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Patterns of Fertility and Contraceptive Use in Tanzania

by

Akim Jasper Mturi

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Department of Social Statistics

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ABSTRACT

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The evidence that fertility has started to decline in parts of sub-Saharan Africa is the major motive of conducting the current research. This is particularly important because the Tanzanian Government considers the current fertility levels to be very high. As a consequence, the Government of the United Republic of Tanzania has established a National Population Policy in 1992.

This study examines the reproductive behaviour of Tanzanian women. The study of current levels and trends of fertility showed that, on the average, a Tanzanian woman bears six children. This is a decline from seven births per woman which prevailed between 1960s and early 1980s. The reduction in infant and child mortality and the rise in age at first marriage are among the factors responsible for the decline in fertility in Tanzania. It should be noted, however, that this decline is largely confined to urban areas. The percentage of women using contraception is still very low in Tanzania but a rising trend has been observed recently.

Breasfeeding is both prolonged and universal in Tanzania and its importance in lowering fertility below its biological maximum is noted. In fact, the effect of breastfeeding durations in prolonging birth intervals is found to be statistically significant even after controlling for amenorrhea and after resuming sexual relations. Variations in durations of breastfeeding, length of birth intervals and the extent of using contraception are found to depend mainly on the region of residence, the type of place of residence and the age of women. It is important therefore to design separately programmes to lower fertility by regions of residence, by rural/urban residence and where relevant target young women separately.

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Notes on Publications

Parts of this thesis have been published as papers/chapter in peer-reviewed journals and a book. This section gives notes for the publications achieved so far. Chapter Four has been summarized and published as a paper with the following citation: Mturi, Akim J. and P.R. Andrew Hinde (1995). "Fertility Decline in Tanzania." **Journal of Biosocial Science**, volume 26, no. 4: pp. 529-538. Another published paper which uses a lot of information from Chapter Four as well as other Chapters in the thesis has the following reference: Mturi, Akim J. and P.R. Andrew Hinde (1995). "Recent Demographic Changes in Tanzania: Causes, Consequences and Future Prospects." **Journal of International Development**, volume 7, no. 1: pp. 117-134.

Two papers have been published as a result of the work done in Chapter Seven. The background information for the analysis used in Chapter Seven is given in a paper: Mturi, Akim J. and Siân L. Curtis (1995). "The Determinants of Infant and Child Mortality in Tanzania." **Health Policy and Planning**, volume 10, no. 4: pp. 384-394. One paper extracted from Chapter Seven has been accepted for publication with the following citation: Mturi, Akim J. and Siân L. Curtis (1996). "Fertility, Infant Mortality and Family Planning Policy in Tanzania." **Population Dynamics: Some Past and Emerging Issues**, R.A. Powell, E.A. Mwageni and A. Ankomah (eds.). Exeter: Institute of Population Studies, University of Exeter (forthcoming).

Chapter One

Introduction

1.1 Research Problem

Until late 1980s it was still believed that fertility rates are highest in sub-Saharan Africa[1] and there is no indication of a declining trend. In fact, various scholars suggested a rising trend in fertility in several African countries (see for example Cochrane and Farid, 1989). The reasons behind the persistently high fertility rates in the region have been suggested to include strong pronatalist forces inherent in the kinship system in Africa (Caldwell and Caldwell, 1987; Frank and McNicoll, 1987). This has caused a considerable controversy over the likelihood of fertility rates declining in the near future in sub-Saharan Africa.

The analyses based on the Demographic and Health Surveys (DHS) data, however, have given a different impression. Although fertility levels are still the highest in the world, a declining trend has been observed in several African countries. The most obvious countries where fertility has started to decline include Kenya, Zimbabwe and Botswana (Arnold and Blanc, 1990; van de Walle and Foster, 1990; Robinson, 1992; Cohen, 1993; Rutenberg and Diamond, 1993). This observation has created an interest on understanding better the African fertility. That is why the study of fertility trends and the associated factors in sub-Saharan Africa has been given special attention in the recent past.

This study is meant to contribute in understanding African fertility by examining the situation prevailing in one country: the

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[1] Sub-Saharan Africa includes all countries in Africa except Egypt, Libya, Tunisia, Algeria, Morocco and the Republic of South Africa. Throughout the thesis, Africa should be interpreted as sub-Saharan Africa unless stated otherwise.

United Republic of Tanzania. The Government of the United Republic of Tanzania considers the population growth rate (caused mainly by high fertility levels) to be very high. It has been demonstrated also that the rapid population growth rate in Tanzania has negative effects on the economy, health, education, employment, agriculture, environment and urbanisation (Mturi and Hinde, 1995). It is against this background that the Government of the United Republic of Tanzania formulated the National Population Policy, announced in July 1992, which, among other things, encourages a reduction of fertility (Planning Commission, 1992).

But, the success of the population policies particularly in Africa has been doubtful. For instance, Kenya recognized the implications of population growth in overall development long before most other African countries started to worry. As a consequence, the Kenyan family planning programme was established in 1967 (Frank and McNicoll, 1987). It was 20 years after this, however, before fertility started to decline in Kenya. This implies that more effort needs to be made towards understanding the determinants of fertility in African societies so that proper strategies can be formulated. To identify the sub-groups of the population where fertility is relatively high or is resistant to decline is a step forward in any programme meant to reduce fertility.

The study of fertility patterns and contraceptive use is therefore very timely in Tanzania because of various reasons. It is important to understand current fertility levels and factors associated with high fertility levels in Tanzania so that the impact of the National Population Policy can be assessed. Also, the analysis of new data could be used to give a better understanding of fertility trends in Tanzania in the recent past. In other words, it is important to find out if Tanzania has joined the wave of fertility decline experienced in various African countries and suggest the factors associated with the observed trends. Coincidentally, this

study started shortly after the completion of the Tanzania Demographic and Health Survey (TDHS). Therefore TDHS data were used for a detailed study of the important aspects of fertility and use of family planning methods.

The Tanzanian National Population Policy (TNPP) document (Planning Commission, 1992) states that the major causes of the high fertility levels in Tanzania are the early and universal marriage of women and the absence of effective fertility regulation within marriage. Other determinants of high fertility outlined in the same document include: a preference for male children, low levels of education, the low status of women, the large age difference between spouses, and a positive attitude towards large families. All these factors have been found to have a significant effect on fertility in different parts of the world. However, specific studies for Tanzania are few.

Fertility differentials have been considered in all the post-independence population censuses conducted in Tanzania, using the number of children ever born for specified ages of the mother as a measure of fertility. The census reports consistently state that fertility is higher among women residing in rural areas than it is among those in urban areas. Also, women with no formal education or with very limited education have higher fertility than those with high levels of education. Analyses of fertility among different occupational groups of women have shown that women in the agricultural sector have higher fertility than those in other occupational groups. The difference in fertility between married and widowed women is marginal, and the fertility of women never-married is much lower than other categories of marital status, as expected, but it is not negligible (Egero and Henin, 1973; Ngallaba, 1983a; Chuwa and Komba, 1994).

Whilst the analysis of census data considerably adds to our

understanding of the determinants of fertility in Tanzania, it conceals variations within sub-groups of the population. The individual behaviour of women and other aspects of fertility such as the intervals between births and the use of traditional as well as modern methods of family planning cannot be studied using census data. Several small-scale regional or district-level studies have been conducted in Tanzania to study fertility and the related factors, but the results cannot be generalised to the country as a whole.

1.2 Objectives of the Study

The study intends to examine reproductive behaviour for Tanzanian women and to suggest possible measures which can be taken in order to reduce fertility. Initially, the trend in fertility for the period 1967-1992 is studied, after which an examination of the contribution of each of the proximate determinants of fertility is carried out. In order to identify the sub-groups of the population with especially high fertility, the social, behavioural, biological and demographic determinants of fertility are studied.

The length of the interval between entry into sexual union and the first birth, and the interval between successive live births have important implications for fertility. Since the childbearing process is confined to a period of about 35 years, short birth intervals will lead to higher fertility. The determinants of the length of birth intervals are therefore investigated. The importance of breastfeeding in widening birth intervals, reducing infant morbidity and mortality, and conferring health benefits on the mother implies that we need thoroughly to understand breastfeeding practices in Tanzania. The analysis of birth intervals is therefore followed by a study of the determinants of breastfeeding.

After discussing the determinants of fertility, it is necessary

to shed some light on the consequences of unfavourable reproductive behaviour. A chapter has been devoted to an examination of the impact of the family planning programme on infant mortality rates through changing reproductive patterns in Tanzania. This is done by estimating the potential reductions in infant mortality that could be achieved if the Government's policies to eliminate high-risk childbearing through the use of family planning are successful. That is, if we assume that all high-risk pregnancies have been eliminated (keeping other things constant) what would happen to infant mortality? However, since complete elimination of all high-risk births is unrealistic, we examine the anticipated change in infant mortality if the family formation pattern is subject to some degree of favourable change and contrast this with what might happen to infant mortality rates if the policy failed and a less favourable pattern became the norm as often occurs during fertility transition.

Due to the importance of contraceptive use in explaining the variation in fertility and the fact that use of contraception is not yet widespread in Africa, it is important to examine the knowledge and use of contraception in Tanzania. The sub-groups of the population with low acceptance rate are identified along with the related factors. Finally, the study investigates the levels of unmet need and demand for family planning. The major focus will be to find out the proportion of women exposed to the risk of pregnancy who want to limit or space their births but are not using contraception, and what are the characteristics of these women.

1.3 Background to Tanzania

The United Republic of Tanzania is located in eastern Africa and consists of the mainland of Tanganyika and the islands of Zanzibar, altogether covering 940,000 square kilometres, 60,000 of

which are inland water.[2] Initially, Tanganyika and Zanzibar were two different countries. Tanganyika achieved independence from British rule on 9 December 1961 and Zanzibar became independent from the rule of the Sultanate on 12 January 1964. On 26 April 1964, Tanganyika and Zanzibar were amalgamated to form the United Republic of Tanzania.

Administratively, the mainland of Tanzania is divided into 20 regions, and Zanzibar into five (Figure 1.1). However, due to small number of cases in each region included in the TDHS, seven zones have been created by combining administrative regions according to geographical location and demographic similarities. Figure 1.2 shows the seven zones used throughout the thesis when examining regional effects. The breakdown of the zones is as follows: Northern (Arusha and Kilimanjaro), Coastal (Dar es Salaam, Pwani and Tanga), Central (Dodoma, Shinyanga, Singida and Dodoma), Southern (Lindi, Morogoro, Mtwara and Ruvuma), West Lake (Kagera, Mwanza and Mara), Southern Highlands and Western (Iringa, Kigoma, Mbeya and Rukwa) and Zanzibar (all regions in Zanzibar).

Tanzania is a poor country with a mixed economy in which agriculture plays a major role. The economy expanded after independence until the mid-1970s when various factors, including droughts, oil price increases, the Tanzania-Uganda war, and the break up of the East African Community, cumulatively had a devastating effect. Recently, however, steady growth has resumed. For instance, during the period 1985-1990, the annual growth in gross domestic product (GDP) measured in constant 1976 prices was 3.9 per cent (United Republic of Tanzania, undated).

Since independence, Tanzania has conducted three population censuses and two demographic surveys. The censuses were taken in

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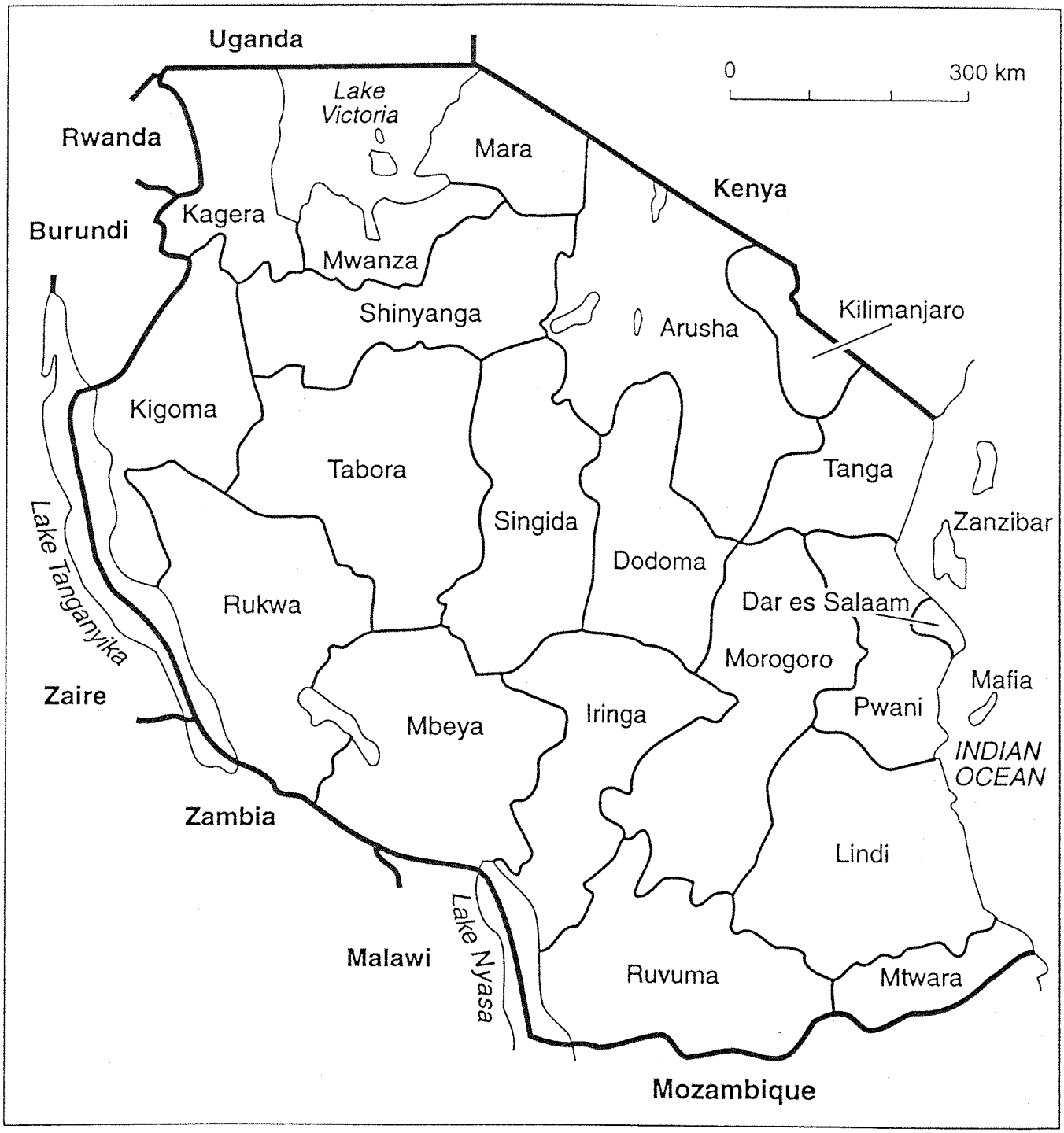
[2] Tanzania has borders with Kenya and Uganda to the north, Rwanda, Burundi and Zaire to the west, and Mozambique, Malaŵi and Zambia to the south. To the east of the country is the Indian ocean (see Figure 1.1).

Figure 1.1. Map of the United Republic of Tanzania Showing Administrative Regions.



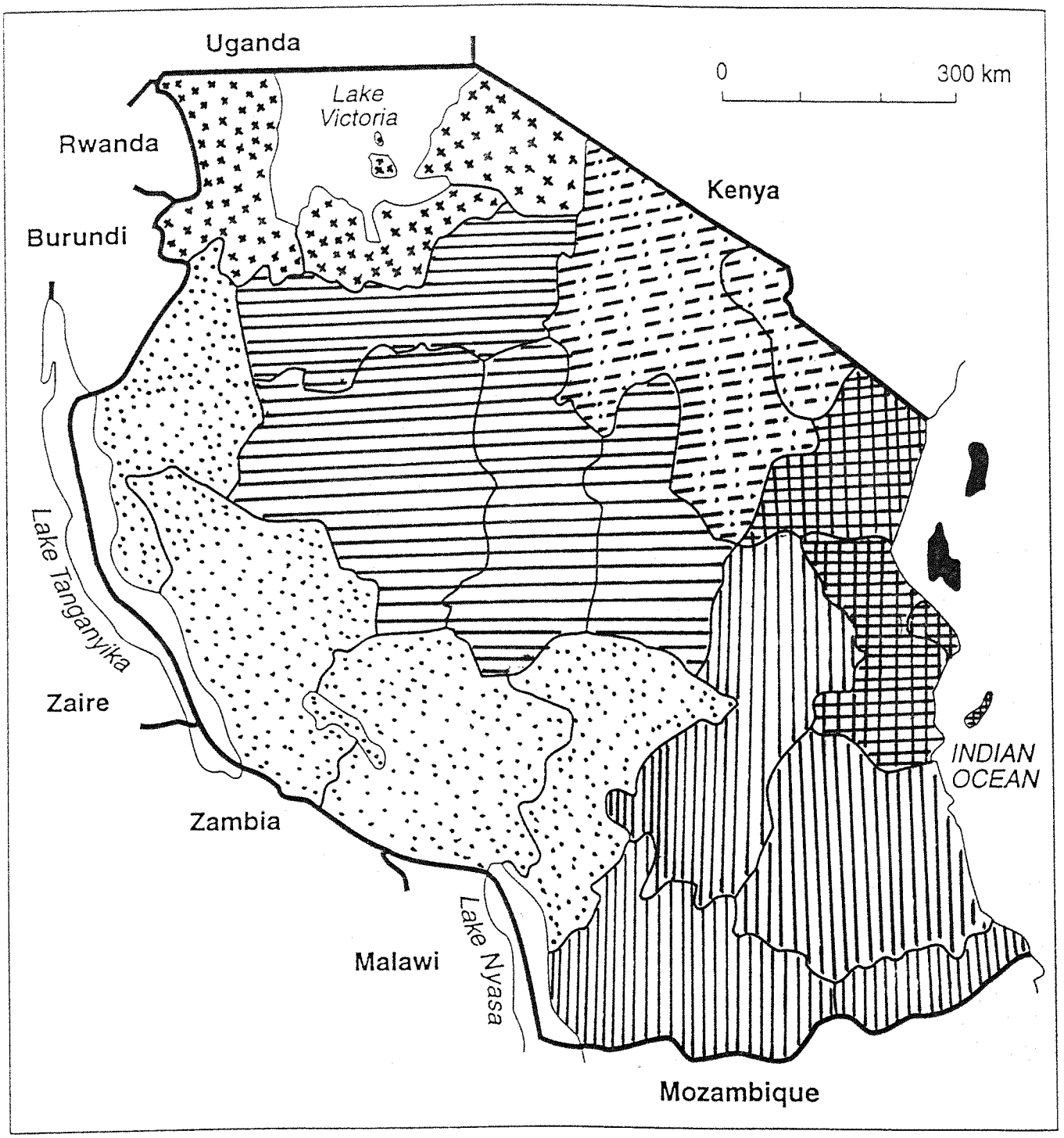
1967, 1978 and 1988; the first national demographic survey was conducted in 1973 (Henin et al., undated) and the Tanzania Demographic and Health Survey was carried out in 1991/92. These are the major sources of demographic statistics in this country, since the registration of vital events is still very incomplete.

The 1967 Population Census enumerated a total of 12.3 million inhabitants. The population then increased to 17.5 million by the time of the 1978 census, implying an annual growth rate of 3.2 per cent during the inter-censal period 1967-78. The population increased further to 23.1 million by the time of the 1988 census, giving an annual growth rate of 2.8 per cent for the period 1978-88. These figures suggest that the population growth rate has been declining in Tanzania (Bureau of Statistics, 1989; Barke and Sowden, 1992). This decline, however, has been questioned, particularly for the major city of Dar es Salaam. For instance, Briggs (1993) has discussed factors which might have caused the population of Dar es Salaam to be under-counted at the 1988 census.

The population density is 26 persons per square kilometre, a figure which gives the impression that Tanzania is a sparsely populated country. However, the population is unevenly distributed, and some areas are experiencing serious population pressure. This has encouraged the government to formulate a population distribution policy which was enforced as long ago as 1969-74, in the second-five year plan (United Republic of Tanzania, 1969). The villagisation programme of the 1970s,[3] the plan to develop Dodoma in order to reduce the importance of Dar es Salaam, and the control of rural-urban migration are among the efforts made by the government towards

[3] In the 1970s the government moved over 90 per cent of the Tanzanian Mainland's rural population into villages to make it easier to provide basic social services e.g. health services, primary schools and a clean water supply (United Republic of Tanzania and UNICEF, 1990). This was one of the Government policies based on socialism, equity and self-reliance as stipulated in the Arusha declaration (Nyerere, 1967).

Figure 1.2. Map of the United Republic of Tanzania Showing Zones Used in this Study.



a more even distribution of the population (United Nations, 1989). Tanzania's population is mainly rural. Currently, over 80 per cent of the population is residing in rural areas. Generally, women marry early. The TDHS data indicate that the median age at first marriage for women is about 18 years, and about 75 per cent of women marry before they attain the age of 25 years (Ngallaba et al., 1993).

The education system of Tanzania has different levels some of which are compulsory. The first level is primary education locally referred to as foundation education. Almost all primary schools are owned by the State. Primary education is compulsory and the entry age is seven or eight years. Children are supposed to spend seven years in primary school; standard one to standard seven. Enrolment in primary schools rose dramatically after the establishment of the Universal Primary Education in 1974 accompanied by the villagisation programme.[4] The second level which is secondary education comprises of two parts: the first four years is ordinary level and the next two years is advanced level. A small number of primary school leavers are selected to join ordinary-level secondary schools (they compete by doing a standard seven examination), as the number of secondary schools is very small compared with primary schools. The Government own most of the secondary schools. Recently, however, many private secondary schools have been established. Few students who qualify ordinary-level final examination are chosen to join advanced-level secondary schools. The number of students joining the University, higher learning institutions etc. is a very small proportion of those who started the foundation level. Despite the commitment of the Government, the 1988 Population Census showed that almost half of the people (49 per cent) are illiterate (Komba et al., 1991).

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[4] In order to fulfil the target of the Government in giving basic education to all, Universal Primary Education was introduced in 1974. It was a reaction to the low enrolment rate which was 48.6 per cent in 1973. The target of this policy was to have 100 per cent enrolment for all school age children by year 1977 (Muze, 1980).

Many religious groups exist in Tanzania, but data on their representation are not available. In many regions Christianity (Catholics and Protestants) and Islam co-exist beside traditional religions. Most of the traditional faiths are tribal religions such as animism (the belief that objects and natural phenomena possess souls). Furthermore, there are people without any faith. General observation is that areas where missionaries settled and Christianity is a dominant religion (for instance, in Kilimanjaro region), have relatively many primary and secondary schools and consequently have high literacy rate.

As already stated, in order to tackle the population problems, the Government of the United Republic of Tanzania has formulated the National Population Policy. The broad objective of this Policy is

> "to reinforce national development through developing available resources, in order to improve the quality of life of the people. Special emphasis shall be laid on regulating population growth rate, enhancing population quality, and improving the health and welfare of women and children. The mutual interplay between population and development shall constantly be borne in mind. Thus, the population policy shall always be the main guide of national development planning." (Planning Commission, 1992, pp.10-11).

The goals of the TNPP are to reduce the annual growth rate through a reduction in the numbers of births and an increase in voluntary fertility regulation. Therefore special emphasis is given to the National Family Planning Programme (NFPP) established in 1989 specifically for raising the contraceptive acceptance rate (Ministry of Health, 1989). Along with NFPP, the Family Planning Association of Tanzania (UMATI) and other agencies in the private sector have jointly facilitated the idea of making family planning services available to all who want them, encouraging every family to space births at least two years apart, and supporting family life education

programmes for youth and family planning for men as well as women, as encouraged by the Government.

1.4 Organisation of the Thesis

This introductory chapter is followed by a literature review which covers the state of knowledge on the subjects included in the analysis. The sources of data used, along with an assessment of the data quality are given in Chapter Three. Chapter Three, also, gives a brief discussion of the major statistical techniques used in the analysis. Chapter Four is the first analytical chapter, in it recent fertility trends and differentials are discussed. It contains a general overview of fertility levels in Tanzania as computed from different data sources, after which the determinants of fertility are examined.

The analysis of the determinants of birth intervals is given in Chapter Five, and Chapter Six contains an analysis of the determinants of breastfeeding. The description of the Tanzania Family Planning Policy and the analysis of the effect of a change of reproductive patterns on infant mortality are presented in Chapter Seven. Chapters Eight and Nine discuss family planning issues. Whilst Chapter Eight examines knowledge and current use of contraception as well as determinants of current contraceptive use, Chapter Nine presents the analysis of unmet need and demand for family planning. Finally, the summary and conclusions are given in Chapter Ten.

Chapter Two

Literature Review

2.1 Introduction

This chapter presents the current state of knowledge on the fertility change in sub-Saharan Africa. The debate in the literature regarding the onset of fertility transition in this region is the central issue addressed. The determinants of African fertility are outlined. The discussion on the proximate determinants of fertility giving more emphasis on breastfeeding and contraception is presented. This is followed by the review of socio-economic and demographic determinants of fertility and their applicability in sub-Saharan Africa. This chapter is concluded by giving an analytical framework followed in the thesis.

2.2 Fertility Transition in Sub-Saharan Africa

The study of fertility in sub-Saharan Africa has been an area of interest for the past two decades or so. However, it was since early 1980s when more effort was given to trying to understand fertility trends and differentials in this part of the developing world. Surveys such as the Contraceptive Prevalence Surveys (CPS), World Fertility Surveys (WFS) and Demographic and Health Surveys (DHS) have made a major contribution to the study of fertility in this region. The work done by the World Bank (Cochrane and Farid, 1989; Acsadi et al., 1990; van de Walle and Foster, 1990), the Ife conference (van de Walle and Ebigbola, 1987), the papers presented during the African Population Conference in Dakar (International Union for the Scientific Study of Population, 1988), and the papers and books written under the auspices of the Panel on the population Dynamics of sub-Saharan Africa of the National Research Council (NRC) Committee on Population (Bertrand et al., 1993; Blesdoe and Cohen, 1993; Brass and Jolly, 1993; Foote et al., 1993; National Research

Council, 1993) are among the examples which show that there is a concern to understand African fertility. These are in addition to the efforts of specific institutions and individuals.

The major reason for this shift of interest is the evidence of fertility decline observed in different African countries which was not anticipated in the near future. It has been documented that fertility decline has begun in at least three countries: Kenya, Botswana and Zimbabwe (Arnold and Blanc, 1990; van de Walle and Foster, 1990; Cross et al., 1991; Freedman and Blanc, 1991; Robinson, 1992; Cohen, 1993; Brass and Jolly, 1993; Rutenberg and Diamond, 1993; Cleland et al., 1994) and parts of some other countries, for example southwest Nigeria (Caldwell et al., 1992b; Cohen, 1993) and northern Sudan (Cleland et al., 1994). However, it is argued that the African fertility transition is different to that experienced in premodern western countries in certain important aspects (Caldwell et al., 1992b; Robinson, 1992).

Caldwell and his colleagues have attempted to explain the factors influencing high fertility in sub-Saharan Africa. The "wealth-flow" theory (Caldwell, 1976) is among Caldwell's early writings on the theory of fertility decline which was inspired by the African context. The theory asserts that fertility decreases only when there is a change in economic relations. That is, the level of fertility will depend on whether children are a financial asset or a burden to their parents. In industrial societies, children are known to be a financial burden, as education, clothing, entertainment, etc. cost parents a lot. However, in traditional societies, children are generally an asset as, for example, they help work the land and are involved in the collection of fuel-wood and water (Caldwell, 1976). They also provide security for their parents when the latter are aged and infirm. According to Caldwell, since wealth flows in Africa have continued to be in favour of parents, fertility is not likely to decline. However, one can argue otherwise as van de Walle and Foster

(1990) put it,

> "That children often provide some security for their parents later in life is not in doubt; however, the proposition that parents of large families are better off than those with few children has not been adequately tested." (p.32).

Caldwell (1977) argued that high fertility is economically rational in traditional African economies where land is held by the lineage and increasing numbers provide the best form of investment available to control the land and its products. The tendency of most young people to take non-agricultural jobs, not only because of modernization, but also because of a reduction in the size of landholding with time due to scarcity of land, would appear to contradict this argument. For instance, the increasing scarcity of land in northern Tanzania meant that landholding were broken up so that most sons could inherit land; in consequence land litigation among kinsmen increased, and the value of land in the highlands rose by 700 per cent (Maro, 1974, cited in DeLancey, 1990). However, Caldwell (1977) makes the point that even when children take jobs in non-agricultural sectors, the family ties lead them to remit money back to their families. Indeed, having many children increases the chance that one will do well in the non-agricultural sector, and help keep the family. Thus the apparent contradiction can be resolved.

Caldwell and Caldwell (1987) have reviewed ways in which cultural and religious factors in sub-Saharan Africa affect both the supply of and demand for contraception and consequently sustain high fertility. They characterized ancestor worship and the horror of infertility as fundamental characteristics of African reproductive system. This view, however, has been questioned. It seems there is no direct evidence that ancestor cults are still uniformly important in Africa to the extent of having a strong impact on fertility, and childlessness is not as serious as suggested by the Caldwells (van de Walle and Foster, 1990). Further, there is evidence of an increase in

the demand for modern methods of birth control such as abortion and sterilization in sub-Saharan Africa (Coeytaux, 1988; Rutenberg et al., 1991; Westoff and Ochoa, 1991; Robinson, 1992).

The cultural set-up of the family structure which gives husbands the power of reproductive decision making, whilst placing most of the economic burden for raising children on mothers (Caldwell and Caldwell, 1987), together with responsibility for agricultural production (Boserup, 1985; Frank and McNicoll, 1987) have been outlined as the major factors influencing high fertility in sub-Saharan Africa. The argument is that, since husbands receive the advantages of status and prestige from paternity as heads of household, whilst not having to bear any economic burdens, they are encouraged to opt for high fertility. This argument is supported by Page (1988) who suggests that one of the three necessary conditions for fertility transition is that lower fertility must be in the interest of those making a decision about fertility. This implies that either mothers should be reproductive decision makers or husbands should be economically responsible for children. There is some evidence that the second option is occurring in Africa particularly in connection with the cost of educating children (Oppong, 1987).

Nevertheless, it can be concluded that both the family structure and its consequences for power and decision-making (Caldwell and Caldwell, 1987; Page, 1988) and the fact that children provide old-age security for their parents (Caldwell, 1976; van de Walle and Foster, 1990) have been stated as the major socio-cultural factors causing high fertility in sub-Saharan Africa. It has been demonstrated, however, that fertility can decline in the absence of these conditions. In rural Kenya, for example, fertility declined in 1980s without a corresponding shift in lineal flow wealth from the younger to the older generation (Dow et al., 1994).

It seems that until the late 1980s demographers, as well as other social scientists, were convinced that fertility would remain high in sub-Saharan Africa, and that a decline would not be experienced until the forces that support high fertility in the region were weakened. For instance, Kenya has had one of the highest fertility rates in the world and was believed to be a poor prospect for fertility decline (Frank and McNicoll, 1987) but is currently experiencing a fertility decline. According to the experience of premodern societies, fertility in Africa was not supposed to decline, at least in the near future. The apparent fertility decline in tropical Africa, therefore, is a new experience which, in a way, is a challenge to demographers.

Caldwell et al. (1992b) have examined the features of the countries in sub-Saharan Africa where fertility transition has began and concluded that Africa has a different type of fertility decline than that experienced elsewhere in the world. The common characteristics of Kenya, Botswana and Zimbabwe (where fertility decline has been observed) include the following: first, they alone in the region exhibit infant mortality rates below 70 per thousand live births; second, they have unusually high levels of education; and, third, they are unique in their high levels of contraceptive practice, ranging between 27-44 per cent of married women. However the chief feature that marks these fertility declines in Africa as possibly a new type of demographic transition is a similarity in contraceptive use and fertility decline at all ages (Caldwell et al., 1992b). Knodel (1977) argued that during the initial stages of fertility decline, one should anticipate larger relative decline in marital fertility rates at older ages since most couples want at least some children during early years of marriage. As the decline of fertility progresses, this differential between young and old women is reduced (Knodel, 1977). This feature has been widely applicable to premodern western countries.

When analysing the fertility transition in Kenya, Robinson (1992) has concluded that there is a general perception of a growing economic burden of large families in Kenya that has led to a positive attitude towards family planning and a decline in the desired number of children. Further, the increase in contraceptive prevalence, particularly for modern methods, and the overall increase in demand for contraception have contributed to the fertility transition in Kenya. In order to make better predictions about other countries in sub-Saharan Africa, Robinson (1992) wrote,

> "They [African countries] should continue effects at rapid socio-economic transformation, stressing health, education, and social infrastructure. They should not be obsessed with cultural 'barriers' to demographic change since in Africa, as elsewhere, these seem to have an ability to change and accommodate, even while persisting at a formal level. Above all, it seems important to supply family planning services which stress approaches consistent with the tradition of birth-spacing." (p.457).

The study of African fertility trends, however, has been controversial. Due to the absence of a trustworthy registration system on vital rates, the major sources of data used are censuses and surveys which ask women to report their children retrospectively. These data face problems of memory lapse and misreporting errors. It has been reported that women omit some of their children and/or misreport their birth dates or their children's birth dates, both of which affect fertility estimations (United Nations, 1983). The changes in fertility observed during the analysis can be due to these problems and not necessarily actual fertility change. These problems have been minimized in the recent surveys particularly the Demographic and Health Surveys (Arnold, 1991). However, as argued by Thomas and Muvandi (1994) for the case of Botswana and Zimbabwe, the use of different surveys to study fertility trends in a country may create biases due to different sample compositions. Therefore, the

study of fertility trends in Africa is not a straightforward exercise.

2.3 The Proximate Determinants of Fertility

The determinants of fertility are grouped into two categories: direct and indirect. The indirect determinants include socio-economic, cultural and environmental variables. These are known to affect fertility through the direct determinants. Whilst the indirect determinants have relevance to policy makers since they provide mechanisms susceptible to manipulation by official policy, the change in these variables does not necessarily change fertility levels. The direct determinants, on the other hand, influence fertility directly and the change in one or more of these variables changes fertility unless the effect is offset by another variable. The direct determinants, which are usually referred to as intermediate fertility variables or proximate determinants of fertility are biological and/or behavioural in nature.

Bongaarts (1978) has named eight intermediate fertility variables: proportion married, contraception, induced abortion, lactational infecundability, frequency of intercourse, sterility, spontaneous interuterine mortality and duration of viability of ova and sperm. Five of these have been identified to be of particular relevance for fertility levels and trends in Africa: proportion married, lactational infecundability, contraception, abortion and sterility (Page, 1988).

2.3.1 Proportion Married

The proportion married measures the proportion of women of reproductive age that are engaged in sexual intercourse regularly. This variable is named as one of the major determinants of high fertility in sub-Saharan Africa since marriage is early and universal

in this region. Although marital dissolution through divorce or widowhood is common, remarriage rates, particularly for fecund women, are very high leaving very low proportions of single women at any given age (Bongaarts et al., 1984; Page, 1988). There is some evidence, however, that the age at first marriage is increasing as education for women becomes widespread. This is likely to reduce fertility. Indeed in some countries (e.g. Northern Sudan) postponement of first marriage has been outlined as the main determinant of fertility decline observed (Cleland et al., 1994). In studying recent trends in marriage ages using data from 14 regions in Tanzania, van de Walle (1993) observed that the proportion never marrying is moving progressively up the age distribution and this influenced him to conclude that

> "... the Tanzanian data suggest the old norm of universal female marriage may be changing." (p.146).

However, the definition of marriage is problematic in Africa. Usually marriage in African societies is 'a process' and therefore there is some ambiguity in determining exactly when a couple is married (van de Walle, 1993). This implies that the magnitude of the proportion of married women will depend on the indicator of marriage used. Furthermore, the rise of pre-marital sexuality and childbearing in the region (Meekers, 1994) water down the effect of the variable 'proportion married women' on fertility.

2.3.2 Contraception

Any deliberate practice undertaken to reduce the risk of conception is considered as contraception. Contraceptive use has been described as the most important proximate determinant of fertility (Sherris et al., 1985; Mauldin and Segal, 1988). Robey and his colleagues have shown that differences in levels of contraceptive use explain 92 per cent of the variation in fertility among the 50 countries they studied (Robey et al.,1992). This implies that where

contraceptive use is widespread, fertility is low. It is therefore essential to study the extent of use of contraception in order to make sensible comments about the current and future fertility rates in a society.

Contraceptive prevalence is lower in sub-Saharan Africa than in other parts of the world. Contraceptive prevalence rate estimated in all African countries was less than 15 per cent by 1990 except Zimbabwe, Botswana and Kenya (Rutenberg et al., 1991; Robey et al., 1992). Moreover, the reason given for using contraceptives in many African societies is birth spacing rather than limiting fertility (Bertrand et al., 1993). It can therefore be argued that low contraceptive prevalence is partly responsible for the high fertility levels in sub-Saharan Africa.[5] However, the higher rates of contraception to be anticipated in Africa are likely to reduce fertility. Indeed, the recent DHS conducted in sub-Saharan Africa has shown an increase in contraceptive prevalence rate in various countries. For instance, in Tanzania, the second and third phases of DHS show that contraceptive prevalence rate has doubled from 10 (1991/92) to 20 (1994) per cent in less than 3 years period (Weinstein et al., 1995).

Table 2.1 presents the percentage of currently married women aged between 15 and 49, currently using any contraceptive method. Of the countries in the region, Zimbabwe has the highest contraceptive prevalence rate (48 per cent) followed by Botswana (33 per cent) and Kenya (33 per cent). The current estimate for Botswana, however, is supposed to be higher than the quoted figure as the DHS was conducted seven years ago. It should be noted from the Table that there are countries in sub-Saharan Africa which have very low contraceptive prevalence.

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[5] The countries in Central Africa with low contraceptive prevalence and low fertility are exempted from this generalisation. As noted in Section 2.3.5, the low fertility observed in these countries is due to pathological sterility.

Table 2.1. Percentage of Currently Married Women (15-49) Currently Using a Contraceptive Method in Selected African Countries.

Country	Year	Contraceptive Prevalence Rate
Zimbabwe	1994	48
Botswana	1988	33
Kenya	1993	33
Namibia	1992	29
Rwanda	1992	21
Tanzania[1]	1994	20
Ghana	1993	20
Madagascar	1992	17
Zambia	1992	15
Cameroon	1991	13
Malawi	1992	13
Togo	1988	12
Sudan	1989-90	9
Burkina Faso	1993	8
Senegal	1992-93	7
Nigeria	1990	6
Uganda	1988-89	5
Mali	1987	3

Source: Demographic and Health Surveys (1995).
1 Weinstein et al. (1995).

