questions on the part of either the interviewer or the respondent, data entry errors etc. Non Sampling errors can only be minimized in a survey but cannot be avoided and are usually difficult to evaluate analytically.

Sampling error is a measure of variability between all possible samples. The advantage here is that the error can be estimated from the survey results. Sampling error encountered in the KDHS were computed by use of some complicated statistical methodology. It was noted that the relative standard error for most estimates of the country as a whole was not large.

In age reporting, it was noted that the proportion of population aged 0-4 was lower than the percentage aged 5-9. It was also lower than the proportion age 0-4 from other sources. This was found to be partly due to displacement of younger children into the 5-9 age group. It was noted that women aged 15-19 were displaced to age group 10-14. There was also displacement of women from age group 45-49 to 50-54.

In the case of age heaping whipples index was used to detect it. It was found that age heaping was slightly higher than in KCPS of 1984 but lower than the 1979 census. Preference for ages ending with 0 and 5 and to a lesser extend 2 and 8 were apparent for both males and females.

2.1.3 METHODOLOGY OF DATA ANALYSIS

In this section we shall discuss the various methods of data analysis. Three methods will be employed in this study. These are Chi-square, Multiple Regression and Multiple classification Analysis. These methods are discussed below.

2.1.4 CHI-SQUARE

Chi-square is one of the simplest and most widely used non-parametric tests in statistical work. It does not make assumptions about the population being sampled. The Chi-square describes the magnitude of discrepancy between theory and observation, that is, with the aid of Chi-square test, one can know whether a given discrepancy between theory and observation can be attributed to chance or whether it results from the inadequacy of the theory to fit the observed facts. If Chi-Square is zero, then it means that the observed and the expected frequencies completely coincide. The greater the value of Chi-Square the greater will be the discrepancy between observed and expected frequencies.

The formula for computing Chi-Square is;

$$X^2=\Sigma(O-E)^2/E$$

where: O - is observed frequency.

E - Expected or theoretical frequency.

The calculated value of X^2 is compared with the table value of X^2 for given degrees of freedom at specified levels of significance. If the calculated value of chi-square is greater than the table value the difference between theory and observation is considered to be significant, that is, it could not have arisen due to fluctuation of simple sampling.On the other hand if the calculated value of chi-square is less than the table value, the difference between theory and observation is considered significant, that is it could have arisen due to fluctuation of sampling. The number of degrees of freedom is described as the number of observation that are free to vary after certain restriction have been imposed on the data. Thus the number of degrees of freedom for all the cells is (c-1)(r-1)

where: c - refers to columns

r - refers to rows

Thus in a two by two table the degrees of freedom will be (2-1)(2-1)=1 in a three by three table the degrees of freedom will be (3-1)(3-1)=4.

Conditions for application of Chi-Square test

1. Experimental data must be independent of each other.
2. Sample data must be drawn at random from target population.
3. Data must be expressed in original units.
4. Sample should contain at least 50 observations.

5. There should be no less than five observations in any one cell.

However because we shall be using computer to calculate Chi-Square, our interpretation shall be that if observed significance level of the test is small, that is, if it is less than .05 or .01, then the null hypothesis shall be rejected and the alternative hypothesis will be accepted, that the two variables are dependent. Chi-Square usually employs two types of hypotheses, the null (H_o) and the alternative hypothesis (H_A).

Thus

H_o : States that the two variables are independent.

while

H_A : States that the two variables are dependent.

The researcher then sets out to confirm or disapprove the H_o at a given level of significance.

2.1.5 <u>MULTIPLE REGRESSION</u>

The ordinary least square regression will also be used in the analysis. Regression analysis shows the strength and direction of independent variable on dependent variables. To be able to establish the direct relationship between selected socio-economic and demographic factors on fertility, regression will be used.

The regression model postulates a causal relationship between the dependent and independent variable. The model is in the form:

$$Y_i = A + BX_1 + BX_2 + e_i$$

where

A - is a constant

B - is the regression coefficient of the independent variable i.

e_i - Error term which is assumed to be normally distributed with a mean of zero.

The expected values of the dependent variable (Y_i) can be obtained and its relation to the actual value calculated through Multiple Correlation coefficient, R^2, given as;

$$R^2 = 1 - \frac{\Sigma(Y_i - Y_i)}{\Sigma(Y_i - Y)^2} = \frac{SSR}{SSY}$$

R^2 -is the coefficient of determination that shows the amount of variation in the dependent variable Y, that is explained by the independent variables.

Testing of Statistical Significance.

F-test

This is used to test the null hypothesis, that all K independent variables considered together do not explain a significant amount of variation in the dependent variable Y.

$H_o : B_1 = B_2 = B_3 = \ldots B_k = 0$

F test is computed thus

SST = SSR + SSE

where

SST - is the total sum of squares

SSR - is the squared sum of regressors which shows the sum of squares explained by the entire regression equation.

SSE - is the squared sum of errors (deviations)

Thus

$$F = \frac{SSR/K}{SSE/N-K-1} = \frac{R^2/K}{(1-R^2)/(N-K-1)}$$

where

N - is the total sample.

K - is the number of regressors in the equation.

K, N-K-1 - is the number of degrees of freedom.

If the computed F value is greater than the table value we reject the null and accept the alternative hypothesis.

__T - test__

This also used to determine the goodness of fit between the sample mean and the population mean.

The T statistic is given thus;

$$t = \frac{X - u}{s\sqrt{(n - 1)}}$$

where

x - is sample mean.

u - is population mean.

s - is the sample standard deviation.

n - is the sample size.

$(n-1)$ - is the degrees of freedom.

To use t-test the following conditions will have to be fulfilled.

1. The variable be an interval measure
2. Form of the distribution be normal.
3. Can be used for small samples of less or equal to 30.

The null hypothesis for t - statistic is

H_0 : $X_i = 0$

H_A : $X_i = 0$

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

Assumptions of Multiple Regression

1. The dependent variable and the independent variables should be normally and randomly distributed.
2. The independent variables have to be linearly related to the dependent variable.
3. The mean value of t=0, that is, E(e)=0 and that e is not correlated to any other variable.

4. The dependent variable must not be dichotomous. But can be interval or ratio form.

<u>Problems of Multiple Regression.</u>

The basic problem with multiple regression is that of multicollinearity, defined as the intercorrelations of the independent variables. This problem arises when independent variables overlap. The greater the overlap of the independent variables, the lower the reliability of the regression coefficients.

When using Stepwise regression there arises a problem, in that, it decides for the researcher variables to be included. This means that one does not have absolute control over what he is doing. The advantage with Stepwise is that it only analyses those variables that contribute substantially to the explanation of the dependent variable.

<u>Dummy Regression</u>

Dummy variables are used when one wants to insert a nominal scale variable into a regression equation. This is because numbers assigned to categories of a nominal scale are not assumed to have order and unit of measurement and thus cannot be treated as scores as it would be the case in a normal regression. A set of dummy variables is created by treating each category of a nominal variable as distinct and assigning arbitrary scores for all cases depending upon their presence or absence in each of the categories. You can have a nominal variable with say three categories. Then these categories can be assigned arbitrary scores either 0 or 1 with one of them acting as a reference category.

Description of variables used in the dummy regression

NOED - This dummy variable indicates women with no education. It forms our reference category.

PRINC - Dummy variable indicating if a woman had not completed primary school (1, if not completed, 0, otherwise).

PRICOMP - Dummy variable showing if a woman has completed primary school (1, if completed, 0, otherwise).

SECPLUS - Dummy variable showing if a woman had secondary and higher education (1, if level attained, 0, otherwise)

EXPODUR1- Dummy variable showing if elapsed duration since last birth is between 0 to 23 months. This acted as our reference category.

EXPODUR2- Dummy variable showing if elapsed duration since last birth is between 24 to 35 months (1, if the case, 0, otherwise).

EXPODUR3- Dummy variable showing if elapsed duration since last birth is between 36 and 60 months (1, if the case, 0, otherwise).

EXPODUR4- Dummy variable showing if elapsed duration since last birth is over 60 months (1, if the case, 0, otherwise).

HUSOCC1 - Dummy variable showing if the husbands occupation is in agriculture or farming. This formed our reference category.

HUSOCC0 - Dummy variable showing if husband does not work (1, if the case, 0, otherwise).

HUSOCC2 - Dummy variable showing if the husbands occupation is in sales or in services (1, if the case 0, otherwise).

HUSOCC3 - Dummy variable indicating if husbands occupation is manual or House service (1, if the case, 0, otherwise).

HUSOCC4 - Dummy variable indicating if husbands occupation is proffessional or clerical (1, if the case, 0, otherwise).

URBRES - Dummy variable indicating if the womans current place of residence is in the urban area. This acted as our reference category.

RURRES - Dummy variable indicating if womans current place of residence is rural (1, if resident in the rural area, 0, otherwise).

2.1.6 MULTIPLE CLASSIFICATION ANALYSIS.

Multiple classification is a technique for examining the interrelationships between several independent variables and a dependent variable within the context of an additive model. Unlike other simpler forms of multivariate methods, the technique can handle dependent variables with no better than nominal measurement and interrelationships of any form among the independent variables or between an independent and a dependent variable. The dependent variable, however, should be an intervally scaled (or a numerical) variable without extreme skewness or a dichotomous variable with two frequencies which are not extremely unequal.

MCA shows how each independent variable relates to the dependent variable both before and after adjusting for the effects of the other independent variables and how all the independent variables considered together relate to the dependent variable.

Advantages of MCA

This technique overcomes some of the problems of trying to apply either of the two more usual multivariate procedures to survey data. If analysis of variance is to be used, the problem of correlated independent variables must be considered. If multiple regression or discriminant function analysis is to be used, one is confronted with the problem of independent variables which are not numerical but categorical, often with scales as weak as the nominal level. If we take a case of correlated independent variables, the traditional analysis of variance technique will require that the independent variables be independent. Correlated independent variables not only create problems for estimating the total variation explained by a set of independent variables, they also affect one's estimate of the predicted value of the dependent variable.

A key feature of the MCA technique is it's ability to show the effects of each independent on the dependent variable both before and after taking into account the effects of all other variables. Other forms of traditional multivariate methods (analysis of covariance, multiple regression, and discriminant functions) perform this but they can only do it when the data are of a prescribed form. They usually require that all the variables be measured on an interval scale and that relationship be linear.

Another important feature of the MCA technique lies in it's freedom from these restriction. The independent variables are always treated as sets of classes or categories, so it does not matter whether a particular set represents a nominal scale(categories) or ordinal scale (ranking) or an interval scale (classes of numerical variable).

The advantage of using MCA are those of convenience in input, output and presentation. The MCA coefficients are all expressed as adjustments to the grant mean, not deviations from single class which must be excluded from each set when dummy variables are used.

Limitation of MCA

There are two main limitations of MCA:

1. The basic analytical model and procedures used to solve equations implied by the model.
2. Theoretical limitation: that is that the sample size be large enough.

The first limitation arises because the method assumes that the data are understandable interms of an additive model. In this way the technique is insensitive to interaction effects.

The second limitation is due to the iterative procedures used to solve the normal equations required by additive model. Usually when the independent variables are highly intercorrelated, then the sequential adjustments do not converge rapidly and infact estimates may still be changing when the interactions are stopped. In this case the convectional regression coefficients are also quite unstable. However, if the overlap is too great as when a sub-class of each of the independent variable is identical with the other, then the process does not converge at all. In this case the solution to the usual normal equations of multiple regression becomes impossible.

Another limitation is that there are supposed to be a large number of cases which are as a result of large number of degrees of freedom associated with most MCA analysis.

Additive Models and their Limitation

MCA assumes that the phenomena being examined can be understood interms of an additive model. In simple terms, it assumes that the average score (this is on the dependent variable) for a set of individuals is predictable by adding together the 'effects' of the several independent variables. An important implication of this is that the results can be distorted by interaction.

Iterative Procedure and it's Limitation

The central aspect of MCA is it's ability to determine the 'coefficients' or 'adjusted deviations' associated with the categories of each independent variable. The values of these coefficients can be obtained by solving a set of simultaneous linear equation called the normal equations. In MCA this estimates are arrived at by a series of successive approximations, altering one coefficient at a time on the basis of latest estimates of the other coefficients. These coefficients are mathematically identical to those which could be derived by solving the normal equation of ordinary regression using "dummy variables" and adjusting the coefficients so that the weighted mean of each set is equal to zero.

Statistical Background of MCA

The statistical model used by MCA is not new. The model specifies that a coefficient be assigned to each category of each independent variable and that each other units score on the dependent variable be treated as a sum of the coefficients assigned to the categories characterizing it, plus the average for all cases, plus an error term.

$$Y_{ij...n} = Y + a_i + b_j + ... + e_{ij...n}$$

where

$Y_{ij...n}$: is the score (on the dependent variable) of individual n who falls in category i of independent variable A, category j of independent variable B etc.

Y : grand mean on the dependent variable.

a_i : the effect of membership in the i^{th} category of independent variable A.

b_j : the effect of membership in the j^{th} category of the independent variable B.

$e_{ij...n}$: error term for this individual.

The adjusted coefficients can be thought of as having been estimated in such a manner that they provide the best possible fit to the observed data, that is, so as to minimize the sum of the (squared) errors.

The normal equation solved in MCA are of the nature:

$$a_i = A_i - Y - 1/w_i \; \Sigma_j w_{ij} b_j - 1/w_i \Sigma_k w_{ik} c_k$$

$$b_j = B_j - Y - 1/w_j \; \Sigma_i w_{ij} a_i - 1/w_i \Sigma i w_{jk} c_k$$

$$c_k = C_k - Y - 1/wk \; \Sigma_i w_{ik} a_i - 1/w_k \Sigma_j w_{jk} b_j$$

where:

A_i : is the mean value of Y for cases falling in the i^{th} category of independent variable A.

B_j : is the mean value of Y of cases falling in the j^{th} category of the independent variable B.

C_k : is the mean value of Y for cases falling in the k^{th} category of independent variable C.

w : number of cases (weighted).

Statistics displayed by MCA are found in the following way: First we need to get the basic terms. Thus

Y_k : individuals K's score on the dependent variable.

W_k : individuals K's weight.

N : number of individuals.

C : total number of categories across all independent variables.

P : number of independent variables.

a_{ij}: adjusted duration of the j^{th} category of independent variable i on the final computation (iteration).

Hence we have:

Sum of Y = $\Sigma_k W_k Y_k$

Sum of Y^2= $\Sigma_k W_k (Y^2{}_k)$

Grand mean of Y= $\Sigma_k W_k Y_k / \Sigma_k W_k$

Sum of Y for category j

of independent variable i = $\Sigma_k W_{ijk} Y_{ijk}$

Sum of Y^2 for category j

of independent variable i = $\Sigma_k W_{ijk} Y^2{}_{ijk}$

Standard deviation of Y = $\Sigma_k W_k Y^2{}_k - (\Sigma_k W_k Y_k)^2 / \Sigma_k W_k \ / \ \Sigma_k W_k - (\Sigma_{ijk}/N)$