2.3.3 Lactational Infecundability

It has been established that breastfeeding has an influence on fertility by lengthening the period of postpartum infecundability (Bongaarts and Potter, 1983). In societies where breastfeeding is generally prolonged and universal, and contraceptive use is rare, the primary determinant of birth interval length will be the duration of breastfeeding. Breastfeeding leads to the release of prolactin which inhibits the release of gonadotrophin (the hormone which initiates resumption of the menstrual cycle) (van Ginneken, 1978; McNeilley, 1993). The longer and the more intensive breastfeeding is, the greater the release of prolactin and therefore the greater the contraceptive effect of breastfeeding. Full breastfeeding, where the infant has no other source of food, suppresses it almost totally, whereas less intense and frequent suckling suppresses it partially. Thus a woman can resume ovulation whilst still breastfeeding, and

many do. However, it has been noted that a woman who has stopped breastfeeding is more likely to be pregnant once ovulation returns compared with a woman still breastfeeding, due to reduction of fecundability for breastfeeding women (Guz and Hobcraft, 1991).

Lactational infecundability arises after a pregnancy when a woman is unable to conceive until the normal pattern of ovulation and menstruation is restored. Bongaarts and Potter (1983) have observed the period of postpartum amenorrhea to be 1.5 months following delivery in the absence of any lactation. The average duration of postpartum amenorrhea increases in proportion to the average length of breastfeeding, lasting for about 60 to 70 per cent of the duration of breastfeeding where breastfeeding lasts two years and more. For the longest breastfeeding durations observed in practice, amenorrhea periods of up to two years occur (Bongaarts and Potter, 1983).

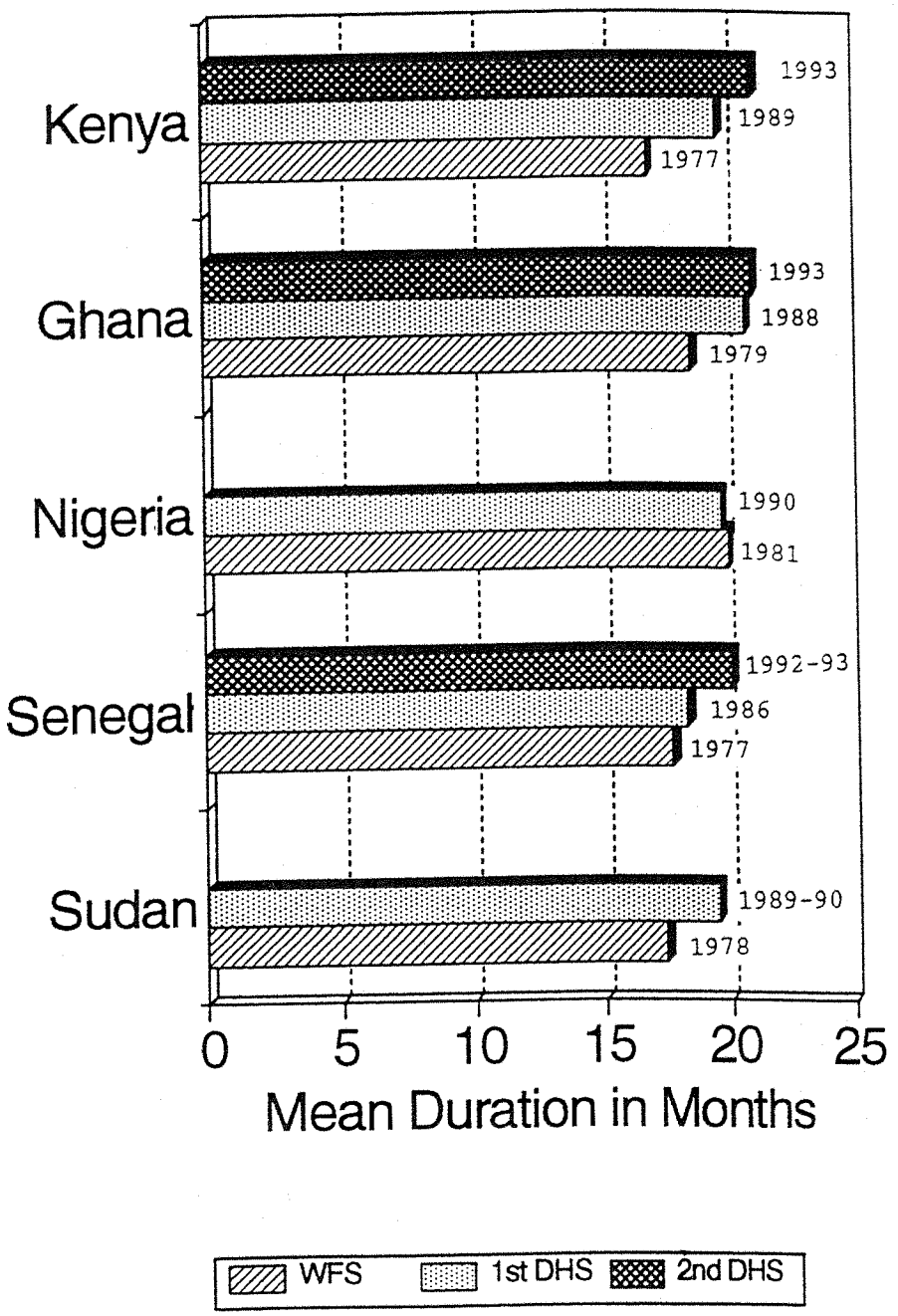
Long and intensive breastfeeding is evidently universal throughout of sub-Saharan Africa. However, breastfeeding durations vary between countries and particularly within countries. The mean duration of breastfeeding is about 19 months in Lesotho, 18 months in Ghana, 16.5 months in Kenya and Sudan and the corresponding durations of postpartum amenorrhea are 13 months in Lesotho, 12 months in Ghana and 11 months in Sudan and Kenya (Bongaarts et al., 1984). A median duration of breastfeeding of 22.7 months in Bamako corresponded to a length of amenorrhea of 15.2 months and for a period of breastfeeding of 18.5 months in Bobo-Dioulasso, amenorrhea lasted 13 months (van de Walle and Omideyi, 1988). The mean duration of breastfeeding observed in Kibaha, Tanzania was between 18 and 19 months and the mean duration of amenorrhea was between 7 and 10 months for different educational groups (Komba and Kamuzora, 1988).

The general observation is that duration of breastfeeding declines with development. In particular, breastfeeding declines with urbanization and education which are not independent of each other

(Lesthaeghe et al., 1981b). However, it is encouraging to find that durations of breastfeeding have been increasing in recent years in several African countries. Figure 2.1 presents the trends in the mean duration of breastfeeding for African countries with at least two national surveys. The trend observed is that the duration of breastfeeding has been increasing except in Nigeria where it is somewhat stable. Therefore breastfeeding is still a potential factor in reducing fertility in sub-Saharan Africa.

The postpartum non-susceptible period is usually defined for each woman according to whichever period is longer, that of postpartum amenorrhea or that of postpartum sexual abstinence (Lesthaeghe et al., 1981a). In many African cultures, the resumption of intercourse is linked with weaning. Breastfeeding and sex are known to be incompatible since sperm are believed to poison the mother's milk. Therefore prolonged durations of postpartum abstinence are observed in sub-Saharan Africa. For the countries cited by Page (1988), the duration ranges from 12.4 months (Ghana) to 18.2 months (Benin) with the exception of Kenya which had a duration of 4.1 months. The Yoruba of Nigeria have recorded a duration of about three years which means that the sexual taboo lasted longer than the breastfeeding period (Caldwell and Caldwell, 1977). An erosion of the practice of postpartum abstinence has been observed in many areas of sub-Saharan Africa. Bongaarts et al. (1984) noted that in Tanzania in 1970s, the period of postpartum abstinence rarely exceeded six months. However in Kibaha, Tanzania, the period recorded ranged from 8.4 months for women with at least 9 years of schooling to 10.6 months for illiterate women (Komba and Kamuzora, 1988). The most notable observation is that the period of postpartum sexual abstinence is becoming shorter, especially in East Africa, and this is likely to raise fertility. However, the demographic role of abstinence is much reduced by the relative stability of lactation.

Figure 2.1. Trends in the Mean Durations of Breastfeeding for Five Countries in Sub-Saharan Africa with at Least Two Surveys.



Source: Trussell et al. (1992) and First DHS Country Reports.

2.3.4 Induced Abortion

Data on induced abortion, a practice that deliberately interrupts the normal course of gestation, is very rare in Africa. This is due to the fact that induced abortion is illegal (unless performed to save the mother's life) in most African countries. It is therefore difficult to assess the effects of induced abortion on fertility in this region. It has been observed, however, that abortion is in fact not uncommon, particularly in urban areas and the number of cases presented at hospitals for abortion is increasing (though restricted to young and unmarried women) (Coeytaux, 1988; Justesen et al., 1992).

2.3.5 Sterility

Sterility, whether primary or secondary, has been known to affect fertility particularly in areas where there is high incidence of sterility. In Gabon, for example, the key determinant of the exceptionally low fertility (TFR of 4.1) was noted to be pathological sterility (Bongaarts and Frank, 1988). If sterility is reduced, fertility is likely to rise - this is the trend in countries where prevalence of sterility is high. However, sterility seems to be relatively lower in East and West Africa compared with Central Africa. Bongaarts et al. (1984) have noted that the highest levels of infertility are found in central Africa where over a large area more than 20 per cent of women aged 45-49 are childless. The percentage of women aged 45-49 who are childless is 12-20 and 3-12 in East and West Africa respectively. A more recent estimation procedure developed by Larsen and Menken (1991) has shown that prevalence of sterility in Kenya is relatively low compared with other sub-Saharan African countries (Ghana, Lesotho, Cameroon, Sudan) included in their analysis. This implies that sterility is still low in East Africa and its impact on fertility in small.

2.4 The Socio-economic and Demographic Determinants of Fertility

World Fertility Survey (1977) has given a list of explanatory variables in a simple framework for fertility analysis to include: the socio-economic structure (health and education levels and facilities), the environment (regional and geographical differences), the socio-economic and cultural characteristics (migration status, religion, ethnicity, education and income) and the biosocial characteristics (nutrition and health, and infant and childhood mortality). These variables affect fertility indirectly through the proximate determinants explained in the previous section.

The spread of education and literacy among women is believed to be fundamental to changes in reproductive behaviour. The effect of women's education on fertility in less developed countries is found to be curvilinear, that is, fertility tends to rise first with education and then decreases sharply once a certain level of education is attained (Cochrane, 1979). The argument is that education is positively associated with improved health, lower levels of infertility, abandonment of traditional constraints upon sexual behaviour and the practice of breastfeeding, all of which are known to raise fertility levels. As education level increases, marriage tends to be postponed which causes a negative effect on fertility and counteracts the initial effect of fertility increase. Moreover, educated women relatively desire fewer children, have high contraceptive prevalence, have a higher chance of working outside their home; all of these factors are known to lower fertility levels (Cochrane, 1979). However, there is also a possibility of the reverse causation which is less documented, that is, the initiation of childbearing causing the termination of education (Cochrane, 1979). While analysing the relationship of fertility and level of education in sub-Saharan Africa, Cohen (1993) has shown that fertility is either curvilinearly or negatively related with education but does not appear very responsive to small amount of education.

Generally, fertility is higher for women residing in rural areas compared with those residing in urban areas. Higher level of education, higher work status, modern environment, aspirations for higher level of living, are among the factors which can cause fertility among urban women to be lower than among rural women (Stolnitz, 1983 cited in Bulatao, 1984). Also, it is assumed that urban women have better knowledge of, and access to, modern contraception than women in rural areas (Cohen, 1993). A recent demonstration has shown that rural fertility is substantially higher than urban fertility in every African country included in the analysis (Cohen, 1993).

Education and occupation of the husband (or the partner) can be used to measure the socio-economic status of a family and also as the indicator of the quality of child rearing if more appropriate variables such as income are not available. The basic assumption is that the higher the education level of the husband and his work status, the higher the income which leads to improved living conditions. Bulatao and Lee (1983a) have argued that,

> "In principle, whether children are net producers or net consumers, higher income or greater wealth should make them more affordable and therefore increase demand for surviving children, with a subsequent increase in the number of desired births. However, income increases may lead to a demand for higher quality children rather than a large number." (pp.767-768).

The relationship between employment of women and fertility has been an interesting subject due to the existing opposing patterns. Occupation of women can affect fertility through the effect on income. That is, working women can have fertility performance influenced by their income through the mechanisms explained above. However, the major effects of women's employment on fertility is considered to fall under two perspectives: the "role-

incompatibility" hypothesis and the "opportunity cost" hypothesis (United Nations, 1985). A woman is expected to have fewer children if child rearing put some restrictions in performing her duties as a worker. The second perspective on the opportunity cost of children hypothesizes that as the cost of rearing children (in terms of time and financial) increases due to increased labour market opportunities of women, fertility will decrease. These hypotheses show that women's employment can affect fertility differently from one society to another.

It has been shown that infant and child mortality can influence fertility levels. Experience of child loss or fear of child loss experience may lead parents to have additional children, either to replace those who have already died, or as insurance against expected deaths (Friedlander, 1977; Preston, 1978). The implications then is that, improved child survival is likely to increase motivation to limit births and thus lead to fertility decline, this is what has been named as "child survival hypothesis" (Taylor et al., 1976). Further, for women who breastfeed their children, an infant or a child death may shorten their period of infertility following a birth and thus in the absence of contraception reduce the interval between births which may increase the number of births over the reproductive life (Friedlander, 1977; Preston, 1978). This biological effect is expected to be high in populations where couples do not consciously aim to have a desired number of surviving children and use no contraception, and where the practice of breastfeeding is widespread.

Infant and child mortality can also affect fertility through what is called the "societal response effect" (Friedlander, 1977; Preston, 1978). Early childhood mortality may create a conflict producing strains of too high or too low family size relative to family size norms. As a substitute or a complementary response various alternative societal responses (e.g. migration, change in household structure, change in the level of economic production etc.)

may develop to relieve the strains while fertility norms remain unchanged or change at a relatively low pace (Friedlander, 1977). However, the study of the magnitude of the effect of infant and child mortality on fertility is problematic due to the existence of reverse causality and the presence of confounding factors which affect both fertility and childhood mortality simultaneously.

Religion has been found to be related with fertility in various societies. Lucas (1980) has argued that Muslims often have higher fertility than non-Muslims, and Catholics frequently have higher fertility than other christians. Whilst Catholic doctrine is argued to be pro-natalist by favouring large families and rejects the most efficient methods of birth control, Muslims have high fertility because of early and universal marriage and the majority of Muslims live in traditional agricultural societies where children are economically useful and levels of education are relatively low (Lucas, 1980). However, as a society develops, the fertility differentials by religious groups are expected to be minimal.

It is generally argued that polygyny enhances child spacing in most African societies (Schoenmaeckers et al., 1981). For instance, female abstinence can be maintained more easily in a society that practises polygyny. The Tanzanian experience has shown that pregnancies are more frequent among monogamous unions than polygamous unions (Henin, 1979). On the contrary, it has been argued that polygyny is negatively associated with contraception (Caldwell and Caldwell, 1981) and women married to the same man can compete to bear children particularly in societies where status of a woman depends on the number of surviving children. Therefore the effect of polygyny on fertility can be in either direction.

2.5 Analytical Framework

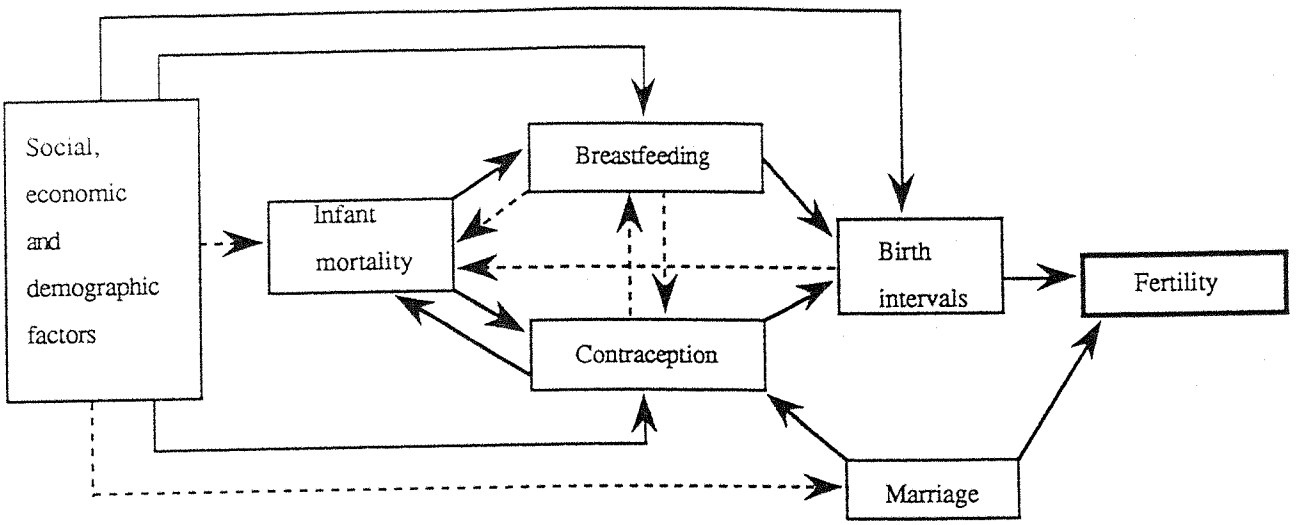
The Tanzanian fertility can be analysed using a simple

framework presented in Figure 2.2. The direct effect of marriage patterns on fertility has been well established as mentioned in section 2.3.1. Women who marry early and stay in marriage for a long time have higher fertility than their counterparts who delay their first marriage and who experience marriage dissolution (which is not accompanied by early remarriage). The study of the relationship between type of marriage and fertility has given contradicting results. Whilst polygyny has been noted to reduce fertility of individual women (Garenne and van de Walle, 1989), other studies has shown that polygyny increases women's fertility (Ahmed, 1986). Yet various researchers have observed that polygyny has no effect on fertility (see for example, Mulder, 1989). All these possibilities prompt one to include marriage variables in the study of fertility.

A birth interval is defined as the interval between two successive live births or the interval between entry into sexual union and the first live birth. The study of birth interval dynamics is of interest since it provides an opportunity for major new insights into the patterns of reproductive behaviour in a population. The relationship between birth intervals and fertility performance is well established. Prolonging birth intervals, other things being equal, will certainly result in lower birth rates: shortening birth intervals will increase birth rates. It has been suggested that analysis of data on birth intervals may detect changes in underlying fertility behaviour earlier than period fertility measures since birth intervals are sensitive enough to detect current or recent changes in fertility patterns for women still in reproductive ages (Ryder, 1965). Therefore, among other things, analysis of birth interval dynamics can be used as a tool in evaluating family planning programmes.

In order to understand the determinants of birth interval lengths, it is necessary to identify the components of a birth interval. Lesthaeghe et al. (1981a) describe the five components of

Figure 2.2. A Simple Framework for the Study of Fertility in Tanzania



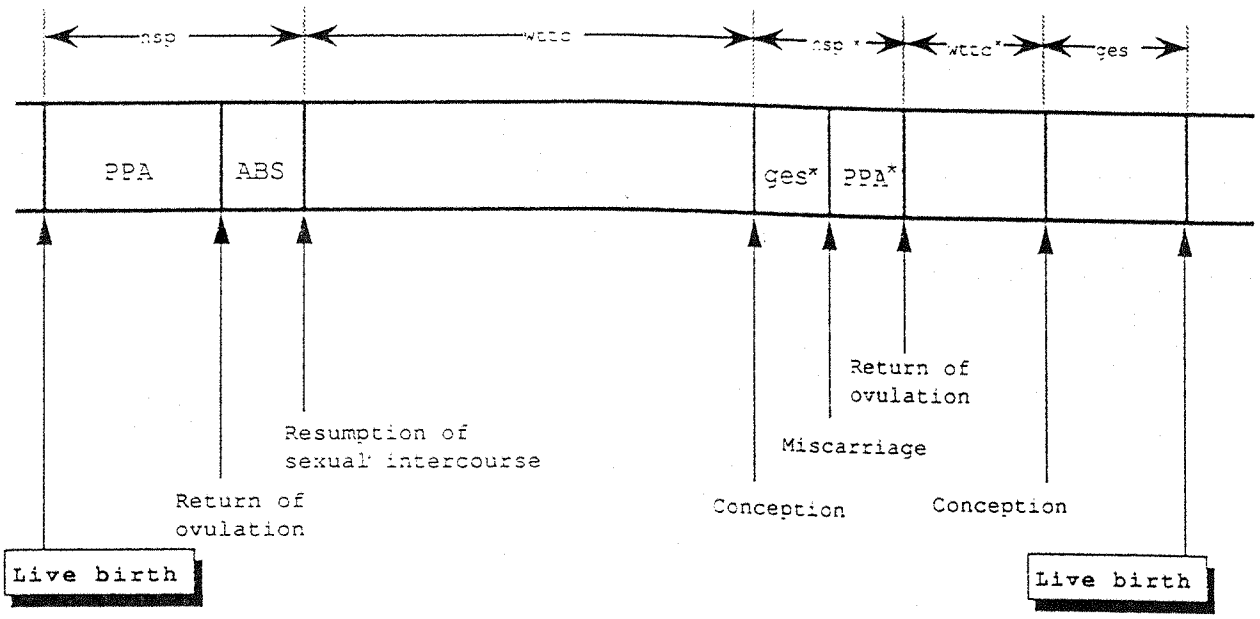
Note: The relationships shown by broken lines are not analysed in this study.

any interval between successive births which are summarized in Figure 2.3. First, a postpartum non-susceptible period explained in section 2.3.3. The second component of a birth interval is the waiting time to conception; or the time a woman is exposed to the risk of conception. The length of the waiting time to conception is influenced by the fecundability level for non-sterile women, the use and effectiveness of contraception and frequency of sexual intercourse (Lesthaeghe et al., 1981a; Bongaarts and Potter, 1983).

Some conceptions do not end up in a live birth due to miscarriages and these create the third and the fourth components. It is estimated that about 12 to 18 percent of recognized pregnancies are lost and many more conceptions are lost before they are

recognized clinically (Simpson and Carson, 1993). Obviously, women who experience miscarriages will have longer intervals between live births than women who do not. Therefore, Lesthaeghe et al. (1981a) mentioned the third component of a birth interval to be an additional

Figure 2.3. The Components of a Birth Interval.



Source: Lesthaeghe et al. (1981a)

Note: PPA and ABS are not applicable to the first birth interval

nsp = non-susceptible period
nsp* = additional nsp due to miscarriages
PPA = postpartum amenorrhea
PPA* = some amenorrhea due to miscarriages
ABS = postpartum abstinence beyond amenorrhea
wttc = waiting time to conception
wttc* = waiting time to conception due to miscarriages
ges = gestation period
ges* = partial gestation

non-susceptible period for any miscarriage that occurs, which includes partial gestation and some amenorrhea. An additional waiting time to conception following any miscarriage is named as a fourth component. The fifth component of a birth interval is the period of gestation preceding the live birth; this does not deviate much from nine months, although there are slight variations in the gestational age of children at birth. Other things being equal, premature births cause short birth intervals compared to full term births.

It should be noted that the components of a birth interval discussed above apply to all closed intervals except the first birth interval. The first component (non-susceptible period) is not included in the first birth interval due to the absence of a preceding birth. Also, it should be noted that some women do not experience miscarriages in the interval. In this case the components of a birth interval are reduced to three: non-susceptible period, waiting time to conception and gestation period.

The two main components of a birth interval (at least in sub-Saharan Africa) are; non-susceptible period (a function of intensity and frequency of breastfeeding), and waiting time to conception (a function of use of contraception and separation of partners). The variation in the birth interval lengths is largely explained by breastfeeding practices and use of contraception. Therefore it is important to have a thorough understanding of the practices of and attitudes towards breastfeeding and contraception. The length of birth intervals, marriage patterns, breastfeeding practices, and use of contraception are affected by social, economic and demographic factors. The most important factors are education, income, occupation, residence and maternal age. The empirical evidence of these relationships is given in the respective chapters except for marriage which is not discussed in detail in this study. The next chapter presents the assessment of data and the description of the main statistical techniques used.

Chapter Three

Data and Methods of Analysis

3.1 Introduction

The aim of this chapter is twofold: firstly, to state the data sources used in the analysis and attempt to assess these data; secondly, to describe the methods of analysis applied. With regards to the assessment of data, standard methods of checking data quality are used, the important ones being the extent of heaping of respondents ages, the errors in reporting the number of births, and the extent of imputed birth dates. An attempt is also made to assess the accuracy of data on reporting the duration of breastfeeding.

The methods of analysis described in this chapter include the Bongaarts' model for estimating the proximate determinants of fertility, logistic regression and event history analysis. Logistic regression is applied in the analysis of the determinants of contraceptive use as well as the determinants of unmet need for family planning. The event history analysis (particularly hazards models) is used in studying the determinants of birth intervals and determinants of duration of breastfeeding.

3.2 Data Sources

The Tanzania Demographic and Health Survey (TDHS), conducted between October 1991 and March 1992 under the second phase of the Demographic and Health Surveys (DHS) programme is the major source of data used in this study. Four types of questionnaire were used in the TDHS: the service availability questionnaire, the household questionnaire, the female questionnaire and the male questionnaire. The household questionnaire lists all usual residents of the household as well as visitors and was used to identify women and men eligible for the individual interview. A total of 9,238 women (96 per

cent of the eligible women identified) aged between 15 and 49 years were successfully interviewed in all 25 administrative regions of Tanzania. Complete birth histories were collected from each woman. However, the detailed information on the use of health facilities and feeding patterns is only available for children born after 1 January 1986. Approximately one quarter of the households were selected for the male individual questionnaire, out of which 2,114 men (88 per cent of the eligible men identified) aged between 15 and 60 years were successfully interviewed.

The TDHS gives an opportunity to study fertility and family planning at the national level using individual-level data from both women and men. The individual questionnaire for women was based on the DHS Model "B" questionnaire, which is designed for use in countries with low contraceptive prevalence. The standard questionnaire was modified in order to collect information specifically relevant to Tanzania. The male questionnaire was similar to the female questionnaire but it excluded the questions about birth history and the sections on maternal and child health and included a module on condom knowledge and use. The questionnaire used as well as details about the sample design, data collection and processing are given in the First Country Report (Ngallaba et al., 1993), and will therefore not be repeated here.

The population census data will supplement the TDHS data particularly in studying fertility trends. The three Tanzanian post-independence population censuses were conducted on August 27/28 in 1967, 1978 and 1988 respectively for both the mainland of Tanzania and Zanzibar. These censuses are the major source of mortality and fertility statistics in the country since registration of births and deaths is very incomplete in Tanzania. Usually the questions asked during the censuses are similar with minor modifications. Therefore the census data are expected to be comparable.

3.3 Data Quality

A global assessment of the quality of DHS data collected in 22 countries did not detect any serious errors that would vitally affect the demographic estimates (Arnold, 1991). Nevertheless, some effort must be made to evaluate the TDHS data so that specific problems can be identified. Major problems associated with retrospective data that can affect fertility estimates include the accuracy of the respondents' age reported on the individual questionnaire and the quality of birth history data. This section deals with these non-sampling errors as reported in the female questionnaire.

The age distribution of females by single years of age for rural and urban dwellers is given in Figure 3.1. A common feature of such age distributions in censuses and surveys in developing countries is heaping on ages ending with 0 or 5, and to some extent those ending with even numbers. The TDHS is no exception. A marked heaping at ages 30, 35 and 45 is observed for rural dwellers, whereas there is heaping for ages 19, 30, 40 and 45 for their urban counterparts. This means it is necessary to be cautious when performing any analysis which involves women's age. However, the extent of heaping seems to be more or less the same for women residing in rural areas compared with their urban counterparts. The problem of heaping in particular ages can be slightly reduced by grouping women in five-year age groups as shown in Figure 3.2. It can be observed from the figure that age distortions have been smoothed to a large extent compared with Figure 3.1. The percentage of women decreases consistently from age group 15-19 to age group 45-49 in both rural and urban areas. It should be noted, however, that more younger women are residing in urban areas whereas more older women are residing in rural areas.

Table 3.1 shows that no woman failed to report both her date of birth (month and year) and age. Whilst 3.9 per cent reported only

Figure 3.1. Percentage Distribution of Women by Age.

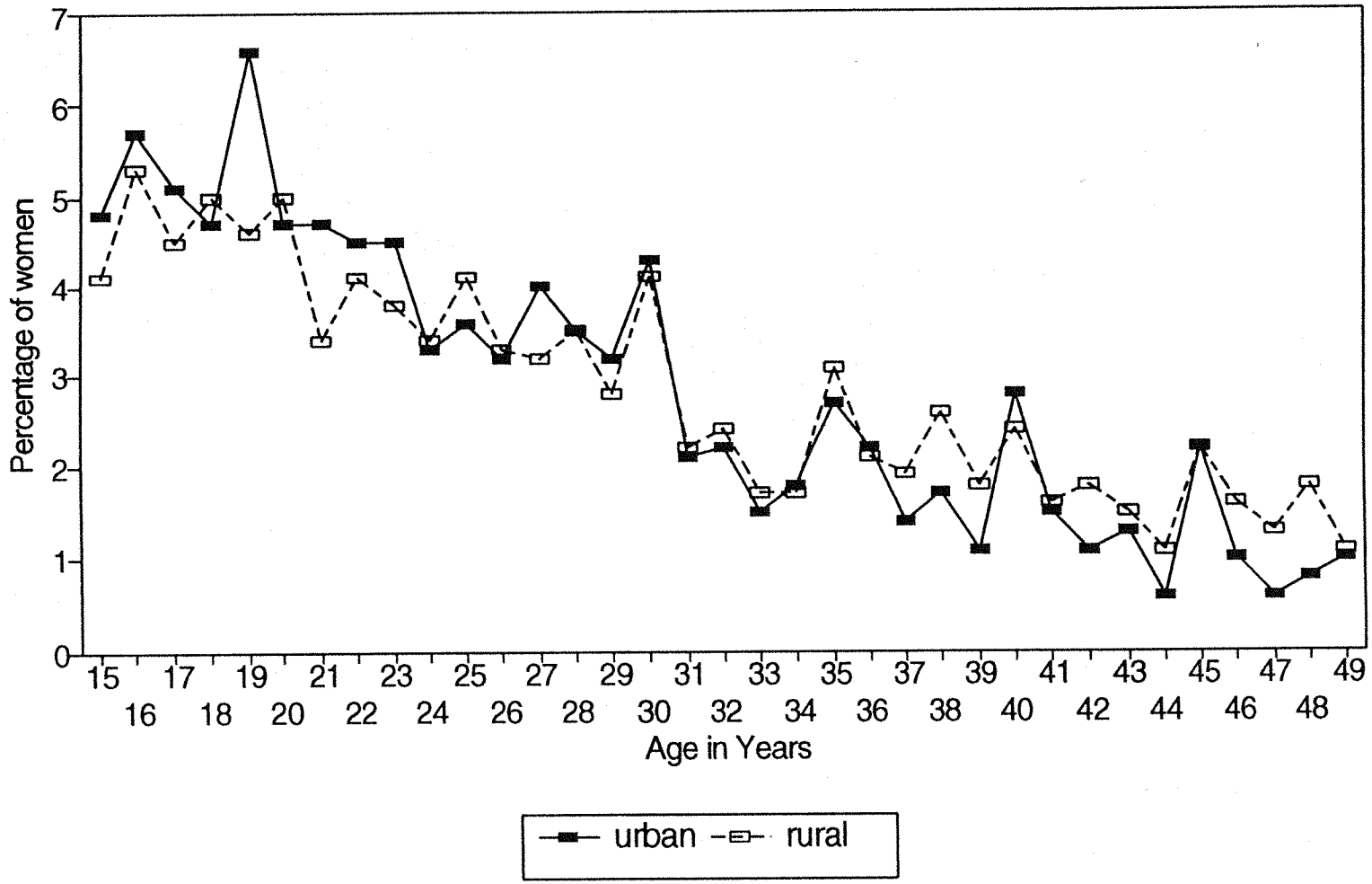


Figure 3.2. Percentage Distribution of Women by Five-year Age Groups.

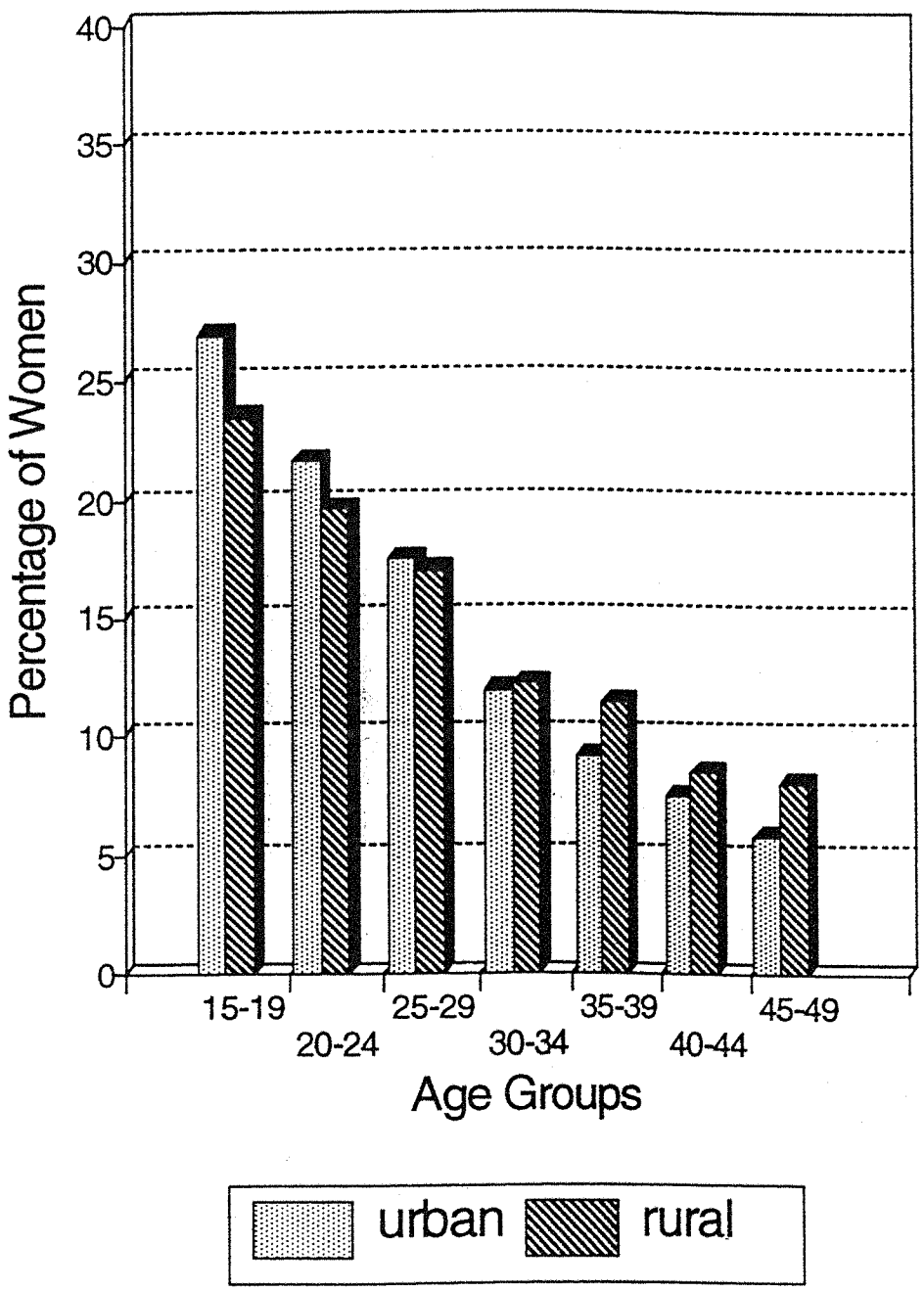
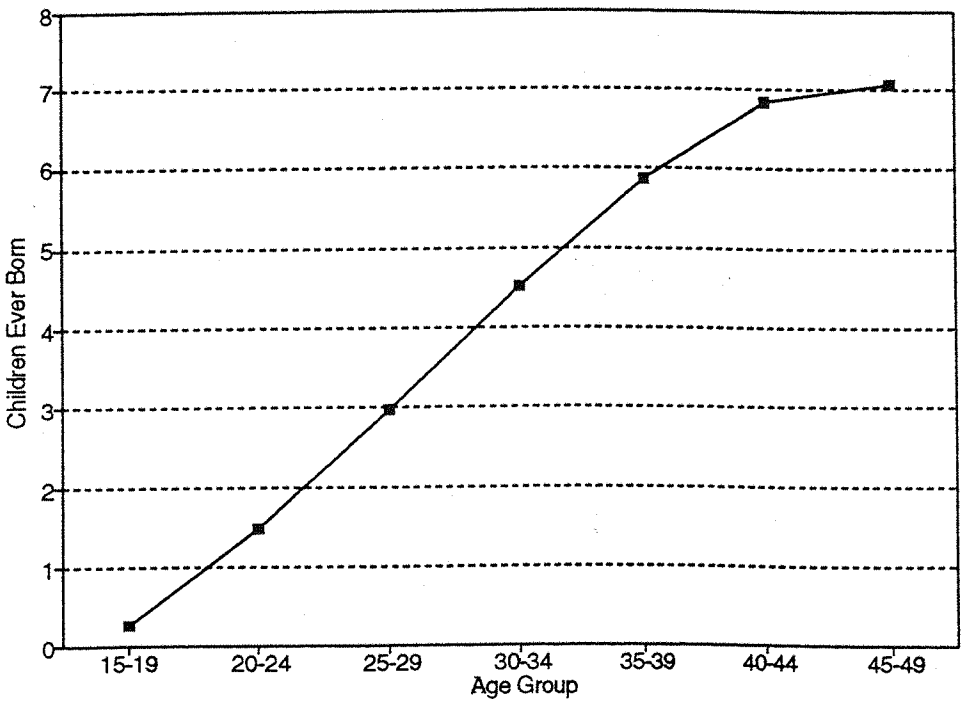


Table 3.1. Percentage Distribution of Women and Children (born since 1980) with Imputed Birth Dates.

	Women	Children
no imputation	40.6	84.8
year imputed	0.0	0.0
month imputed	55.5	11.0
age and month imputed	0.0	3.8
year and month imputed	3.9	0.1
age and year imputed	0.0	0.0
all imputed	0.0	0.3

Source: 1991/92 TDHS

Figure 3.3. Number of Children Ever Born by Age Group of Women.