Mean Y for category j

of independent variable i $Y_{ij} = \Sigma_k W_{ijk} / \Sigma_k W_{ijk}$

Sum of squares based on

unadjusted deviation for

independent variable i $U_i = \Sigma_j (\Sigma_k W_{ijk})(Y_{ij} - Y)$

Sum of squares based on

adjusted deviation for independent variable i	$D_i = \Sigma_j(\Sigma_k W_{ijk})(a_{ij})^2$
Explained sum of squares	$E = \Sigma_i \Sigma_j a_{ij}(\Sigma_k W_{ijk} Y_{ijk})$
	$= \Sigma_i \Sigma_j \ldots \Sigma_n W_{ij\ldots n}(a_i + b_{j\ldots})^2$
Total sum of squares	$T = \Sigma_k W_k (Yk - Y)^2$
	$= \Sigma_k W_k (Y_k{}^2) - (\Sigma_k W_k Y_k)^2 / \Sigma_k W_k$
Eta for independent i	$n_i = \sqrt{(U_i/T)}$
Beta for independent i	$\beta_i = \sqrt{(D_i/T)}$
Multiple correlation coefficient (squared)	$R^2 = E/T$
Adjustment for degrees of freedom	$A = N-1/N+P-C-1$
Multiple correlation coefficient (squared and adjusted for degrees of freedom)	$R^2_{adj} = 1-[(T-E)/(N-C+P-1) \ / \ T/(N-1)]$
	$= 1-(1-R^2)A$
Eta (squared and adjusted for degrees of freedom)	$Eta^2_{adj} = 1-[(T-E)/(N-C) \ / \ T/N-1]$
	$= 1-(1-Eta^2)A$

CHAPTER THREE

APPLICATION OF CHI-SQUARE AND REGRESSION ANALYSIS

3.1.0 INTRODUCTION.

Fertility is usually determined by many factors besides infant and child mortality. Thus in order to find out which other factors affect fertility, we shall have selected socioeconomic and demographic variables being analyzed to see if they affect fertility. In this chapter our dependent variable shall be children ever born. The establishment of this relationship will enable us to control for those confounding factors when trying to isolate the effect of infant and child mortality on fertility. Because CEB is seriously influenced by age, we shall have to control for it. Out the seven age groups , we shall re-group them to form three age groups. These will include age group 15-24, being young women, 25-34 middle aged women and 35-49 taken as old women. Thus our analysis will be by this three age groups.

There will be two methods of analysis that will be applied. These are Chi-square which will be used to find if there is an association between the dependent and the independent variable. Multiple Regression analysis will be used to find the strength and direction of the relationship.

3.1.1 CHI-SQUARE ANALYSIS

In this section we shall examine if there exist a relationship between the named independent variable with the dependent variable which is children ever born. Chi-square (X^2) shows if any two variables are dependent or independent at a given level of significance. Chi-square, however, does not show the strength of the relationship.

In Chi-square, the null hypothesis states that there is no association between the variables in question. The alternative hypothesis states that there is an association between the variables. Thus it is on the basis of this that we set out to perform our analysis. In order to capture fully the relationship children ever born was classified into three categories, that is 1-3, 4-7, 8+. This can be seen as low fertility, moderate fertility and high fertility respectively. This was also necessary for the computer run.

Analysis by the various socio-economic variables are considered below:

3.1.2 EDUCATION

Looking at Education we notice that the two variables, education in its categories and children ever born are highly dependent at one percent level of significance. The observed or rather the calculated Chi-square value is by far greater than the expected value. Thus the two variables are highly dependent according to the level of significance displayed. This can be observed from table 3.1.2(a) below.

Table: 3.1.2(a) Chi-Square Analysis of Children ever born and Education level for age group 15-24.

		level of education				
		no educ	pri incomp	pri comp	sec+	total
children ever born	1-3	155	614	1072	721	2563
	4-7	18	41	15	14	89
	total	173	655	1087	736	2651

Chi- square	D.F	Significance
62.68721	3	.0000

when we consider the chi-square for age group 25-34 we notice that it has increased markedly to 168.84011 though the number of degrees of freedom has also increased . The two variables are found to be dependent and significant at one percent. This is shown in table 3.1.2(b)

Table: 3.1.2(b) Chi-Square Analysis of Children ever born and Education level for age group 25-34.

		Level of education				
		no ed	Pri inc	Pri comp	sec+	total
Children ever born	1-3	157	222	164	312	855
	4-7	363	386	272	209	1229
	8+	64	49	16	5	134
total		584	657	451	525	2217

Chi-square	D.F	Significance
168.84011	6	.0000

The same case applies for women aged 35-49. The two variables are found to be dependent telling from the level of significance. Table 3.1.2.(c) below

Table: 3.1.2(c) Chi-Square Analysis of Children ever born and Education level for age group 35-49.

		Level of Education				
		no educ	Pri inc	pri comp	sec+	total
Children ever born	1-3	116	49	27	41	233
	4-7	401	223	139	70	833
	8+	453	308	99	18	878
Total		969	580	266	130	1945

Chi- square	D.F	Significance
101.05924	6	.0000

From the foregoing analysis we note that the level of fertility is highly dependent on a womans education at as low level of significance as one percent.

3.1.3 EXPOSURE DURATION

The time that has elapsed since last birth shows that it is dependent on fertility. In the first age group 15-24 we notice that the observed chi-square is much larger than the expected value. Level of significance displayed is very low meaning that the two variables are highly dependent.

The same case is observed for age groups 25-34 and 35-49. The two variables are highly dependent at one percent level of significance. This can be seen from table 3.1.3 (a) (b) (c)

It thus clearly indicate that duration of exposure since last birth has a significant effect on fertility.

Table: 3.1.3(a) Chi-Square Analysis of Children ever born and Eposure duration for age group 15-24.

		Exposure duration				
		1	2	3	4	total
Children ever born	1-3	839	201	113	1409	2563
	4-7	79	7	2		89
	Total	919	207	115	1409	2651

Chi-square	D.F	Significance
129.31683	3	.0000

Table: 3.1.3(b) Chi-Square Analysis of Children ever born and Eposure duration for age group 25-34

		Exposure duration				
		1	2	3	4	Total
Children ever born	1-3	289	106	135	325	855
	4-7	750	236	141	103	1229
	8+	81	32	13	8	134
	Total	1119	374	288	436	2217

Chi-square	D.F	Significance
343.16414	6	.0000

Table: 3.1.3(c) Chi-Square Analysis of Children ever born and Eposure duration for age group 35-49

		Exposure duration				
		1	2	3	4	Total
Children	1-3	8	5	16	205	233
ever	4-7	152	109	109	463	833
born	8+	326	107	158	287	878
	Total	486	222	283	955	1945

Chi-square	D.F	Significance
275.80449	6	.0000

3.1.4 HUSBANDS OCCUPATION

The analysis of the relationship between husbands occupation and children ever born for the age group 15-24 show that the relationship is significant at one percent. Husbands occupation and fertility are dependent. The value of the chi-square is not so high as in the case we have observed before.

For the age group 25-34, at one percent level of significance the two variables are independent. It is only at 5 percent level that they are dependent.

The analysis for age group 35-49 show that the two variables are still dependent at 5 percent level of significance.

It is noticeable that in last two age groups, husbands occupation does not display dependence between itself and fertility at one percent level of significance. In the two age group 25-34 and 35-49 dependence is established at 5 percent level of significance. Tables 3.1.4(a),(b) and (c) give the chi-square and related statistics.

Table: 3.1.4(a) Chi-Square Analysis of Children ever born and Husbands occupation for age group 15-24

		Husbands occupation					
		0	1	2	3	4	Total
Children ever born	1-3	16	250	290	230	221	1006
	4-7	1	26	26	31	4	89
	Total	17	276	316	261	225	1094

Chi-square 17.8153   D.F 4   Significance .0013

Chi-square	D.F	Significance
17.8153	4	.0013

Table: 3.1.4(b) Chi-Square Analysis of Children ever born and Husbands occupation for age group 25-34

		Husbands occupation					
		0	1	2	3	4	Total
Children ever born	1-3	18	214	170	121	169	692
	4-7	23	425	301	195	241	1185
	8+	1	53	24	29	22	130
	Total	41	693	494	346	433	2007

Chi-square	D.F	Significance
16.43341	8	.0366

Table: 3.1.4(c) Chi-Square Analysis of Children ever born and Husbands occupation for age group 35-49

		Husbands occupation					
		0	1	2	3	4	Total
Children ever born	1-3	4	79	55	25	39	202
	4-7	18	340	181	112	148	800
	8+	31	404	167	134	133	868
	Total	53	823	403	272	320	1871

Chi-Square	D.F	Significance
16.04336	8	.0418

3.1.5 **RESIDENCE**

For residence, in the age group 15-24, the analysis show that the children ever born is independent of the place of residence. The Chi-square value is not significant at even 20 percent. In this case we reject the alternative hypothesis that there is an association between the two variables and accept the null hypothesis that there is no association. In otherwords, the two variables are independent.