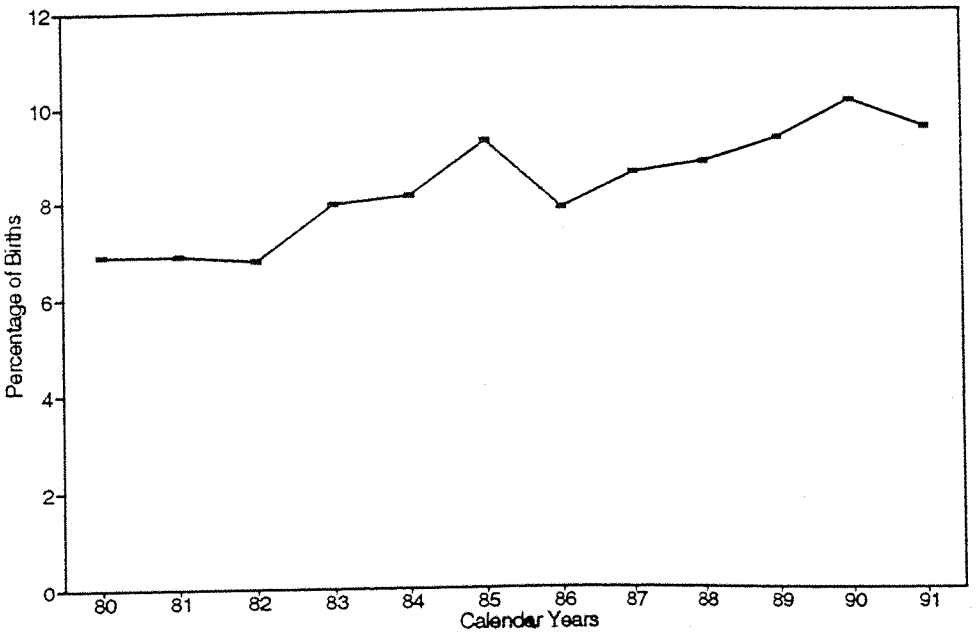


their age, 40.6 per cent reported both month and year of birth. A majority of women (55.5 per cent) reported year of birth and their age without giving the month of birth. These figures show that women were willing to respond on their dates of birth and that almost all women knew or at least can give the year they were born.

A general picture of the coverage of the number of live births can be obtained by looking at the average number of children ever born by five-year age groups of women. Figure 3.3 shows that the mean number of children ever born increases monotonically with age even at older ages where memory lapse is expected to be at a maximum. The distribution of births by calendar years since 1980 is given in Figure 3.4. It seems that there is no serious distortion in reporting births except for the years 1985 and 1986. Mturi and Curtis (1995) have noted the possibility of births being displaced from 1986 to 1985 in order to avoid asking the detailed health and breastfeeding sections which are required for children born after 1 January 1986. This type of displacement of births has also been observed in DHS surveys conducted in other countries (Arnold, 1991). In order to avoid this problem in fertility estimations, four-year periods (1980-84, 1984-88 and 1988-92) will be considered when examining trends instead of the traditional five-year periods. Also, all analyses which involve children included in the detailed health and breastfeeding sections will not include 1986 births since they are likely to be under-reported.

It has been noted that if the age of a child is known but the year of birth is not known, an incorrect calculation of the year of birth may be made from the child's age (Arnold, 1991). This is due to the fact that either the interviewer or the respondent may try to calculate the year of birth by simply subtracting the child's age from the calendar year of the interview, without considering whether the child has already his or her birthday in the year of interview. The TDHS data, however, show that the respondents were able to report

Figure 3.4. Percentage Distribution of Births in Years.



both the month and year of birth for 84.8 per cent of children born since 1980 (Table 3.1). The problem explained above can only affect the 0.1 per cent of the children who had only their age reported which implies that its impact is insignificant. Table 3.1 also shows that 11.0 per cent of the children born since 1980 had their month of birth imputed and 3.8 per cent had age and month of birth imputed. It can be concluded therefore that the reporting of birth dates for children was not so bad.

3.4 The Assessment of Reporting Durations

In several parts of this study variables measured by durations are considered. Some durations, such as the length of birth intervals, have been computed from other variables. However, there are several variables measured by durations given directly by the respondents. These include: the duration of breastfeeding, the duration of postpartum amenorrhea, the duration of abstinence etc. These durations are reported retrospectively which means they are

subject to recall errors since most of these variables do not have social implications which help them to be remembered. Digit preference may be another reason for reporting errors. Probably the most serious source of error is caused by the fact that people think of durations in terms of years and then convert them into months. This behaviour causes heaping in durations of multiples of six or twelve months.

The information about breastfeeding practices for weaned children is collected retrospectively. Women were asked if they ever breastfed each of their children born after 1 January 1986. If the answer was "yes", they were asked to state the number of months for which each child was breastfed. The distribution of children according to the duration of breastfeeding reported for the weaned children born since 1 January 1988 is presented in Figure 3.5.[6] The Figure shows that the durations of breastfeeding reported have a marked pattern of heaping at durations which are multiples of six months particularly at 18 and 24 months.[7] Further, the problem of heaping is equally serious for children born to women residing in both urban and rural areas (the figure showing rural/urban differentials is not presented here). It has been argued, however, that this heaping might be genuine if a society has strong attitude towards the weaning time of a child.

The current status information (for births after 1 January 1988) on whether a child is still breastfeeding at the time of the TDHS combined with a knowledge of the child's age can be used to ascertain the duration of breastfeeding (at least to the date of the

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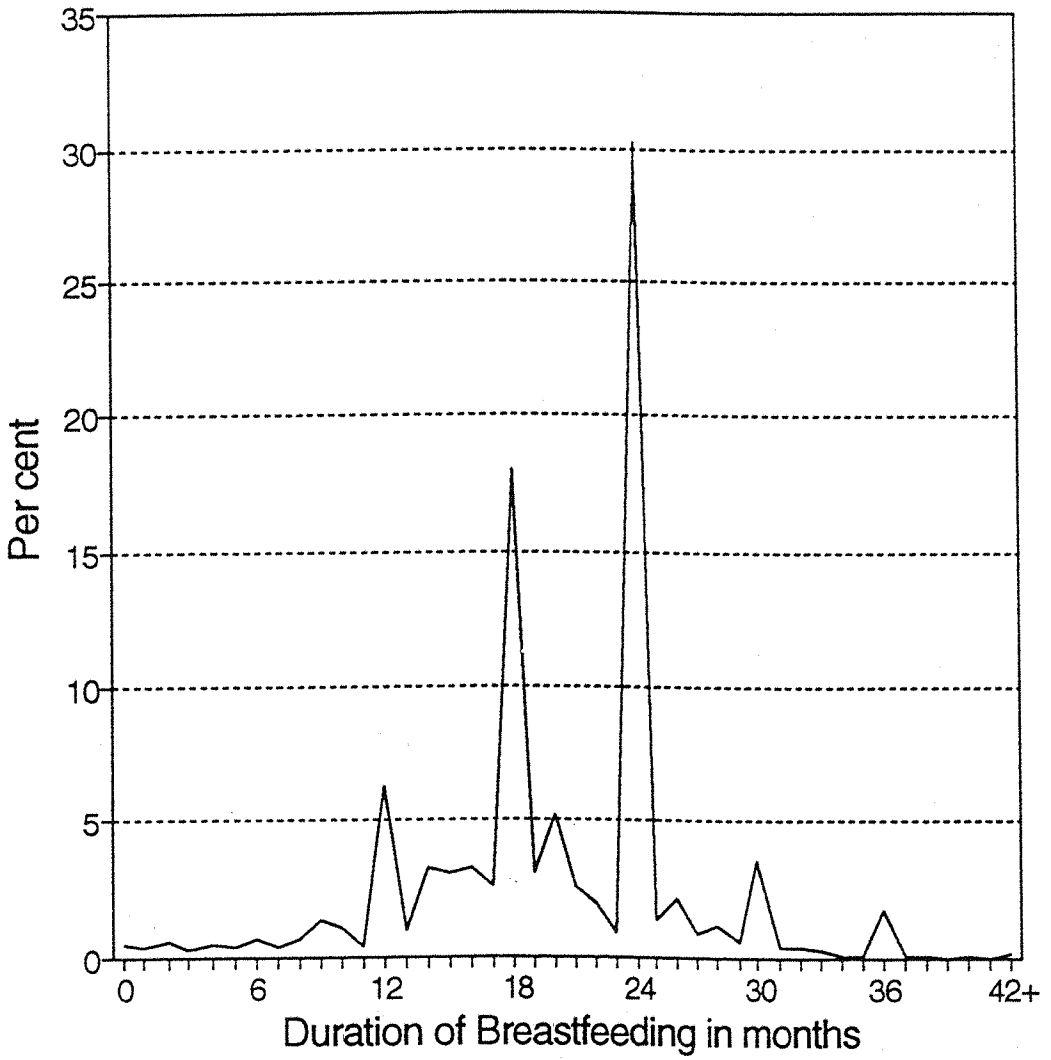
[6] Since the duration of breastfeeding is reported retrospectively, better reporting is expected for the period close to the survey date than a longer period from the survey.

[7] A full 60 per cent of all reported durations for weaned children in the period between 1 January 1986 to the survey date were multiples of six.

Figure 3.5. Distribution of Weaned Children According to the Duration of Breastfeeding (using data collected retrospectively).



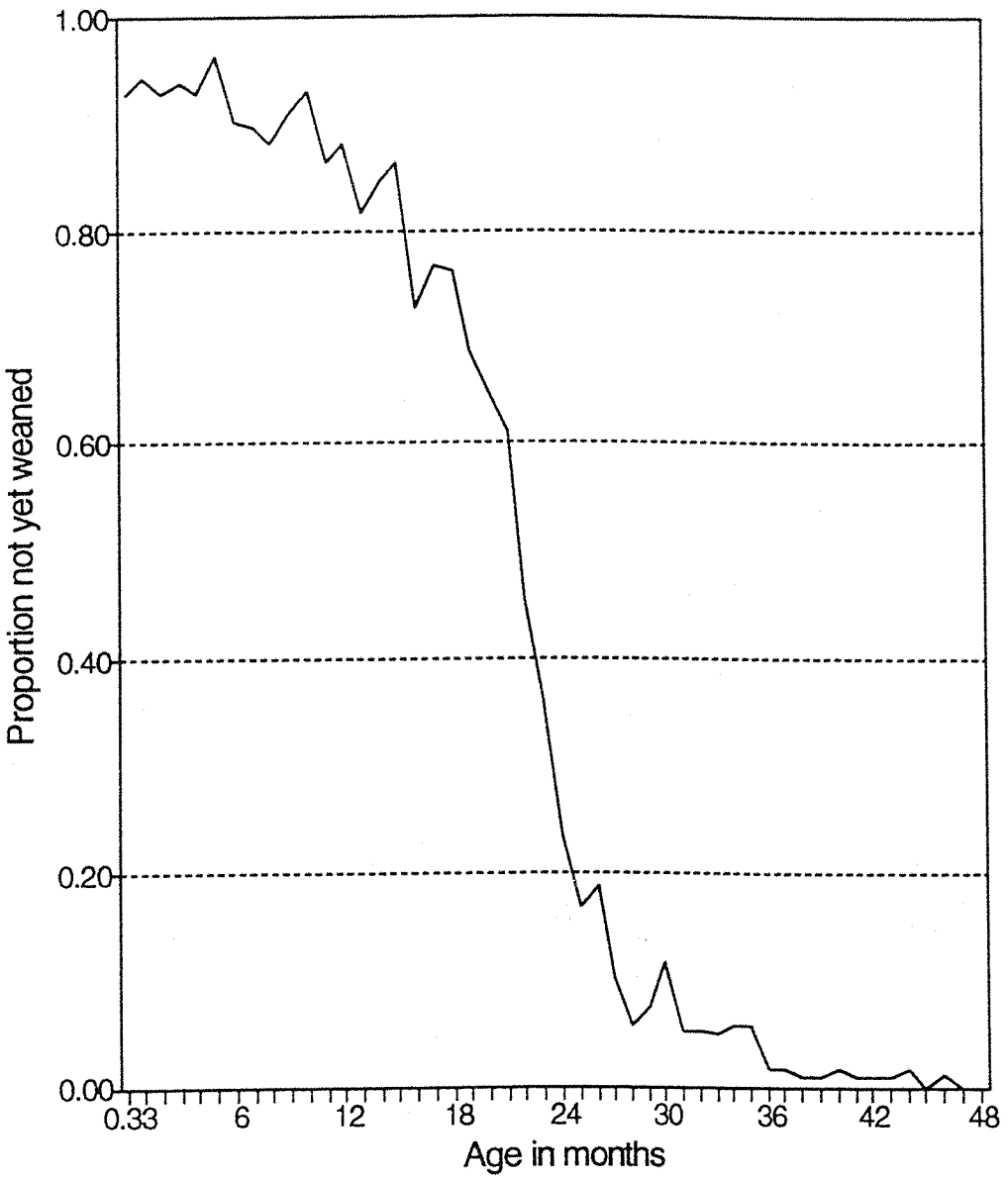
survey). Diamond et al. (1986) have argued that if the heaping observed for retrospectively reported durations is genuine, the same pattern should appear when using current status breastfeeding data. That is, if mothers did wean large proportions of children at exactly 12, 18 and 24 months etc. then you would expect that the current status data would show "jumps" at those durations if you plotted the distribution of ages at the survey date of those still breastfeeding. However, the breastfeeding survivor function for current status data given in Figure 3.6 does not reveal a pattern consistent with especially large numbers of children being weaned at these exact ages. The empirical survivor function shows that about 80 per cent of Tanzanian women appear to wean their children between 15 and 27 months. The biggest "jump" is observed between 15 and 16 months and the second biggest "jump" is between 21 and 22 months. Both "jumps" do not appear in the retrospective data. Therefore we assume that the current status data are relatively accurate and that the heaping is not genuine.

The problem of heaping has encouraged us not to rely only on retrospective data. The analysis of the determinants of breastfeeding is therefore done for both the retrospective data and current status data so that the results can be compared. Although a variety of techniques have been developed to adjust the heaped data, these techniques are of little use for the analysis of determinants of breastfeeding, where breastfeeding is a dependent variable in a functional relationship (Akin et al., 1981). The reporting of breastfeeding durations suggest a possibility of misreporting for other variables reported as durations. Therefore these variables should be analysed with caution.

3.5 Bongaarts' Model for Estimating the Proximate Determinants of Fertility

This section and the next two give a brief discussion of the

Figure 3.6. Breastfeeding Survivor Function for Current Status Data.



methods of analysis employed in this study. Bongaarts (1978) has developed a framework for analyzing the proximate determinants of fertility which was later elaborated by Bongaarts and Potter (1983). The framework shows that group variation in fertility is due to four main factors: proportion of women married, practice of contraception, induced abortion, and period of lactation infecundability. Further, the model (sometimes referred to as Bongaarts' model) has quantified the contribution of these four factors to the observed fertility level.

The general form of the Bongaarts' model is given as follows:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF \qquad (3.1)$$

where C_m = index of proportion married

C_c = index of contraception

C_a = index of induced abortion

C_i = index of postpartum infecundability

TF = total fecundity rate

TFR = observed total fertility rate

The indices take values between 0 and 1 depending on the magnitude of the fertility-inhibiting effect. The index of marriage equals 1 if all women of reproductive age are married and 0 in the absence of marriage. The index of contraception equals 1 in the absence of contraception and 0 if all fecund women use 100 per cent effective contraception. If all pregnancies are aborted, the index of induced abortion becomes 0 and in the absence of abortion the index is 1. Finally, the index of postpartum infecundability equals 1 in the absence of lactation and postpartum abstinence and 0 if the duration of infecundability is infinite. The total fecundity rate is maximum number of children a woman can have in her reproductive years in the absence of lactation, abstinence, and contraception, and if she remains married during the entire reproductive period.

The index of proportion married is calculated as the weighted average of the age-specific proportions married by using the formula:

$$C_m = \{\Sigma m(a)g(a)\}/\Sigma g(a) \qquad (3.2)$$

where *m(a)* is proportion currently married among females aged *a* years and *g(a)* is the age-specific marital fertility rate. *g(a)* can be computed by dividing the age-specific fertility rate by the proportion of women that is currently married in each age group.

The index of postpartum infecundability is estimated by using the formula:

$$C_i = 20/(18.5+i) \qquad (3.3)$$

where *i* is the average duration of postpartum infecundability caused by breastfeeding or postpartum abstinence. The estimate of *i* is taken as the sum of the postpartum amenorrhea and that portion of postpartum abstinence beyond amenorrhea. The constant 20 in equation (3.3) represents the average birth interval length (in months) if no breastfeeding and postpartum abstinence are practised. In the presence of breastfeeding and postpartum abstinence, the average birth interval is estimated to be 18.5 months plus the duration of postpartum infecundability.

The index of contraception is given by the equation:

$$C_c = 1.00 - (1.08 \times u \times e) \qquad (3.4)$$

where *u* is the average proportion of married women currently using contraception and *e* is the average contraceptive effectiveness. The value of *e* is computed using the weighted average of the method-specific use-effectiveness, *e(m)*, by the proportion of women using a

given method, $u(m)$. That means using the following formula:

$$e = \{\Sigma e(m)u(m)\} / u \qquad (3.5)$$

where $\Sigma u(m)=u$. Bongaarts and Potter (1983) give the values of $e(m)$ used in the computation of e. The constant 1.08 given in equation (3.4) is an adjustment for the fact that women or couples do not use contraception if they know or believe that they are sterile (Bongaarts and Potter, 1983).

The index of abortion can be computed by using the formula:

$$C_a = TFR/(TFR + b \times TA) \qquad (3.6)$$

where TA is the total abortion rate equal to the average number of induced abortions per woman at the end of the reproductive period if induced abortion rates remain at prevailing levels throughout the reproductive period. b is the number of births averted per induced abortion which may be approximated by the equation:

$$b = 0.4\ (1+u) \qquad (3.7)$$

It has been suggested that in the absence of contraception, an induced abortion averts about 0.4 births, while about 0.8 births are averted when moderately effective contraception is practised (Bongaarts and Potter, 1983). Equation (3.7) yields b=0.4 when u=0, and b=0.8 when u=1.0. Generally, the index of induced abortion can be defined as the ratio of the observed total fertility rate (TFR) to the estimated TFR without induced abortion (TFR + b x TA).

The Bongaarts' model has been very useful in estimating the proximate determinants of fertility. However, several factors have been noted to affect the reliability of the estimates from this model. The reporting errors for the variables: current age, age at

marriage, duration of breastfeeding, duration of postpartum abstinence, use of contraception and abortion is one of the problems which make the model give biased estimates. Obviously, this problem will not only affect the Bongaarts' model but any model which estimates the proximate determinants of fertility.

The index of the proportion married, C_m, assumes that all fertility occurs within marriage or union. But, a substantial number of non-marital births occur particularly in Africa and this can cause a serious bias on the value of C_m. In order to circumvent this problem, some analysts have introduced a variable (M_o) which captures the effect on total fertility of births outside union (Jolly and Gribble, 1993). That is, if $\acute{C}_m$ captures the effect on total fertility of the specific observed union pattern under the assumption that no births occur outside union, the product of M_o and $\acute{C}_m$ gives C_m. It should be noted, however, that M_o is not a fertility-reducing parameter of the model but a correction factor for $\acute{C}_m$.

Another factor which is usually a problem in applying Bongaarts' model (at least in Africa) is the failure to incorporate the incidence of induced abortion. Although the assumption that abortion is insignificant is valid in some countries, in others this assumption can create serious bias in the estimation of the model. In many countries, induced abortion is permitted only to save mother's life. So people practise illegal induced abortion (of which data cannot easily be collected) to terminate unwanted pregnancies. The extent of the problem used to be minimal, but, as Justesen et al. (1992) show, the number of induced abortions is growing very fast particularly among the young and unmarried women residing in urban areas.

It has been argued that Bongaarts' model produces very good estimates under the assumption of random use of contraception and induced abortion. Reinis (1992) finds that with non-random use of

contraception, which is more likely given that women tend to use contraception depending on their family-building plans, the estimates produced (except for C_i) are less accurate. For instance, if use of contraception is concentrated at the later ages, C_c is a poor estimator of the fertility-reducing impact of contraception because use is dominated by women who have become sterile. Reinis (1992) has concluded that the Bongaarts' model performs poorly when women use contraception to stop rather than to space births, when there is delayed marriage, and when contraception use is most prevalent at the oldest ages. These problems, however, seem to be minimal in a country like Tanzania where women use contraception at all ages and use mainly for spacing purposes.

3.6 Logistic Regression

In a study of determinants of contraceptive use, for example, the response variable may be use or non use of contraception at the time of the survey. In a situation like this one, the standard multiple regression analysis becomes inappropriate as the response and predictors can not be related through a linear relationship. One important method that can be used in such a situation is logistic regression. Logistic regression has been widely used in a functional relationship where the response variable is categorical, often either a success or failure.

Suppose that y_i is a binomial random variable, with n_i trials, and with probability of success on any trial equal to Θ_i (with $0 \leq \Theta_i \leq 1$ unknown). In logistic regression, we model Θ_i as a functional form relating Θ_i to X_i known to be S - shaped (Weisberg, 1985). This can be done by using the logit transform of Θ_i, defined to be

$$\text{logit } (\Theta_i) = \ln[\Theta_i/(1-\Theta_i)] \qquad (3.8)$$

The logit is the logarithm of the odds of success, the ratio of

the probability of success to the probability of failure. The properties of the logit function include:

(1) as Θ_i increases, so does logit (Θ_i), and

(2) logit (Θ_i) varies over the whole real line, whereas Θ_i is bounded between 0 and 1.

The logistic regression model can then be expressed into two equivalent ways. First, we can fit a linear model in the logit scale,

$$\text{logit } (\Theta_i) = \beta_0 + \beta_1 X_i \qquad (3.9)$$

solving (3.9) for Θ_i, using (3.8), we get the form

$$\varepsilon(y_i/n_i) = \Theta_i = \exp(\beta_0 + \beta_1 X_i) \;/\; 1 + \exp(\beta_0 + \beta_1 X_i) \qquad (3.10)$$

Equation (3.10) expresses the model as an S - shaped curve in the original probability scale. It can be noted also that equation (3.9) and (3.10) are equivalent.

In logistic regression, the deviance is useful in some goodness of fit tests, and changes in deviance between various models are used in significance testing. The deviance is defined as

$$deviance = 2 \times \sum y_i \ln\left(\frac{y_i}{n_i \theta_i}\right) + (n_i - y_i) \ln\left(\frac{n_i - y_i}{n_i - n_i \theta_i}\right) \qquad (3.11)$$

with $N-\delta$ degrees of freedom, where δ is the number of ß's in the linear form and N is number of binomials. To compare two nested models, compute the changes in deviance and degree of freedom, compare the results with the p-value of the chi-square distribution.

3.7 Event History Analysis

3.7.1 Introduction

Event history analysis is used to study duration data, which represent the non-occurrence of a given event. There must be some well-defined starting event and a well-defined finishing event that is of interest. For example, if we wanted to study the second birth interval; the starting event is the birth of the first child and the finishing event is the birth of the second child. The duration of interest is the time elapsed since the first to the second child. This is the simplest form of event history which is considered solely by measurement of the entrance into some initial state until attainment of some final state. Other types of event history data in demographic studies include age at marriage, infant mortality, breastfeeding, divorce, migration, etc. Event histories can be more complicated by having a multiple and/or repeated events. Consider for example job changes and marriages, these can occur many times over the lifetime of an individual.

A major feature of event history data is that for some individuals the event of interest may not have happened by the time of observation. This is called censoring which happens when incomplete information is available about the duration of the risk period because of the limited observation period. There are three types of censoring. The right-censoring occurs when the event has not happened when the individual is observed. If the event happens before the individual is observed, this is called left-censoring.[8] Finally, the interval censoring which occurs when only upper and/or lower bounds are available between which the true value of the observation is not known. Unlike other conventional methods such as linear

[8] Left-censoring is less of a problem in survey data because if the event has occurred the interviewer can ask when it occurred.

regression analysis, event history analysis has a capacity to deal with censored observations particularly right-censoring. However, censoring should be assumed to be uninformative, that is, it does not depend on the covariates of interest. This is similar to assuming data are missing at random in the analysis of data with missing values.

Another advantage of event history analysis over standard statistical procedures is the ability to deal with time-varying explanatory variables. There is severe bias or loss of information if explanatory variables that change in value over the observation period are included in the model as a constant. But event history analysis allows one to include explanatory variables in a model much closer to their natural state of occurring. In practice, time-varying explanatory variables are usually measured at regular intervals, therefore in the estimation of models with these variables it will depend on the frequency with which these variables are measured.

3.7.2 Hazards Models

The event history analysis models hazards rates. Yamaguchi (1991) defines event history analysis as the analysis of the duration for non-occurrence of an event during the risk period or as the analysis of the rates of the occurrence of the event during the risk period. The hazard rate (or hazard function), $h(t)$, expresses the instantaneous risk of having the event at time t, given that the event did not occur before time t. If T is the random variable for the duration of the risk period for an event, then the hazard function $h(t)$ is given as

$$h(t) = \lim_{t \to 0+} \frac{P(t+dt > T \geq t \mid T \geq t)}{dt} \qquad (3.12)$$

where $P(t+dt > T \geq t/T \geq t)$ indicates the probability that the event

occurs during the time $(t, t+dt)$ given that the event did not occur prior to time t.

Equation (3.12) can also be written as $h(t) = f(t)/S(t)$. The survivor function $S(t)$ is given as

$$S(t) = P(T \geq t) = \exp\left[-\int_0^t h(u)\,du\right] \qquad (3.13)$$

and the probability density function of T is given as

$$f(t) = \lim_{t \to 0+} \frac{P(t+dt > T \geq t)}{dt} \qquad (3.14)$$

$$f(t) = h(t) \exp\left[-\int_0^t h(u)\,du\right]$$

Although modelling duration data can be done by specifying the relation between explanatory variables (sometimes called covariates) and one of the functions 3.12, 3.13 or 3.14, event history analysis usually models the hazard function, $h(t)$. Several reasons have been outlined as to why modelling $h(t)$ may be advantageous over $f(t)$ and $S(t)$ (see for example, Cox and Oakes, 1984; Yamaguchi, 1991).

The hazards modelling can be performed by assuming a distribution for duration data, that is, use of parametric methods. Parametric methods assume that the time until an event or the times between events come from very specific distributional families, the most common being the exponential, Weibull and Gompertz distributions. However, sometimes the application of this approach has problems. Allison (1984) mentions two problems which are usually encountered when using parametric methods. First, it is necessary to

decide how the hazard function depends on time, and there may be little information on which to base such choice. Moreover, if the hazard function is believed to be non-monotonic, it may be difficult to find a model with the appropriate shape. Second, these models do not allow for explanatory variables whose values change over time. Even if one succeeds to develop fully parametric models that include time-varying explanatory variables, estimation of these models is somewhat cumbersome. Cox (1972) has proposed a proportional hazards model which solves both problems.

3.7.3 The Proportional Hazards Model

The proportional hazards model (sometimes referred to as Cox model) may be written as:

$$h(t) = h_0(t) \exp(\beta X) \qquad (3.15)$$

where $h_0(t)$, which represents the major dimension of time dependence, is called the baseline hazard function, X is a vector of covariates, some may be measured continuously or be factors, and β is a matrix of coefficients to be estimated.

The baseline hazard function is common for all subjects, and is interpreted as the hazard for persons for whom all the covariates are zero. The model assumes that when, say X_1 is an interval-scale variable, the hazard rate becomes $exp(\beta_1)$ times as much for each unit increase in X_1, controlling for effects of other covariates and time. In other words, the proportional hazards model supposes that there is some unknown baseline hazard function describing the process being analysed and that the effect of the covariates is to shift the hazard up or down proportionally. This method is described as semi-parametric or partially parametric due to the fact that it can be

used without specifying the functional form of $h_0(t)$.[9]

The Cox's partial likelihood (PL) method for parameter estimation is noted to be the most popular approach in event history analysis (Yamaguchi, 1991). The PL estimates of parameters are obtained by maximizing the partial likelihood function (see Cox, 1972; Allison, 1984; Yamaguchi, 1991 for the mathematical details). Most computer programmes give the estimates of both β and $exp(\beta)$, also show whether or not an effect is significant. The exponents of the β coefficients {i.e. $exp(\beta)$} are relative risks which may be interpreted as measures of causal effect.[10] Relative risks do not depend on how $h_0(t)$ is specified.

The application of proportional hazards model is based on the assumption of proportionality. The hazard function, $h(t)$, is supposed to be proportional to the baseline hazard function, $h_0(t)$, regardless of the amount of time elapsed since the starting event. Therefore, the assumption of proportionality should be tested to all time-independent covariates before fitting the proportional hazards model. The graphical method is usually used for this purpose. For proportional hazards model, the survivor function is given as

$$S(t) = S_0(t)^{\exp(\beta X)} \qquad (3.16)$$

where $S_0(t)$ is the survivor function for persons for whom all the covariates are zero and is given as

$$S_0(t) = \exp\left[-\int_0^t h_0(s)\,ds\right] \qquad (3.17)$$

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[9] If the functional form of the baseline hazard, $h_0(t)$, is specified, then it is called the parametric proportional hazards model.

[10] Relative risk ($\exp \beta$) is usually preferred over β as the measure of causal effect.

It follows that the log minus log survivor function is given as

$$\ln[-lnS_i(t)] = \ln[-lnS_0(t)] + \beta X \qquad (3.18)$$

The equation (3.18) indicates that if all covariates are time-independent, differences in the log minus log survivor function among groups with different covariate values become constant over time. This characteristic can be used in a visual examination of non-proportional effects for time-independent covariates.

The second method of testing the assumption of proportionality involves an extension of the basic Cox model (Hinde, 1993). Suppose we have a variable X_1 which has two levels, coded as 1 and 0 in the data. We wish to test whether or not the hazard experiencing some event of interest is different proportionally for a person in level 1 than for a person in level 0. We create a new variable by multiplying X_1 by lnt, where t is time since the start event, and we add this new variable to the Cox model in addition to X_1. If the coefficient of $X_1 lnt$ is not significantly different from zero, the hazards associated with the two levels of X_1 are proportional. This test can also be applied in the same way with variables measured continuously, that is, time-varying covariates.

Chapter Four

Recent Fertility Trends and Differentials

4.1 Introduction

This chapter examines the fertility levels, trends and differentials in Tanzania. Indirect estimates of fertility are obtained from the three post-independence population censuses of Tanzania. These estimates give the national trends in fertility for the period 1967-1988. The study of fertility trends is also done by using the 1991/92 Tanzania Demographic and Health Survey (TDHS) data. The direct estimates of fertility for the period of approximately ten years prior to the TDHS are calculated.

The second task of this chapter is to examine the determinants of fertility in Tanzania. The Bongaarts' model is used to investigate the proximate determinants of fertility. Next, the descriptive analysis is used to examine fertility differentials. Finally, the socio-demographic determinants of cumulative fertility are analysed using the multiple regression analysis.

4.2 Population Census Estimates

4.2.1 The Method

Two types of data were obtained from the population censuses on which fertility estimations are based. First, women were asked question(s) regarding the number of children they had ever borne. Second, women were asked how many children they had borne in the twelve months prior to the census. The answers to the first set of questions give information on life-time fertility and those to the second set on current fertility.

A problem frequently encountered with data on current fertility

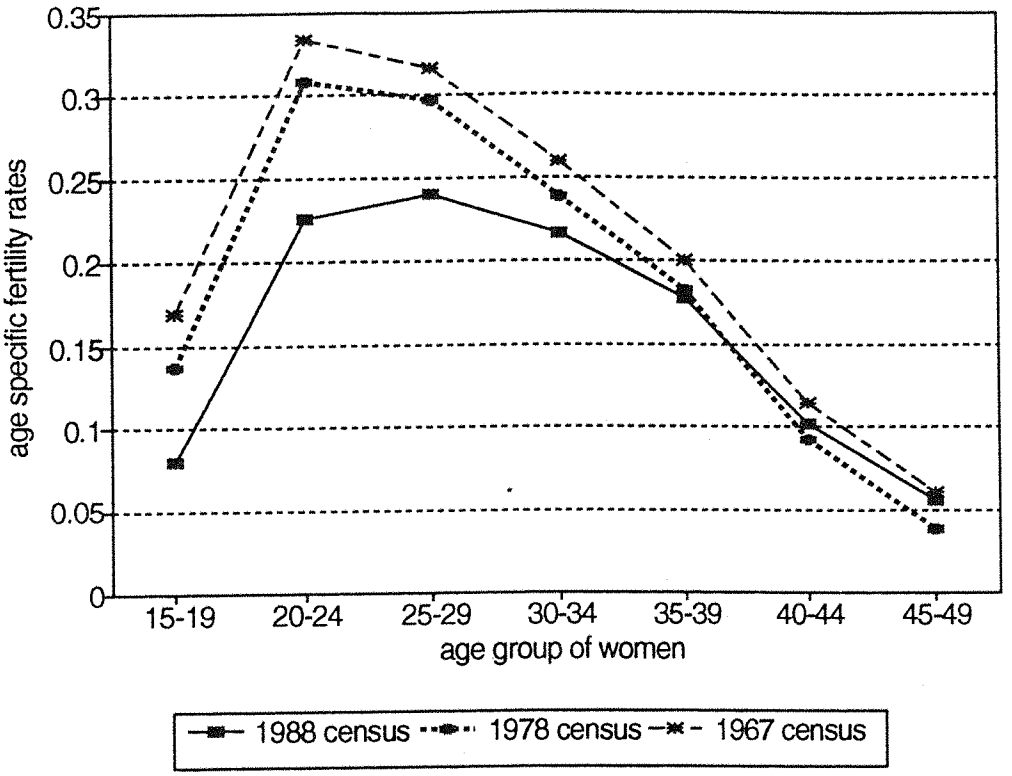
is under-reporting of births. One possible explanation is that women report births which took place during the census calendar year instead of the required period of twelve months prior to the census. However, the shape and age pattern of fertility obtained from current fertility data are in most cases accurate. This implies that there is a need to adjust the age specific fertility rates (ASFRs) so that the total fertility rate (TFR) can be computed accurately.

The usual method to adjust the ASFRs is to adopt one of a number of strategies which use the P/F ratio first proposed by Brass (1964). This is the ratio between reported number of children ever born by women at a particular age (P) and the sum of the ASFRs to that age (F). In situations where there has been no decline in fertility this ratio should be around one. However, this is not the case due to the fact that F is affected by under-reporting of births 12 months prior to the census (assumed to be constant at all ages) and P is affected by omission of children, particularly by older women. This latter error is overcome by adjusting the ASFRs by the P/F ratio for women aged 20-29, since these women are believed to report their number of children ever born most accurately. This estimation procedure is based on an assumption that fertility levels and patterns have not changed markedly in the recent past.

4.2.2 Fertility Patterns

Figure 4.1 shows the pattern of fertility by age as reported by respondents aged 15-49 years in each census. The shape of the curves looks similar to those observed in other less developed countries. That is, the ASFR increases from early ages of childbearing (15-19 years) and reaches its maximum value in the age group 20-29 years. It then declines steadily to the end of the childbearing ages (45-49 years). Figure 4.1 also shows that the curves for the 1967 and 1978 censuses look similar, having a sharp peak at age group 20-24 whereas the 1988 census data has a peak for women aged 25-29. This implies a

Figure 4.1. Age Pattern of Fertility Reported During Censuses.



change in the age-specific fertility pattern. Another observation from the curves is that the ASFRs are consistently higher for the 1967 census compared with the 1978 and 1988 censuses. Whilst the 1978 census gives higher ASFRs for younger women than that in 1988, the opposite is true for older women (aged 40 years or above). It could be concluded from this that recently women have tended to bear more children at an old age than previously. However, it could also be argued that the observed pattern is due to better reporting of live births by old women in the 1988 census compared with the 1978 census. In summary, the age pattern of fertility observed in Figure 4.1 suggests a decline in fertility for women under 40 years particularly for the period 1978-88.

4.2.3 Fertility Estimates

A summary of the estimates for all three censuses is given in Table 4.1, which presents the fertility rate estimated using a range of different methods, together with a final "best" estimate. The reported national TFR for the 1967 census is 7.3 (7.4 for rural dwellers and 5.1 for urban dwellers) and the use of P/F ratio to adjust for under-reporting of births to older women inflates further the fertility level to a TFR of 8.1. Egero and Henin (1973) argue that births in the period 12 months prior to the census might have been over-reported due to a problem with the reference period. It is possible that women reported their births since 7 July 1966 instead of 28 August 1966 because enumerators were told to ask people recall their live births since one and a half months after Saba-Saba day in 1966.[11] However, there is also the possibility that children were omitted due to the way the question was framed. Women aged 12 years and above were asked a single question on the number of children they had ever had. It has been argued that a single question on the number of children ever born increases the number of omitted births particularly amongst older women who are more likely to omit children not living at home or those who died a long time ago (United Nations, 1983). This argument is supported by the relatively small value of average children ever born for women in age group 45-49 (P7) given in Table 4.1.

The official estimate given by Egero and Henin for the 1967 census was obtained by computing TFR based on the "child-woman" ratio method. The TFRs estimated for national, rural and urban areas were 6.6, 6.7 and 4.4 respectively (Egero and Henin, 1973). Whilst the possibility of over-reporting due to misunderstanding of the reference period cannot be ruled out, this estimate places the

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[11] Saba-Saba day (7 July) refers to the day TANU, then the ruling and the only political party, was established. This day used to be very special and was celebrated nation-wide every year. Hence it was easier for a person to remember this event than 28 August.

Table 4.1. Fertility Estimates From Tanzanian Population Censuses.

Method	Total	Rural	Urban
1967 Census*			
1. Reported TFR	7.3	7.4	5.1
2. TFR by P/F ratio method .	8.1	7.9	5.0
3. TFR by C/W ratio method .	6.6	6.7	4.4
4. TFR based on C_x	6.4	-	-
5. P7.....	5.2	5.3	3.3
"Best" Estimate	6.9	-	-
1978 Census**			
1. Reported TFR	6.4	-	-
2. TFR by P/F ratio method .	7.2	-	-
3. TFR by C/W ratio method .	6.8	-	-
4. TFR based on C_x	7.0	-	-
5. P7	6.1	-	-
6. $(P3)^2/P2$	6.6	-	-
7. $P2(P4)^4/P3$	7.7	-	-
"Best" Estimate	7.2	-	-
1988 Census***			
1. Reported TFR	5.4	5.8	3.9
2. TFR by P/F ratio method .	6.5	7.1	4.8
5. P7	6.5	6.6	5.7
"Best" Estimate	6.5	7.1	4.8

Source: * Egero and Henin (1973)
** Ngallaba (1983b)
*** Chuwa et al. (1991)

Note: - implies not available; P2, P3, P4 and P7 given in methods 5, 6 and 7 stand for parity for women aged 20-24, 25-29, 30-34 and 45-49 respectively.

method 1. TFR = $\Sigma ASFR(i)$ where i is five-year age group of women; 15-19, 20-24, ... , 45-49.
method 2. P stands for parity and F stands for cumulated age specific fertility rates
method 3. C/W ratio stands for Child-Woman ratio
method 4. C_x stands for cumulative age distribution under age x

see text for discussion of how the "best" estimate was chosen.

official figure lower than the reported TFR (0.7 births per woman) which seems implausibly low. Egero and Henin did not take into consideration other problems known to cause under-reporting of births 12 months prior to the census. For instance, in addition to the fact that only a single question was used, people particularly in Africa are usually reluctant to talk about recently dead children, especially those who died in infancy, and this can deflate the number of recent births. It can therefore be argued that reporting of births during 1967 census was probably subject to errors in both directions; those which inflate the number of births and those which deflate the number of births.