Considering both the remaining two age groups 25-34 and 35-49, the analysis displays a strong association between children ever born and the place of residence. The Chi-square value is significant at one percent. Thus we accept the alternative hypothesis that the two variables are dependent. The results of the analysis are displayed in the tables below:

Table: 3.1.5(a) Chi-Square Analysis of Children ever born and Residence for age group 15-24

		Residence		
		Urban	rural	Total
Children ever born	1-3	549	2013	2563
	4-7	14	75	89
	Total	563	2088	2651

Chi-square	D.F	Significance
1.5837	1	.2082

Table: 3.1.5(b) Chi-Square Analysis of Children ever born and Residence for age group 25-34

		Residence		
		Urban	Rural	Total
Children ever born	1-3	260	594	855
	4-7	142	1087	1229
	8+	9	125	134
Total		411	1806	2217

Chi-square	D.F	significance
132.60018	2	.0000

Table: 3.1.5(c) Chi-Square Analysis of Children ever born and Residence for age group 35-49

		Residence		
		Urban	Rural	Total
Children	1-3	59	175	233
ever	4-7	101	732	833
born	8+	43	835	878
	Total	202	1742	1945

Chi-square	D.F	Significance
85.18202	2	.0000

3.1.6 REGRESSION ANALYSIS

In this section we shall discuss the results from regressing the socio-economic and demographic variables with children ever born.

When we consider the problem of multicollinearity, as shown in the correlation matrix, it is evident that the problem is not serious for the age group 15-24. The correlations between the various independent variable are less than .300 save for the correlation between women with secondary and higher education and those who have completed primary school. The coefficient is shown as -.517. This nevertheless is not serious.

The other two age groups 25-34 and 35-49 show a similar case. The correlation coefficients for the various categories of independent variables are not strong enough to complicate the analysis.

Results obtained for each independent variables are discussed below.

3.1.7 EDUCATION

Education has always been regarded as influencing fertility of a woman. From the analysis of the women aged 15-24, we find that PRINC, PRCOMP and SECPLUS are negatively related to children ever born at 5 percent level of significance. From Table 3.1.3(a) it is noticed that, with reference to no education category, women with secondary plus education had -.6071 children everborn compared to -.5958 and -.2805 for those with primary complete and primary incomplete respectively.

For women in the age group 25-34, Table 3.1.3(b), women with SECPLUS are found to be negatively related to CEB and significant at 5 percent. PRINC and PRCOMP are negatively related with CEB but are not significant at 5 percent.

Analysis for women aged 35-4, PRINC shows a positive relationship with CEB which contrast with the finding for age group 15-24 which shows a negative relationship. SECPLUS still maintains a significant negative relationship at 5 percent. PRICOMP is not significant in this age group.Refer Table 3.1.3(c).

3.1.8 DURATION OF EXPOSURE

Duration of elapsed period since last birth was also considered in the regression. We had four categories of exposure EXPODUR1, EXPODUR2, EXPODUR3 and EXPODUR4.

For age group 15-24 we find that EXPODUR4 is negatively related to CEB and is significant at 5 percent. EXPODUR2 is also found to be negatively related to CEB though not significant at 5 percent. The other durations of exposure are not in the equation meaning that they are completely insignificant.

Considering women of age group 25-34, we find that EXPODUR4 is still negatively related to fertility and also still significant at 5 percent. The only difference is that the coefficient has drastically reduced from -1.02070 to -.88896 meaning that in this category reduction in CEB as a result of the EXPODUR4is less than in the age group 15-24. EXPODUR2 still maintains a negative though not significant relationship with CEB.

Analysis of women of age group 35-49 show that EXPODUR4 is still negatively related to CEB but now the value is higher than both the previous age groups. It is still significant at 5 percent. EXPODUR2 is found not to be significant at 5 percent but has a negative relationship.

From the foregoing discussion we notice that EXPODUR1, and EXPODUR3 do not seem to influence fertility because they have not featured as significant in any age group.

3.1.9 RESIDENCE

According to this study, place of current residence was divided into two categories: urban residence (URBRES) and rural residence (RURRES).

From the regression analysis, for the women aged 15-24, RURRES is positively related to CEB and significant at 5 percent relative to urban residence.

For Women aged 25-34, RURRES still was found to be positively related with CEB and significant at 5 percent. Although there is positive relationship for both age groups, nevertheless for the age group 25-34 the value is higher than that of aged 15-24. This means that women aged 25-34 had higher CEB according to their place of residence than those aged 15-24.

The same positive relationship was found for the case of women aged 35-49. The relationship was significant and the coefficient much higher compared to the other two age groups. Interpreted, this means that women currently resident in rural areas have a higher CEB than those resident in the urban areas.

3.2.0 HUSBANDS OCCUPATION

Husbands occupation was used in this analysis to indicate the socio-economic status of the family. Socioeconomic status has been known to affect fertility. Husbands occupation was classified into five categories. Those who never worked (HUSOCC0), those in farming/agriculture (HUSOCC1), sales/services (HUSOCC2), manual labour/house service (HUSOCC3) and lastly professional/clerical (HUSOCC4).

Analysis of these variables for women falling in the age group 15-24 show that HUSOCC0, HUSOCC2, HUSOCC3 are positively related to fertility (CEB) and are significant at 5 percent. HUSOCC4 is positively related to fertility though not significant.

For the case of women aged 25-34, HUSOCC3 and HUSOCC4 are positively related to fertility and significant at 5 percent. In this particular age group, HUSOCC0 and HUSOCC2 have been discarded because they are not significant in their influence on fertility.

In the final case of women aged 35-49, only HUSOCC3 is found to have a positive relationship and significant at 5 percent. The others HUSOCC0, HUSOCC2, and HUSOCC4 are found to have a negative relationship but not significant.

3.2.1 SUMMARY OF REGRESSION ANALYSIS

In the foregoing analysis the stepwise regression run was filtering out variables that were not significant and leaving only those that were found to be significant.

In a regression run, we usually have R^2 displayed. This indicates the proportion of total variation that is explained by all the variables considered. The F value is also displayed on the computer output. It shows the significance of all the variables that have been considered.

In the age group 15-24 all the variables considered, R^2 value was .45854 meaning that 46% of the total variation in the dependent variable was explained by the variables in question. The F value was shown as 248.5159 and significant at one percent.

The equation for the relationship between the dependent variable and the independent variables is;

$$CEB = 1.6736 - 1.02070(EXPODUR4) + .82704(HUSOCC2) + .87227(HUSOCC3) + .67524(HUSOCC0) - .28047(PRINC) + .16682(RURRES) - .59582(PRCOMP) - .60709(SECPLUS).$$

For age group 25-34, R^2 reduces to .3463 showing that the independent variables explained 35% of the variation in the dependent variable. F value was given as 167.1631 and significant at one percent. The equation for the relationship is;

$$CEB = 2.6600 - .88896(EXPODUR4) + .89966(RURRES) - .50773(SECPLUS) + .28946(HUSOCC4) + .24705(HUSOCC3).$$

R^2 reduced further to .2494 when age group 35-49 was considered. This indicates 24% explanation in the variation in the dependent variable by the independent variables in question. F value displayed as 91.92051 was also significant at one percent.
The equation is given as;

$$CEB = 4.0065 - 1.86221(EXPODUR4) + 1.34768(RURRES) - .70443(SECPLUS) + .30973(PRINC) + .39928(HUSOCC3).$$

The progressive diminishing of R^2 shows that as the age group increases (or rather as the age of the woman increases) other factors other than the ones considered in the analysis also account for the actual fertility outcome.