An alternative estimate of the TFR was computed for this study. Since the major problem was mentioned to be related with the reference period, TFR was computed basing on two assumptions: all women reported their births for the period 7 July 1966 - 28 August 1967 and births are evenly distributed throughout the period. If these assumptions are adopted a P/F ratio of 0.95 can be used to adjust for both the reference period error and the under-reporting of births in the period.[12] This gives an adjusted TFR of 6.9 which is argued to be more plausible for Tanzania in 1967 than the official estimate of 6.6.

The data collection process was modified for the 1978 census so as to avoid the problems faced in 1967 census. The first modification was to ask three questions on children ever born instead of just one. Women were asked to report the number of their own children still living with them, the number living elsewhere and the number who had died. The total number of children ever born was obtained by adding the three numbers reported. Although this method is known to minimize the problem of omission of births (United Nations, 1983), the parity

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[12] The adjustment factor for reference period error is 365/418, and that of under-reporting of births is 1.088. The two figures combined ((365/418) x 1.088) gives 0.95.

for women aged 45-49 (P7) of 6.1 still appears to be low, suggesting that a significant number of births to older women are omitted. The second modification was to record all births for the calendar years 1977 and 1978 and compute births from 29 August 1977 to 28 August 1978 under the assumption that births are evenly distributed throughout the period. This approach gave a reported TFR for the 1978 census of 6.4 which is also argued to be on the low side. Ngallaba (1983b) adjusted the reported TFR by the P/F ratio of 1.125 which gave a TFR of 7.2.

Several other procedures were also used to estimate the TFR using the 1978 census data.[13] The cumulative age distribution under age x (C_x) gave a TFR of 7.0 whereas the female "child-woman" ratio (C/W) method estimated a TFR of 6.8. Finally, Ngallaba (1983b) estimated the TFR based on parities at various ages. The methods used include the Coale-Demeny method $((P3)^2/P2)$ and Brass method $(P2(P4)^4/P3)$. These gave TFRs of 6.6 and 7.7 respectively. It was, however, the average of TFR obtained from the P/F ratio and the Coale-Demeny method that was used to derive the official level of 6.9 (Ngallaba, 1983b). However, no specific reason was given for the choice of these two indices used to give the official estimate. For consistency with the 1967 and 1988 estimates, we use the TFR estimated using the P/F ratio method of 7.2.

The computational procedure followed to obtain TFR during the workshop on the initial analysis of the 1988 census data (Chuwa et al., 1991) is adopted for the estimation of fertility levels in 1988. The relational Gompertz approach to estimating the P/F ratios (Zaba, 1981) was used to compute the TFR. The P/F ratios were calculated for Tanzania as a whole and for both rural and urban dwellers. The values obtained are 1.23, 1.15 and 1.49 for total, rural and urban areas

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[13] United Nations (1983) gives a description for the estimation of TFR using both cumulative distribution under age x (C_x) and 'child-woman' ratio (C/W) method.

respectively. The rather low value for rural dwellers and the corresponding high value for urban dwellers are surprising. This is because one would expect reporting errors to be rather smaller among urban dwellers - who are likely to be better educated - than among their counterparts in the rural areas. To illustrate this, if the value of 1.49 was to be accepted then it would imply that urban women under-reported their births in the 12 months prior to the census by almost 50 per cent. This is extremely unlikely.

It is therefore concluded that the high P/F ratio in the urban areas is a result both of a decline in fertility and of selection effects in the fertility of rural-urban migrants. Women who have recently migrated to urban areas will have very low current fertility and this will inflate the P/F ratio. On the other hand, those women who remain in the rural areas will be more likely to have children as they would not migrate with a tiny baby and the rural areas will thus be more likely to have relatively low P/F ratios. The national ratio, on the other hand is unaffected by these biases due to migration and is therefore considered to be the most reliable. The national figure (1.23) is the adjustment factor used for the national as well as for both rural and urban areas under the assumption that urban under-reporting will be no worse than that in rural areas. However this adjustment factor is still higher than those used for the 1967 and 1978 censuses. This may be due to a decline in fertility in the recent past. The national TFR calculated is 6.5 children per woman, whereas TFR for women residing in rural and urban areas are 7.1 and 4.8 respectively.

The national estimates show that fertility did not begin to decline in Tanzania until late 1970s or early 1980s. A modest fertility decline has been observed in the inter-censal period 1978-1988. It seems, however, that the fertility decline was concentrated in urban areas.

4.3 Fertility Levels and Trends from the TDHS

4.3.1 The Calculation of Rates

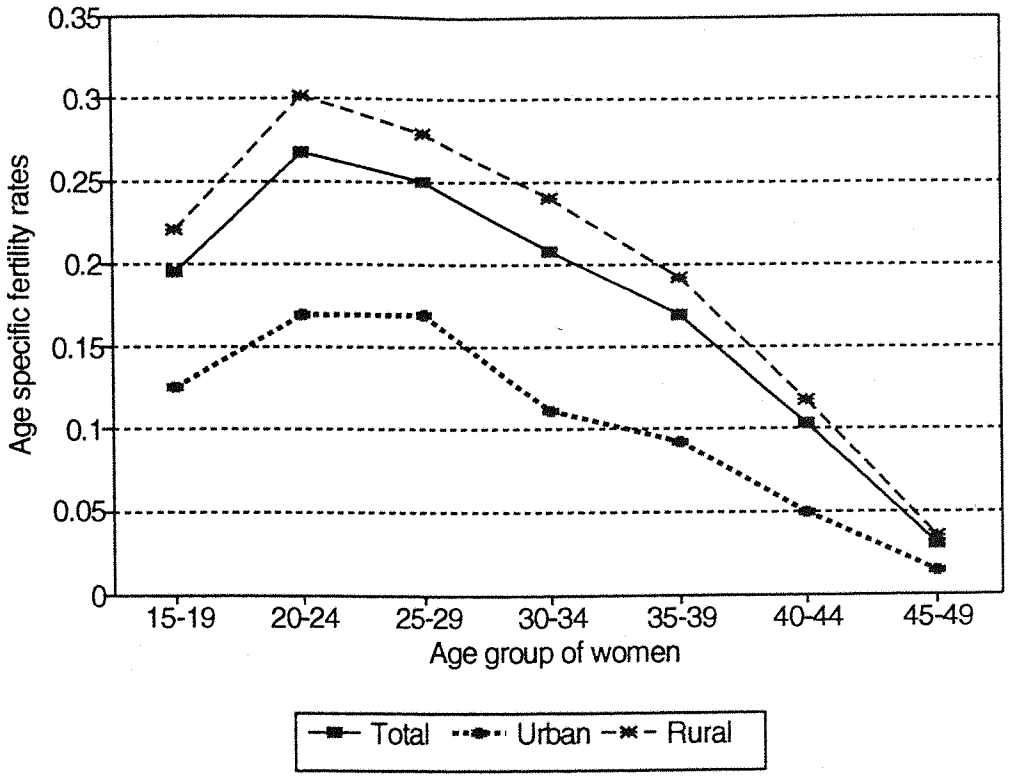
The Tanzania Demographic and Health Survey provides an alternative data source with which to study recent fertility levels and trends in Tanzania. The complete birth history of live births from each woman collected using the women's individual questionnaire was used for the calculation of fertility rates for three periods prior to the survey. Four-year windows have been chosen for the purpose of showing the trend in fertility. These are April 1980-March 1984, April 1984-March 1988 and April 1988-March 1992. As stated earlier this choice of periods is made because there is a problem of displacement of births from year 1986 to year 1985. The age pattern of fertility has been presented only for the most recent period.

ASFRs are calculated from the birth histories by dividing the number of births to women in a specified age group, during a specified time period, by the number of woman-years of exposure during the same period. The details of the estimation of ASFRs are given in Appendix 1. The TFR at time t is calculated by summing the ASFRs for five year age groups and multiplying by five. Since in the period April 1984-March 1988 we have no data on fertility to most of the women aged 45-49 years and, in the period April 1980-March 1984 we have no data on births to most of the women aged above 40 years, the computation procedure had to be modified. The TFR was computed based on women aged 15-39 for both these periods and then adjusted in order to take into account those women aged 40-49. The adjustment factor is the ratio between TFR for women aged 15-49 to those aged 15-39 for the most recent period: April 1988-March 1992.

4.3.2 Age Pattern of Fertility

Figure 4.2 gives the age pattern of fertility as observed

Figure 4.2. Age Pattern of Fertility Reported in 1991/92 TDHS.



during the 0-3 years prior to the TDHS for total, rural and urban areas. The figure shows that rural women have much higher fertility in all age groups compared with their urban counterparts. The pace of reproduction for rural dwellers reaches a peak in the age group 20-24 years and then declines steadily to the end of the reproductive lifespan. This pattern is broadly similar to that shown by the 1967 and 1978 population censuses. Urban dwellers on the other hand have a broad peak in age groups 20-24 years and 25-29 years. The low rate for urban women aged 30-34 years may be due to under-reporting of births in this age group. However there is no specific reason which can be given for this anticipated under-reporting of births. The curve for all women looks similar to that of women residing in rural areas. The distinctive feature for age pattern of fertility observed for TDHS is that ASFR for age group 15-19 is higher than that observed in censuses. This suggests a rise in teenage childbearing.

4.3.3 Fertility Levels and Trends

Table 4.2 gives the TFRs computed for the three four-year windows. The TFR for the period April 1988-March 1992 is 6.1 which suggests that fertility in Tanzania is moderate by sub-Saharan African standards. This statement can be supported by the TFRs given in Table 4.3. Tanzania lies in between countries with the lowest and highest fertility levels. There does appear to have been some decline in fertility during the recent past. The TFR was 7.0 in the early 1980s and decreased to 6.5 in the mid-1980s before reaching 6.1 during the four years prior to the survey.

Therefore Tanzania has experienced a reduction in fertility by about 0.8 births per woman (a 12 per cent reduction) during a decade prior to the survey. This can be regarded as a substantial decline in fertility during the recent past. In order to understand the causes of the fertility decline in Tanzania, it is necessary to study the determinants of fertility. The next section therefore deals with the proximate determinants of fertility.

Table 4.2. Fertility Estimates from the 1991/92 TDHS.

Period	Total Fertility Rate
April 1980-March 1984	6.95
April 1984-March 1988	6.49
April 1988-March 1992	6.12

Table 4.3. Total Fertility Rates for Some Selected Sub-Saharan African Countries.

Country	Year of Survey	TFR
Botswana	1988	4.7
Namibia[1]	1992	5.2
Zimbabwe	1988/1989	5.3
Cameroon[2]	1991	5.7
Tanzania[3]	1991/1992	6.1
Ghana	1988	6.1
Togo	1988	6.1
Senegal	1986	6.2
Liberia	1986	6.4
Kenya	1988/1989	6.5
Burundi	1987	6.5
Mali	1987	6.9
Uganda	1988/1989	7.2

Source: Arnold and Blanc (1990).
1 Katjuanjo et al. (1993).
2 Balépa et al. (1992).
3 1991/92 TDHS.

4.4 The Proximate Determinants of Fertility

The data used to compute indices for the Bongaarts' model are given in Appendix 2 and Table 4.4 gives a summary of the results. The estimate of C_m is 0.76. Robinson and Harbison (1995) estimated C_m of 0.72 for Kenya in 1993 which was 0.76 in 1989. A comparative study for the proximate determinants of fertility in sub-Saharan Africa done by Jolly and Gribble (1993) showed that C_m ranged from 0.68 (northern Sudan) to 0.98 (Mali). The estimate of C_m for Kibaha, Tanzania calculated by Komba and Kamuzora (1988) was 0.72. This shows that our estimate is within the range estimated elsewhere in Africa.

The C_m of 0.76 indicates that non-marriage alone suppresses maximum fertility by about 24 per cent to a total marital fertility rate (TM) of 11.5. This means, if Tanzanian women were all married throughout their reproductive period, the TFR would be about one-third (1/0.76) higher than it is, with an average of 8.1 births per

woman. Another way to view this estimate is to say that late marriage, non-marriage and divorce or widowhood together suppress fertility by about 24 per cent.[14] In fact, marriage is almost universal in Tanzania (over 99 per cent of women have been married or have co-habited at least once by age 45). Moreover, marriage takes place at a young age, the median age at first marriage is 17.9 years. Thus the reduction in the exposure to sexual intercourse which results from divorce and widowhood occurring during women's reproductive period seems to be contributing substantially to this suppression of fertility.

Among currently married women, 10.4 per cent were using family planning methods at the time of the interview. Contraceptive prevalence is therefore very low in Tanzania. The estimated C_c of 0.91 implies that about 9 per cent of maximum potential fertility has been suppressed by use of family planning methods (or that if no women were using contraception, the TFR would be only slightly higher than it is). This shows that Tanzania is a typical high fertility country.[15] Bongaarts (1978) says that C_c ranges between 0.8 and 1.0 for countries with TFR greater than 5. In sub-Saharan Africa, C_c is estimated to be greater than 0.9 in all countries except Botswana, Zimbabwe and Kenya (Jolly and Gribble, 1993). These figures agree with the results obtained here.

Unfortunately, there are no data with which to calculate the value of the index of induced abortion (C_a), which is therefore assumed to be 1.0. Although induced abortion is illegal in Tanzania

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[14] The question on temporary separation for married couples was not asked in the TDHS. Therefore the effect of temporary separation on fertility is not included in the calculation of C_m. This is likely to over-estimate the total marital fertility rate.

[15] Although in Africa there are countries with high TFR and high contraceptive prevalence rate (CPR) (e.g. Zimbabwe), and low TFR and low CPR (e.g. Gabon), the typical feature is high TFR and low CPR. For example, out of twelve countries studied by Jolly and Gribble (1993), eight countries have TFR greater than 6 and C_c greater than 0.9.

Table 4.4. Summary Measure of the Proximate Determinants of Fertility.

Index	Intermediate step	Estimates of index
C_m	$\Sigma m(a)g(a)=1.224$ $\Sigma g(a)=1.619$	0.756
C_c	u=0.104 e=0.815	0.908
C_a	TA=0	1.000
C_i	DBF=21.5 PPA=14.9 ABS= 6.6 i=15.6	0.587
TF = 6.12/(0.756 x 0.908 x 0.587)		15.2

Source: 1991/92 TDHS

Note: see text for details of the computational procedure

g(a) = the age-specific marital fertility rates
m(a) = the age-specific proportions of females currently married
u = proportion currently using contraceptives among married women of reproductive age (15-49)
e = average use-effectiveness of contraception
TA = total abortion rate
DBF = duration of breastfeeding
PPA = duration of postpartum amenorrhea
ABS = duration of postpartum abstinence
i = mean duration of postpartum infecundability
TF = total fecundity rate

unless undertaken to save the life of the mother, illegal abortion does occur, especially amongst young unmarried Tanzanian women living in urban areas (Justesen et al., 1992). Therefore the assumption of C_a being 1.0 is likely to over-estimate fertility levels.

Table 4.4 shows that postpartum infecundability has the strongest fertility-inhibiting effect of all the indices in Tanzania. The estimated C_i of 0.59 means that postpartum amenorrhea and postpartum abstinence suppresses maximum potential fertility by about

41 per cent to a total natural marital fertility rate (TN) of 8.9. This is mainly a result of universal and prolonged breastfeeding. Nearly all women (98 per cent) breastfeed their children for sometime and the mean duration of breastfeeding is 21.5 months (excluding children currently being breastfed and those who have died). These breastfeeding practices consequently prolong the period of postpartum amenorrhea to a national average of 14.9 months (excluding durations of amenorrhea greater than 30 months). Abstinence from sexual intercourse after the birth of children does occur, but the mean duration of postpartum abstinence recorded is only 6.6 months (excluding durations of abstinence greater than 36 months and women currently abstaining from sexual intercourse).

These indices for the four proximate determinants of fertility together with a TFR of 6.1 given in the preceding section give a total fecundity rate (TF) of 15.2 (6.12/(0.756 x 0.908 x 0.587) = 15.2). Bongaarts (1978) suggested a value of TF between 13.5 and 17.0 for countries with a TFR greater than 5, and an overall mean figure of 15.3. Therefore the TF of 15.2 estimated for all women is very close to Bongaarts' mean figure and this adds credibility to the results obtained. It is also possible to compute Bongaarts' indices for rural and urban women separately in order to examine rural/urban fertility differentials observed in Figure 4.2. However, there will be a problem of interpretation of indices particularly C_m. The urban effect is likely to be confounded by rural-urban migration suggested in Section 4.2.3.

The analysis of the proximate determinants of fertility suggests that late marriage, divorce and widowhood, and especially postpartum infecundability are the main factors reducing the prevailing levels of fertility in Tanzania from their biological maximum. However, the duration of postpartum abstinence is short in Tanzania by sub-Saharan African standards and therefore its contribution to fertility levels is minimal. Contraception use has

only a very minor fertility inhibiting effect.

These findings have implications for future fertility trends. As development proceeds it is likely that durations of breastfeeding will be reduced.[16] Other things being equal, this will lead to a rise in fertility. To compensate for this, the use of contraception should be encouraged. It seems a further decline in fertility is more likely in Tanzania through a rise in contraceptive prevalence rate because the room for manipulating other proximate determinants in order to lower fertility is minimal. The determinants and future prospects of contraception use are explained in detail in Chapter Eight.

4.5 Socio-Demographic Determinants of Fertility

4.5.1 Differentials in Fertility

The study of the proximate determinants of fertility is not enough to inform policy. The indirect determinants need to be considered in order to understand the social and economic factors which can be manipulated to change fertility levels. In the initial analysis which follows, we compute the variation in the mean number of children ever born (CEB) with various social and demographic factors. Since the number of children ever born is known to be highly associated with age, it is necessary to examine differentials in cumulative fertility in different age groups of women. The results are summarized in Table 4.5.

Women residing in urban areas have lower fertility than their rural counterparts. As stated in Chapter Two, this pattern is also true for all countries in sub-Saharan Africa (Cohen, 1993). The difference becomes substantial as the age of women increases.

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[16] Even if breastfeeding durations are not reduced, a further decline in fertility caused by breastfeeding practices is very unlikely.

Table 4.5. Mean Number of Children Ever Born According to Selected Socio-demographic Characteristics and Age of Women.

Characteristic	Age of Women 15-24	25-34	35-49
Type of Place of Residence			
Rural	0.86(2965)	3.65(2072)	6.64(1906)
Urban	0.64(1099)	3.33(699)	5.81(496)
Zone of Residence			
Northern	0.60(470)	3.15(341)	6.51(278)
Coast	0.72(573)	3.35(338)	6.33(304)
Central	0.85(935)	3.77(595)	6.41(538)
Southern	0.85(560)	3.28(416)	6.22(435)
West Lake	0.81(776)	3.84(515)	6.85(387)
Southern H&W	0.91(631)	3.66(488)	6.49(397)
Zanzibar	0.82(119)	3.92(79)	6.68(62)
Women's Level of Education			
No education	1.08(638)	4.11(967)	6.61(1518)
Incomplete pr	0.70(734)	4.12(492)	6.59(602)
Complete pr	0.82(2401)	3.01(1195)	5.64(245)
Secondary+	0.31(291)	2.38(118)	4.03(37)
Partner's Level of Education			
No education	1.59(274)	4.06(538)	6.76(795)
Incomplete pr	1.51(232)	4.28(552)	6.73(670)
Complete pr	1.39(1169)	3.55(918)	6.48(360)
Secondary+	1.27(146)	2.99(189)	5.69(126)
No partner	1.33(186)	3.27(365)	5.72(388)
Religion			
Muslim	0.80(1250)	3.58(795)	6.33(788)
Catholic	0.77(1222)	3.60(915)	6.57(640)
Protestant	0.72(1079)	3.39(667)	6.54(562)
Others	1.10(489)	3.78(383)	6.54(400)
Marital Status			
Never married	0.19(2037)	1.28(190)	3.76(33)
Married	1.42(1841)	3.82(2216)	6.66(1981)
Widowed	2.26(17)	3.96(77)	6.29(171)
Divorced	1.23(169)	3.09(288)	5.27(217)
Type of Marriage			
Monogamous	1.41(1508)	3.79(1579)	6.83(1271)
Polygamous	1.48(323)	3.86(633)	6.35(703)
Age at First Marriage			
<16	1.80(355)	4.98(474)	6.70(541)
16-18	1.37(1054)	4.05(823)	6.72(701)
19-21	1.14(466)	3.13(564)	6.28(358)
22+	1.71(147)	3.05(710)	6.07(752)
Child Loss Experience			
0	0.66(3690)	2.97(1747)	5.16(927)
1	2.16(332)	4.08(688)	6.49(691)
2+	3.02(42)	5.60(336)	7.99(784)
Total	0.80(4064)	3.57(2772)	6.47(2402)

Source: 1991/92 TDHS

Note: Numbers of women in each group are given in parentheses. pr stands for primary and H&W stands for Highlands and Western.

Regional effects were investigated using the seven zones described in Chapter One. In fact, there seems to be no clear pattern. However, West Lake and Zanzibar have marginally higher cumulative fertility than other zones. Indeed, the regional fertility differentials obtained by using the 1988 Tanzanian census data showed that regions in West Lake and Zanzibar zones have higher TFR than regions in other zones (Mturi and Hinde, 1995).

Parental education is another factor known to have an influence on fertility. The spread of education and literacy among women is believed to be fundamental to changes in reproductive behaviour. Table 4.5 shows that cumulative fertility decreases as mother's level of schooling increases. This is true for women beyond age 25. The pattern for young women is not clear, perhaps because they have just started the reproductive process. Partner's education gives more or less a similar pattern to that observed for women's education. One possible explanation is that women's education is highly correlated with their partners' education. There is also a possibility that partner's education influences fertility in a similar way as women's education.

It seems there is no difference in fertility among the different religious groups in Tanzania. The differences are marginal in all age groups except that young women in the "other" category have higher mean CEB than women in other categories. The "others" category includes women with traditional faiths or no religion, who are more likely to marry at a younger age particularly if residing in rural areas.

As expected, women who have married have much higher cumulative fertility in all three broad age groups than their counterparts who have never married. Divorced women have the lowest fertility among the three ever-married groups, whereas widowed women have slightly higher fertility than married women in the age groups 15-24 and 25-

34. It is interesting to note that older women in polygamous marriages have lower cumulative fertility than those in monogamous marriages. However the difference is minimal for women aged 15-34. The fact that women in polygamous marriages have lower fertility than women in monogamous marriages may be attributed to differences in sexual behaviour. The frequency of intercourse is expected to be higher for a woman in monogamous marriage, than a woman in a polygamous marriage keeping other things constant.

Table 4.5 includes two demographic factors: age at first marriage and child loss experience. Age at first marriage in a non-contracepting society becomes an important determinant of the length of reproductive life and thus is highly and negatively correlated with CEB. Late age at first marriage shortens the reproductive period of a woman which will consequently reduce the total number of CEB (and vice versa). The pattern given in the table for women aged less than 25 years is not clear. This is probably due to the small number of cases observed for women married at age 22 or beyond and fact that most of these women were not in a union for a long time and therefore it is too early to observe the impact of age at first marriage on fertility. However, for women aged 25-34, fertility decreases as age at first marriage increases. Women married before age 16 have about two more births than women married after age 22. A similar pattern is repeated for women currently aged 35 years or more although the gap between different ages at first marriage is reduced. In fact older women (aged 35+ years) married before age 16 have more or less similar fertility to that of women married when they were between 16 and 18 years.

Women who have lost some of their offspring tend to have borne more children than their counterparts whose children have all survived. A woman can either replace a dead child or have as many children as possible so as to insure that she will ultimately have the number she wants. Women with child loss experience have much

higher fertility than women without this experience and the higher the number of children dead the higher the fertility. This is true for all age groups of women. However, the mechanism remains a problem in this type of relationship due to the reverse causality between fertility and child mortality. Women with a large number of CEB are more likely to have child loss experience compared with women with few CEB (Pebley and Stupp, 1987).

In summary, the descriptive analysis has given the expected results. The factors found to have a significant influence on cumulative fertility include type of place of residence, women's and partners' level of education, marital status, age at first marriage and child loss experience. A woman is likely to have a large number of children ever born if she was married before reaching the age of 18; stays in rural areas; has low or no education and has lost at least one of her children.

4.5.2 Regression Analysis

After examining the differentials in fertility, we are now in a better position to pick up associated variables and subject them to a more complex analysis in order to examine their relative importance as the determinants of fertility. However, it is necessary also to account for the interrelationships between the chosen independent factors. The correlation analysis (not presented here) suggested that various independent variables were highly correlated and hence some were dropped to avoid the problem of multicollinearity. For instance, in the case of education of mother and her partner, education of partner was dropped. Multiple regression analysis is the multivariate analysis undertaken to examine the determinants of cumulative fertility in Tanzania. Only currently married women are included in the regression analysis.

Table 4.6. The Variables Used in the Regression Analysis.

Variable	Abbr	Explanation
Children ever born	CEB	number of children ever born (0 - 16)
Place of residence	RES	dichotomous (0 - 1) 0 = rural 1 = urban
Level of Education	EDU	education of women in completed years (0 - 15) 0 = no schooling . . 15 = university
Age at first marriage	AFM	age at first union (12 - 35) 12 = 12 yrs or less . . 35 = 35 yrs or more
Type of marriage	TOM	dichotomous (0 - 1) 0 = monogamous 1 = polygamous
Child loss experience	MOR	dichotomous (0 - 1) 0 = no child died 1 = one or more died
Age of women	AGE	age in completed years (15 - 49)

Note: Figures in parentheses give minimum and maximum values

The seven variables used in the analysis along with a brief description of their measurement are given in Table 4.6. The response variable is the number of children ever born (CEB) which ranges from 0 to 16. Among the explanatory variables, three are dichotomous (type of place of residence, type of marriage and child loss experience) whereas the remaining three are continuous variables (level of education, age at first marriage and current age). Together with the variables given in Table 4.6, several other variables have been included in the regression analysis. Since education of women is known to have a non-linear relationship with the number of children ever born, the variable "education squared" was added in the model.

Also, there was a need to include the variables "age squared" and "age cubed" for the same reasons. It should be noted that the variables "age", "age squared" and "age cubed" were transformed to "age-12", "age-12 squared" and "age-12 cubed" respectively because childbearing is known to begin after age 12.

The regression equation used in this analysis is given as:

$$CEB = \alpha + \beta_1(RES)+\beta_2(EDU)+\beta_3(EDU)^2+\beta_4(AFM)+\beta_5(TOM)+\beta_6(MOR)+ \beta_7(AGE)+\beta_8(AGE)^2+\beta_9(AGE)^3 \quad (4.1)$$

where α is a constant and $\beta_1....\beta_9$ are unstandardized regression coefficients for each of the respective explanatory variables.

Table 4.7 gives the ordinary least square (OLS) regression coefficients (standardized and unstandardized) for all nine explanatory variables along with their standard errors (SE) computed for unstandardized coefficients. It is interesting to note that all variables selected are significant to at least 0.05 level and explain the variation in CEB by 62.6 per cent.[17] The apparent effect of age on CEB is expected since age of women and the number of children ever born are highly correlated. Women tend to have more children as they become older and the relationship seems to be non-linear due to the fact that all terms for age included in the model have a significant effect on CEB. However, the variables "age", "age squared" and "age cubed" were included in the equation as a control.

The effect of child loss experience is second most important in determining fertility levels. However, as explained earlier, the interpretation of this result is problematic due to the problem of reverse causality. Since both variables are known to affect each other, it is difficult to interpret the results. Table 4.7 shows a

[17] It seems this high explanatory power of the variation in CEB is mainly due to the effect of the three variables of age of women.

Table 4.7. The OLS Regression Coefficients for the Determinants of Children Ever Born.

Variable	Coefficient		SE
	Standardized	Unstandardized (β)	
Type of place of residence (RES)	-0.043	-0.334**	0.064
Education of women (EDU).....	-0.016	-0.013	0.020
Education of women squared $(EDU)^2$	-0.049	-0.005*	0.002
Age at first marriage (AFM)	-0.092	-0.044**	0.004
Type of marriage (TOM)	-0.044	-0.289**	0.053
Child loss experience (MOR)	0.236	1.437**	0.053
Age of women (AGE)	0.400	0.135**	0.041
Age of women squared $(AGE)^2$	1.149	0.009**	0.002
Age of women cubed $(AGE)^3$	-0.938	-0.0002**	0.00004
Constant (α)	-	0.574*	0.228

R^2 (adjusted) = 62.6 per cent

Source: 1991/92 TDHS

Note: ** significant at 0.01 level
* significant at 0.05 level

significant (to at least 5 per cent level) non-linear relationship between education and cumulative fertility. This non-linear relationship arises as no education is related to high fertility and the higher the education of women the lesser the number of children ever born. However, small amounts of education may break down birth-spacing practices without lowering fertility desires or increasingage at marriage and hence be associated with much higher fertility (Cochrane, 1979; Cohen, 1993). Rural women, with early and/or monogamous marriages have higher fertility than urban women, with delayed and/or polygamous marriages. These findings are very similar to those given in the descriptive analysis.

4.6 Conclusion

This chapter has shown that the 1991/92 TDHS estimates TFR of 6.1 births per woman in Tanzania (based on the four-year period prior to the survey). A declining trend in fertility has been observed. The estimated TFR for the period 1980-84 is 7.0 births per woman which decreased to 6.5 during the period 1984-88. Overall there was a 12 per cent decline in fertility during a decade prior to the TDHS. The census data also support this declining trend which began in late 1970s or early 1980s. The decline in fertility, however, is largely confined to urban areas.

The analysis of proximate determinants of fertility has shown a significant contribution of breastfeeding (through its effect on postpartum infecundability) on lowering fertility levels below the biological maximum. This is due to the fact that the use of contraception is not wide-spread in Tanzania. Also, the contribution of postpartum abstinence, late marriage, divorce and widowhood in lowering fertility seem to be minimal. Therefore use of contraception should be encouraged if a further decline in fertility is to be observed. Unfortunately, the effect of abortion on fertility could not be assessed in this analysis because of non-availability of data.

The socio-demographic determinants of fertility suggest the factors which can be manipulated in order to accelerate a decline in fertility. Reductions in infant and child mortality, improvements in women's level of education and the delaying of the age at first marriage to at least 18 years are among the factors which can reduce fertility in Tanzania. It should be noted that all these variables are related to one another. Therefore, in order to understand the mechanisms through which fertility can be manipulated it is important to study the components of fertility. This is done in the subsequent chapters.

Chapter Five

The Determinants of Birth Intervals

5.1 Introduction

The analysis of birth intervals is of interest to fertility studies since it can provide further insights into the mechanisms underlying fertility change (Njogu and Martín, 1991). Other things being constant, prolonging intervals between births reduces the number of children a woman can have during her childbearing period. Furthermore, short birth intervals are known to be associated with an increased risk of infant and child death[18] (Hobcraft et al., 1983; Mturi and Curtis, 1995) and possibly the higher risk of foetal wastage[19] (Gray, 1981). It is against this background that the Tanzanian government, through the National Population Policy, aims at discouraging pregnancies at intervals of less than two years apart (Planning Commission, 1992).

In sub-Saharan Africa, the traditional child-spacing practices have been noted to be the predominant determinants of birth intervals (Lesthaeghe et al., 1981a). These include prolonged breastfeeding with extended periods of postpartum amenorrhea and postpartum abstinence. Indeed, the analysis of proximate determinants of fertility in Tanzania presented in Chapter Four has revealed that breastfeeding is the leading proximate determinant of fertility. Other factors known to influence birth intervals directly include: contraceptive use, abortion, sterility, intrauterine mortality and separation between spouses (Bongaarts, 1981). Acting through these direct factors are socio-economic and cultural factors, which include

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[18] It should be noted that the reverse causality also exists. That is, an infant or a child death leads to shorter birth intervals because breastfeeding ceases on the death of the infant.

[19] However, as explained in Chapter Two, death of foetuses will tend to lengthen the intervals in which the deaths occur.

education, place of residence, religion and income.

This chapter examines the determinants of birth intervals in Tanzania and suggests possible measures to be considered for prolonging birth interval lengths. The next section discusses source of biases in the study of birth intervals which is followed by the review of literature for the determinants of birth intervals. Methods and materials applied in this analysis and the results obtained are presented in sections 5.4 and 5.5 respectively. Finally, section 5.6 presents the concluding remarks.

5.2 Source of Biases

The analysis of birth intervals is an area strewn with potential pitfalls. One of them is poor data quality. Although there have been a significant number of improvements in the collection of data in the recent past, this remains a major problem (particularly in African demography). Most of the studies on birth intervals use data collected retrospectively and which are hence subject to mis-reporting errors. If birth dates of children or marriage dates for the mother are reported wrongly, it is obvious that birth intervals will be calculated wrongly. This problem is even more serious when dealing with postpartum variables. For instance, a woman is unlikely to be able to recall with precision the date she resumed menstruation after birth of a child (particularly if it was several years ago) unless there are either very strong taboos associated with amenorrhea or special ceremonies held to mark the resumption of menstruation (Page, 1981). Therefore there is a possibility of obtaining misleading results.

The study of the first birth interval has been very problematic. The major reason is the high incidence of pre-marital childbearing in some societies. In Kenya, for example, 41 per cent of all women interviewed during the 1989 Kenya Demographic and Health

Survey (KDHS) already had a child or were pregnant before marriage (Njogu and Martín, 1991). Also, the meaning of marriage is not straightforward; moreover it can change with time. Therefore the interval between marriage and first birth can often be a very misleading measure of the length of the first birth interval. Some analysts have avoided this problem by excluding the first birth interval from the analysis of birth interval dynamics (Trussell et al., 1985; Bumpass et al., 1986; Njogu and Martín, 1991).

Mis-specification of the causal relationship between some covariates and a birth interval can be a source of biases. A good example is the relationship between birth intervals on one hand and infant and child mortality or breastfeeding on the other. A child may die as a result of a short preceding birth interval due to either maternal depletion or competition between siblings (see Curtis, 1992 for more details). This death may then cause a shorter subsequent birth interval. For the case of breastfeeding, long birth intervals give a greater opportunity for prolonged breastfeeding (Bumpass et al., 1986). In other words the length of a birth interval may influence the duration of breastfeeding.

Another source of bias in the study of birth intervals is the presence of confounding factors. For example, when examining the influence of the death of a child on a birth interval, there are factors that influence both the length of the interval and the mortality risk of the child and hence may induce a spurious association between the two. Curtis (1992) has explained in detail the potential confounding factors for the study of birth spacing and infant mortality. It is necessary therefore to understand the confounding factors when dealing with the determinants of birth intervals so that proper controls may be introduced.

Some analysts have argued that omitted proximate variables may be one of the problems in the study of birth intervals (Bumpass et

al., 1986, Rindfuss et al., 1989). When examining results from individual-level data given by various scholars, Rindfuss et al. (1989) found that the four proximate variables usually quoted (i.e. marriage, breastfeeding, contraception and abortion) do not explain all the differences in birth interval dynamics. They suggested that omitted proximate variables, poor data quality and possibly model specification errors contributed to this. Coital frequency, sexually transmitted diseases and fecundity are among the proximate variables mentioned to be unnoticed. However, they concluded that the additional proximate variables and improvement in data quality require prospective data collection and large samples, both of which need major investments.

Other potential problems include selectivity and censoring. The analysis of birth intervals selects women who have attained a certain parity. For instance, the second birth interval includes only women who have reached the second parity some time before the survey. Njogu and Martín (1991) suggest that constraining the analysis to the years immediately prior to the survey date will largely reduce selectivity bias. However, inclusion of intervals begun too close to the survey date, e.g. in the year before the survey, will result in pregnancy rates that are biased downwards, because a pregnancy may not be recognized or reported until the fourth or fifth month of gestation (Trussell et al., 1985). Therefore a compromise should be reached on the period of analysis which includes as many intervals as possible but avoids this and other problems (including recall errors). The period between one and four years before the survey has been recommended (Trussell et al., 1985). Censoring arises due to the fact that maternity histories are artificially truncated by the interview. Hence we have incomplete information for a number of birth intervals, most of which will eventually be closed after the survey date. Hazard models take care of the censored information and they have been successfully used to study birth intervals (see for example Trussell et al., 1985).

5.3 State of Knowledge

The length of a birth interval depends entirely on the length of its components. Thus the five components (discussed in Chapter Two) are considered as the proximate determinants of birth intervals. Page and Lesthaeghe (1981) present among the first detailed studies on birth intervals in tropical Africa. Although the papers are based on only few specific areas in West and Central Africa, to some extent they give an overview of the societal arrangements that were prevalent during the 1970s in traditional African cultures as a whole. Specifically, Page and Lesthaeghe (1981) demonstrate the importance of prolonged breastfeeding and postpartum abstinence as major determinants of the long intervals between successive births typically observed in sub-Saharan Africa. Universal and prolonged breastfeeding is one typical characteristic of an African population. Therefore a substantial amount of the non-susceptible period is contributed by amenorrhea.

Traditionally (in sub-Saharan Africa at least), sexual intercourse while a woman is breastfeeding is discouraged and this intensifies the contraceptive effect of breastfeeding particularly when abstinence lasts beyond amenorrhea. It is believed that a suckling child suffers if the mother has intercourse because spermatozoa poison the mother's milk, and even that they pollute the milk when entering it. Further, premature resumption of sexual relations is believed to be indecent and immoral (Caldwell P. and Caldwell J.C., 1981). These beliefs and possibly others not stated here have led to prolonged postpartum abstinence in sub-Saharan Africa. For instance, among Yoruba women in Nigeria, the duration of postpartum abstinence is prolonged up to three years (Caldwell and Caldwell, 1977). However, some erosion of the postpartum taboo in Eastern Africa has been noted (Schoenmaeckers, et al., 1981) and hence its contribution to the length of non-susceptible period tends to be minimal in this sub-region. This is because the duration of

breastfeeding is greater than the duration of postpartum abstinence. In fact, some analysts have predicted the disappearance of abstinence as a relevant proximate determinant of birth intervals in the near future (Lesthaeghe, 1986).

Contrary to the situation in developed societies, the contribution of the waiting time to conception to the length of birth intervals may be much less than that of the non-susceptible period in sub-Saharan Africa. Waiting time to conception is determined by the fecundability of a couple (Menken, 1989).[20] Fecundability is lower in Africa, even after controlling for pathological sterility (Lesthaeghe et al., 1981a). This is partly due to long durations of breastfeeding. High frequency of intercourse accompanied by non-use of contraception and separation of spouses are factors also known to influence the waiting time to conception.

Data on miscarriages are very scarce in sub-Saharan Africa. Therefore the part of birth interval length contributed by foetal losses is not well known. However, since the factors causing miscarriages are biological in nature, their contribution to the birth interval will probably not differ much from one population to another. However, miscarriages are known to be influenced by poor nutrition and the type of work women do. The differences in birth interval length caused by fluctuations of gestation period from one population to another are minimal. All in all, the length of the non-susceptible period remains the most important component in determining birth interval length in sub-Saharan Africa. This is undoubtedly true.

The relationships between birth intervals and socio-demographic factors have been documented. These factors (sometimes referred to as

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[20] Fecundability is the probability that a woman will conceive in a month in which she is considered susceptible.

background variables) affect birth intervals by influencing one or more of the proximate determinants. Mturi (1990) has constructed a path diagram to show the possible paths for the determinants of birth intervals. All nine background variables considered were hypothesized to operate through postpartum amenorrhea and waiting time to conception assuming that gestation period does not deviate much from nine months. The application of 1977-78 Kenyan Fertility Survey (KFS) data to the model showed that short last closed birth intervals were observed for women who breastfed the penultimate child for a short duration, did not use contraception in the interval, resided in urban areas, had lower maternal age at birth of penultimate child, no or little education and whose penultimate child died. However, woman's occupation, age at first marriage and parity had weak effects in determining the last closed birth interval in Kenya.

The evidence of recent fertility decline in Kenya has encouraged Njogu and Martín (1991) to study the mechanisms underlying the decline by comparing the 1977-78 KFS data with 1989 KDHS data. They noted the increase in length of all birth intervals with time to be one major mechanism through which fertility has declined. Further, the increase in interval length was found to be entirely attributable to increases in contraceptive use at all parities. The level of contraceptive use (women using contraceptives among those married) increased from 6 per cent to 27 per cent between 1977-78 and 1989, which caused the total fertility rate to decline from 8.1 to 6.7 births during the same period. There was a small change in the duration of postpartum infecundability between 1977-78 and 1989 which caused relatively a minimal change in fertility. Surprisingly, the delay in age at first marriage with time observed in Kenya did not have any impact on fertility, since a large number of women get married during the first pregnancy or after the birth of the first child. In other words, since childbearing in Kenya is not confined to marriage, a later age at marriage has a negligible impact on fertility (Njogu and Martín, 1991).

Trussell et al. (1985) analyzed the determinants of birth intervals using WFS data from Indonesia, Malaysia and the Philippines. Using hazard models, their analysis focused primarily on the effects of breastfeeding and contraception on the second birth interval and beyond. Other variables included in the analysis were: birth order, length of previous birth interval, age of the mother at beginning of the interval, education of mother and father, working away from home for the mother, rural-urban residence, region of residence or ethnicity, sex of the preceding birth and occupation of father. They found significant effects of breastfeeding, contraception and the length of the previous interval. Women breastfeeding for long durations or using contraception had longer birth intervals than those who were not doing these things. Further, short birth intervals were associated with short subsequent intervals, while long intervals were associated with long subsequent ones even after controlling for breastfeeding and use of contraception. The hazard of conception of a subsequent child is greatest for women who start an interval at ages less than 25 and smallest for those who begin at age 35 or higher. Generally, birth order is not a significant covariate once other biological covariates are controlled.

The significant socio-economic variables (i.e. after controlling for age, contraception, breastfeeding and the length of the previous interval) were ethnicity (in Malaysia), male occupation (in the Philippines), urban residence, male occupation and education (in Indonesia). In Malaysia, women in the Chinese, the Indian and other ethnicity categories had shorter birth intervals than did Malay women. In the Philippines, wives of men in the professional occupation category had lower risks of a subsequent pregnancy than wives of farmers or agricultural workers. In Indonesia, having a husband in the higher education group or in the manual or professional occupation category has the effect of shortening birth intervals whereas women residing in urban areas had longer birth

intervals. Interestingly, female education is found not to be a significant determinant of birth intervals (Trussell et al., 1985).

In an analysis of Korean birth intervals, Bumpass et al. (1986) used 1974 Korean Fertility Survey data to show that contraceptive use, abortion, breastfeeding, infant and child mortality, marital separation and age of mother at the beginning of an interval had significant intermediate effects on birth interval length. The probability of having a birth within a specific time of the previous birth (excluding first birth interval) was lower for women using contraception, who reported an abortion, who breastfed the child which initiated the interval for at least two months, who had marital separation lasting at least three months, whose maternal age was high and who did not experience the loss of the child who initiated the interval. This is because of shorter breastfeeding durations for children who died since their control for length of breastfeeding was crude. The effect of socio-economic variables on birth intervals were also considered. Educated women were found to have relatively long birth intervals beyond birth order two. The influence of wanting a son (for women without one) in shortening birth intervals was noted. Finally, women with some urban residence showed significantly lower probabilities of having a birth only beyond order three.

Singh et al. (1993) have analyzed birth intervals for two Indian states: Uttar Pradesh and Kerala. They used a multivariate hazards modelling technique to examine the effects of each of the variables: age at marriage, social class of a household (and/or women's and husbands' education), religion and caste, sex and survival status of the previous infant for women not using contraception and not sterilized. For Uttar Pradesh, duration of marriage was also included in the analysis, whereas for Kerala, mother's work status in the interval and marriage cohort were included. Birth interval length was significantly shorter for women with lower age at marriage (for first birth intervals) and higher age

at marriage (for second and third intervals), women with no or low education and/or in low or middle household economic status and for women whose previous child had died. Working women and Moslem or Christian women in Kerala were also observed to have shorter birth intervals than non-working women and Hindus. It is worth noting that in some cases this analysis gave somewhat different results between first birth interval and other intervals. This suggests that there is a need to study the first interval separately.

Kallan and Udry (1986) studied factors affecting waiting time to first birth (excluding contraception) using WFS data for nine developing countries: Dominican Republic, Fiji, Jordan, Korea, Mexico, Panama, Sri Lanka, Ghana and Cameroon. The covariates included in their hazards model were age at first marriage, respondent's education, husband's education, urban-rural residence and birth cohort. The significant effect of age at marriage was consistent in all countries studied: it was found to have a curvilinear effect on the waiting time. In the first birth interval, the waiting time to conception for non-contracepting women is primarily determined by fecundability. Kallan and Udry found that fecundability increased with age at marriage during adolescent years until a plateau was reached around age 19 or 20. Respondent's and husband's education were also found to have a positive significant influence on fecundability and hence negative effects on waiting time to first birth. Further, more recent birth cohorts were found to have higher fecundability. Therefore, Kallan and Udry's (1986) analysis showed that short first birth intervals are characteristic of women who were married at a higher age, who were educated (with educated husbands), and who belonged to recent birth cohorts.

5.4 Methods and Materials

This analysis uses data collected in the 1991/92 Tanzania Demographic and Health Survey. Details of the reproductive history of

each woman were collected using the individual women's questionnaire, together with background information. However, some information (for example that concerning breastfeeding, amenorrhea and abstinence) was only collected for births since 1 January 1986, so it is not possible to include children born before this date in this analysis. Moreover, in order to avoid the problem of the displacement of births from 1986 to 1985 observed in this data set, this analysis includes only intervals which begin with a birth on or after 1 January 1987. Since breastfeeding cannot take place before the first birth and postpartum abstinence from sexual intercourse is, by definition, only practised after a birth, the interval between marriage and the first birth has been excluded from the analysis.

The duration of interest in this study is that between the date of the birth marking the start of the interval (index child) and either the date of the next conception, or the interview date (if no conception occurred before then). If the interval is terminated by a conception, it is termed a "closed interval", otherwise it is termed an "open interval". In order to avoid any selection bias, open as well as closed intervals are included in the analysis. However, as noted earlier, including these intervals will result in pregnancy rates that are biased downwards, because a pregnancy may not be recognized or reported until four or five months after conception (Trussell et al., 1985). In other words, women may have been pregnant at the time of the survey but not been aware of the fact, or not reported it to the interviewer. Their birth intervals will be misclassified as open, when they are really closed. To avoid this, we have in our data set, artificially "backdated" the interview date to nine months before the actual interview date. This study is, therefore, confined to a window of about 4 years: the period from 1 January 1987 to nine months prior to the interview date. A total of 6,687 intervals were identified. However, 396 intervals had missing information on either duration of breastfeeding or postpartum amenorrhea or postpartum abstinence, and hence were deleted from the

sample. The sample used in the analysis, therefore, includes 6,291 intervals of which 3,904 were open and 2,387 were closed.

Since many intervals (all the open intervals) are censored, a hazards model is used for the analysis. A Cox proportional hazards model is used here. This choice is supported by the fact that the effect of the majority of covariates on the hazard of conception is proportional for the whole duration since the index birth. Trussell et al. (1985) provide a brief discussion of the application of hazards models to the analysis of birth intervals. The statistical package EGRET (Statistics and Epidemiology Research Corporation, 1990) was used for the analysis.

The fixed covariates used in the analysis, along with their categories, are summarized in Table 5.1. The zones of residence stated earlier are also used here except for Zanzibar which is included in the Coastal zone because the number of cases in Zanzibar were not enough to deal with it separately. Therefore the zones are reduced to six. Rural or urban residence is included as a covariate, since fertility is known to be higher in rural areas than in urban areas (Cohen, 1993). This implies that birth intervals should be shorter for rural women compared with their urban counterparts.

Mother's education and partner's education were considered to be proxy covariates for the socio-economic status of the household. Usually, highly educated women and/or women with highly educated partners have a high income, better health status, better nutrition and better living standards than less well-educated women: all these factors may influence fertility (Cochrane, 1979). The two education covariates have the following categories: no schooling, some primary schooling, completed primary schooling, and secondary schooling and above. However, partner's education was dropped after a preliminary analysis due to its high correlation with mother's education, and the

Table 5.1. Fixed Covariates Used in the Analysis of Birth Intervals.

Covariate	Number of Intervals
Zone:	
Central	1376
Coastal	1082
Northern	497
Southern	1008
West Lake	1147
Southern Highlands and Western	1181
Type of Place of Residence:	
Rural	5306
Urban	985
Maternal Education:	
None	2412
Some primary	828
Completed primary	2851
Secondary and above	200
Religion[1]:	
Moslem	1980
Catholic	1880
Protestant	1425
None	978
Type of Marriage:	
Monogamous	3911
Polygamous	1387
Not married	993
Maternal Age:	
<20	1195
20-29	3260
30-34	900
35+	936
Sex of the Index Child:	
Male	3155
Female	3136
Birth Order of the Index Child:	
1	1405
2	1135
3-4	1509
5-6	1093
7+	1149
Total	6291

Source: 1991/92 TDHS

Note: 1. the covariate includes missing values

presence of cases (2.7 per cent of the total) with missing information.

Other social covariates included in the analysis are religion and the type of marriage. It has been shown that Tanzanian women in monogamous marriages have higher fertility than those in polygamous marriages (see Chapter Four). It is interesting, therefore, to find out if there is a significant difference in the length of birth intervals according to the type of marriage. Also, it has been argued that women belonging to different religious groups may have different actual fertility performances (Bulatao and Lee, 1983): this might be a result of different birth interval lengths. Indeed, Singh et al. (1993) have found that Indian women of different religious groups have different birth interval lengths.

The sex of the index child is a potential factor determining the birth interval length (Trussell et al., 1985) and is included in this analysis. Finally, the mother's age at the birth of the index child and the order of the index child are hypothesized to affect birth intervals. These two factors have potentially different effects on birth intervals but, in practice, they are highly correlated (particularly in societies with high fertility and the near universal marriage of women at a young age). Therefore, it is important to explore both in the analysis in order to examine the independent effects of each.

Breastfeeding, postpartum amenorrhea and postpartum abstinence are time-varying covariates known to have a direct impact on birth intervals (Bongaarts, 1978). A time-varying structure of eight categories was formed from these three covariates (see the initial structure in Table 5.2). Women move between the status categories listed in this table when they finish their periods of abstinence, or breastfeeding, or cease to be amenorrheic. For instance, a woman will move from status 0 to status 2 if she ceases to be amenorrheic whilst

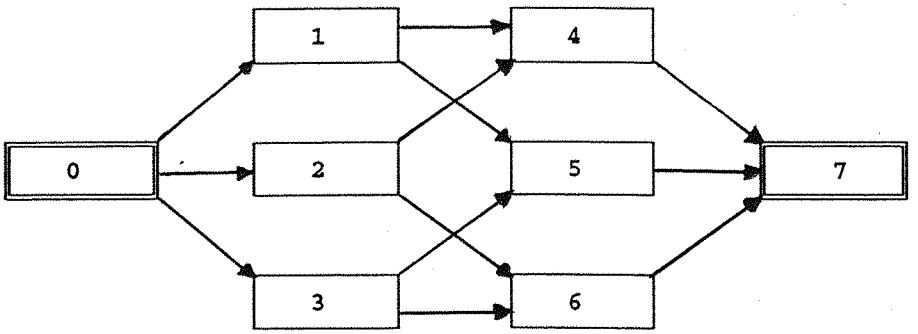
Table 5.2. Time-varying Structure Included in the Analysis of Birth Intervals.

Status code	Breastfeeding	Abstaining	Amenorrheic
Initial Structure			
0	yes	yes	yes
1	no	yes	yes
2	yes	yes	no
3	yes	no	yes
4	no	yes	no
5	no	no	yes
6	yes	no	no
7	no	no	no
Second Structure			
0	all other combinations		
6	yes	no	no
7	no	no	no
Final Structure			
3	all other combinations		
2	yes	no	no
1	no (child dead)	no	no
0	no (child alive)	no	no

still abstaining and breastfeeding, and then from status 2 to status 6 if she resumes sexual intercourse while still breastfeeding. In all cases a woman starts a birth interval in status 0 and finishes it in status 7, unless the survey date arrives before she has reached status 7. Figure 5.1 summarizes all possible paths which can be taken by a woman in any interval.

The preliminary analysis showed that only status 6 (breastfeeding only) and status 7 (none) had effects which were significantly different from status 0 (breastfeeding, amenorrheic and abstaining). Therefore statuses 0 to 5 were amalgamated, so that the total number of categories became three: abstaining and/or amenorrheic, breastfeeding only, and none (see the second structure in Table 5.2). A woman changes from status 0 to 6 if she stops abstaining or ceases to be amenorrheic while still breastfeeding and

Figure 5.1. All Possible Paths for the Time-Varying Structure.



Note:
0 breastfeeding and amenorrheic and abstaining
1 abstaining and amenorrheic (not breastfeeding)
2 breastfeeding and abstaining (not amenorrheic)
3 breastfeeding and amenorrheic (not abstaining)
4 abstaining only
5 amenorrheic only
6 breastfeeding only
7 none

finally from status 6 to 7 when she stops breastfeeding. The Status of women who stop breastfeeding before amenorrhea and/or abstinence changes directly from 0 to 7 at the point when they cease to be both amenorrheic and abstaining.

One of the reasons why a woman might stop breastfeeding relatively soon after the birth of the index child is if that child dies. It is known that the death of an infant reduces the length of the subsequent birth interval. Clearly, one possible reason for this is that the duration of breastfeeding is reduced. In order to see whether this is the sole reason, we subdivided status 7 (neither breastfeeding, nor amenorrheic, nor abstaining) into two, depending on whether the index child was alive or dead. If the hazard of

conception does not differ significantly between these two categories, it can be concluded that the reduction in the length of birth intervals following infant deaths is due purely to the early cessation of breastfeeding. If, on the other hand, the hazard of conception is higher for women whose child has died than it is for those whose child is still alive, some additional effect exists. As a result, a time-varying structure of four categories was finally used. For convenience, the codes were changed to be 3 for women either abstaining or amenorrheic, 2 for women only breastfeeding, 1 for women neither abstaining nor amenorrheic with the index child dead, and 0 for women neither abstaining nor amenorrheic nor breastfeeding with the index child alive (see the final structure in Table 5.2).

5.5 Results

In a proportional hazards model the covariates are assumed to act multiplicatively on the baseline hazard and the effect is constant over time. Table 5.3 gives the relative risks along with their corresponding 95 per cent confidence intervals for a parsimonious model containing the covariates which were significant at the five per cent level.

To understand the effect of breastfeeding, abstinence and amenorrhea on the hazard of conceiving, we define the reference category to consist of women who are neither breastfeeding, nor abstaining, nor amenorrheic and whose index child is still alive. Compared with women in the reference category, the risk of conception is 88 per cent lower for women who are abstaining and/or amenorrheic (whether or not they are breastfeeding), and 51 per cent lower for women who are breastfeeding, but neither amenorrheic nor abstaining. In other words, breastfeeding alone reduces the risk of getting pregnant by more than half. These results suggest that the fertility-inhibiting effect of breastfeeding is still high even after controlling for postpartum amenorrhea and postpartum abstinence.

Table 5.3. Estimated Relative Risks and 95 per cent Confidence Interval for Parsimonious Hazards Model.

Covariate	Relative Risk	95% Confidence Interval
Time-varying Structure:		
amenorrhea/abstinence	0.22*	0.188 - 0.254
breastfeeding	0.49*	0.434 - 0.544
none and child dead	2.21*	1.893 - 2.572
none and child alive	1.00	-
Type of Place of Residence:		
rural	1.00	-
urban	0.70*	0.620 - 0.802
Zone of Residence:		
Central	1.00	-
Coastal	0.82*	0.718 - 0.941
Northern	0.90	0.751 - 1.073
Southern	0.72*	0.629 - 0.834
West Lake	1.11	0.988 - 1.253
Southern Highlands and Western	0.99	0.878 - 1.125
Maternal Education:		
no schooling	1.00	-
some primary	0.99	0.873 - 1.131
completed primary	1.01	0.913 - 1.109
secondary and above	0.77*	0.597 - 1.003
Type of Marriage:		
monogamous	1.00	-
polygamous	0.84*	0.763 - 0.931
not married	0.58*	0.505 - 0.656
Maternal Age at Birth of Index Child:		
<20	0.94	0.832 - 1.064
20-29	1.00	-
30-34	0.72*	0.628 - 0.833
35+	0.44*	0.366 - 0.534
Sex of the Index Child		
Male	1.00	-
Female	1.09*	1.009 - 1.185
Birth Order of the Index Child		
1	1.00	-
2-6	0.84*	0.750 - 0.949
7+	0.93	0.768 - 1.135

Source: 1991/92 TDHS

Note: * Significant at the 0.05 level.

Women who ceased breastfeeding and child died have 121 per cent higher risk of conception than women who ceased breastfeeding and child is alive. It might be pointed out that the children of women who do not breastfeed at all (or for a very short duration) are more likely to die, disturbing the implied causality in the argument here. However, we know from our data that 98 per cent of Tanzanian women breastfeed their children for sometime, and well over 90 per cent breastfeed for at least 12 months (provided that the child survives for that period of time). This suggests that it is the death of a child, rather than a woman's decision not to breastfeed, which usually the first event in the chain of events leading to short birth intervals. Therefore, the death of a child has an independent effect on the risk of getting pregnant.

The risk of conception is 30 per cent lower for women residing in urban areas compared with their rural counterparts. Zone of residence also has a significant effect on birth interval lengths. Women residing in the Coastal and Southern zones have a lower risk of conception compared with women residing in the Central zone. Women in the Northern, West Lake, Southern Highlands and Western zones do not have a significantly different risk of conception than women in the Central zone.

Maternal age is found to have a significant effect on birth interval lengths. The risk of conception is 28 per cent lower if a woman's age at the birth of the index child is between 30 and 34 years than it is if a woman's age is between age 20 and 29 years, and it becomes 56 per cent lower if a woman's age at the birth of the index child is 35 years or over. The risk of conception is not statistically different for women who started an interval while aged under 20 years compared with those who started while aged 20-29 years. These results are not surprising: they merely show that as a woman grows older (after 30 years old) her fecundity declines.

Parity of the mother is found to have a significant effect on the risk of getting pregnant. Women in parity 2 to 6 have 16 per cent lower risk of conceiving compared with women in parity 1. However, women in parity 7 or higher do not have excess risk of getting pregnant compared with women in parity 1. This implies that women in parity one and parity seven or higher have shorter birth intervals than women in parity 2-6. The results for high parity (7+) women are not expected since it has been suggested that the higher the parity the longer the birth intervals (Huffman et al., 1987). It is important therefore to understand the mechanisms thorough which parity affects the risk of conceiving after controlling for maternal age, amenorrhea and abstinence.

The risk of conception for women in polygamous marriages is 16 per cent lower than women in monogamous marriages. This suggests that overall women in monogamous marriages have shorter birth intervals than women in polygamous marriages. This is to be expected since women in polygamous marriages are likely to have a reduced frequency of intercourse compared with women in monogamous marriages. Also, women in polygamous marriages are more likely to adhere to other traditional customs and values (in favour of long intervals between births) which are not controlled in this analysis (such as other types of abstinence). The risk of conception decreases further for women without a partner compared with women in monogamous marriages.

A mother's education is found to be a significant determinant of her hazard of conception. Women with secondary education or above have a 23 per cent lower risk of conception than women who have no schooling. However, women who have completed primary education or with some primary education do not have a different risk of conception than women with no schooling. Finally, the sex of the index child influence the length of the succeeding birth interval. If the index child is a girl, the risk of conception for the mother is 9 per cent higher than when the index child is a boy.

5.6 Concluding Remarks

This analysis of the durations from birth to the next conception has shown that breastfeeding is one of the major determinants of birth interval lengths in Tanzania. The fertility-inhibiting effect of breastfeeding is significant even after amenorrhea ceases and after resuming sexual relations. The results further suggest that the death of the index child creates some additional effects on shortening birth intervals.

Maternal age, parity, education and type of marriage of the mother as well as sex of the child have been found to affect the length of birth intervals. Women who give birth at ages 30 or over, who are involved in polygamous marriages, who are in parity 2 to 6, and who have at least secondary education have been found to have longer birth intervals than other women. It has been found also that the place where a woman resides influences the length of intervals between her births. As expected, women residing in urban areas have longer birth intervals than their rural counterparts. Furthermore, women residing in Southern and Coastal regions have longer birth intervals than women residing in other parts of the country.

The analysis has shown that any policy aimed at lengthening birth intervals in Tanzania should encourage breastfeeding. Currently, the median duration of breastfeeding in Tanzania is about 22 months. Unfortunately we could not include contraceptive use in the analysis, because of a lack of data on exactly when contraception was used. However, this is not likely to change the results for traditional child spacing practices very much since Tanzania has a very low contraceptive prevalence. It is, however, the most probable explanation of the longer birth intervals recorded for women residing in urban areas since it is amongst these women that contraceptive use in Tanzania is concentrated at present (see Chapter Eight).

It is clear from these results that a reduction in the typical duration of breastfeeding in Tanzania will, other things remaining equal, lead to shorter birth intervals. If such a reduction should occur, it will mean that the task of achieving a decline in fertility is made more difficult, since a portion of the increased contraceptive prevalence rates which are a goal of the TNPP will simply be compensating for the reduction in breastfeeding, rather than contributing to a reduction in fertility. It should be noted, however, that the birth intervals are fairly long in Tanzania. According to the 1991/92 TDHS, the median number of months since previous birth for second order births and above was 33.3 months (Ngallaba et al., 1993).

Chapter Six

Patterns and Determinants of Breastfeeding

6.1 Introduction

Chapter Five has shown that universal and prolonged breastfeeding is a very important factor in lengthening birth intervals in Tanzania. It consequently leads to a reduction in fertility from its biological maximum as noted in Chapter Four. Since the length of birth intervals is also known to be negatively related to infant and child mortality in Tanzania (Mturi and Curtis, 1995), prolonged breastfeeding is likely to reduce the number of infant and child deaths. Other health benefits of breastfeeding have been discussed in detail in the literature (see for example McCann et al., 1981; vanLandingham et al. 1991). Breast milk is a vital source of nutritious uncontaminated food, especially for infants. This is particularly important in poor areas of the world where infant formula is likely to be improperly used and clean water is not always available.

The government of the United Republic of Tanzania has taken positive measures towards encouraging women to breastfeed frequently and for long durations. Along with breastfeeding campaigns operated through clinics and nutrition centres, working women are given 84 days' maternity leave. Thereafter, they are given breaks during working hours specifically for nursing their children. It is from this background that we attempt to investigate the determinants of breastfeeding in Tanzania so as to assist policy makers to identify the sub-groups of the population where the erosion of breastfeeding practices is taking place most rapidly. It should be noted, however, that due to strong attitudes towards breastfeeding practices, more than 97 per cent of Tanzanian infants are breastfed for at least sometime. This implies that "erosion" of breastfeeding in Tanzania means reduction in duration, not a decline in the per cent ever

breastfed. Therefore the major concern in this study is to examine the factors affecting the duration of breastfeeding.

6.2 Evidence from Other Studies

The major purpose of breastfeeding in most societies is infant nourishment (Nag, 1983). Breast milk is nutritionally appropriate since it provides immunological protection not present in infant formula and is free from contamination (McCann et al., 1981). There is now a considerable body of evidence that children that are not breastfed or who are breastfed for very short durations are at greater risk of death during infancy. VanLandingham et al. (1991) have discussed all possible mechanisms through which breastfeeding affects the health of a child. In addition, most of the health benefits of breastfeeding have been found to be stronger in countries or areas with the least favourable general health conditions (Huffman and Lamphere, 1984).

Because of the health and contraceptive benefits of breastfeeding, the study of changes in breastfeeding patterns has attracted many researchers. A decline in the duration of breastfeeding, other things being constant, should lead to shorter birth intervals. It will consequently increase both fertility and infant mortality rates[21], or affect health of children through lack of a balanced diet and spread of contagion diseases such as diarrhoea.

Various factors have been observed to influence breastfeeding patterns in developing countries. The type of place of residence, the

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[21] The negative relationship between birth intervals and infant and child mortality has been discussed extensively in the literature (see for example Hobcraft et al., 1983). The causal mechanisms are not yet definitively established though. However, there is a consensus that a short birth interval between two children increases the risk of death of both of them.

educational level of the mother, and income have been stated to be the most important factors explaining breastfeeding differentials (Huffman, 1984). Women residing in urban areas breastfeed their children for shorter durations compared with their rural counterparts (Mott, 1984; Mock et al., 1986; Akin et al., 1986; Srinivasan et al., 1989; Benefo and Parnell, 1991). This may be due to higher educational and employment opportunities for women in urban areas, and greater use of breastmilk substitutes (Nag, 1983). The duration of breastfeeding tends to go down as the education of the mother increases even after controlling for other social and demographic factors (Akin et al., 1981; Jain and Bongaarts, 1981; McCann et al., 1981; Smith and Ferry, 1984; Mott, 1984; Mock et al., 1986; Srinivasan et al., 1989; Benefo and Parnell, 1991).

The influence of women's work on breastfeeding has been documented (Nag, 1983). Women who work away from home or work in high status occupations are likely to breastfeed for short durations compared with those working at home or working in low status occupations (Benefo and Parnell, 1991). This may partly be explained by constraints on time, particularly for working women residing in urban areas (Huffman, 1984). A woman working away from home is likely to reduce the intensity of breastfeeding immediately after her maternity leave and/or cease breastfeeding earlier than she would have done if she was not working away from home. However, the net effects of "work status" and "place of work" on the duration of breastfeeding, after controlling for other variables, have been found to be minimal in many countries (Jain and Bongaarts, 1981; Akin et al., 1981; Smith and Ferry, 1984; Akin et al., 1986; Srinivasan et al., 1989).

The socio-economic status of the household is another factor known to have a negative relationship with breastfeeding (McCann et al., 1981; Akin et al., 1981; Nag, 1983; Mock et al., 1986). As a family becomes richer, one of the things purchased with added

resources is substitutes for breast milk (Akin et al., 1981). The effect of this factor is often measured by husband's education, husband's occupation, or family income. However, as noted by Trussell et al. (1992), women's education, urban residence and socio-economic status are all highly correlated and this suggests a possibility of biases in any analysis which does not incorporate proper controls for these variables. Nevertheless, Jain and Bongaarts (1981) have found that husband's occupation has an independent effect on the breastfeeding behaviour of wives.

Several demographic factors have also been noted to be associated with breastfeeding practices. These include mother's age and parity, sex of the child and use of contraception. Smith and Ferry (1984) have found that the duration of breastfeeding increases with age and parity, and also that age effects are to be stronger in countries in which women breastfeed for relatively long durations, whereas parity tends to be dominant in countries with shorter breastfeeding durations. Older women and high-parity women breastfeed for longer durations because they may have more attachment to traditional values and behaviour (Trussell et al., 1992). However, Adair et al. (1993) have found that older mothers in the Philippines supplement their infants earlier, but totally wean them later. Also, Akin et al. (1981) have found that mother's age is negatively related to breastfeeding in Sri Lanka. The explanation given is that older women breastfeed for shorter durations because they have a small volume of milk.

In societies where sex preferences are strong, mothers may be more anxious to stop childbearing after reaching a target number of the more desired sex. This might affect the duration of breastfeeding since they might nurse the desired child longer than earlier children (Smith and Ferry, 1984). This hypothesis, however, is not supported by empirical findings in most societies (Jain and Bongaarts, 1981; Mott, 1984; Smith and Ferry, 1984; Oni, 1987; Srinivasan et al.,

1989). But, Akin et al. (1986) have shown that boys are breastfed longer than girls in the Arab countries studied.

The use of modern contraceptives is known to be associated with short durations of breastfeeding: contraceptive users breastfeed for shorter durations than non-users in most populations (Akin et al., 1981; Smith and Ferry, 1984; Oni, 1987; Akin et al., 1986; Adair et al., 1993). Women may view breastfeeding as a means of postponing or preventing pregnancy and substitute one method with the other, or may think that breastfeeding and contraceptive use are incompatible (Potter et al., 1995). They might also view contraception as a substitute for lactational sub-fecundity (Trussell et al., 1992). It has been observed also that combined pills affect the output of breast milk. Koetsawang (1982), for example, has shown that even low dose oestrogen-progesterone combinations appear to have a negative effect on breast milk output. Potter et al. (1995) argue that the inverse association between contraceptive use and breastfeeding practices may be due to the fact that the two variables are influenced by similar covariates, and thus have a spurious correlation.

The relationship between breastfeeding durations, on one hand, and religion and type of marriage, on the other, has been examined particularly in Africa. Christians have been found to breastfed for shorter durations than muslims among Nigerian women (Oni, 1987) and among Kenyan women (Mott, 1984). Also, Kenyan women in polygamous unions breastfeed their children for longer durations than women in monogamous unions (Mott, 1984). It has been argued that muslim women and women in polygamous unions adhere more strongly to traditional values and to breastfeed for longer durations (Mott, 1984).

Nag (1983) has discussed other cultural factors affecting breastfeeding which are not easily identified and measured. In some areas mothers prolong breastfeeding durations so as to maintain the

close parent-child relationship. That is, mothers breastfeed to show love and care to a child. The psychological and social support from other members of the family such as mother-in-law or sister-in-law, is also mentioned to cause breastfeeding differentials in non-industrial societies. This is particularly important in societies where there is a strict period for nursing a child. If, for example, a tribe expects women to breastfeed a child for at least two years, a woman living in an extended family together with other adult members of the clan is more likely to continue breastfeeding until the end of the period expected than other women. For Ghanaian women, Benefo and Parnell (1991) found that women living with their parents have a significantly lower risk of supplementing breast milk and weaning relative to those not living with their parents.

Nag (1983) also mentions the negative effect of the availability of powdered milk and modern health services on breastfeeding patterns. This effect is likely to be more established for women of high socio-economic status residing in urban areas. Adair et al. (1993) found that feeding advice given to mothers by health professionals and lower formula prices decreased the duration of breastfeeding in Cebu, the Philippines.

6.3 Data and Covariates

The analysis of the determinants of the duration of breastfeeding in Tanzania uses data from the 1991/92 TDHS. The information for all children born in the 48 months window before the interview for every woman is available, thus used in this analysis. There were 6,758 such children. A total of 225 of these were never breastfed or information about whether or not they were ever breastfed was missing. These children have all been excluded from the analysis.

The rationale for excluding those children who were never

breastfed is that our main interest is in the social and economic factors which determine breastfeeding behaviour. In countries like Tanzania where breastfeeding is almost universal, the factors which prevent a child ever being breastfed are mainly physiological and medical. Moreover, such factors probably do not vary very much within the population. The 1991/92 TDHS data show that the proportions of children never breastfed certainly do not vary among different subgroups of the population as all subgroups had 97 or higher per cent of children ever breastfed.

The two types of breastfeeding data collected in the TDHS have been mentioned earlier (Chapter Three) to include: retrospectively reported durations of breastfeeding for weaned children (or ages at weaning) and the current status information on whether a child is still breastfeeding at the time of the survey. It was not necessary to exclude the 225 cases with missing information when analysing current status data. But, since one of our interests is to compare the results for the two sets of data, similar samples should be used.

Table 6.1 shows the ten covariates hypothesised to influence breastfeeding duration in Tanzania based on evidence from previous studies. These are: zone of residence, type of place of residence, maternal education, maternal occupation, the mother's religion, maternal age, birth order of the child, the sex of the child, whether or not the mother has ever married and type of her marriage.

The mother's age at the birth of the child, the birth order of the child and the sex of the child are the demographic factors known to have an effect on the duration of breastfeeding. After the preliminary analysis, maternal age was divided into two categories: "under 30 years" and "30 years and above"; and the birth order of the child was divided into three categories: "1-4", "5-6" and "7 and above".

Table 6.1. Covariates used in the Analysis of Durations of Breastfeeding.

Covariate and category	Children	
	Number	Percentage
Zone of Residence		
Central	1387	21.2
Coastal	1109	17.0
Northern	545	8.3
Southern	1035	15.8
West Lake	1200	18.4
Southern Highlands and Western	1257	19.2
Type of Place of Residence		
Rural	5512	84.4
Urban	1021	15.6
Mother's Level of Education		
No schooling	2360	36.1
Incomplete primary	1243	19.0
Complete primary	2930	44.8
Religion		
Moslem	2067	31.6
Catholic	1959	30.0
Protestant	1468	22.5
Other or none	1039	15.9
Maternal Age		
<30	4670	71.5
≥30	1863	28.5
Birth Order of the Child		
1-4	4264	65.3
5-6	1115	17.1
7+	1154	17.7
Sex of the Child		
Male	3258	49.9
Female	3275	50.1
Mother's Occupation		
Farmers	3581	54.8
Manual work	940	14.4
Office work	150	2.3
None	1862	28.5
Mother ever/never Married		
Ever married	6102	93.4
Never married	431	6.6
Type of Marriage		
Polygamy	1429	21.9
Monogamy	4084	62.5
No partner	1020	15.6
Total	6533	100.0

Source: 1991/92 TDHS

Five socio-economic characteristics of the mother have been used: her level of education, her occupation at the time of the survey, whether or not she has ever married, the type of her marriage and her religion. The mother's education is analysed in three categories: "no schooling", "incomplete primary education", and "complete primary education and above". Unfortunately, it was not possible to have secondary education and above as a separate category due to the lack of sufficient cases. The mother's occupation at the time of the survey is classified into four categories: "farmers" (working on their family farms), "manual work" (including agricultural workers, craftsmen, machine operators, small-scale traders and labourers), "office work" (white-collar workers), and "no occupation stated" (for mother's who said that they were not working). We have to assume that a mother's occupation when she was breastfeeding her child is the same as that reported in the survey. The mother's religion was classified as "Moslem", "Catholic", "Protestant" and "other or none" (the latter denoting those with traditional beliefs or without any reported religion).

Type of place of residence (that is, whether rural or urban) is known to be an important covariate affecting breastfeeding practices (Nag, 1983; Huffman, 1984) and hence is included in this study. Finally, the zone of residence is included to control for geographical as well as other cultural factors which are not easy to measure. The seven zones presented in Figure 1.2 are also used here. However, the number of cases for Zanzibar zone was too few for it to be considered separately, therefore it was amalgamated with Coastal zone.

Several important covariates have not been included in this analysis for different reasons. Family income (or husband's income) and husband's education, which are often used as indicators of the socio-economic status of the family were not included in the analysis. Information on income was not collected in the TDHS.

Information on the husband's education, on the other hand, is available (although there are quite a few cases with missing information) but husband's education is highly correlated with that of his wife which is included.

The effect of the use of contraception on breastfeeding could not be examined in this study due to a lack of data on exactly when a woman had used contraception. The TDHS data give information only about whether or not a woman was using a particular method at the time of the survey, and on whether or not a woman had ever used a method.

6.4 Methodological Issues

Current status breastfeeding data have the advantage of being less prone to measurement errors compared with retrospective data (Diamond and McDonald, 1992). A woman is likely to know if she is breastfeeding or not at the time of the interview. This implies that current status data are inaccurate only if the reported status at the time of the interview is inaccurate and/or the reported date of the most recent birth is inaccurate. Since reporting of birth dates for all children have not been found to be seriously inaccurate (Chapter Three), the reporting errors for current status data for births within four years of the survey are not expected to be large.

The major disadvantage of the current status breastfeeding data is that it is not known when weaning will take place. In other words, the use of current status breastfeeding data involves a loss of information since all cases are either right or left censored. That is, it is not known when weaning will take place for children still breastfeeding and the information on when weaning took place for children not breastfeeding at the time of the survey is not utilized. Further, Bracher and Santow (1981) criticize the use of current status data to study "recurrent events" such as breastfeeding, due to

the fact that any "recurrent event" is affected by length-bias sampling problems. However, John et al. (1988) show analytically that only one sampling scheme can recover the correct survival distribution, so there is no problem in analysing current status data when the sampling frame is appropriate. For example, if a sample of all births during a fixed period or sample of all births of a given parity is used to study the distributions of weaning times for infants in a population, then the distribution of weaning times estimated from current status data is the same as the distribution of weaning times for infants in the population as a whole (John et al., 1988). In this analysis, we have used a sample of all births during a fixed period.

It seems, therefore, that there are two serious problems facing the current status data namely: children who died prior to the survey and censoring. The analysis reported below for current status data includes children who died prior to the survey. This means that estimates of the effect of the social and economic covariates on the duration of breastfeeding are contaminated by the effect of mortality (which truncates breastfeeding).[22] The latter problem can be overcome by using a statistical technique which takes care of the censored information. Survival analysis is therefore the appropriate approach for the multivariate analysis of the current status data.

A non-parametric proportional hazards model using splines is applied for computing the proportion of children who are still breastfeeding by single month of age at interview. The details of the model is given in Diamond et al. (1986). A spline $S(x)$ is a smooth piece-wise defined function whose "pieces" are low-degree polynomials defined on separate intervals of the range of x. The pieces are joined together in a suitably smooth fashion at join points called

[22] Similar models were estimated with the current status data excluding children who died before the survey. The results were not much different from those reported below.

knots. In practice, cubic splines are often used. Lenth (1977) shows that a cubic spline may be defined as

$$S(x) = \gamma_0 + \gamma_1 x + \gamma_2 Q_2(x) + \ldots\ldots\ldots + \gamma_{k-1} Q_{k-1}(x) \qquad (6.1)$$

where k is the number of knots. The knots are ordered and scaled on the unit interval so that, if t_i is the position of knot i, $i = 1, \ldots, k$, we have $0 = t_1 < \ldots t_i \ldots < t_k = 1$. The functions $Q_j(x)$ in equation (6.1) are defined to be

$$Q_j(x) = 1 - x - t_j + (7t_j x)/3 + (t_j x^3 + t^3_j x)/6 - \{[\min(x,t_j)]^3\}/6 - \{t_j x[\max(x,t_j)]\}/2 \qquad (6.2)$$

for $j = 2, 3, \ldots\ldots, k-1$.