TABLE 3.1.6(a)

COEFFICIENTS OF REGRESSION RESULTS (WOMEN AGED 15-24).

EQUATIONS

	1	2	3	4	5	6	7	8
EXPO4*	-1.402	-1.3029	-1.1825	-1.0793	-1.0409	-1.0317	-1.0337	-1.0207
HUSOCC2		.6289	.7573	.8602	.8247	.8602	.8576	.8270
HUSOCC3			.7921	.8960	.8462	.8809	.8809	.8723
HUSOCC0				.6102	.6459	.6688	.6520	.6752
PRINC					.2811	.2616	.2011	-.2805
RURRES						.1869	.1986	.1668
PRICOM							-.1082	-.5958
SECPLUS								-.6071
Const	1.8300	1.6890	1.5153	1.3718	1.2713	1.1131	1.1664	1.6736
R^2	.3262	.3557	.3944	.4140	.4385	.4427	.4443	.4585
StdErr	.9487	.9279	.8998	.8853	.8669	.8638	.8627	.8518
F-Val	282.48	739.87	574.73	467.28	344.17	299.95	264.06	248.52

EXPO4* denotes EXPODUR4 as used elsewhere.

TABLE 3.1.6(b)

COEFFICIENTS OF REGRESSION RESULTS (WOMEN AGED 25-34)

EQUATIONS

	1	2	3	4	5
EXPODUR4	-.9778	-.9062	-.9034	-.8900	-.8890
RURRES		.9946	.8725	.8839	.8997
SECPLUS			-.4446	-.5091	-.5077
HUSOCC4				.2408	.2895
HUSOCC3					.2471
Constant	3.2823	2.4920	2.7553	2.7148	2.6600
R^2	.3030	.3359	.3427	.3445	.3463
Std Err	1.7632	1.7215	1.7131	1.7111	1.7092
F-Value	320.72	279.78	230.56	193.64	167.16

TABLE 3.1.6(c)
COEFFICIENTS OF REGRESSION RESULTS (WOMEN AGED 35-49

	EQUATIONS				
	1	2	3	4	5
EXPODUR4	-2.0036	-1.9166	-1.8709	-1.8651	-1.8622
RURRES		1.5600	1.2928	1.3025	1.3477
SECPLUS			-.8538	-.7533	-.7044
PRINC				.3240	.3097
HUSOCC3					.3993
Constant	6.6716	5.2924	4.1655	4.0673	4.0065
R^2	.2006	.2273	.2446	.2471	.2494
Std Err	2.5859	2.5429	2.5157	2.5121	2.5090
F-Value	243.60	190.34	125.54	106.01	91.92

CHAPTER FOUR

APPLICATION OF MULTIPLE CLASSIFICATION ANALYSIS

4.1.0 INTRODUCTION

In the foregoing chapter, we discussed the various socio-economic variables that influence fertility. That chapter formed a basis for looking at the current chapter. Usually, when one wants to control for the effects of some variables, he is required to show that there exist a relation between the control variables and the dependent variable. This we have already done in the previous chapter.

In the previous chapter we used children ever born as an dependent variable. In this chapter we intent to still use children ever born, but now in a slightly different way as shall be seen presently.

4.1.1 THE DEPENDENT VARIABLE.

The earlier studies conducted on the topic of the relationship between infant and child mortality with fertility mostly used children ever born as their dependent variable. This were mostly done at aggregate levels. With recent availability of household reproductive experiences, the analysis has shifted from aggregate to individual level. When household data is used, there is usually a bias in estimation of the effect especially when CEB is used as a dependent variable. The problem arises from the fact that fertility decisions are not static but are a life long process up to the time childbearing stops. Children ever born shows the cumulative fertility which does not show the sequential fertility decision making process. Thus it is not a continuous variable, rather it is a discrete one.

Recently there has been a recognition that fertility decisions are taken sequentially rather than at once. The advantage of sequential over static approach is that couples may modify their initial desires for children during the course of their reproductive years.

When sequential analysis is used, the experience of child mortality can be seen to affect subsequent fertility. Couples as of a given parity asses the child mortality experienced so far and possible future mortality in order to decide whether or not to have an additional child. Child mortality experienced among children already born will make Parents have more births in order to replace the dead children.

4.1.2 STRATEGY FOR ANALYSIS.

The aim of this chapter is to investigate at individual level the extent to which couples adjust their reproductive behaviour to their experience with infant and child mortality. Thus the analytical approach adopted here is to compare the additional children ever born subsequent to a specific parity between women who have experienced a child death up until that point and those who have not. The analysis of any particular parity includes all women who attained that parity whether or not they went on to successively higher parities but excludes all women who stopped childbearing at a lower parity. Thus women who eventually attained parity six are included in all the repetitions of the analysis while women who stopped childbearing at parity one are included only in the analysis refering to women attaining parity one. As a result of this type of analysis, the sample size decreases with successive parities. To avoid the problem of small sample size, the analysis will be limited to the first six parities.

To reduce the biases caused in the results by other confounding factors, the analysis included only currently married women. There was no variable indicating if the woman has been continuously married. In this case we assumed that currently married woman have been in stable union ever since they got married. This restriction allows the analysis of those women who are likely to respond to infant and child mortality effectively. Women who are single or divorced may not have the motivation to replace the dead child.

In addition, only those couples who experienced no multiple births up to the particular parity they have attained were included in the analysis. The reason for this control was to avoid the problems caused by multiple births when analyzing reproductive histories of individual couples in terms of the impact of prior child deaths on subsequent fertility. The probability that a subsequent confinement will result in multiple births is higher for women who have experienced a prior multiple birth confinement and since the risks of mortality are far greater for multiple births than for single births, their inclusion in the analysis can lead to an association between the number of subsequent children and the number of child deaths, even when no deliberate attempts at replacement are made. Thus to solve this problem,the analysis was confined to those without multiple births. It should however be noted that multiple confinements were not many in KDHS and thus the restriction only eliminates a small proportion of otherwise eligible women. Even when we have controlled for this factors the results will still be biased by some confounding factors. This can be reduced or eliminated by introducing control variables into the analysis. Using the multiple classification analysis the results are adjusted for five of this control variables, type of place of residence, education of woman, occupation of the husband, elapsed duration since last births, and age of the wife at attained parity.

4.1.3 ANALYSIS OF AGE AT ATTAINED PARITY.

In the previous chapter we could not establish the relationship between age and fertility. This was because we were controlling for age in the analysis.

Age of a woman is an important determinant of fertility. The younger the woman in the family building process, the greater the length of time she is likely to experience additional births and the more likely she will continue having children. Among women who start childbearing at the same age, those who experience an infant death will most likely tend to reach a given parity in a shorter period of time, that is, at an earlier age than those whose infants survive. We shall have to control by the process of multiple classification analysis the age at first birth which is likely to influence the age at attained parity.

The results obtained are shown in the table 4.1.2(a). The strength of the association prior to adjustment is shown by the eta statistics and adjustment by the beta statistics. The adjusted results take into account the positive association between child mortality and age of the woman.

From table 4.1.3(a) we notice that for parity 2 and 3 there is no consistent pattern, this could be due to data problem. For parity four, the unadjusted values show that women who had experienced higher child loss attained that parity at a lower age than those who had not experienced any. After adjustment the results fail to show this relationship. Parities 5 and 6, both the unadjusted and adjusted values show the negative relationship between the number of infant deaths experienced and the age at which the mother attained the parity.

As we have seen from the table, there is a potential bias that would result from the common association of age at achieving a particular parity with both subsequent fertility and previous child loss. To avoid this bias we have to introduce as a control variable age at which parity is attained.

Table 4.1.3(a)

age of mother at attaining parities two through six among prior births, unadjusted and adjusted for the age at first birth.