In our application, we replaced x in equation (6.2) by a_i, where a_i is the age axis re-scaled on the unit interval such that the age of the oldest child in the sample at the time of the survey is set equal to 1.0 and the ages of all other children are expressed as proportions of that age. The knots were fixed such that $t_1=0$, $t_2=0.25$, $t_3=0.5$, $t_4=0.75$ and $t_5=1$. For each child the functions $Q_j(a_i)$ were then calculated. Finally, we fitted the model

$$\log\{-\log[1-p_i(X_i'; k)]\} = \gamma_0 + \gamma_1 a_i + \gamma_2 Q_2(a_i) + \ldots\ldots\ldots + \gamma_{k-1} Q_{k-1}(a_i) + X_i'\beta \qquad (6.3)$$

where $\mathbf{X}_i'$ is the value of a vector of covariates for individual i, β is a vector of parameters, and p_i is the probability that an individual with a vector of covariates $\mathbf{X}_i'$ has experienced the event by age a_i. The link function $F^{-1}[p_i(X_i; t)] = \log\{-\log[1-p_i(X_i; t)]\}$ is known as the complementary log-log transformation. Since this is one of the standard link functions handled in GLIM (Aitkin et al., 1989),

we fitted the models using the GLIM package.[23]

Retrospectively reported durations of breastfeeding for children who are no longer being breastfed have been widely used to study the patterns and determinants of breastfeeding. However, in almost all countries there is a problem of digit preference which has raised concern over the degree of bias in these data. This has created a debate over the accuracy of the estimates from retrospective data, which is still inconclusive. Although a variety of techniques have been developed to adjust the heaped data, these techniques are of little use for the analysis of determinants of breastfeeding, where breastfeeding is the dependent variable in a functional relationship (Akin et al., 1981).

For consistency with the analysis of the current status data, the Cox proportional hazards model has been chosen as a multivariate statistical technique to be used to analyse the retrospective breastfeeding data. The variable of interest is the duration of breastfeeding for children born in the 48 months window before the interview date, the duration was right-censored if a child was still breastfeeding at the time of the survey. If we let $h(a;x)$ be the hazard of weaning a child at (child's) age a months for a mother with a vector of covariates x, then the model we estimate may be written as

$$\log h(a;x) = \log h_0(a) + x'\gamma \qquad (6.4)$$

where, $h_0(a)$ is some unspecified baseline hazard, and γ is a vector of parameters.

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[23] We also used the five knots (0, 12, 24, 36 and 60 months) and estimated the cubic splines given by Grummer-Strawn (1993). The proportional odds model for current status data was estimated using the logit link. The results were very similar to the results obtained using proportional hazards model and hence are not presented here.

6.5 Results

Table 6.2 gives the mean durations of breastfeeding estimated from both sets of data for various categories of the covariates. The procedure described in Trussell et al. (1992) was used to estimate the means. The table shows that breastfeeding duration in Tanzania is quite long. The overall estimated mean duration was 21.0 months both for the retrospective data and for the current status data. Thus, the two methods of estimation give very similar results for the whole sample.

The similarity extends to sub-groups of children defined on the basis of the selected covariates (Table 6.2). Both types of data show that high parity children and children born to older women (aged 30 years or more at the time of the birth) are breastfed for longer than low parity children and those born to younger women. With regard to religion, shorter mean durations are observed for women in the "other or none" category compared with other categories. Rural women breastfeed their children for slightly longer than urban women.

One of the pronounced effects is observed for zone of residence. The Southern zone has the longest mean duration whereas the shortest mean durations are observed in West Lake, Coastal and Central zones. The difference between the mean duration in the Southern zone and that in West Lake zone is 3.8 months in the retrospective data and 4.1 months in the current status data.

The most striking feature of the set of mean durations reported in Table 6.2, however, is the smallness of social and economic differentials in the mean duration of breastfeeding when compared with those observed in many other countries (Trussell et al., 1992). However, the pattern is consistent with that observed by Trussell et al. in other east and central African countries, for example Burundi and Kenya (the latter in the case of the DHS data).

Table 6.2. Mean Durations of Breastfeeding (in months).

Covariate and category	Retrospective data	Current status data
Zone of Residence		
Central	20.0	20.4
Coastal	21.2	20.6
Northern	22.1	22.0
Southern	22.3	22.6
West Lake	18.5	18.5
Southern Highlands and Western	22.2	22.3
Type of Place of Residence		
Rural	21.1	21.2
Urban	19.1	19.9
Mother's Level of Education		
No schooling	21.5	21.4
Incomplete primary	20.6	20.8
Complete primary	20.5	20.7
Religion		
Moslem	21.4	21.5
Catholic	21.3	21.8
Protestant	20.4	20.3
Other or none	19.8	19.3
Maternal Age		
<30	20.3	20.2
≥30	22.5	22.9
Birth Order of the Child		
1-4	20.3	20.2
5-6	21.9	21.9
7+	22.2	22.9
Sex of the Child		
Male	20.9	21.0
Female	20.9	20.9
Mother's Occupation		
Farmers	20.8	20.9
Manual work	21.1	21.3
Office work	21.3	20.8
None	20.9	21.0
Mother ever/never Married		
Ever married	20.9	20.9
Never married	21.0	21.5
Type of Marriage		
Polygamy	20.7	20.8
Monogamy	20.9	21.0
No partner	21.3	21.5
Total	20.9	21.0

Source: 1991/92 TDHS

The multivariate analysis yields similar results for the two types of data (Table 6.3). Once other variables were controlled, a mother's marital history and the sex of the child have no significant effect on the duration of breastfeeding. The analysis also shows that the effects of maternal education and occupation on the duration of breastfeeding are insignificant. Therefore, contrary to what has been found for some other countries, maternal education per se does not affect the duration of breastfeeding in Tanzania.

Older women (aged 30 years or more at the time of the birth) and women who are at parities beyond the fourth were found to have longer durations of breastfeeding than younger women and women in parities 1-4 respectively in both data sets. Women residing in urban areas breastfeed for shorter durations than their counterparts residing in rural areas. The difference in breastfeeding amongst different zones is evident after controlling for other variables. Women residing in the Northern, Coastal, Southern, and Southern Highlands and Western zones breastfeed their children for longer durations than women residing in the Central zone. There is only one zone (West Lake) where women breastfeed for shorter durations than the Central zone.

Religion is found to be a significant determinant of duration of breastfeeding for both data sets. However, only women in "other or none" category using the current status data indicated to breastfeed for shorter durations than Moslem women. The effect of type of marriage is significant only for the retrospective data. Women who stated not have a partner breastfed their children for longer durations than women in polygamous marriages. The difference of durations of breastfeeding for women in monogamous marriages is not significantly different to women in polygamous marriages. It can be concluded therefore that the effects of religion and type of marriage are modest.

Table 6.3. Estimated Relative Risks of Cessation of Breastfeeding for the Parsimonious Proportional Hazards Models.

Covariate and category	Retrospective data	Current status data
Zone of Residence		
Central	1.00	1.00
Coastal	0.76*	0.99
Northern	0.70*	0.83
Southern	0.69*	0.78*
West Lake	1.23*	1.44*
Southern Highlands and Western	0.71*	0.77*
Type of Place of Residence		
Rural	1.00	1.00
Urban	1.25*	1.37*
Maternal Age		
Age <30	1.00	1.00
Age ≥30	0.80*	0.82*
Birth Order of the Child		
1-4	1.00	1.00
5-6	0.89*	0.78*
7+	0.95	0.75*
Type of Marriage		
Polygamous	1.00	-
Monogamous	0.97	-
No partner	0.87*	-
Mother's Religion		
Moslem	1.00	1.00
Catholic	0.97	0.89
Protestant	1.07	1.09
Other or none	1.10	1.22*

Source: 1991/92 TDHS

Note: Asterisks denote significance at 0.05 level. Relative risks greater than 1.00 imply shorter durations than the reference category.

6.6 Conclusion

Breastfeeding is very prevalent in Tanzania. On the average, a Tanzanian woman ever breastfeeds her child will do so for about 21 months. This chapter presents an analysis of the determinants of the duration of breastfeeding in Tanzania using the 1991/92 TDHS. Based on the evidence from previous studies of other countries, ten covariates were hypothesized to influence the duration of breastfeeding in Tanzania. These are: zone of residence, type of place of residence, maternal education, maternal occupation, maternal religion, maternal age, birth order of the child, sex of the child, whether or not mother has ever married and type of marriage.

Only modest breastfeeding differentials among subgroups of the population exist. The duration of breastfeeding for a Tanzanian woman depends principally on whether she lives in a rural or an urban area, the zone where she lives, her age and her parity. Women residing in urban areas and those who gave birth while under 30 years of age are likely to breastfeed for shorter durations than older women. Moreover, women at parities beyond fourth breastfeed for longer durations than woman at parities 1-4. Also, women residing in the Central and West Lake zones breastfeed for shorter durations than women residing in other zones.

The analysis uses both retrospective and current status data. In both cases a proportional hazards model has been used for the multivariate statistical analysis. The two types of data give fairly similar results. The retrospective data, however, suggest one other significant determinant of breastfeeding durations: mother's type of marriage. However, the covariate has modest effects. The comparison of the results obtained from retrospective data and current status data has shown minor differences in other countries too {see for example Arbi (1986) for the case of Pakistan}.

The fact that young women breastfeed for relatively short durations suggests that breastfeeding may decline over time in Tanzania. It is not only the younger generation which breastfeeds for relatively shorter durations but also those of the older generation with few children ever born (four or less). The size of this group of low parity women will grow substantially as Tanzania moves to the next stage of fertility transition, where smaller families are a norm. Special programmes, therefore, need to be designed to encourage young and single mothers, as well as women with few children, to breastfeed their children for long durations. Also, special attention should be given to women residing in urban areas as well as those residing in Central and West Lake regions where breastfeeding durations are relatively short.

Chapter Seven

Family Planning Policy in Tanzania

7.1 Introduction

It has been suggested from the previous chapters that a further decline in fertility in Tanzania is more likely to occur through raising contraceptive prevalence, which is still low. The impact of family planning programmes in raising contraceptive prevalence rates in sub-Saharan Africa has been documented (among others see: Sherris et al., 1985; Bertrand et al., 1993). Zimbabwe, Kenya and Botswana are the countries which have demonstrated the most successful family planning programmes in sub-Saharan Africa. This chapter describes the Tanzanian Family Planning Policy established in 1988. A brief history of the establishment of the family planning activities in Tanzania is given. Also, the execution, the achievement as well as the shortcomings of the TFPP are presented.

Given the implication of family planning to infant mortality in a society, this chapter also investigates the effect of change of reproductive patterns on infant mortality rates in Tanzania. In other words, we estimate the potential reductions in infant mortality that could be achieved if the Government policies to eliminate high-risk childbearing through the use of family planning are successful.

7.2 General Issues

7.2.1 A Historical Note

Family planning services started to be formally provided in Dar es Salaam (then the capital city) in 1959. Later, they were provided in major towns by the Non-Governmental Organisation (NGO) now called the Family Planning Association of Tanzania (UMATI). The services were initially meant for the white population who were governing

Tanganyika (now Tanzania mainland) and a few highly placed government servants. The government of Tanzania started to assist UMATI in providing family planning services through its Maternal and Child Health (MCH) clinics in 1974. By 1982, over one-third of the clinics had a family planning component, and about 80 per cent of MCH clinics had family planning of some sort by 1987 (Ministry of Health, 1989). However, UMATI continued to coordinate all family planning activities in the country until 1989.

The government of Tanzania established a National Child-Spacing Programme (NCSP) in 1984 (which was launched in 1985). The major task of the NCSP was to provide family planning services in order to improve the health and well-being of women and children. However, the evaluation which was done in 1987 showed that there was no evidence to suggest any improvement in maternal and child health, and the prevalence of contraceptive use was still low (Ministry of Health, 1989). The major constraints facing the expansion of services under NCSP were identified to be lack of trained service providers and poor logistical support. This evaluation initiated the idea of formulating a Family Planning Policy (FPP). This was adopted as a government policy in 1988. The FPP is implemented by the National Family Planning Programme (NFPP) established in 1989 under the Ministry of Health.

Historically, then, the main rationale for providing family planning through the Tanzanian Ministry of Health has been to improve the health of mothers and children. The 1988 FPP specifically highlights the detrimental effects on maternal and child health of pregnancies occurring before the age of 18 and after the age of 35, birth intervals of under three years and birth orders of five or more (Mrisho, 1991). Consequently, much emphasis has been given to the provision of family planning as a key element in achieving national goals for infant and maternal mortality rates. Therefore, the overall goal of the FPP is the promotion of the health and nutritional status

of the family especially that of mothers and children (Ministry of Health, 1989).

7.2.2 Execution of the Family Planning Policy

After its establishment in 1989, the NFPP became the coordinator of all family planning activities in Tanzania mainland. In Zanzibar, there is a sister programme (Zanzibar Family Planning Programme) which was launched in 1987. The major responsibility of the NFPP is the management and distribution of contraceptives to all service delivery points. A special USAID and UNFPA-funded project is underway to improve the management and distribution of contraceptive supplies. The initial broad objective of the NFPP was to raise contraceptive acceptance rate from about seven per cent in 1989 to 25 per cent by 1993 (Ministry of Health, 1989). The plan was that this would be achieved through improving the accessibility and quality of Tanzanian family planning services by consolidating past strengths and rectifying weaknesses. The specific objectives of the NFPP were: to improve the quality of family planning services through the training of service providers; to improve supervision and upgrade the logistics system; to improve the accessibility of family planning services by increasing the proportion of health units providing family planning services; to improve the general health of mothers and children; and to raise the awareness of and demand for family planning services.

UMATI continued to work closely (and in collaboration) with the Ministry of Health (through the NFPP) even after handing over the coordination of family planning activities. However, UMATI's major roles (excluding the coordination) remained the same: to motivate, educate and inform the general public on the need for child-spacing; to train both government and NGO service providers; and to procure and distribute contraceptives. Currently, UMATI has a total of six projects (UMATI, 1992) which are: Voluntary Surgical Contraception or

VSC (the Ministry of Health has delegated to UMATI the coordination of VSC); rural Community Based Distribution (CBD) of contraceptive services (where villagers become community based distributors of family planning); UMATI model clinics (two clinics in Dar es Salaam and one in Moshi serve as static family planning delivery points); family planning for the private sector (as an initial stage, UMATI sponsors doctors and nurses from the private sector for training); youth family planning services through peers (UMATI has a pilot centre in Dar es Salaam for pioneering the delivery of family planning counselling and service provision to out-of-school youths through peer groups); and community-based family planning through integrated family planning, nutrition and parasite control projects (two pilot areas for integrated projects are situated in Kilimanjaro region and one in Morogoro region).

The NFPP operates through different institutions and agencies including the government, parastatal organizations[24], the private sector and NGOs (Ministry of Health, 1989). The Population and Family Life Education Programme (POFLEP) under the Ministry of Community Development, Women affairs and Children, is a population Information, Education and Communication (IEC) programme, responsible for creating awareness among the people about the relationship between population factors and development. POFLEP also aims at helping people take action immediately on family planning activities. Another project designed to provide IEC support to the NFPP is the Health Education Division (HED) of the Ministry of Health. The HED helps in printing IEC materials for clients in dispensaries, health centres and hospitals. Also, the HED is involved in research into family planning-related problems.

Other implementing agencies of the family planning policy include: the Responsible Parenthood Education Project for Youth

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[24] These are organisations owned, financed and managed by the government.

(EMAU), which is designed to bring about desirable changes in attitudes, behaviour and knowledge compatible with parental aspirations and in conformity with accepted Tanzanian cultural norms and values; the German Agency for Technical Co-operation (GTZ) family health programme which involves the production of IEC materials, and research into and the provision of family planning services; the Seventh Day Adventist (SDA) church health service, which offers family planning services in its dispensaries; the Department of Community Health at Muhimbili University College of Health Sciences, which is a resource unit for in-service training; the Demographic Training Unit of the University of Dar es Salaam, which deals with training, research and consultancy activities in the areas of population, family planning and demography; the Organization of Tanzania Trade Unions (OTTU), which provides family planning services in its clinics; the Marie Stopes Organisation, which provide private family planning services in its clinics; the Tanzania Parents Association (WAZAZI), which trains its regional and district secretaries to educate parents about family welfare, and produces educational materials about responsible parenthood, training manuals, and which also conducts research. The Christian Medical Board of Tanzania (CMBT) functions as a link between the health care systems of the Dioceses and Churches, and liaises with the government. Finally, the British Overseas Development Administration (ODA) Family Health Project (which works through the Tanzanian government) aims at expanding family planning services in Mbeya region.

7.3 An Overview of Problems Facing Family Planning Activities in Tanzania

The functioning of the family planning clinics in Tanzania was assessed using a situation analysis for the year 1990 (Ministry of Health and Africa OR/TA Project, 1993) and was later compared with that in Nigeria and Zimbabwe (Mensch et al., 1994). It was found that the Tanzanian clinics have limited contraceptive supplies and

logistics management. For instance, fewer than half of the service delivery points surveyed offered IUDs, injectables and spermicides. Other shortcomings of the Tanzanian clinics include a lack of privacy, a lack of staff trained in family planning, poor record keeping for individual clients and a lack of information, education and communication (Ministry of Health and Africa OR/TA Project, 1993). The comparative study with Nigeria and Zimbabwe showed that Tanzanian clinics were better than clinics in the other two countries only on supervision (Mensch et al., 1994). These results indicate that the NFPP has a major task to improve the MCH clinics with a family planning component and to establish family planning services in MCH clinics without this component. Also, industrial clinics, parastatal clinics and clinics that serve commercial firms need to be strengthened by providing adequate family planning services.

Anecdotal evidence from family planning service providers, clients and administrators of the NFPP has shown that the programme is much stronger nowadays and that several international donors are keen to assist the programme financially. However, several problems were noted to hinder the expansion of family planning services in the country. These were stated to be: (1) the low capacity to train service providers which has caused the quality of services to be low; (2) the lack of cooperation between doctors and nurses in clinics (in most cases doctors do not participate and do not know what is going on in the family planning section); (3) the lack of storage facilities in clinics, particularly in rural areas; (4) a lack of knowledge (for clients) about the wide range of contraceptives available; (5) the lack of counselling in most clinics; and (6) a lack of privacy in clinics.

In addition people need to be positive about the programme and motivated to use the services in order for the programme to be successful. Various scholars have discussed the obstacles facing the use of modern contraceptive methods in Tanzania. Among these are

socio-cultural factors, which include a desire for large families, religious beliefs opposed to family planning and the socialization process[25] (Omari, 1989). The argument is that if the society has a positive attitude towards large families, believes that children are gifts from God which cannot be prevented, and understands that the major role of a woman is to bear children, then the acceptance rate of modern methods of contraception will continue to be low. Mboma et al. (1988) have also included rumours and religion as stumbling blocks for the acceptance of modern contraceptives in Tanzania. Some religious beliefs do not admit the use of family planning services, and this has been a serious problem facing family planning activities in some areas, particularly where most of the people are Roman Catholics. Finally, Kamuzora (1992) suggests that two major reasons for low contraceptive use in Tanzania to be the low status of women, which is connected with patriarchy, and a lack of economic security (particularly in old age).

Various factors stated to hinder the expansion of family planning services in Tanzania are tested in Chapter Eight. Before doing that, we discuss one important factor (infant mortality) which is mentioned to be associated with family planning programmes. This is discussed in the next section.

7.4 The Family Planning Programme and Infant Mortality in Tanzania

7.4.1 Introduction

Since the main rationale for providing family planning services in Tanzania is to improve the health of mothers and children, it is important to find out if any progress will be made in reducing mortality if the family planning programme is successful. This

[25] Omari (1989) argues that socialisation (i.e. mixing with other people) has a great influence on the adaptation of new ideas and innovations; family planning being one of them.

section analyses the impact of the family planning programme on infant mortality rates through changing reproductive patterns in Tanzania.[26] We estimate the potential reductions in infant mortality that could be achieved if the Government policies to eliminate high-risk childbearing through the use of family planning are successful. That is, if we assume that all high-risk pregnancies have been eliminated, and keep other things constant, we ask what would happen to infant mortality? However, since the complete elimination of high-risk births is an unrealistic scenario, we examine the anticipated change in infant mortality if the family formation pattern is subject to a more realistic favourable change and contrast this with what might happen to infant mortality rates if the policy failed and a less favourable pattern became the norm (as often occurs during fertility transition). This is done by imposing the family formation patterns of two existing populations, Zimbabwe and Brazil, which experience more favourable and less favourable family formation patterns respectively, on the Tanzanian population. Finally, the policy implications of the results are discussed.

No individual-level studies have ever been conducted in Tanzania specifically to study the effects of reproductive patterns on infant mortality, so the policy to reduce infant mortality through family planning is at present based on an assumption that the detrimental effects of early and late childbearing, high order births and short birth intervals observed in other studies also apply in Tanzania. In addition, very little is actually known about the distribution of births by maternal age, birth order or birth interval. The potential for large reductions in infant mortality through family planning will depend on both the magnitude of the excess risk associated with high-risk reproductive behaviour and on the frequency of such births. If relatively few births occur in the

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26 Our choice of infant mortality is mainly determined by the availability of data. Data on maternal mortality were not collected in the 1991/92 TDHS.

high-risk groups then the potential for infant mortality reduction will be limited even if the policy is successful in eliminating all high-risk births. Given the emphasis placed on family planning as a means to achieve Government targets for infant mortality rates in Tanzania, an evaluation of the potential for such reductions is urgently needed.

The main reason that so little is known about reproductive patterns and infant mortality in Tanzania is that suitable data have hitherto not been available to study this issue. However, the 1991/92 Tanzania Demographic and Health Survey, for the first time, provides us with appropriate data to undertake such a study. An earlier analysis of the determinants of infant and child mortality using the TDHS data (Mturi and Curtis, 1995) suggests that there is indeed excess risk of infant and child death associated with teenage childbearing and birth intervals of less than two years. However, no excess risk was found for births beyond order four or for births to women over age 35. In addition the frequency of short birth intervals appears to be less than was previously thought. Given these initial findings, the potential for reductions in infant mortality through family planning may be less than was originally envisaged.

7.4.2 Literature Review

The effect of certain aspects of reproductive behaviour on an infant's chances of survival has long been recognized (Omran, 1976). Many scholars have emphasized the association of maternal age, parity and birth interval with the risk of infant mortality. The risk of infant mortality is relatively high among very young and older mothers and for first and highest parities. Further, short birth intervals have been found to increase the risk of death for infants and young children (see Omran, 1981; Pebley and Millman, 1986 for a review). Any initiative to avoid high-risk pregnancies can therefore be taken as a measure to reduce infant deaths. It is from this

perspective that family planning has been advocated as a means of reducing infant mortality rates.

Trussell and Pebley (1984) used data from 25 developing countries to show the potential impact of family planning on infant mortality rates (IMRs). They demonstrated that IMRs would be reduced by about 5 per cent if childbearing occurred entirely within the age range 20 to 34, by another 8 per cent if all births after the third were avoided, and by about 10 per cent if all births were spaced at least 2 years apart. This is a total reduction of 23 per cent. Their analysis is based on an assumption that maternal age, parity and birth spacing are causally related to infant and child mortality when the effects of potentially confounding variables are controlled (Trussell and Pebley, 1984). This study initiated a considerable debate on whether family planning will actually have an effect on infant mortality. Rinehart et al. (1984) pointed out that Trussell and Pebley (1984) ignored the fact that more births would be first births if high order births are reduced and the likelihood that women who delayed first births to age 20 might then want to have several children close together. Also, the calculations ignored any possible overlap between improvements due to changing spacing and those due to changing mother's age and total number of children. In addition, they neglect improvements in the health services each mother and child might receive because there would be fewer births (Rinehart et al., 1984). However, Rinehart and his colleagues strongly agree with the conclusion that family planning is an effective way to prevent infant mortality through helping couples to avoid high-risk pregnancies.

Hobcraft's (1987) analysis of 34 developing countries also showed that family planning can be used, through changing family formation patterns, as an effective way of saving children's lives. For instance, his analysis found that infants born to teenage mothers have 30 per cent excess risk compared with those born to mothers aged 25-34 years and infants of order 7 or above have 21 per cent excess

risk compared with infants of order 2 or 3. Hobcraft argued that if some of these births are avoided, then mortality to infants will be reduced. However, he criticizes the methodology used by Trussell and Pebley especially in assessing the potential changes in the levels of child mortality by eliminating all births in particular high-risk categories by arguing that the methodology considers situations that are too unrealistic (Hobcraft, 1987).

The major argument against the view that family planning can reduce infant mortality is presented by Bongaarts (1987). Bongaarts agreed that pregnancies at the highest and lowest maternal ages and birth orders, and of birth intervals shorter than two years are associated with higher risks of infant death. However, he argued that when contraceptive prevalence increases, offsetting effects arise between the different aspects of reproductive patterns which may consequently actually increase infant mortality rates. Bongaarts (1987) used simulation models to show that if confounding variables are included in the analysis, teenage childbearing and births of order seven and above decline whereas there is an increase in the influence of births of order one and of births following short birth intervals. This conclusion was not received positively by many scholars.

Responding to Bongaarts' paper, Trussell (1988) questioned the IMR as a measure of mortality when examining the effect of family planning because an increase in the incidence of first order births is an inevitable consequence of the successful use of contraception. Also, Trussell argued that increases in contraceptive prevalence are typically associated with both abandonment of traditional birth spacing practices and with a reduction in teenage fertility, therefore it would be misleading to attribute the differences in family-building patterns between high-prevalence and low-prevalence populations to family planning per se (Trussell, 1988). Although Potter (1988) believes that family planning does reduce infant

mortality, he suggested three important issues that should be considered when assessing the relationship between family planning and infant mortality: a shift in the social composition of birth cohorts as a population moves through the fertility transition, the aversion of high-risk pregnancies such as those to women with a history of difficulties with pregnancy or labour, and the change in family relationships that result from change of family sizes such as the relationship between a mother and her children. Bongaarts (1988) responded to both Trussell's (1988) and Potter's (1988) comments by defending his earlier arguments.

This debate on whether family planning can have an effect on infant mortality prompted the work by Palloni and his colleagues. Palloni and Kephart (1989) analyzed data from Columbia, Ecuador and Peru which suggested that adoption of efficient contraception does have favourable but weak effects on the survival of infants. An extension of Palloni and Kephart's procedure also supported the argument that family planning reduces infant mortality rates, however the necessity of integrating breastfeeding effects when assessing the impact of family planning on infant mortality was highlighted (Palloni, 1988; Palloni and Pinto, 1989).

With the exception of Bongaarts' (1987) analysis, all other studies suggest that infant deaths can be reduced if family planning is practised. The argument is that since the major concern for family planning programmes is to postpone, to space and to limit births, infant mortality rates are likely to be reduced if a family planning programme is successful. Most of these studies, however, have focused on theoretical discussion or general analyses.

7.4.3 Methods and Materials

The major source of data used in this study is the 1991/92 TDHS. The information, about women's birth histories along with the

women's background characteristics, makes it possible to study the determinants of infant and child mortality in Tanzania, and the results obtained by Mturi and Curtis' (1995) analysis are used in this study. The 1988 Zimbabwe DHS and the 1991 Brazil DHS which covered only the Northeast (NE) region provide supplementary data.

The method used to examine the impact of family planning on infant mortality is based on that used by Trussell and Pebley (1984). The level of infant mortality for the current distribution of births is computed from Mturi and Curtis's (1995) results and is then compared with the level computed from a distribution which eliminates all high-risk births. The percentage change in infant mortality associated with the elimination of high-risk pregnancies is then evaluated. Whilst eliminating all high-risk pregnancies predicts the maximum change possible, many scholars have disagreed with this approach due to its unrealistic nature (Hobcraft, 1987; Palloni, 1988; Rinehart et al., 1984). Therefore, the procedure is repeated taking a more favourable observed family formation pattern.

The weighted distribution of births presented in Table 7.1 shows that the proportion of teenage births is lower in Zimbabwe than in Tanzania whereas proportion of births to women aged between 20 and 34 is higher in Zimbabwe than Tanzania. As in Tanzania, breastfeeding in Zimbabwe is almost universal (the median duration of breastfeeding is 19.3 months) and postpartum sexual abstinence is common among mothers with a median duration of 4.3 months (CSO and IRD/Macro Systems, 1989). This implies that Zimbabwe has traditional child spacing patterns similar to Tanzania; this may be the reason for the small differences observed in the family formation pattern of the two countries. However, the 1988 Zimbabwe DHS show that Zimbabwe has the highest contraceptive prevalence in sub-Saharan Africa (43 per cent of currently married women), much higher than that of Tanzania. Further, analysis of the Zimbabwe DHS data shows that, unlike other

Table 7.1. Observed Distribution of Births by Maternal Age, Birth Order and Preceding Birth Interval for Tanzania, Zimbabwe and Brazil.

Variable	Tanzania 1986-92		Zimbabwe 1983-88		Brazil 1981-86	
	N	%	N	%	N	%
Total	8865	100.0	3292	100.0	3905	100.0
Maternal age						
<20	1684	19.0	526	16.0	618	15.8
20-29	4654	52.5	1766	53.6	2032	52.0
30-34	1295	14.6	540	16.4	668	17.1
35+	1232	13.9	460	14.0	587	15.0
Birth order						
1	2034	22.9	696	21.1	932	23.9
2-4	3823	43.1	1481	45.0	1704	43.6
5+	3008	33.9	1115	33.9	1269	32.5
Preceding birth interval						
1st birth	2034	22.9	696	21.1	932	23.9
<24 months	1306	14.7	480	14.6	1262	32.3
24-35 months	2796	31.5	1096	33.3	708	18.1
36+ months	2729	30.8	1020	31.0	1003	25.7
TFR	6.3		5.3		3.7	
CPR	10		43		59	

Source: 1991/92 Tanzania DHS
1991 Brazil (NE) DHS
1988 Zimbabwe DHS

Note: TFR is the total fertility rate measured among women aged 15-49 years, and CPR is the per cent of currently married women aged 15-49 years using any contraceptive method.

countries in Asia and Latin America, the desire to space births appears to have been the primary motivation for young women with few children to adopt family planning, the pill being the mostly commonly used method (Bertrand et al., 1993). The higher contraceptive prevalence rate is therefore the justification for considering Zimbabwe DHS data being more favourable than that of Tanzania and consequently is associated with a more favourable family formation pattern. This is therefore used as an example of the changes that could realistically be achieved in Tanzania through the family planning programme.

The key element of Bongaarts'(1987) argument that family

planning does not reduce infant mortality is that, in practice, as contraceptive use increases, offsetting changes occur in reproductive patterns due to changes in other proximate determinants. This certainly has occurred in many countries, so the analysis examines what would happen to the infant mortality rate in Tanzania if it too followed this path. Brazil is a good example of such a population, as it experiences high levels of contraceptive use but does not have a family formation pattern beneficial to infant mortality. Breastfeeding and postpartum sexual abstinence are less common than in Tanzania. The 1991 NE Brazil DHS data estimated the median duration of breastfeeding to be four months whereas the mean duration of postpartum sexual abstinence is estimated to be less than two months (Ferraz et al., 1992). This indicates that traditional child spacing patterns in Brazil have been eroded when compared with Tanzania. The NE Brazil DHS estimated a contraceptive prevalence of 59 per cent of all married women of reproductive age. However, sterilization is the most popular method implying that most women practice family planning for stopping rather than for postponing or spacing births. Although the contraceptive prevalence is relatively high, overall Brazil has a less favourable family formation pattern than Tanzania. This is characterised by a high proportion of short birth intervals, which carry the highest risk of all the high-risk reproductive behaviours. Table 7.1 shows that teenage births account for 16 per cent of all births in Brazil compared with 19 per cent in Tanzania, but that childbearing at older ages is more frequent in Brazil than Tanzania. Since stopping behaviour is more common in Brazil than in Tanzania, it seems that marriage patterns are different in these two countries. That is why a higher proportion of Brazilian women bear children at older ages than Tanzanian women.

As mentioned above, the model estimated by Mturi and Curtis is used to estimate the infant mortality rate in each of these hypothetical situations. They used a hazards model approach to investigate the determinants of mortality amongst those aged under

five years during the period 1986-1992 in Tanzania. The age axis was split in to four intervals; less than 1 month, 1-7 months, 8-14 months and 15-59 months, and a constant hazard was fitted within each interval.

The covariates selected for this analysis are presented in Table 7.2. The analysis focused on socio-economic and demographic determinants (Mturi and Curtis, 1995). The demographic variables selected were maternal age at the time of the birth, birth order and preceding birth interval as these consistently have been demonstrated to be strongly related to child survival (e.g. Hobcraft et al., 1985). Since first births do not have a preceding birth interval, birth order and preceding birth interval are combined to form one variable. The Maternal and Child Health (MCH) programme in Tanzania considers a woman to be at high-risk of pregnancy complications if she has (among other factors) a preceding birth interval of less than two years and/or has five or more births. Therefore, these categories are considered explicitly.

The remaining two demographic variables are the survival status of the preceding child at the conception of the index child, and the sex of the child. The survival status of the preceding child at the conception of the index child is included for two reasons. First it controls for family mortality risks as the mortality risks of siblings are correlated (Cleland and Sathar, 1984; Curtis et al., 1993). Second it controls for potential biases in the birth interval effects since the death of the preceding child may cause both a short preceding birth interval for the index child through the interruption of breastfeeding and an increased risk of death due to familial correlation in mortality risk. First births are classified as having no preceding death. Sex of child was also included as female births generally experience lower mortality than males unless there are strong sex of child preferences in which case the position may be reversed.

The socio-economic variables selected were maternal education and partner's education, urban/rural residence and presence of a radio in the household. Maternal education not only acts as an indicator of socio-economic status but is also thought to have a direct effect by influencing maternal behaviour (Caldwell, 1979; Cleland and van Ginneken, 1988). Partner's education may also act in a similar way and may be more influential in societies where female education is universally low and where mothers have little or no autonomy. Earlier studies based on the 1978 census data have suggested that child mortality tends to be higher in rural areas than in urban areas of Tanzania (United Republic of Tanzania and UNICEF, 1990) but the rural development program may have eroded this differential. The presence of a radio in the household acts as an indicator of the economic circumstances of the household. This in turn is likely to influence access to health services and ability to provide adequate nutrition for their children. Although a radio is a very crude economic indicator, its choice is due to the fact that radio is relatively widely used and valued in almost all parts of Tanzania. Other household assets such as cars, motorcycles, refrigerator and television are only available in very few households especially the well-off households in towns. Also, variables such as the type of building materials used for the dwelling can be misleading as an economic indicator because some parts of the country do not consider building modern houses as important so even a very wealthy family may live in very modest accommodation.

The next variable included is source of drinking water. This has a direct effect on child mortality through influencing exposure to water-borne diseases such as diarrhoea. The type of sanitary facilities available are also likely to influence exposure to disease but this is highly correlated with source of drinking water. Preliminary analysis suggested that source of drinking water was the most useful variable in discriminating under-five mortality levels. Finally, regional effects were investigated by dividing the country

into seven zones according to geographical location, using the classification given in Chapter One.

Details of the estimation procedure are given in Mturi and Curtis (1995).[27] The determinants of both neonatal and postneonatal mortality were investigated using the proportional hazards model. This technique assumes that covariates act multiplicatively on the constant baseline hazard within each age group and the effect is constant over time. Following the approach of Trussell and Pebley (1984), the probability of dying before age one, ${}_1q_0$, for the observed distribution of births is computed from 10 covariates hypothesized to affect infant mortality by using the estimated parameters and a set of average characteristics which represent the observed distribution of births (see Table 7.2). The probability of dying before age one is then recomputed assuming each of the alternative distributions of births described above. The percentage change in the probability of dying in the first year of life is then calculated for each scenario.

The following equation summarizes the computational procedure:

$$ {}_1q_0 = 1.0 - \exp[-\{e^{\alpha 1+\beta 1X} + e^{\alpha 2+\beta 2X} + e^{\alpha 3+\beta 2X}\}] \qquad (7.1) $$

where the vector **X** refers to the set of covariates included in the model. It was decided to analyse the first month of life separately from the rest of the period since it is known that neonatal mortality is more associated with endogenous causes of death. Thus the vector β_1 refers to the set of parameter estimates for neonatal mortality model whereas β_2 refers to the parameter estimates for the postneonatal model. The symbols α_1, α_2 and α_3 denote the age parameters for the first three age intervals (less than 1 month, 1-7 months and 8-11 months respectively. Whilst α_1 is estimated from the neonatal model, α_2 and α_3 are estimated from the postneonatal model as

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[27] The paper is attached at the end of the thesis.

there are two age intervals. In other words, the part $\alpha_1+\beta_1X$ given in equation 7.1 refers to age interval 'less than 1' month whereas $\alpha_2+\beta_2X$ and $\alpha_3+\beta_2X$ refer to age intervals '1-7' and '8-11' months respectively.

7.4.4 Results

Table 7.2 presents the observed distribution of births and parameter estimates for the period 1986-92. This is the information used in deriving the estimates given in Table 7.3. Two variables that indicate the family formation pattern are considered: maternal age, and birth order and preceding birth interval. However, maternal age is only significant (at the five per cent level) in the postneonatal period whereas the variable 'birth order and preceding birth interval' is significant in both neonatal and postneonatal periods.

The value of ${}_1q_0$ estimated from Table 7.2 is 0.072. If all births to women aged less than 20 years are eliminated, keeping other things constant, ${}_1q_0$ is reduced to 0.070 which is a reduction of about 2.1 per cent (Table 7.3). If all births with a preceding birth interval of less than two years are postponed to beyond two years, ${}_1q_0$ is reduced by 5.7 per cent. This implies that if the family planning programme in Tanzania is successful enough to eliminate all teenage births and to postpone all births with a preceding birth interval of less than two years, ${}_1q_0$ will be reduced to 0.066, which is a potential reduction of 7.8 per cent. As noted earlier, no excess risk was found to women of parity five or higher or women over age 35. Not surprisingly, therefore, Table 7.3 shows that the percentage change in ${}_1q_0$ after eliminating births to women aged 35 or more is negligible. On the other hand, the elimination of births beyond order four increases ${}_1q_0$ by 6.2 per cent, primarily due to the corresponding increase in the percentage of first births.

These changes represent the maximum changes that could be

Table 7.2. Observed Distribution of Births and Parameter Estimates for All Covariates.