Number of child death among prior birth	Age at achieving parity									
	2		3		4		5		6	
	unadj.	adj.	unadj.	adj	unadj.	adj.	unadj.	adj.	unadj.	adj.
0	32.72	32.67	33.86	33.84	35.24	35.03	36.65	36.61	37.66	37.59
1	32.67	32.88	32.91	33.94	35.21	35.21	36.78	36.83	38.36	38.40
2+	34.75	34.84	34.95	35.19	35.15	35.31	36.33	36.47	36.33	37.20
eta/ beta	.02	.02	.03	.03	.00	.00	.02	.02	.07	.07

4.1.4 EFFECT OF INFANT AND CHILD MORTALITY ON SUBSEQUENT FERTILITY AT EACH PARITY.

If couples replace their dead children then we expect a positive relationship between the number of subsequent birth to women of a given parity and the number of experienced infant and child losses among children already born. The number of additional birth is expected to be least for women whose children have all survived and should be expected to increase with more child losses.

In table 4.1.4(a), the additional number of children ever born is shown as deviations from the grand mean at each attained parity.

Several findings are discernable from this table. The unadjusted results are consistent with replacement behavior. It is only at parity five and six that there seems to be some inconsistency especially for women who have lost two children. In all the other parities, as the woman experienced more child losses they had a higher subsequent fertility at that parity. There is evidence of a strong association between prior experience of infant and child mortality and subsequent fertility behaviour as shown by the eta coefficients.

After adjusting for the confounding factors, we get the differences between those with no prior infant loss and those with one infant loss from parity two to six as .26, .24, .20, .27, .34,. This shows the amount of adjustment the couples made after experiencing this one child loss. They went on to have a higher fertility. For parity one, the subsequent fertility after one child loss is not consistent with replacement strategy. This could be due to the fact that the couples have not yet settled enough to make effective fertility decision and especially so to replace the dead child.

When we compare women with one child loss and those with more than one prior child loss, we find that the subsequent fertility for those with more than one prior child deaths have a greater number of additional live births than those women who have had only one prior child loss. Take a case of parity two, those who experienced two infant deaths went on to have 5.699 additional births compared to those who experienced one child loss who had 5.669 (these values are after adjustment for the confounding factors). It is also worth noting that those who experienced three and more child losses went on to have a much greater number of additional live births. Deviation for parity three and above are given as 1.67, 1.51, 1.29, 1.15 additional births.

Considering the eta coefficients shown in the unadjusted column we notice that as the parity increases the correlation between prior infant and child death and subsequent fertility at each parity becomes stronger. That is as a woman experiences more prior infant deaths of her children she will automatically go for more subsequent births. Beta value which is shown in the adjusted column shows that prior child loss explains at each parity a greater variation in additional children ever born reaching its highest at parity six.

The analysis also show that a substantial amount of variation in the number of additional children ever born at each parity is explained by all the independent variables including infant and child mortality. The coefficients of determination displayed in the MCA run as R^2 gives values of .613, .574, .539, .485, .410, .368 for parity one to six.

Table 4.1.4(a)

Number of additional Children ever born, expressed as deviation from the overall mean, according to the number of deaths before age five for Parities one to six.

Number of infant deaths at each attained parity.	Grand mean	Unadjusted	Adjusted*	N
Parity 1	5.001			
0		.00	.01	2291
1		.07	-.24	111
eta/beta		.01	.02	
Parity 2	5.439			
0		-.04	-.03	889
1		.25	.23	231
2		.76	.26	21
eta/beta		.04	.05	
Parity 3	5.983			
0		.08	-.05	1536
1		.27	.19	243
2		1.04	.64	53
3		2.61	1.67	23
eta/beta		.10	.06	
Parity 4	6.621			
0		-.07	-.07	1132
1		.11	.13	261
2		.26	.27	72
3+		2.27	1.51	15
eta/beta		.11	.08	
Parity 5	7.301			
0		-.10	-.11	801
1		.13	.16	254
2		.12	.17	73
3+		1.37	1.29	31
eta/beta		.13	.15	
Parity 6	7.863			
0		-.13	-.16	592
1		.19	.18	209
2		.06	.20	77
3+		.95	1.15	38
eta/beta		.14	.16	

*Adjusted for education,residence,husbands occupation,age at attained parity and duration of exposure

4.1.5 <u>THE ROLE OF CONTRACEPTION</u>

It has been said that the influence of infant and child mortality on subsequent fertility depends on whether the couples exercise fertility control after reaching their desired family size (Mensch:1984, Nur:1985). If contraception is not practiced then childbearing will continue until when the woman will be physiologically incapable of having more children or when the marriage dissolves. When no contraception is practiced the subsequent fertility is expected to be completely independent of prior child losses. Thus little or no association is expected between infant and child mortality and subsequent fertility for the couples who do not contracept. On the other hand an association is expected incase of contracepting couples between prior infant and child loss and subsequent fertility behaviour.

Table 4.1.5(a) shows the outcome of the analysis of those who have never used any contraceptive method and those who have ever used. Considering the never users, the unadjusted and adjusted deviation seem not to show a consistent replacement pattern. Comparing the adjusted results between never users and ever users of contraception, those who have lost no prior child and those with one child loss indicate that the ever users go on to have a higher number of births than those who do not use. The results from the ever users show clearly that family limitation is one of the factors that enhance replacement.

The figures show that the never users went on to have -.13, .28, .13, -.15, .01, and .12 births for parities one through six, while the ever users had .30, .31, .43, .54, .51, and .55 additional births after experiencing one prior child loss. It is also clear that those who experienced higher child losses, only the ever users had a much higher number of additional live births than the never users.

Table 4.1.5(a)

Mean number of additional children ever born by parity, and deviation from the mean by parity and prior experience of infant death for parities one to six, and by never users and ever users of contraception.

Number of infant death at attained parity.	Never users Grand mean.	Unadj.	adj.	N	Ever users Grand mean.	Unadj.	adj.	N
Par 1	4.996				4.993			
0		.00	.01	1168		-.01	.01	1222
1		-.01	-.02	66		.25	.31	49
eta/beta		.00	.01			.02	.02	
Par 2	5.466				5.420			
0		-.04	-.03	943		-.04	-.04	1035
1		.31	.25	135		.19	.27	106
2		-.19	-.17	16		3.69	1.65	5
eta/beta		.04	.04			.10	.05	
Par 3	6.054				5.917			
0		-.06	-.05	757		-.12	-.07	856
1		-.00	.08	131		.66	.36	127
2		.98	.68	38		1.06	.69	16
3		2.54	1.70	3		*	*	
eta/beta		.10	.07			.12	.07	
Par 4	6.682				6.571			
0		-.01	-.01	552		-.13	-.13	642
1		-.18	-.16	137		.40	.41	140
2		.05	.15	45		.78	.64	30
3+		1.94	1.49	14		3.63	2.92	2
eta/beta		.13	.10			.13	.12	
Par 5	7.268				7.335			
0		-.04	-.05	403		-.14	-.17	447
1		-.06	-.04	132		.26	.34	140
2		-.20	-.15	42		.50	.57	35
3+		1.28	1.26	26		2.00	1.91	5
eta/beta		.15	.14			.13	.15	
Par 6	7.756				7.968			
0		-.10	-.12	307		-.17	-.20	323
1		.02	.00	98		.38	.35	12
2		-.06	.05	49		.31	.50	40
3+		.98	1.13	31		1.23	1.64	6
eta/beta		.15	.18			.15	.17	

Adjusted for the effects of Education, Residence, Husbands occupation, duration of exposure and age at attained parity.
* Data missing.

4.1.6 THE DEGREE OF REPLACEMENT

In this analysis we attempt to measure the degree of replacement or replacement rate defined as the ratio of additional births to additional deaths (preston 1978).

To accomplish this we use the ever users column in table 4.1.5(a). This is because, it is only when contraception (family limitation) is practiced that replacement will be evident.

Table 4.1.6(a) shows the mean number of replaced birth and the percentage of replaced birth at each parity and child loss levels. We notice that replacement rate in kenya is less than one or rather the percent of replaced birth fall short of 100%. Replacement is said to be complete when one additional child death in a family prior to the end of the parents reproductive life induces one additional birth. The highest replacement rate is evident at parity two for the women who experienced two child losses. The two infant losses were replaced by 1.69 births. Replacement rate is more or less stable for parities three through six. For one infant that died, it tended to be replaced by .43, .54, .51, and .55 additional birth for parities three to six. There is also stability in replacement rate for the case of those who experienced two prior infant deaths.

It should however be recognized that this index of replacement exaggerates the efforts of replacement because at every given parity the number of additional births do not only reflect the reaction to prior infant loss but also the subsequent overall response to subsequent child losses. This positive relationship between prior and subsequent child losses will have to bias upwards the degree of replacement.

Table 4.1.6(a)
Adjusted mean number of additional children ever born, number of replaced births and degree of replacement by experience of infant and child deaths at each attained parity.

No. of infant death at each attained parity.	Mean number of subsequent birth.	Mean number of replaced birth.[a]	percent replaced births.[b]
Parity 1			
0	5.00		
1	5.30	.30	30
Parity 2			
0	5.38		
1	6.69	.31	31
2	7.07	1.69	85
Parity 3			
0	5.85		
1	6.28	.43	43
2	6.61	.76	38
Parity 4			
0	6.44		
1	7.00	.54	54
2	7.21	.77	38
parity 5			
0	7.17		
1	7.68	.51	51
2	7.91	.74	37
parity 6			
0	7.77		
1	8.32	.55	55
2	8.47	.70	35

a) Mean number of replaced births refers to the difference in the adjusted mean number of additional children ever born between groups of women who have and have not experienced infant deaths.

b) Percent replacement = $\frac{\text{Replaced births}}{\text{Number of infant deaths}} \times 100.$

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

5.1.0 SUMMARY

This study had three objectives . The first was to establish if women who experienced child loss go on to have more births or not at each given Parity. The tool of analysis used to find out the effect was multiple classification analysis. This technique gives both the unadjusted and adjusted results. The adjusted results show the effect of a given variable after all the other confounding factors are controlled.

Second was to examine the relationship between selected socio-economic and demographic variables with fertility. The analytical tool were was Chi-square which measure dependence, and multiple regression analysis to measure the strength of the relationship.

Thirdly, was to measure the degree of replacement rate in Kenya by calculating the ratio additional births to deaths for women who practice conscious family limitation.

By use of KDHS data this study was able to show the effect of socio- economic and demographic factors on fertility.

Chapter three formed a preliminary level analysis to show the effect of selected socio-economic and demographic factors on fertility. The chapter formed the basis of chapter four. Fertility is known to be affected by many factors. Thus to be able to isolate the effect of one variable, then the other variables that are known to affect the dependent variable must be controlled. In our analysis, the selected socio-economic and demographic variables have been demonstrated as affecting fertility. In chapter four this variables formed the control variables. Thus conclusions that have been drawn in this study are based on the two chapters.

5.1.1 FINDINGS AND CONCLUSIONS

Chapter three shows the results of Chi-square and regression analysis. Analysis in this chapter was done by age groups. The findings show that there is a significant relationship between education and fertility measured by CEB using Chi-square. The relationship is pronounced in all the three age groups. Regression analysis showed that there was a significant and negative relationship between women with primary incomplete, primary complete and secondary and above level of education with fertility for age group 15-24. In age group 25-34, only secondary and above was found to have a negative and significant effect on fertility. Age group 35-49, Primary incomplete displayed a positive and significant relationship while secondary and above showed a negative and significant relationship. Thus there is a significant relationship between education and fertility (CEB).

Chi-square analysis for elapsed duration since last birth, had similar results as the one observed for education . For all age groups, the relationship between the variables, dependent and independent was confirmed at one percent level of significance. Regression results indicate that amongst all the categories, only elapsed duration since last birth of over sixty months, has a negative and significant relationship with fertility in all the age groups. Some other exposure durations show a relationship though not significant at five percent level of significance. Thus the null hypothesis was rejected. Hence there is a significant relationship between elapsed duration and fertility.

The variable, Husbands occupation also considered in the study gave some interesting results. For the case of age group 15-24 the relationship was found to be significant at one percent by use of Chi-square analysis. Results for the other two age groups, 25-34, 35-49 were found to be significant at five percent. With respect to those employed in Farming/agriculture in one way or another, they all have a positive and significant relationship with fertility. Thus the null hypothesis was rejected at five percent level of significance in all the three age groups and thus conclude that husbands occupation significantly affects fertility.

Results from Chi-square analysis on the relationship between residence and fertility for the age group 15-24, show that there is no significant relationship between the two variables at five percent level. In this case we reject the alternative hypothesis and accept the null hypothesis that there is no significant relationship between the given variables in that age group.

The other two age groups 25-34 and 35-49 show a significant relationship between residence and fertility. In all the age groups Rural residence had a positive and significant relationship with fertility with respect to Urban residence when regression analysis was performed. We thus conclude that place of residence significantly affects fertility.

The analysis of age at attaining a given parity by using MCA technique indicate that it is only at the higher parities, that is, four, five, and six, that the hypothesis was confirmed. At these parities, women who had lost the highest number of children, that is , two and above attained the parity at a lower age compared to the other women who had lost none or one, this confirmed our hypothesis.

When we consider the effect of infant and child mortality on subsequent fertility at each parity, we found that as from parity two, for both the adjusted and the unadjusted results in the MCA analysis, women who lost more children had a higher number of additional children ever born, indicating that, women who experienced a child loss went on to have an additional birth to replace the dead child. The strength of the relationship between child loss and subsequent fertility was also found to be strong and increasing with parity.

When we considered which category among the ever users of contraception and never users are likely to exhibit replacement effect, it was found that, ever users of contraception displayed a much more consistent replacement effect compared to the non users. Thus we conclude that replacement is only effective where conscious fertility limitation is practiced.

Results from table 4.1.6 (a) showing the degree of replacement, clearly shows that replacement in Kenya is on average less than half (.5). That a woman who lost her child could not replace it fully. This means that a woman who has suffered a child loss may not be able to replace the child immediately because of fecundity impairments at the time of death or due to other socio-cultural norms that may require abstinence until some rites have been performed or due to unpleasantness of experiencing yet another death when another child is born.

<u>Summary</u>

From the foregoing discussion we have found that, all the socio-economic and demographic factors considered in the analysis proved to have a significant relationship with the dependent variable.

We have also established that infant and child mortality has an effect on fertility, and that contraception users display replacement strategy. We have also demonstrated that replacement in kenya is less than unity.

5.1.2 RECOMMENDATION FOR POLICY FORMULATION

For policy makers, factors affecting fertility are more interesting if they can be influenced by administratively and politically feasible means. Unfortunately determinants of fertility that are linked to policy are often poorly understood.

But from this study there are some illuminating findings, and thus on the basis of the findings we recommend that:

1. Since primary complete and secondary and above levels of education have demonstrated a consistent negative relationship with fertility, we recommend that the Government should offer more concessions in education so that more and more women can have access to higher levels of education.
2. Programmes aimed at reducing infant and child mortality should be undertaken. Improvement in maternal and child health should be emphasized.
3. When child survival is favourable then women will go for fewer children. In this regard we recommend that organized family planning programmes should be undertaken. In this case because child mortality levels are still not favourable we recommend that non reversible family planning methods should be popularized.
4. The socio-economic status of women should be improved. Women should be encouraged to take active part in income generating activities etc so as to elevate them from just being tools for procreation.

5.1.3 RECOMMENDATION FOR FURTHER RESEARCH

To be able to understand fully the effect of infant and child mortality on fertility, other channels through which this effect operates must be investigated.