Variable	Proportion of Births (weighted)	Parameter Estimates (β) <1 month	1-11 months
Constant	na	-2.69	-5.70
Maternal age			
<20	0.190	-	-
20-29	0.525	0.10	-0.29*
30-34	0.146	0.12	-0.19
35+	0.139	0.16	-0.26
Birth order and preceding birth interval			
1st order	0.229	-	-
2-4, <24	0.087	-0.03	0.07
2-4, 24-35	0.184	-0.83*	-0.20
2-4, 36+	0.160	-0.86*	-0.41*
5+, <24	0.060	0.04	0.03
5+, 24-35	0.131	-0.75*	-0.22
5+, 36+	0.148	-0.89*	-0.52*
Zone of residence			
Northern	0.110	-	-
Coastal	0.110	0.14	1.02*
Central	0.254	-0.21	0.75*
Southern	0.133	0.19	1.00*
West Lake	0.191	-0.14	1.08*
Southern Highlands and Western	0.174	-0.09	0.60*
Zanzibar	0.028	-0.21	-0.28
Type of place of residence			
urban	0.206	-	-
rural	0.794	-0.50*	0.26
Survival status of the preceding child			
alive	0.907	-	-
dead	0.093	0.39*	0.33*
Maternal education			
none	0.358	-	-
some primary	0.192	0.10	0.15
primary and higher	0.449	-0.20	-0.09
Partner's education			
none	0.239	-	-
some primary	0.215	0.08	-0.22
primary and higher	0.485	0.05	-0.01
no partner	0.061	0.25	-0.65*
Source of drinking water			
piped	0.299	-	-
well	0.321	0.04	-0.24*
other	0.379	0.15	-0.11
Availability of radio in a household			
yes	0.350	-	-
no	0.650	0.03	0.13
Sex of the child			
male	0.509	-	-
female	0.491	-0.19	-0.16*

Source: 1991/92 TDHS

Note: 1. Asterisks denotes coefficient is significant at 0.05 level, *na* stands for not applicable, *dash* denotes the baseline category.
2. The age parameters used are: $\alpha_1 = 0$, $\alpha_2 = 0$ and $\alpha_3 = -0.38$.
3. The selected parsimonious hazards models and the discussion of the determinants of infant and child mortality in Tanzania are presented in Mturi and Curtis (1995).

Table 7.3. Percentage Change in ${}_1q_0$ Associated with Different Family Formation Patterns During the Period 1986-92.

	% Change
No births to women aged <20	-2.1
No births to women aged 35+	0.0
No births of order 5+	6.2
No births with preceding birth interval <24 months	-5.7
Imposing Zimbabwe family formation pattern	-1.0
Imposing Brazil family formation pattern	9.8

Source: Table 7.2
The 1986 Brazil DHS
The 1988 Zimbabwe DHS

Note: The reference ${}_1q_0 = 0.072$

achieved if all high-risk births are eliminated. As already discussed, such a scenario is unrealistic. Table 7.3 suggests that if the current family formation pattern of Zimbabwe were to be achieved in Tanzania, ${}_1q_0$ will be reduced by only one per cent. This small change confirms that the family formation pattern in Tanzania is already relatively favourable so there is little scope for further improvement. However, this does not mean that the family planning programme has no potential role in improving child survival, since as Bongaarts (1987) demonstrated, fertility decline is often associated with the adoption of less favourable family formation patterns. This is clearly illustrated by applying Brazil's family formation pattern to Tanzania, which results in a potential 9.8 per cent increase in infant mortality. The magnitude of this increase suggests that the family planning programme does have an important role in preventing the deterioration of family formation patterns during the fertility transition.

7.4.5 Discussion and Policy Implications

The analysis has shown an association between family formation patterns and infant mortality in Tanzania. The current maximum potential reduction in infant mortality if all births to teenage mothers and all births born after an interval of less than two years are eliminated is 7.8 per cent. Eliminating births to women aged over 35 and births of order five or more does not reduce the infant mortality rate further because these births do not experience any significant excess mortality risk in Tanzania. These estimates are based on a very hypothetical and unrealistic situation but they provide an upper limit on the possible magnitude of the reduction. Even under this idealised situation, the potential survival gains that could be achieved are modest.

The distribution of births during the five years prior to the 1988 Zimbabwe DHS provides a more realistic favourable situation since it has a traditional child spacing pattern similar to Tanzania but has higher contraceptive prevalence and a lower TFR. This analysis shows that a very small reduction (one per cent) in infant mortality levels could be achieved if the family formation pattern of Tanzania changes to follow that of Zimbabwe. This confirms that the family formation pattern in Tanzania is already relatively favourable so there is little scope for further improvement. However, there is considerable scope for the family formation pattern in Tanzania to deteriorate as contraceptive use increases. If the family formation pattern of Tanzania follows that of NE Brazil, the infant mortality rate could increase by about ten per cent despite the fact that the contraceptive prevalence in NE Brazil is relatively high.

It should be noted that the method applied here is relatively simplistic and has several limitations. The model assumes that the effects of maternal age, birth intervals and parity are directly causal once the effects of other covariates in the model are

controlled. It also assumes that the distribution of births by other characteristics, such as maternal education, does not change. The calculations also neglect indirect effects such as improvements in the health services each mother and child might receive because there would be fewer births (Rinehart et al., 1984; Potter, 1988), and do not allow for the fact that the composition of births changes over the first year because children in the high-risk groups die earlier than children in low-risk groups (Palloni and Pinto, 1989). Nevertheless, the results do illustrate clearly that large changes in the infant mortality rate should not be expected through the family planning programme.

An important finding of this study is that, in the Tanzanian context, it is the elimination of short birth intervals and teenage childbearing that would reduce infant mortality most, rather than the reduction of proportion of high parity births or childbearing amongst older women. Other studies have also shown that the detrimental effects of high birth order and older maternal age on infant's and child's survival are less important than the effects of young maternal age, being first born or close spacing between births, at least in developing countries (National Research Council, 1989). Therefore, from the perspective of further improving child survival, effort should be focused on discouraging teenage pregnancies and births less than two years apart. Even here, however, the gains that can realistically be achieved are small. Whether pregnancies above age 35 and beyond the fourth birth need more emphasis for the sake of the mother's health needs further research. In addition, smaller families may result in indirect beneficial health effects due to the availability of increased resources per child.

One of the main motivations for this analysis was to examine why the National Child Spacing Programme does not appear to have reduced infant mortality rates since its launch (Ministry of Health, 1989), and to assess whether this indicates that the programme has

failed. Our conclusion is that policy makers should not expect large declines in the infant mortality through the family planning programme because the family formation pattern in Tanzania is already relatively favourable due to traditional child spacing behaviour, and because the excess mortality risk associated with high parity births and births to older mothers is relatively small after controlling for other socio-economic factors. In addition, the infant mortality rate is not a very good indicator for assessing the impact of family planning programmes on mortality (Trussell, 1988). Hence, the fact that the infant mortality rate has not declined since the launch of the National Child Spacing Programme should not necessarily be interpreted as indicating that the programme has failed. However, our analysis does not suggest that there is no role for the family planning programme in improving infant survival and the effort by the United Republic of Tanzania to raise contraceptive prevalence needs to be supported. As explained above, from a child health perspective emphasis should be on encouraging teenagers to postpone pregnancies and on maintaining the existing child spacing patterns through both traditional child spacing practices, such as breastfeeding and postpartum sexual abstinence, and the use of modern contraception. Traditional child spacing practices are often eroded as a country develops, so the family planning programme will need to provide modern contraception as an alternative to traditional birth spacing methods in order to maintain the prevailing favourable family formation patterns. In the long term this may prove to be the more crucial role of the family planning programme in improving infant survival in Tanzania and it is in this context that the programme should be evaluated.

Chapter Eight

Levels and Determinants of Contraceptive Use

8.1 Introduction

Since fertility has started to decline in various countries in the region, it is important to understand the levels of contraceptive use and examine the factors associated with contraceptive prevalence there. Such understanding should assist policy makers to establish proper strategies for raising contraceptive prevalence. This chapter uses the 1991/92 TDHS data to examine the levels and determinants of contraceptive use among Tanzanian women. Traditionally, family planning services in Tanzania are not provided for unmarried women, therefore we have decided to study currently married women and never-married women separately. This is particularly important because premarital sexual activity is very common in Tanzania. Given that the age at first marriage is rising, it is likely that premarital fertility (most of which is unwanted) will increase if proper measures are not taken to avoid premarital pregnancies.

The major focus of what follows is the examination of the extent of contraceptive use and the identification of sub-groups of women who are particularly unlikely to use contraception. This implies that the chapter examines only the individual-level factors related to contraceptive use. Both tabular analysis and logistic regression analysis are used for these purposes. For women currently using contraception, the methods used are described (to show the extent of method mix in Tanzania). However, before studying contraceptive use, it is important to have an idea about the knowledge of contraceptive methods among women since this is an important pre-requisite of use. This is the subject of the next section.

8.2 Knowledge of Contraception

The 1991/92 TDHS collected information about knowledge of contraception for all respondents. The interviewer asked the respondent to name all the family planning methods of which she had heard. For methods not mentioned by the respondent, the interviewer gave a one line description and then asked again if the respondent had ever heard of it. This is known as "probing". The respondent is considered to have known a method if she said that she had heard of it either spontaneously or after probing. Table 8.1 presents the percentage distribution of the respondents according to their knowledge of contraception and selected background characteristics. A woman is considered to know a modern method if she stated that she knew at least one of the following: the pill, intrauterine device (IUD), injection, barrier methods (diaphragm, foam or jelly), condom, female sterilization or male sterilization. A woman is considered to know only traditional methods if she stated that she knew only periodic abstinence or the mucus method or withdrawal or any other traditional method. The "none" category includes all women who said they did not know any method at all.

Table 8.1 indicates a high level of awareness (80 per cent) among currently married women in Tanzania: 77.6 per cent know at least one modern method and 2.6 per cent know only a traditional method. The results for male respondents in the TDHS also show a high level of awareness of contraceptive methods: 84 per cent of currently married men interviewed claimed to know at least one modern method (Ngallaba et al., 1993). However, the level of awareness for never-married women is lower than currently married women. Only 56 per cent of never-married women claimed to know a contraceptive method. A major challenge for the Tanzanian National Family Planning Programme is, therefore, to work out how to introduce knowledge of family planning methods to the 44 per cent of never-married women and 20 per

Table 8.1. Percentage Distribution of Women by Knowledge of Contraception by Selected Background Characteristics.

Characteristic	Currently Married				Never Married			
	None	Trad	Modern	N	None	Trad	Modern	N
Total	19.8	2.6	77.6	6038	44.4	0.9	54.7	2261
Type of place of residence								
rural	23.4	3.2	73.4	4726	51.9	1.2	46.9	1556
urban	6.5	0.5	93.0	1312	27.9	0.2	71.9	705
Zone of residence								
Central	22.4	4.3	73.2	1386	43.8	2.1	54.1	504
Coastal	16.8	1.0	82.2	754	42.6	0.5	57.0	323
Northern	19.4	2.8	77.7	608	34.0	0.9	65.1	360
Southern	9.6	1.4	89.0	948	35.7	0.2	64.1	294
Southern H&W	30.1	3.0	66.9	1073	62.1	0.0	37.9	315
West Lake	19.6	2.5	77.9	1100	52.1	1.2	46.7	404
Zanzibar	4.1	0.0	95.9	168	19.9	0.0	80.1	61
Highest educational level								
no schooling	31.3	4.5	64.2	2505	64.1	2.0	33.9	233
lower primary	14.3	1.8	83.8	879	56.3	1.0	42.7	187
upper primary	11.2	1.1	87.7	2500	45.6	0.7	53.7	1578
secondary +	1.1	0.0	98.9	154	11.3	1.3	87.4	263
Partner's highest educational level								
no schooling	30.4	4.1	65.4	1619	-	-	-	-
lower primary	20.8	3.5	75.7	1170	-	-	-	-
upper primary	15.8	1.7	82.5	2720	-	-	-	-
secondary +	3.8	0.6	95.6	462	-	-	-	-
Current occupation								
unemployed	21.2	2.5	76.3	1814	52.5	0.7	46.8	1070
agriculture	21.6	3.0	75.3	3224	45.8	1.5	52.7	734
traders	14.1	1.4	84.5	680	18.4	0.6	81.0	202
other workers	4.7	1.2	94.0	320	27.1	0.4	72.5	255
Religion								
Moslem	11.5	1.2	87.3	1834	36.3	0.2	63.6	669
Catholic	16.6	1.8	81.5	1761	44.5	1.0	54.4	739
Protestant	14.6	2.0	83.3	1412	44.0	1.0	54.9	663
Others	46.7	7.1	46.2	1031	73.9	2.8	23.3	189
Type of marriage								
monogamous	18.0	2.2	79.8	4358	-	-	-	-
polygamous	24.6	3.6	71.8	1659	-	-	-	-
Number of previous marriages								
none	17.7	3.3	79.0	1178	-	-	-	-
one or more	20.0	2.4	77.7	4748	-	-	-	-
Age group of women								
15-24	21.8	1.9	76.3	1841	-	-	-	-
25-34	15.0	1.8	83.1	2216	-	-	-	-
35-44	20.2	3.2	76.6	1437	-	-	-	-
45-49	30.8	6.6	62.6	544	-	-	-	-
Number of living children								
none	29.7	2.4	67.9	619	52.8	0.7	46.5	1815
1-2	18.4	1.6	80.0	2059				
3-4	18.2	3.4	78.4	1539	10.5	2.0	87.5	446
5-6	19.2	3.2	77.6	1090				
7+	19.3	3.2	77.5	731				
Number of dead children								
none	19.3	2.3	78.4	3663	45.9	0.9	53.3	2179
1	18.3	2.6	79.1	1401				
2	20.4	3.4	76.2	532	5.0	2.5	91.5	82
3	26.1	4.9	69.0	280				
4+	28.3	3.9	67.8	162				

Source: 1991/92 TDHS

Note: *dash* indicates not applicable; *Trad* stands for only traditional methods; and *H&W* stands for Highlands and Western

cent of currently married women who never heard of a contraceptive method.

The background variables used throughout this chapter are more or less similar to those used in the previous chapters. The rural-urban classification was decided prior to the interview. If the area was classified as urban, all women interviewed in that area were considered urban dwellers, otherwise they were considered rural women. Regional effects are examined by using the seven zones given in Figure 1.2. These are: Central zone (Dodoma, Shinyanga, Singida and Tabora), Coastal zone (Dar es Salaam, Coast, Tanga), Northern zone (Arusha and Kilimanjaro), Southern zone (Lindi, Morogoro, Mtwara and Ruvuma), Southern Highlands and Western zone (Iringa, Kigoma, Mbeya and Rukwa), West Lake zone (Kagera, Mwanza and Mara) and Zanzibar zone (all regions in Zanzibar). The educational level of the women and their partners has four categories: "no schooling" denotes those who have never attended a formal school, or who attended but did not complete at least a year; "lower primary" denotes those who were at school for 1-4 complete years; "upper primary" comprises those respondents who stayed in primary school for at least five years; and "secondary +" includes all those who attended at least secondary school.

The definition of current occupation depends on how a woman considered her position. Women are classified as "unemployed" if they said they were housewives or claimed not to be employed; the category "agricultural workers" includes those women who stated that they were cultivators, doing mixed farming or employed to work in farms; "traders" are small scale traders and labourers; and "other workers" includes all other occupations such as clerks, machine operators, technicians, teachers, professionals, and managers. Religion is categorized into four groups; Moslem, Catholic, Protestant and others (which includes those of no religion or traditional beliefs). For married women, the type of marriage is either monogamous or

polygamous, and the number of previous marriages can either be "zero" or "one or more". Women were also classified according to their current age, the number of living children they had and the number of dead children they had borne. Several variables were dropped from the study after the preliminary analysis because they were highly correlated with other variables. These included: woman's literacy status, partner's literacy status, partner's occupation, and the number of children ever born. The variables retained in the analysis were found to have stronger association with the knowledge and use of contraception than variables dropped.

Table 8.1 shows that, in every category of every background variable, a majority of currently married women know at least one modern method. This is true even for women who never attended formal schooling and those residing in rural areas. However, there is one outlier for women with traditional beliefs or no beliefs at all. A very large minority of these women (47 per cent) have never heard of any contraceptive method. This is not surprising as this sub-group of women is likely to have a combination of the factors (i.e. reside in rural areas and have no or have little education) which are disadvantaged in terms of gaining modern ideas.

The results for never-married women are mixed. Although the percentages are lower than those for currently married women, in many categories a majority of unmarried women know at least one contraceptive method. However, there are some categories in which a majority of never-married women do not know any contraceptive method. These include those residing in rural areas, or in Southern Highlands and Western zone, those with no schooling or low levels of schooling, those who said that they worked on farms, those with traditional faiths (or no religion), and those without a living child. As an initial step in raising contraceptive prevalence in Tanzania, these groups should be targeted.

8.3 Current Use of Contraception

Women who were not pregnant at the time of the interview were asked if they were currently doing something or using a method to delay or to avoid getting pregnant. This information is very useful as a measure of one of the proximate determinants of fertility as well as a measure of the coverage of family planning programmes (Bertrand et al., 1993). In order for the results to be comparable with other studies, we computed contraceptive prevalence (the percentage of all women of reproductive age, married or living in a union, using some type of contraception), according to their background characteristics (using weighted data). The percentages of current users amongst the never-married women were also computed. The results are presented in Table 8.2 in the columns headed "all".

Table 8.2 shows that 10.4 per cent of currently married women were using some sort of contraception at the time of the interview. Among never-married women, only 5.9 per cent were using a contraceptive method. These rates indicate that the use of contraception is very low in Tanzania. The recent Tanzania Knowledge, Attitudes and Practice Survey (TKAPS) conducted in 1994, however, has shown a rising trend of contraceptive users in Tanzania. The percentage of currently married women interviewed in the TKAPS using contraception was 20.4 per cent; almost double the figure estimated using the TDHS data (Weinstein et al., 1995).

As in other sub-Saharan African countries (see for example Agyei and Migadde, 1995; Rutenberg et al., 1991; Robey et al., 1992; Bertrand et al., 1993), most of the contraceptive users reside in urban areas. Currently married Tanzanian women residing in urban areas have a contraceptive prevalence of 9.4 percentage points higher than those residing in rural areas. However, the difference between urban and rural areas is smaller for never-married women (4.4 percentage points). The highest contraceptive prevalence (24.0 per

Table 8.2. Percentage Distribution of Women who are Currently Using any Contraceptive Method by Selected Background Characteristics, 1991/92 TDHS.

Characteristic	Currently Married		Never Married	
	All	Non-preg	All	Non-preg
Total: per cent	10.4	12.0	5.9	6.1
no. of cases	6,038	5,226	2,261	2,181
Type of place of residence				
rural	8.4	9.7	4.5	4.7
urban	17.8	20.3	8.9	9.2
Zone of residence				
Central	7.9	9.1	7.7	8.1
Coastal	15.5	17.5	7.0	7.3
Northern	24.0	27.1	8.0	8.2
Southern	8.0	9.2	4.0	4.2
Southern H&W	9.2	10.8	3.1	3.2
West Lake	6.5	7.6	5.0	5.1
Zanzibar	7.1	8.3	0.8	0.8
Highest educational level				
no schooling	3.7	4.2	3.6	3.7
lower primary	11.9	13.0	1.3	1.4
upper primary	14.7	17.7	5.6	5.9
secondary +	41.7	49.4	12.6	12.7
Partner's highest educational level				
no schooling	4.3	4.8	-	-
lower primary	9.0	10.2	-	-
upper primary	12.0	14.1	-	-
secondary +	26.6	31.5	-	-
Current occupation				
unemployed	9.8	11.7	2.6	2.6
agriculture	7.3	8.4	7.3	7.6
traders	16.8	18.4	6.1	6.2
other workers	31.8	35.2	15.5	16.1
Religion				
Moslem	11.1	12.7	6.5	6.8
Catholic	10.9	12.6	6.9	7.1
Protestant	14.7	16.9	4.9	5.0
Others	2.5	3.0	3.2	3.3
Type of marriage				
monogamous	11.9	13.9	-	-
polygamous	6.5	7.3	-	-
Number of previous marriages				
none	6.0	6.7	-	-
one or more	11.5	13.4	-	-
Age group of women				
15-24	8.5	10.6	-	-
25-34	11.9	13.8	-	-
35-44	11.9	13.0	-	-
45-49	7.1	7.3	-	-
Number of living children				
none	1.8	2.4	3.6	3.7
1-2	10.7	12.8		
3-4	11.1	12.5	15.1	15.7
5-6	11.4	12.8		
7+	14.0	14.7		
Number of dead children				
none	12.2	14.2	5.6	5.8
1	8.1	9.2		
2	8.0	9.0	13.0	14.3
3	5.8	6.8		
4+	6.6	7.2		

Notes: *dash* denotes not applicable; *non-preg* denotes women not pregnant; and *all* stands for all women.

cent) is observed in the Northern zone, and the Coastal zone has the second highest (15.5 per cent). The other zones have more or less similar contraceptive prevalence levels at between 6.5 and 9.2 per cent. It is not surprising to find that the Northern and Coastal zones have the highest rates of contraceptive use as these zones include the most developed regions. The Northern zone comprises Kilimanjaro and Arusha regions, which have the lowest mortality rates and the highest literacy rates in Tanzania, and a better transport system than the other regions. The Coastal zone includes Dar es Salaam, which is the major city, and it ranks highest using most of conventional measures of development.

Never-married women display a somewhat different pattern of contraceptive use by zone of residence than do currently married women. Among never-married women, the Central zone has among the highest percentage of contraceptive users, and in that zone the extent of use is almost equal to that of currently married users (almost 8 per cent). At the other extreme very few never-married women (0.8 per cent) residing in Zanzibar are currently using contraception. This may be due to the fact that in Zanzibar, a predominantly Muslim society, women are not expected to have sexual activities before marriage. This implies that never-married Zanzibari women who are using contraception may fail to report it. Nevertheless, any attempt to raise contraceptive use among never-married women should involve Zanzibar as well as other zones. The major similarity between never-married women and currently married women is that Northern and Coastal zones have a relatively high percentage of contraceptive users.

The educational level of women has been cited as the most important variable associated with contraceptive use in many countries. It has been observed that better educated women are more likely to use contraception (Rutenberg et al., 1991; Robey et al., 1992; Bertrand et al., 1993). The Tanzanian situation reflects this

pattern. The percentage of currently married women using contraception increases consistently with the level of education. The gap between users who attended at least secondary school and those who never attended formal schooling is enormous (38 percentage points). This is also true when the education of the partner is considered. A slightly different pattern is observed for never-married women as women with no education exchange positions with women with "lower primary" education.

As for occupation, Table 8.2 shows that 31.8 per cent of currently married women and 15.5 per cent of never-married women who were in the "other workers" category were using contraception at the time of the survey. Most of these women have high status jobs indicating that they are educated and have a high income, both of these being factors which encourage women to use contraception. It seems that currently married women who reported that they were unemployed use contraception more than those reported to be working as farmers. However, it is possible that some women working in family farms said that they were housewives and hence are mis-classified as "unemployed". This could also be the reason why, among never-married women, the relative prevalence figures in these two categories are reversed.

The extent of the use of contraception does not vary much between Moslems and Catholics for both currently married women and never-married women. Protestant women who are currently married are more likely to use contraception than other currently married women, whilst Protestant never-married women are less likely to use contraception than Moslem and Catholic never-married women. Whether married or not, women without any faith or with traditional faiths are less likely to use contraception than other women. This is

expected.[28] In traditional African societies, people believe that God has control over the human reproductive system or that children are a gift from God, so that no one should prevent a child from coming into the world (Omari, 1989). Most of women without any faith or with traditional faiths are likely to advocate this ideology. Indeed, Omari (1989) has argued that Tanzanian women who follow traditional belief systems are less likely to use contraception than other women.

Women involved in a polygamous marriage (married to or living with a man married to other wives) are less likely to use contraception than women in monogamous marriages. A lower frequency of intercourse for women in polygamous marriages can discourage them from using contraception. Also, these women are likely to adhere to traditional values and customs which encourage large families. It is surprising to note that women married more than once use contraception more than women married only once. However, this can be explained by the fact that women married more than once are more likely to have the courage to discuss with their partners on use of contraception than women married only once. Further, the fact that a woman is married more than once can mean that she meets many people with different backgrounds, and this can be an advantage when it comes to knowing about and using contraceptive methods.

The number of living children a woman has been found to be associated with the use of contraception (Rutenberg et al., 1991; Robey et al., 1992). The TDHS data show that the percentage of women who have no living child that are using contraception is very small (particularly for currently married women). The extent of use does not vary much with the number of children among currently married women with at least one living child unless the number of living

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[28] This can partly be due to a lack of knowledge caused by little or no education and the fact that these women are residing in rural areas (see Section 8.2).

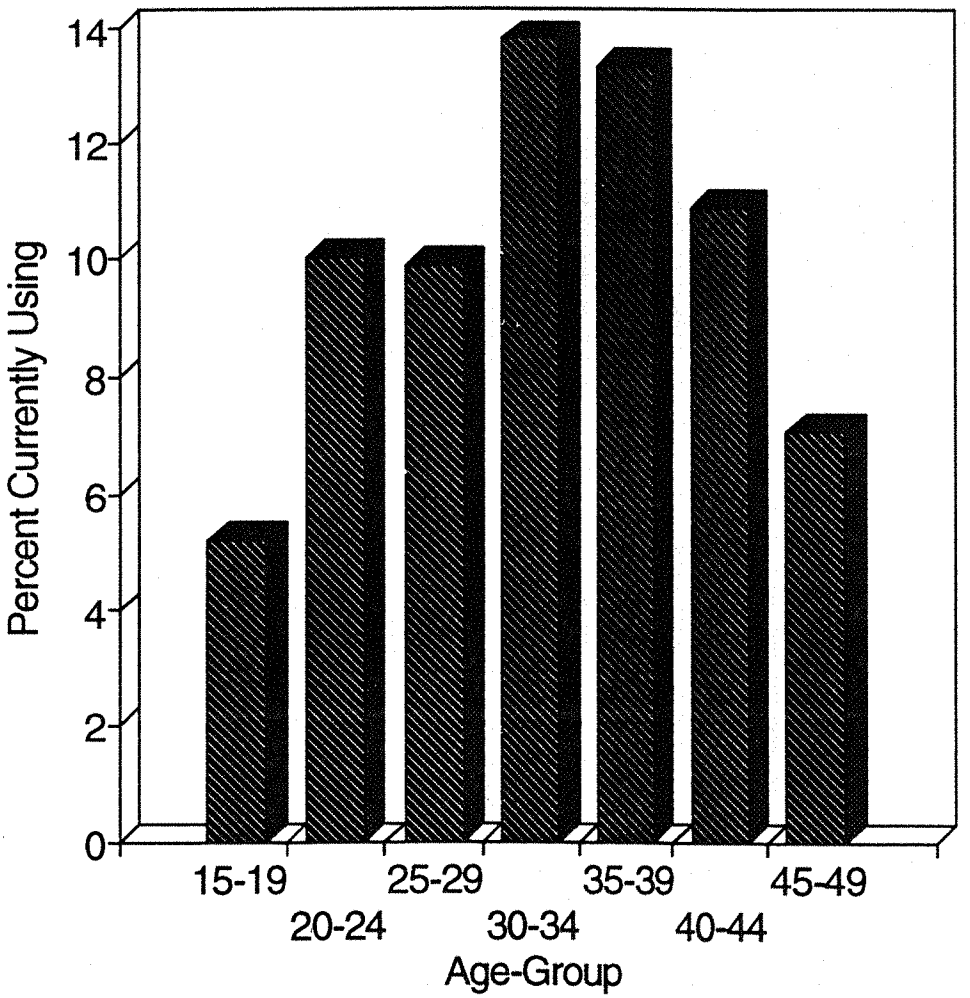
children reaches seven or more. The percentage of never-married women using contraception is from 3.6 for women without a child and 15.1 for those having at least one living child. The death of a child can also discourage a couple from using contraception (Njogu, 1991). The results given in Table 8.2 suggest that, among currently married women, those who have had the death of a child have a lower proportion of users. However, the opposite is true for never-married women. Most of the never-married women without a dead child are nulliparous and hence are not motivated to use contraception.

Finally, it is important to examine the association between the age of a woman and her current use of contraception. The broad age groups of women given in Table 8.2 show that contraceptive use is higher among women aged 25-44 years than among either younger women or older women. Figure 8.1 presents the contraceptive prevalence by five year age groups of women. The shape is approximately an inverted U-shape; contraceptive prevalence is lowest for age group 15-19, increases gradually to reach a maximum at age group 30-34 after which it decreases consistently to age group 45-49. This pattern has been found elsewhere in sub-Saharan Africa (Rutenberg et al., 1991; Robey et al., 1992; Bertrand et al., 1993).

8.4 Contraceptive Method Mix

It is important to examine the specific contraceptive methods used, since different methods have different implications for the family planning programme. It should be noted, however, that since family planning methods are virtually free in Tanzania (except for selected methods in some private clinics), the cost of buying contraceptives is unlikely to be a deterrent to their use. The major constraints for women who know and want to use a modern method are perhaps the high transport costs and the lack of facilities in clinics. A recent situation analysis conducted to assess the functioning of family planning clinics in Tanzania has shown that the

Figure 8.1. Percentage of Currently Married Women Using Contraception in Each Age Group.



Source: 1991/92 TDHS

level of sub-system functioning is very problematic[29] particularly when compared with Nigeria and Zimbabwe (Mensch et al., 1994). This can clearly limit contraceptive method choice, as, for example, if the choice of methods available is very limited or there is a problem of privacy, or if staff do not have adequate skills.

Table 8.3 presents the percentage distribution of women using contraception at the time of the interview according to the method used and their marital status. Modern methods are used more frequently by Tanzanian women than traditional methods and the pill is the most popular method (except for never-married women). The main reason for choosing the pill as the major contraceptive method in Tanzania (a reason which also applies in many other sub-Saharan African countries) is because African women desire large families and use contraception mainly to space births (see Rutenberg et al., 1991; Bertrand et al., 1993). It has been noted also that the availability and promotion of the pill have much to do with its popularity in many countries (Bulatao, 1989).

The second most widely used modern method is female sterilization (again with the exception of never-married women). A majority of the women who want to terminate childbearing, particularly older women with large families (Rutenberg et al., 1991), prefer sterilization. Unfortunately, male sterilization is very unpopular in the African context for cultural reasons, so female sterilization is the chosen alternative for couples. Also, many people in Tanzania dislike barrier methods (diaphragm, foam and jelly) because they are considered to reduce sexual pleasure. Other modern methods used to a limited extent include the condom,

[29] The functioning of family planning clinics was assessed by looking at the availability of different contraceptive methods, equipment and facilities. Training for staff members who supply family planning services, management and record keeping were also assessed.

Table 8.3. Percentage Distribution of Women Currently Using a Contraceptive Method According to the Methods Used and Marital Status.

Method	Married N=630	Single N=133	Divorced N=79	Widowed N=32	Total N=874
Pill	32.3	23.1	42.3	35.5	31.9
IUD	4.1	2.9	1.3	1.2	3.6
Injection	3.7	1.8	0.0	9.5	3.3
Barrier methods	0.2	0.0	0.0	0.0	0.1
Condom	6.7	14.5	8.5	3.3	7.9
Female sterilization	15.7	1.1	32.6	24.9	15.3
Male sterilization	0.2	0.0	0.0	0.0	0.1
All modern methods	**62.9**	**43.5**	**84.6**	**74.4**	**62.2**
Calendar method	12.1	47.2	9.5	17.7	17.4
Mucus method	0.9	3.1	0.0	0.0	1.1
Withdrawal	18.5	4.2	0.0	0.0	14.0
Other	5.7	2.0	5.9	7.9	5.3
All traditional methods	**37.1**	**56.5**	**15.4**	**25.6**	**37.8**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: 1991/92 TDHS
Note: Single refers to never-married women.

injections and IUDs. Traditional methods commonly used include thecalendar method and withdrawal.

It seems that the mix of contraceptive methods used by never-married women is different to that used by ever-married women. The calendar method is the most popular method for women who have never been in a stable union. This may be because of the particular situation of these women. As noted earlier, previously family planning methods were not provided for unmarried women in Tanzania. Although the situation is changing gradually, it is still awkward for an unmarried school girl, for instance, to visit a family planning

clinic. It is therefore convenient for them to use traditional methods which do not require them to go to clinics. Unmarried women with the courage to go to a clinic, or with other means of getting contraception (for example sending a person to obtain contraception on their behalf), prefer the pill because of its "non-clinical" nature. That is, it is relatively easy to understand how to use the pill. The choice of the condom as the second most popular modern method has to do with the protection it offers against sexually transmitted diseases such as AIDS (Mpangile et al., 1993). This is particularly important since for never-married women, they are likely to have multiple partners or to change their partners after a short period.

8.5 Multivariate Analysis of the Determinants of Current Contraceptive Use

Binary logistic regression is the multivariate analysis technique used to examine the relative importance of the determinants of contraceptive use. The response variable is use or non-use of contraception at the time of the survey. Women who were currently pregnant, or who were unsure about being pregnant were excluded from the analysis. Table 8.2 describes the data used for the multivariate analysis (in the columns labelled "non-preg") for currently married women and never-married women. Women missing some information on the explanatory variables were dropped from the analysis. The final sample for currently married women includes 5,036 women, and for never-married women the sample is 2,091. That is, 3.6 per cent of currently married women and 4.1 per cent of never-married women who were not pregnant had some missing information on at least one of the explanatory variables and hence excluded from the multivariate analysis. The analysis of ever-married women produced results similar to that for currently married women, therefore results are presented only for currently married women and never-married women.

Results for currently married women

Table 8.4 presents the parsimonious model for the determinants of current contraceptive use for women currently married or living with a man. Eight variables were found to influence the use of contraception significantly after holding the other explanatory variables constant. The analysis indicates that women's education is the strongest predictor of the use of contraception in Tanzania. Women with "lower primary" education were 2.27 times more likely to use contraception than women who had never attended school and the chance of using contraception increases further as the educational level increases beyond "lower primary". Women who had at least some secondary school education were 7.83 times more likely to use contraception than women without schooling. It is interesting to note that a woman's partner's education also has a significant effect, independently of her own educational level, the direction of this effect being the same, although the odds ratios are weaker. The fact that both the education of women and the education of their partners were significant indicates that these two variables have separate effects in determining contraceptive use.

The prevalence of contraception depends to a large extent on both the zone of residence and the type of place of residence. Tanzanian women residing in urban areas are 2.20 times more likely to use contraception than their counterparts residing in rural areas. Preliminary analysis showed that the chance of using contraception is not significantly different for women residing in the Central zone compared with those residing in the Southern, and Southern Highlands and Western zones. Therefore, these three zones have been combined and considered as the reference category. Women residing in Coastal and Northern zones were respectively 2.33 and 2.66 times more likely to use contraception than women in the reference category. In the preliminary analysis women residing in West Lake and Zanzibar zones

were less likely to use contraception than women in the reference category.

However, after including the significant two-way interaction between the zone of residence and the type of place of residence in the model, West Lake and Zanzibar zones ceased to be significantly different (at 0.05 level) from the reference category. Interestingly, women residing in urban areas in Coastal zone (which includes Dar es Salaam) are less likely to use contraception then women residing in rural areas in Central, Southern, and Southern Highlands and Western zones. Brass and Jolly (1993) have also found that, in Kenya, women residing in urban centres are less likely to use contraception than women residing in rural areas (after controlling for other factors). They argue that once other variables known to influence contraceptive use are controlled, "....there is nothing about urbanisation itself that is significant in increasing contraceptive use and in fact it can be a negative influence." (Brass and Jolly, 1993, p.160). Further, in a multivariate analysis for the pooled WFS and DHS data for Kenya, Ghana, Senegal and Sudan, Bertrand et al. (1993) have found that living in a major city had little or no direct effect on the knowledge of at least one modern method and on modern contraceptive use.

The analysis also suggests that the use of contraception is influenced by the number of living children, the number of previous marriages, the type of marriage and a woman's occupation. Women without a living child were less likely to use contraception and the chance of using a method increased as a woman's family became bigger. Women married more than once and women with a monogamous marriage were more likely to use a method than women married only once and women with a polygamous marriage. Since women working on farms did not have significantly different contraceptive prevalence than unemployed women (this is not surprising - see section 8.2 above), these two categories have been combined and treated as a reference

Table 8.4. Odds Ratios Associated with the Determinants of Current Contraceptive Use for the Parsimonious Model: Currently Married Women.

Variable	Odds Ratio	95% Confidence Interval
Constant	0.02*	0.012 - 0.030
Type of place of residence		
rural	1.00	-
urban	2.20*	1.600 - 3.016
Zone of residence		
Other zones[1]	1.00	-
Coastal	2.33*	1.683 - 3.238
Northern	2.66*	1.953 - 3.622
West Lake	0.73	0.512 - 1.032
Zanzibar	0.71	0.376 - 1.351
Highest educational level		
no schooling	1.00	-
lower primary	2.27*	1.657 - 3.100
upper primary	3.59*	2.706 - 4.774
secondary and above	7.83*	4.678 -13.120
Partner's highest educational level		
no schooling	1.00	-
lower primary	1.65*	1.178 - 2.300
upper primary	1.68*	1.226 - 2.289
secondary and above	2.20*	1.465 - 3.313
Current occupation		
agricultural&unemployed	1.00	-
traders&other workers	1.52*	1.168 - 1.982
professional&clerical	2.06*	1.462 - 2.908
Type of marriage		
monogamous	1.00	-
polygamous	0.69*	0.541 - 0.889
Number of previous marriages		
none	1.00	-
one or more	1.67*	1.268 - 2.203
Number of living children		
none	0.12*	0.062 - 0.236
1-2	0.65*	0.514 - 0.833
3-4	1.00	-
5-6	1.42*	1.068 - 1.887
7+	1.63*	1.187 - 2.249
Interaction between rural/urban residence and zone of residence		
rural and other zones[1]	1.00	-
urban and Coastal	0.41*	0.246 - 0.691
urban and Northern	0.56	0.279 - 1.123
urban and West Lake	0.60	0.242 - 1.479
urban and Zanzibar	0.54	0.215 - 1.349

Source: 1991/92 TDHS

Note: * significant at the 0.05 level
1 other zones include Central, Southern, and Southern Highlands and Western.

category. Women traders and women working in other types of jobs were found to be more likely to use a method of contraception than unemployed women or agricultural workers.

It is surprising to note that the age of a woman does not significantly influence the chance that she currently uses contraception after controlling for other variables. The variables "age squared" and "age cubed" were also included to test for a possible non-linear relationship (as was observed in the bivariate analysis). However, they were all insignificant. Moreover, the number of dead children and religious affiliation ceased to be significant factors in influencing current use of contraception after controlling for the variables listed in Table 8.4. Similar results on the number of dead children and religion have been found in some other parts of sub-Saharan Africa (see for example Agyei and Migadde, 1995).