We thus recommend that with either using secondary or primary data;

1. Physiological or Biological effect should be investigated and know to what extent infant and child mortality affects fertility using this mechanism.
2. Family planning programmes seem not to be having a significant impact on fertility in Kenya. Thus we recommend that the effect of infant and child mortality on contraceptive use be addressed by future researchers on this topic.
3. Investigations should be carried out to find out how a child loss affects the desire for more children. This type of research is advantageous for it impedes the physiological effect.

BIBLIOGRAPHY.

Adlakha. A.L (1970) "A study of infant mortality in Turkey". Ph.D Thesis. University of Michigan.

Becker. G.S. (1960) "An Economic Analysis of Fertility, Demographic and Economic changes in Developed Countries." Princeton; New Jersey: Princeton University Press.

Ben Porath, Y. (1978) :"Fertility Response to Child Mortality: Micro data form Israel",in S.H. Preston (Ed). The effects of infant and child mortality on fertility. New York; Academic Press.

Cantrelle, P.; B. Ferry,; J. Mondot, (1978) : "Relationships between Mortality and Fertility in Tropical Africa. In S.H. Preston (Ed). The effect of infant and child mortality on fertility. New York; Academic Press.

Chanaka, T.T. (1987) : "The effects of child loss experience on Fertility Preference and Regulation : A comparative study based on WFS data for Egypt, Ghana, and Lesotho". In Studies in Africa and Asian demography. Cairo: Cairo Demographic Centre. Seminar No. 17.

Chen, L,C., S. Ahmed,; M. Gesche,; and W.H. Mosley, (1974). "A Prospective Study of birth interval dynamics in rural Bangladesh", Population Studies 28:277-297.

Cicred, (1975): "Seminar on infant and child mortality in relation to the level of fertility" 6-12 May, Bankok.

Cochrane, S.H.(1979): Fertility and Education. What do we really know?. Baltimore: Johns Hopkins University Press.

Cochrane, S.H and Zachariah K.C .(1984): "Infant and child mortality as a determinant of fertility: The policy implication" Proceeding of the Expert Group on fertility and Family, 5-11 January 1983. New York: United Nations.

Easterlin, Richard A. (1969) : Towards a socio-economic Theory of Fertility : Survey of recent research on Economic Factors in American Fertility, in S.J. Behram et al.(Eds), Fertility and Family Planning; A World View Ann Arbor; University of Michigan Press.

Easterlin Richard A.,(1975) "An Economic Framework for fertility analysis", Studies in Family Planning. 6.

Ekanem I.I., (1979); "Prospects fertility decline in sub-saharan Africa, Prospects of Population : Methods and assumptions", Papers of the AD HOC Group of Experts on Demographic Projections, New York.

El-Deeb, B (1988) "Quantitative analysis between child mortality and fertility in Egypt, Sudan, Kenya and Lesotho" Dakar; IUSSP Conference, 1988.

Farah, A (1981): "Influence of child mortality on fertility related attitudes in Greater Khartoum". In Studies in African and Asian Demography. Cairo: Cairo Demographic Centre.

Freedman, R. (1962) : "The sociology of Human Fertility. A trend report and bibliography", Current sociology 10:11.

Friedlander, Dov (1977). The effect of child mortality on fertility: Theoritical Framework of the relationship. In International Population Conference, Vol. 1; Mexico.

Gerardo, Gonzatez (1977): "Some notes on Socio-economic development and Demographic transition". In Proceedings of UN/UNFPA Expert group meeting April/May.

Harrington J.A (1966): "Comparative study of Infant and Childhood survivorship in West Africa" Ithaca, New York; Unpublished Ph.D Thesis,

Hosinger, D.B and Kasarda, J.D (1976): "Education and Human Fertility: Sociology Perspectives", In R.Rider(ed).Population and Development: The Search for Selective interventions. Baltimore; Johns Hopkins University Press.

Kibet, M.K. (1981): "Differential Mortality in Kenya." M.sc Thesis, Population studies and Research Institute, University of Nairobi.

Knodel, J (1968): "Infant Mortality and Fertility in Three Bavarian villages. An analysis of Family Histories from the 19th Century", Population Studies, 21.

Knodel, J. (1981): "Child Mortality and Reproductive Behaviour in German Village Population in the past: A micro level Analysis of the Replacement effect". Research Report No. 81-1, Ann Arbor: University of Michigan.

Leibenstein, H. (1974): "Socio-economic Fertility Theories and Relevance to Population Policy", International Labour Review.

MahaDevan, K. (1981): "Culture, Nutrition and Infant and child mortality: A case study in South Central India". Manilla; IUSSP.

Mensch B.S. (1985) "The effect of child mortality on contraceptive use and fertility in Columbia, Costa Rica and Korea", Population Studies, 39.

Mosley, W.H and L.C Chen (1984) "An analytical framework for the study of child survival in developing countries", Population and Development Review, 10.

Namboodiri, N.K. (1983) "Sequential fertility decision making and the life course." In R.A. Bulatao and R.D. Lee (eds) Determinants of fertility in Developing Countries, Volume 2. R.A Bulatao and R.D. Lee (eds). New York: Academic Press.

Olsen, R.J. (1980) "Estimating the effect of child mortality on the number of births," Demography 9:3.

Ondimu, N.K., (1987): "The socio-economic Determinants of infant and child mortality: Evidence from Kenya Contraceptive Survey, 1984". M.A. Thesis, Population studies and Research Institute, University of Nairobi.

Ong'uti, E.N., (1987): "Fertility levels and Differentials in Kenya: Evidence from Kenya Contraceptive survey, 1984". M.A Thesis, Population Studies and Research Institute, University of Nairobi.

Osiemo, J.A.O., (1986): "Estimation of fertility Levels and Differentials in Kenya: An application of the Relational Gompertz and Coale Trussel Models". M.sc Thesis, Population Studies Research Institute, University of Nairobi.

Park, C.B., S.H. Han, and M.R. Choe. (1979). "The affect of infant death on Subsequent Fertility in Korea and the role of family Planning," American Journal of public health 69.

Pebley. R.A, H. Delgado. and E. Brineman,(1979): "Fertility desires and child mortality experience among Guantemalan women". Studies in Family Planning 10:4.

Preston S.H. (1975) "Health Programmes and population growth." Population and development Review 1,2.

Preston S.H. (1978) The effect of infant and child mortality on Fertility. New York: Academic press.

Rodgers G.B (1976) "Fertility and Desired Fertility: Longitudinal evidence from Thailand", Population Studies, 30:3.

Sarma.R.S.S. (1981): "Role of child mortality on Fertility on Fertility Differentials: Evidence from the an intervention programme". In determinants of fertility in some African and Asian countries. Cairo: CDC Research monograph Series No. 10.

Shultz, T.P. (1976). "Interrelationships between mortality and fertility." In R.C. Ridker (eds) Population and Development: The Search for Selective interventions. Baltimore: Johns Hopkins University Press.

Singh, S. N. and Chakrabarty, K.C (1975): "Some findings on influence of mortality on fertility in a rural environment in India. In Seminar on Infant mortality in relation to the level of fertility. Bankok: CICRED.

Trussel, J. and Hammerslough, C. (1983) "A hazards model of the covariates of infant and child mortality in Sri Lanka," Demography 20:1.

United Nations (1987). Family Building By Fate or by Design: A Study of Relationships between Child Survival and fertility. New York: United Nations.

Ware, Hellen, (1977): "The relationship between infant mortality and fertility: Replacement and Insurance effect." International Population Conference, Mexico.

Williams, A.D., (1977): "Measuring the impact of child mortality on fertility: A methodological note." Demography, 14.

Wu, Y. et al (1978): "Effects in Rural Taiwan and Urban Morocco: Combining individual and aggregate data". In Preston S.H (ed). The effects of Infant and Child Mortality on Fertility. New York: Academic press.

Zanamwe, L.(1988) "The relationship between fertility and child mortality in Zimbabwe," Dakar: IUSSP.