Results for never-married women

The parsimonious model for the determinants of contraceptive use obtained for never-married women is presented in Table 8.5. All the variables found to influence contraceptive use for currently married women also influence it for never-married women, with the exception of variables referring to the partner's characteristics (which are, of course, not observed for never-married women). In addition, a woman's age is an important determinant of contraceptive use for never-married women. It seems that unmarried women are more likely to use contraception as they grow older. Moreover, the relationship is non-linear since the variable "age squared" is also found to be significant. However, the majority (more than 90 per cent) of these women are aged 24 years or less and their knowledge of family planning methods is very low (only 56 per cent know at least one method). This suggests that many unmarried women do not use family planning methods mainly because of a lack of knowledge of

Table 8.5. Odds Ratios Associated with the Determinants of Current Contraceptive Use for the Parsimonious Model: Never-Married Women.

Variable	Odds Ratio	95% Confidence Interval
Constant	0.00006*	0.000002 - 0.001359
Type of place of residence		
rural	1.00	-
urban	1.76*	1.083 - 2.870
Zone of residence		
Other zones	1.00	-
Southern H&W	0.50*	0.303 - 0.828
Zanzibar	0.06*	0.008 - 0.451
Highest educational level		
none and primary	1.00	-
secondary and above	4.09*	2.297 - 7.284
Current occupation		
unemployed	1.00	-
agricultural workers	2.10*	1.203 - 3.677
other workers	2.20*	1.250 - 3.860
Age of woman	1.58*	1.203 - 2.072
Age of woman squared	0.99*	0.987 - 0.998
Number of living children		
none	1.00	-
1+	3.20*	1.969 - 5.200

Source: 1991/92 TDHS
Note: * significant at 0.05 level
H&W stands for Highlands and Western

these methods. Even those who know about the availability of contraceptives, very few use a method.

The number of living children is a very strong predictor of contraceptive use for never-married women. Women with at least one living child are 3.2 times more likely to use a family planning method than women without a living child. Urban women use contraception more frequently than rural women. Never-married women residing in five zones (Central, Coastal, Northern, Southern and West Lake) use contraception almost to the same extent. But women residing in Zanzibar and the Southern Highlands and Western zone are less likely to use a method than those living in the five other zones. A

never-married woman needs to have at least secondary education in order to be significantly more likely (4.09 times) to use contraception than a woman with no schooling. The results for women's occupation show that agricultural workers and those in other types of jobs are, respectively, 2.1 and 2.2 times more likely to use contraception than unemployed women. As in the analysis of currently married women, the number of dead children and religion were not found to have any influence on use of contraception after controlling for other variables.

8.6 Conclusion

This chapter has examined the level of contraceptive knowledge and the extent of use among Tanzanian women. The variables known to influence the use of contraception are studied in order to understand the sub-groups of the population that are less likely to use family planning methods. The 1991/92 Tanzanian DHS data are used for this purpose. The analysis has been done separately for currently married women and never-married women.

Knowledge of family planning methods is very high in Tanzania, particularly among currently married women. The TDHS data show that 80 per cent of currently married women know at least one method. However, the level of awareness is lower for never-married women (only 56 per cent know at least one method). Whilst almost all sub-groups of currently married women demonstrate a high level of awareness, a majority of women in some sub-groups of never-married women do not know any family planning method. Specifically, unmarried women residing in rural areas, residing in Southern Highlands and Western zone, with no schooling or with only lower primary education, working in farms, without religious affiliation, and without any living child have low levels of awareness. It is important, therefore, for the Tanzania National Family Planning Programme (NFPP) to target women in these groups so as to raise the level of

awareness. This should be the initial step towards the goal of raising contraceptive prevalence in Tanzania.

Use of contraception is very low in Tanzania. According to 1991/92 TDHS data, the percentages of women aged 15-49 currently using any method are 10.4 and 5.9 for currently married women and never-married women respectively. The percentage of users is as low as 4.0 for some sub-groups of currently married women and 1.0 for some sub-groups of never-married women. Family planning methods are mainly used for spacing purposes and the modern methods most widely used are the pill, female sterilization and the condom. The common traditional methods are the calendar method and withdrawal. It is interesting to note that never-married women mainly use the calendar method. This is suggested to be a consequence of the lack of services related to modern methods which these women suffer. In most cases, young unmarried women cannot get services from Government family planning clinics. This prompts these women to choose traditional methods, which are considered to have low use-effectiveness.

A multivariate analysis of the determinants of current contraceptive use among non-pregnant women showed that, for currently married women, eight of the eleven variables chosen influenced the use of contraception significantly. Currently married women residing in rural areas, with no schooling, married to a man with no schooling, unemployed or working in farms, involved in polygamous marriages, married only once, or without a living child are less likely to use contraception than other women. Further, although contraceptive use is significantly higher among women residing in Coastal and Northern zones, women residing in urban areas in Coastal zone (which includes Dar es Salaam) are less likely to use contraception than women in rural areas in other zones. These women who are less likely to use contraception need to be given special attention by the NFPP if the gap between knowledge and use of contraception is to be narrowed.

The multivariate analysis for never-married women showed that use of contraception is less frequent for those residing in rural areas, residing in Zanzibar and Southern Highlands and Western zone, with no schooling or only primary education, who were unemployed, and who were without a living child. The variables influencing the use of contraception for never-married women were also found to influence currently married women with the exception of the age of women. It is interesting to note that unmarried women are more likely to use contraception as they become older and the association is non-linear.

It should be stressed that the majority of never-married women are teenagers. These women are still not free to use contraception as they wish, even if they do not know about the availability of contraceptives. Previously, these women were not allowed to have access to family planning services. Although this situation has been rectified, many staff members in MCH and UMATI clinics follow the unwritten rule that family planning advice can be given only to married clients (Justesen et al., 1992). This problem needs to be addressed urgently by the National Family Planning Programme because premarital sexuality is very prevalent in Tanzania, and premarital fertility and abortion rates are rising. A study conducted in Dar es Salaam referral hospital (Muhimbili Medical Centre), for instance, has shown that the majority of illegally induced abortions did occur to young and unmarried women (Justesen et al., 1992).

Chapter Nine

Unmet Need and Demand for Family Planning

9.1 Introduction

It has been shown in Chapter Eight that majority of women in Tanzania know at least one method of family planning but very few were actually using a method at the time of the TDHS interview. This situation can arise in many ways. Among the issues which have received attention in the literature is what is called the "unmet need" for contraception, that is, the proportion of women who are exposed to the risk of pregnancy but are not using contraception despite the fact that they want to limit or space their births. The proportion of women with unmet need along with the proportion of women currently using contraception provide family planning programme managers information on the magnitude of the potential demand for contraceptives and services. Therefore, it is important for family planning programmes to utilise the information about unmet need so as to understand the specific needs of women reproductive ages.

Women with unmet need are classified into two groups: those with unmet need for spacing births and those with unmet need for limiting births. The unmet need for limiting births refers to women who state not to want any more births. Women who state to want another birth in a period exceeding two years are considered to have unmet need for spacing. Recently, the definition of unmet need for contraception has been expanded to include pregnant and amenorrheic women who were unintentionally pregnant because they had been unable to use contraception (Westoff, 1988; Westoff and Ochoa, 1991; Westoff and Moreno, 1992). If a pregnant or amenorrheic woman states that her current pregnancy or the pregnancy for her most recent birth was not intended, it means access of contraception would have delayed or stopped that pregnancy. Thus, the woman will have unmet need for limiting births if she wanted no more births or the woman will have

unmet need for spacing births if she wanted to postpone her next birth.

This chapter uses data from the 1991/92 TDHS to estimate the magnitude of unmet need for contraception in Tanzania. The demographic and social variables associated with unmet need for contraception are then examined using bivariate analysis as well as multivariate analysis. Finally, the estimates of total demand for family planning are obtained by adding the proportion of women with an unmet need for contraception to the proportion of current contraceptive users. The analysis in this chapter will help to determine the existing and potential demand for the family planning services and hence suggest where the Tanzania National Family Planning Programme should direct its efforts.

The next section reviews different methods of estimation of unmet need which have been used in the past and justifies the approach taken in this analysis.

9.2 Methods of Estimation

Westoff and Pebley (1981) used WFS data for 18 countries to estimate the unmet need for contraception using twelve different combinations based on exposure and attitudinal criteria. The first measure of unmet need includes currently married women of reproductive age who are exposed to the risk of pregnancy but do not want any more children and are not using effective method. The second measure is similar to the first except that women using any form of contraception are classified as having a met need. In each of the ten other measures the definition of unmet need is made more stringent by the addition of the exposure or attitudinal criteria. Measure three includes women who stated that their desired number of children is less or equal to their actual number and measure four includes only fecund and non pregnant women.

Table 9.1 provides the twelve measures presented in Westoff and Pebley's (1981) paper. These measures result in different estimates of unmet need ranging from an average of seven to 40 per cent depending on which of the twelve criteria were used. However, measure four and nine have been suggested to be the most useful (Westoff and Pebley, 1981). According to measure four, the unmet need for contraception is defined as currently married women who want no more children, who are fecund and not pregnant and who are not using any form of contraception. Measure nine includes currently married women who want no more children, whose desired family size is less than or equal to their number of living children, who are not pregnant or infecund, who are not currently breastfeeding and who are not using any method of contraception.

Table 9.1. Definitions of 12 Measures of Unmet Need.

Criterion	Method											
	1	2	3	4	4A	5	6	7	8	9	10	11
Wants no more children	x	x	x	x	x	x	x	x	x	x	x	x
Desired no. ≤ actual			x					x		x	x	x
Fecund, not pregnant				x	x	x	x	x	x	x	x	x
Not breastfeeding							x		x	x		x
Not using effective method	x					x	x				x	x
Not using any method		x	x	x	x			x	x	x		

Source: Reproduced from Westoff and Pebley, 1981, p.127 (Table 1)

Westoff and Pebley have left the decision of the measure which suits the target population to be decided by those concerned with family planning programmes in the specific countries. The major limitation for Westoff and Pebley's procedure, however, is that the unmet need group includes only women who wanted no more children, that is, unmet need for limiting births. It implies that women with unmet need for spacing births are assumed not to have unmet need for family planning. This can seriously under-estimate the magnitude of unmet need particularly where contraceptive use for spacing purposes

is widespread. Westoff and Pebley (1981) acknowledge this problem. This method has been applied else where (see for example Boulier, 1984; Mturi, 1989; Shah and Ahmed, 1982).

Nortman (1982) has developed a model which incorporates both "limiters" and "spacers". Nortman defined birth spacers as women who want to postpone their next pregnancy for a period of one year or more from the time of the interview. The approach measured unmet need for contraception over a one-year period in which fractions of exposure were calculated. The estimates obtained using data from the six developing countries (Bangladesh, Colombia, Costa Rica, Korea, Mexico and Thailand) who participated in the Contraceptive Prevalence Surveys (CPS) suggest that the percentage of fecund and currently married women of reproductive ages with unmet need for contraception ranges from 22 to 67. The key feature of this method is that it incorporates time as a factor, which allows pregnant or amenorrheic women to rejoin the group of exposed women and require contraceptive protection for at least part of the time period under review (Nortman, 1982). The application of Nortman's method has been very limited because the method produces estimates which are very close to the current-status measures described below despite of its complexity of calculation and description (Westoff, 1988).

The most commonly used method for estimating unmet need for contraception is that given by Westoff (1988) and latter refined by Westoff and his colleagues (Westoff and Ochoa, 1991; Westoff and Moreno, 1992). This method uses current-status information given by currently married women to estimate the potential demand for contraceptives for spacing and for limiting births. Pregnant or amenorrheic women whose pregnancy was unintentional (mistimed or unwanted) are included in the group with unmet need in the recent past. This method has been widely used as a standard procedure for estimating unmet need for contraception using DHS data (details are given in Section 9.3). However, Dixon-Mueller and Germain (1992) have

argued that the method over-estimates the level of unmet need as (in some cases) a majority of women included in the unmet need group are not currently exposed to the risk of pregnancy. For instance, Dixon-Mueller and Germain were suspicious on the findings of Goldman et al. (1989) who estimated total unmet need for Peru in 1986 to be 29.4 per cent whilst only 7.6 per cent were assumed to be currently exposed to the risk of pregnancy (that is, currently sexually active).

The argument that Westoff's approach over-estimates the level of unmet need for contraception is supported by John Bongaarts in his paper "The KAP-Gap and the Unmet Need for Contraception" (Bongaarts, 1991). Bongaarts suggests a method which adjusts Westoff's procedure downwards (based on two arguments) to give upper and lower boundaries for the actual unmet need. He illustrates the method using 15 DHS surveys. The method assumes that fulfilling the unmet need for spacing reduces the unmet need for limiting by an equivalent amount among women who will have a need for limiting births. It is necessary therefore to have an adjustment factor which is subtracted from Westoff's estimates to show the reduction in the need for limiting resulting from satisfying spacing demands. This gives the maximum estimate. The minimum estimate is obtained by making a downward adjustment to correct the over-estimation of spacing needs. The point estimate is obtained by taking the mean of the maximum and minimum values which shows that, on the average, 17 per cent of currently married women in the 15 countries studied have unmet need for contraception. Westoff's approach gave a comparable figure of 21 per cent.

Bongaarts' approach has been criticized that it deals with what will be realized in the future given a steady state rather than giving an estimate of current need of which programme managers require (Westoff, 1992). However, Bongaarts argued that his approach

> "...can be interpreted either as the *current* unrealized contraceptive use that has resulted from unmet demand in the

past, or as the future rise in prevalence that could be achieved given present preferences for the timing and quantity of childbearing" (Bongaarts, 1991 p.127).

In other words, Bongaarts defines unmet need as the additional contraceptive use that would be required to achieve fertility levels consistent with women's stated reproductive intentions and to eliminate all mistimed and unwanted pregnancies. We adopt Westoff's (1988) methodology because the major interest of this analysis is to examine the current situation using most preferably current-status information. Furthermore, the simplicity of the method and the fact that it has been applied in many DHS surveys makes it possible to compare the estimates. The details of the computational procedure followed are given in the next section.

9.3 The computational Procedure

Westoff's approach first distinguishes women who are currently in a union from those who are not, and excludes never-married and formerly married women from the calculation of unmet need. The argument is that married women are exposed more to the risk of conception than are unmarried women. Generally unmarried women have lower levels of sexual activity and higher levels of infecundity than do married women (Dixon-Mueller and Germain, 1992). However, it is necessary to understand the extent of unmet need for particularly never-married women as premarital fertility has become very common in sub-Saharan Africa (Blesdoe and Cohen, 1993; Meekers, 1994) and these women are the least advantaged in having access to contraceptive services. Nevertheless, our efforts to obtain estimates for never-married and formerly married women were unsuccessful as these women were not asked the key questions used for the computations of unmet need. For instance, the questions on wanting to have more children in the future, and when to have them, were only asked to women currently in union. This study therefore presents results only for currently married women in the age range 15-49.

By definition, women have an unmet need for contraception if they are not using a contraceptive method but capable of conceiving, who are exposed to the risk of pregnancy, and who wish to avoid or to postpone pregnancy. Therefore women currently using some form of contraception or sterilized are assumed to have a met need. Dixon-Mueller and Germain (1992) have identified three groups of current users who can be said to have unmet need: (1) women who definitely want to avoid or postpone pregnancy but who are using an ineffective method (2) women who definitely want to avoid or postpone pregnancy but are using a theoretically effective method incorrectly or sporadically (3) women who, regardless of their reproductive intentions, are using a method that is unsafe or unsuitable for them. However, the effect of including these groups of women on the overall estimate of unmet need is minimal, particularly if the contraceptive prevalence of the country under investigation is low. No attempt is made in this analysis to include any of the current users in the unmet group.

Women not using contraception are classified into two categories: pregnant or amenorrheic and not pregnant or amenorrheic. For current pregnancy status, the TDHS asked "are you pregnant now?". The respondents were supposed to give one of the three answers, "yes", "no" or "unsure". Only those who answered "yes" are regarded as pregnant at the time of the interview. Pregnant women are further classified according to whether or not their current pregnancy was intended. The question which is used in this classification is: "at the time you became pregnant, did you want to become pregnant then, did you want to wait until later, or did you not want to become pregnant at all?". The responses to this question give the fraction of pregnant women who were pregnant unintentionally. If the pregnancy had occurred earlier than desired then it is unmet need for spacing births and if pregnancy was not wanted it is unmet need for limiting births. The major problem about the current pregnancy status classification is that many women in the early months of gestation,

do not know whether or not they are pregnant.

Currently amenorrheic women were identified by the response to the question "Has your period returned since the birth of (*name*)?", where *name* refers to the last birth. Women who answered "no" are considered amenorrheic and classified according to the intention of their most recent pregnancy. Amenorrheic women who wanted to postpone their last child for two or more years are considered to have an unmet need for spacing and those who stated to want no more children are considered to have an unmet need for limiting. Currently pregnant or amenorrheic women whose pregnancy was intended at the time at which it happened are excluded from the unmet need group.

Women who were neither pregnant nor amenorrheic are treated separately. The first thing to do with them is to distinguish the fecund from the infecund. Non-pregnant women who have been in a union for at least five years (without using contraception[30]) and who have not had a child are classified as infecund. All women who have had a child in the last five years or who have not had a child but who have been married for fewer than five years are assumed to be fecund. The infecund group also includes non-pregnant women who have not menstruated in the past twelve weeks. Infecund women are excluded from the unmet need category. We then classify fecund women who are not using contraception according to their reproductive intentions. Women who report wanting to postpone the next birth by at least two years from the time of interview are considered to have an unmet need for spacing and those report wanting no more births are considered to have an unmet need for limiting. Women who want another birth soon are excluded from the unmet need group.

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[30] Data on the timing of contraceptive use was not collected in the 1991/92 TDHS. Since contraceptive prevalence is still very low in Tanzania, we assume all ever-users of contraception have used a method in the five years prior to the interview date.

This analysis is done under the assumption that all currently married women who are not pregnant or amenorrheic but who are fecund are sexually active. It is possible that the levels of unmet need will be slightly over-estimated as some of these women are not really sexually active. One way of solving this problem is to exclude all women who stated that they were sexually inactive from the unmet need group. But, the reliability of data on sexuality has been questioned (Westoff, 1988). Finally, it is possible to combine all women with an unmet need for spacing with those with an unmet need for limiting; these together form the overall estimate of unmet need for contraception in Tanzania.

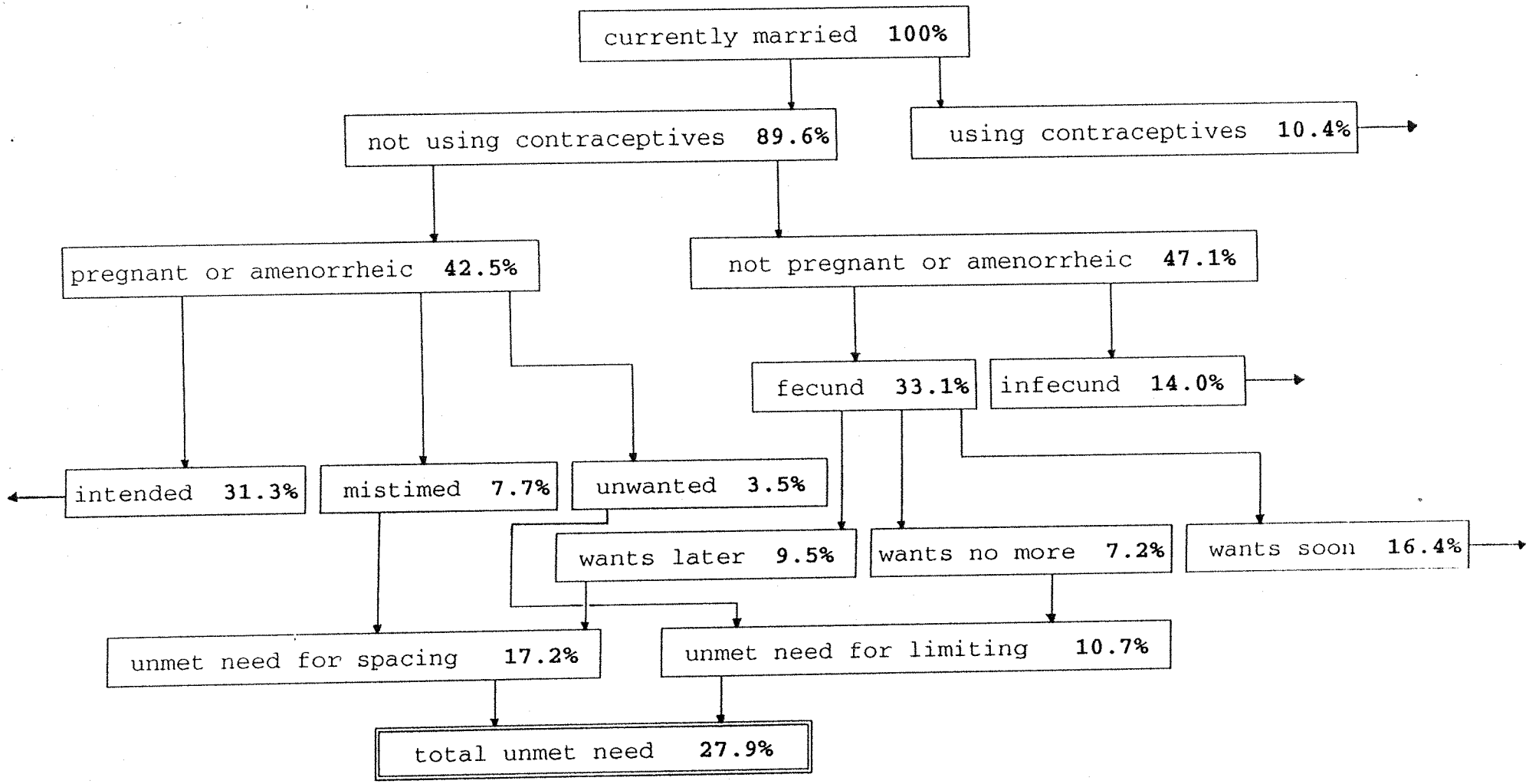
9.4 Estimates of Unmet Need and Demand for Contraception

The 1991/92 TDHS included 6,038 currently married women of reproductive age (15-49). These women were used as a denominator in the calculations of unmet need. Figure 9.1 shows the distribution of currently married women according to the components of unmet need for family planning. The figure shows that 72.1 per cent of currently married women were considered not to be in need of contraception due to the following reasons:

(i) current contraceptive users: 10.4 per cent,
(ii) infecund women: 14.0 per cent,
(iii) current or most recent pregnancy intended: 31.3 per cent,
(iv) want a child soon: 16.4 per cent.

The total unmet need for family planning among currently married women in Tanzania is 27.9 per cent; of which 17.2 per cent have unmet need for spacing births and 10.7 per cent want to limit births. These results are expected as spacing is the predominant family planning concern in sub-Saharan Africa. DHS data from other African countries have shown that estimates of unmet need range from 22 per cent (Zimbabwe) to 40 per cent (Togo), and that the unmet need for spacing exceeds that for limiting by a big margin in all

Figure 9.1 Estimates of the Unmet Need for Family Planning among Currently Married Women (15-49)



Source: 1991/92 TDHS

countries (Westoff and Ochoa, 1991; Westoff and Moreno, 1992).

The total demand for family planning is obtained by adding the unmet need to the current use of contraception. The estimated total demand is therefore 38.3 per cent (27.9 per cent unmet need and 10.4 per cent current contraceptive users). This implies that if every currently married Tanzanian woman in need of family planning uses a method, the contraceptive prevalence rate will raise from the current figure of 10.4 per cent to 38.3 per cent. It seems, therefore, that Tanzania has a moderate demand for family planning compared with other countries in Africa. The comparative study by Westoff and Ochoa (1991) found that the demand for family planning in sub-Saharan Africa ranged from 28 per cent in Mali to 65 per cent in Kenya and Zimbabwe. Nevertheless, there would be a considerable increase in contraceptive use in Tanzania if couples with unmet need were enabled to use a method.

9.5 Socio-Demographic Differentials in Unmet Need for Family Planning

Several variables have been noted to be associated with unmet need for contraception. Among the commonly mentioned covariates in the literature are age, education, the number of children and place of residence (Westoff and Ochoa, 1991; Westoff and Moreno, 1992). Table 9.2 shows a list of eleven covariates hypothesized to have a relationship with unmet need in Tanzania[31], along with the percentages of currently married women with an unmet need for spacing and for limiting. As expected, women over 35 years, women with four or more living children and women with two or more dead children have an unmet need for limiting which is higher than that for spacing. It seems that many of these women have achieved their desired family size that is why they do not want any more children. For all other

[31] The covariates used here are similar to those given in the analysis of current users of contraception presented in chapter 8. Therefore the explanation of these covariates will not be repeated in this analysis.

Table 9.2. Percentage of Currently Married Women with Unmet Need for Family Planning by Background Characteristics.

Characteristic	Unmet need for Spacing	Unmet need for Limiting	Total
Total	**17.2**	**10.2**	**27.9**
Type of place of residence			
rural	16.6	10.2	26.8
urban	19.4	12.5	31.9
Zone of residence			
Central	15.1	9.7	24.8
Coastal	21.1	12.6	33.7
Northern	20.6	16.9	37.5
Southern	19.8	10.8	30.6
West Lake	12.2	9.2	21.4
Zanzibar	26.8	8.9	35.7
Southern Highlands and Western	17.0	8.9	25.9
Highest educational level			
no schooling	13.0	12.5	25.5
lower primary	13.0	18.1	31.1
upper primary	23.0	6.5	29.5
secondary+	14.3	7.1	21.4
Partner's highest educational level			
no schooling	14.6	11.4	26.0
lower primary	13.2	14.9	28.1
upper primary	20.2	7.8	28.0
secondary+	17.8	12.3	30.1
Current occupation			
unemployed	17.1	11.2	28.3
agriculture	30.6	17.4	48.0
traders	18.1	12.9	31.0
other workers	15.3	11.6	26.9
Religion			
Moslem	19.8	10.9	30.7
Catholic	16.6	11.0	27.6
Protestant	19.7	10.9	30.6
others	10.2	9.5	19.7
Type of marriage			
monogamous	18.5	10.8	29.3
polygamous	13.6	10.5	24.1
Number of previous marriages			
none	13.6	11.6	25.2
one or more	18.2	10.5	28.7
Age group of women			
15-24	21.5	2.8	24.3
25-34	23.0	7.6	30.6
35-44	8.6	21.4	30.0
45-49	1.8	21.5	23.3
Number of living children			
none	3.6	1.5	5.1
1-2	20.2	2.8	23.0
3-4	23.3	8.1	31.4
5-6	16.7	18.3	35.0
7+	8.2	34.7	42.9
Number of dead children			
none	19.6	8.5	28.1
1	15.0	12.7	27.7
2	11.3	13.9	25.2
3	13.2	16.8	30.0
4+	7.4	21.0	28.4

Source: 1991/92 TDHS

categories of women, the unmet need for spacing is greater than that for limiting (except for women with lower primary education or women whose partners have lower primary education).

The highest levels of total unmet need (over 40 per cent) are observed for women who stated that they were working in the agricultural sector and those with seven or more living children. Since the majority of women in Tanzania are farmers, it is important for the National Family Planning Programme to provide family planning services to these women so as to reduce the number in the unmet need group. Ways of disseminating information about family planning and associated services need to be organized such that they reach these women. In order for the sub-group of women with seven or more children to decrease as a step towards the fertility transition, it is important to put emphasis on assisting these women to avoid unnecessary births. One strategy to achieve this would clearly be to reduce the number of women in this category with an unmet need for family planning.

Table 9.2 shows that the unmet need is relatively high for women with some formal education, and women residing in urban areas. This pattern is very similar to that observed in other African countries who have participated in the DHS (Westoff and Ochoa, 1991). There is a substantial difference in the amount of unmet need by zone of residence. West Lake and Central zones have the lowest percentage of women with unmet need, and the highest figures are observed in Northern, Zanzibar and Coastal zones. It seems that the areas with highest unmet need are those with highest percentage of women using contraceptives i.e. women residing in urban areas, Northern and Coastal zones. This close relationship between the level of unmet need and the existing contraceptive prevalence suggests that increasing contraceptive prevalence rates might generate further unmet need. Thus satisfying the existing unmet demand for family planning might have a "knock-on" effect.

Younger women have a higher unmet need for spacing whereas older women have a higher unmet need for limiting. Women in the middle of the fertile age range (25-34 and 35-44 age groups) have higher levels of total unmet need than younger and older women. The levels of unmet need are not very different by different religious groups, but women who do not belong to any of the three major religions have a relatively low level of unmet need. Finally, the bivariate analysis shows that women in monogamous marriages and those married more than once have a higher level of unmet need than their counterparts in polygamous marriages or married only once.

9.6 Multivariate Analysis of the Determinants of Unmet Need

The findings presented in Table 9.2 give the general picture of determinants of unmet need when each covariate is examined by itself. For a better understanding of the determinants of unmet need, it is necessary to look at all covariates hypothesized to affect unmet need in a multivariate perspective. As in the bivariate analysis, it is interesting to examine the determinants of unmet need for spacing separately from the unmet need for limiting. This implies that the response variable has three categories: unmet need for spacing, unmet need for limiting, and no unmet need. The multinomial logit model is therefore the best statistical technique to apply. However, the coefficients from a multinomial logit model are expected to be equal to coefficients obtained when performing two binary logit models with the same reference category for the response variable (Begg and Gray, 1984).

In this analysis two binary logit models have been fitted. The response variable for the first model has two categories: unmet need for spacing (coded 1) and no unmet need (coded 0). Also, the response variable for the second model has two categories: unmet need for limiting (coded 1) and no unmet need (coded 0). The eleven predictor variables used are the same in both models. The covariates used are

listed in Table 9.2 along with the categories as introduced in the logistic regression except for age of women which is used in a continuous form (ranging from 15 to 49 years). In order to control for the possibility of a non-linear relationship between age of women and unmet need, "age-squared" and "age-cubed" are included in the models.

The results for the binary logistic models are given in Table 9.3. The woman's partner's highest educational level was dropped after the preliminary analysis because of its high correlation with the woman's highest level of education. Type of place of residence and number of previous marriages did not influence unmet need in either model. Four variables: zone of residence, education of women, age of women and number of living children were found to be significant in both models. Whilst rural/urban residence and number of dead children have an impact only on the unmet need for limiting, occupation and religion were found to affect only the unmet need for spacing. None of the two-way interactions were found to be significant.

For a better understanding of the results given in Table 9.3, it is helpful to construct a multiple classification analysis (MCA) table which shows the probabilities of having an unmet need for spacing and for limiting. The details of the procedure used to calculate such a table are given in Retherford and Choe (1993) and reproduced in Appendix 3. The results obtained are presented in Table 9.4. The probabilities of having an unmet need for spacing and limiting births are estimated for covariates found to be significant in the logistic regression. As expected, the probability of having unmet need for spacing is much higher than that for limiting across all the covariates with two exceptions; women aged 45 years and women with no living child. It is not surprising to find out that women approaching the end of their childbearing ages have a higher probability of having an unmet need for limiting than for spacing

Table 9.3. The Coefficients of the Parsimonious Logistic Regression Models for the Determinants of Unmet Need.

Characteristic	Unmet need for Spacing	Unmet need for Limiting
Constant	-0.852	5.203
Type of place of residence		
urban	-	RC
rural	-	-0.355*
Zone of residence		
Central	RC	RC
Coastal	0.492*	0.263
Northern	0.464*	0.391*
Southern	0.526*	0.107
West Lake	-0.368*	-0.285
Zanzibar	0.704*	-0.115
Southern Highlands and Western	0.128	-0.122
Highest educational level		
no schooling	RC	RC
lower primary	-0.095	0.245*
upper primary	0.170*	0.212
secondary+	-0.237	-0.140
Current occupation		
unemployed	RC	-
agriculture	0.232*	-
traders	0.035	-
other workers	0.036	-
Religion		
Moslem	RC	-
Catholic	-0.087	-
Protestant	0.153	-
others	-0.351*	-
Age of women		
age	-0.083*	-0.669*
age - squared	-0.003*	0.020*
age -cubed	-	-0.0002*
Number of living children		
none	-3.258*	-2.269*
1-2	-0.784*	-1.163*
3-4	RC	RC
5-6	0.492*	0.910*
7+	0.836*	1.830*
Number of dead children		
none	-	RC
1	-	-0.039
2	-	0.067
3	-	0.138
4+	-	0.502*

Source: 1991/92 TDHS
Note: RC indicates the reference category
- denotes the covariate not significant
* indicates the category is significant at 0.05 level

(refer also to the bivariate analysis). Women without a living child have negligible probabilities of having any unmet need as most of them want to have a child as soon as possible.

Women residing in Zanzibar, Southern, Coastal and Northern zones have a higher unmet need for spacing than those living in other zones. A woman residing in Zanzibar has a chance of having unmet need for spacing 14 percentage points greater than a woman living in West Lake regions. The variation in the level of unmet need for limiting births is minimal across types of place of residence and zones of residence. The same pattern of probabilities is observed across educational levels of women, with highest chance of having unmet need being registered by women in the "upper primary" category. Women working in the agricultural sector have the highest unmet need for spacing whereas other occupational categories give probabilities similar to one another. The probabilities for women in the three main religious groups do not differ by a big margin but women who stated that they had no religion or followed traditional faiths have a lower probability of unmet need for spacing purposes. These results are very similar to those obtained for the bivariate analysis presented in Table 9.2.

The age of women gives interesting results. In both models, the relationship between age and unmet need is found to be significant and non linear. The probabilities of having unmet need for both spacing and limiting were computed at ages 15, 25, 35 and 45 (the beginning of the intervals used in the bivariate analysis). Women aged 15 years have the highest levels of unmet need for spacing births (33 per cent) as well as for limiting births (13 per cent). These levels decrease as women grow older. By age 25, the probability of having an unmet need for spacing has reduced to 0.25, and for limiting, to 0.05. The lowest probabilities of having any unmet need are observed for older women. These results suggest that young women are in need of family planning services despite the fact that they

Table 9.4. Multiple Classification Analysis (MCA) Table Showing the Estimated Percentages Having Unmet Need.

Characteristic	Probability of unmet need for Spacing	Limiting	
Type of place of residence			
urban	-	5	(1312)
rural	-	3	(4726)
Zone of residence			
Central	13	4	(1386)
Coastal	20	4	(754)
Northern	19	5	(608)
Southern	21	4	(948)
West Lake	10	3	(1100)
Zanzibar	24	3	(168)
Southern Highlands and Western	15	3	(1073)
Highest educational level			
no schooling	15	3	(2505)
lower primary	14	4	(879)
upper primary	17	4	(2500)
beyond primary	12	3	(154)
Current occupation			
unemployed	14	-	(1814)
agriculture	17	-	(3224)
traders	14	-	(680)
other workers	14	-	(320)
Religion			
Moslem	16	-	(1834)
Catholic	15	-	(1761)
Protestant	18	-	(1412)
others	12	-	(1031)
Age of women			
15	33	13	na
25	25	5	na
35	9	5	na
45	2	4	na
Number of living children			
none	1	1	(619)
1-2	11	1	(2059)
3-4	21	4	(1539)
5-6	29	8	(1090)
7+	33	17	(731)
Number of dead children			
none	-	3	(3663)
1	-	3	(1401)
2	-	4	(532)
3	-	4	(280)
4+	-	6	(162)

Source: 1991/92 TDHS
Note: (-) indicates the probabilities among the categories are not significantly different from each other, na stands for not applicable and numbers in parentheses show the total number of cases for each category.

are the least advantaged in family planning service provision.

The probability of having unmet need increases as the number of living children rises. However, the probability of having unmet need for limiting births does not change until women achieve at least three living children. Women with seven or more children have a very high probability of having unmet need: 0.33 for spacing and 0.17 for limiting. With regard to the number of dead children, the probability of having an unmet need for limiting increases as the number of dead children rises. It becomes substantial for women with at least four dead children. This sub-group of women has a high number of children ever born, which might discourage them from wanting any more births. Also, it is possible that birth complications in the past which caused deaths of previously born children might discourage women from having more children.

9.7 Total Demand for Family Planning

As noted earlier, the total demand for family planning is the sum of those currently using contraception and those with an unmet need. This produces the prevalence rate which would be achieved if all women who need family planning can use a method. Table 9.5 presents the total demand for family planning, along with percentage of women currently using a method (satisfied demand) and percentage of women who want either to space or limit their births (unsatisfied demand). Overall the demand for family planning in Tanzania is 38.3 per cent. It seems that the demand for family planning is moderate by African standards. Westoff and Ochoa (1991) have demonstrated that Kenya, Zimbabwe and Botswana have the highest demand in the region (over 60 per cent) and Mali has the lowest demand (28 per cent).

The pattern of demand for family planning by area of residence is very similar to that observed for both current use and unmet need. That is, women residing in urban areas, Northern and Coastal zones

Table 9.5. Percentage of Currently Married Women According to Demand for Family Planning and Background Characteristics.

Characteristic	Current users[1]	Unmet need[2]	Total
Total	**10.4**	**27.9**	**38.3**
Type of place of residence			
rural	8.4	26.8	35.2
urban	17.8	31.9	49.7
Zone of residence			
Central	7.9	24.8	32.7
Coastal	15.5	33.7	49.2
Northern	24.0	37.5	61.5
Southern	8.0	30.6	38.6
West Lake	6.5	21.4	27.9
Zanzibar	7.1	35.7	42.8
Southern Highlands and Western	9.2	25.9	35.1
Highest educational level			
no schooling	3.7	25.5	29.2
lower primary	11.9	31.1	43.0
upper primary	14.9	29.5	44.2
secondary+	41.7	21.4	63.1
Partner's highest educational level			
no schooling	4.3	26.0	30.3
lower primary	9.0	28.1	37.1
upper primary	12.0	28.0	40.0
secondary+	26.6	30.1	56.7
Current occupation			
unemployed	9.8	28.3	38.1
agriculture	7.3	48.0	55.3
traders	16.8	31.0	47.8
other workers	31.8	26.9	58.7
Religion			
Moslem	11.1	30.7	41.8
Catholic	10.9	27.6	38.5
Protestant	14.7	30.6	45.3
others	2.5	19.7	22.2
Type of marriage			
monogamous	11.9	29.3	41.2
polygamous	6.5	24.1	30.6
Number of previous marriages			
none	6.0	25.2	31.2
one or more	11.5	28.7	40.2
Age group of women			
15-24	8.5	24.3	32.8
25-34	11.9	30.6	42.5
35-44	11.9	30.0	41.9
45-49	7.1	23.3	30.4
Number of living children			
none	1.8	5.1	6.9
1-2	10.7	23.0	33.7
3-4	11.1	31.4	42.5
5-6	11.4	35.0	46.4
7+	14.0	42.9	56.9
Number of dead children			
none	12.2	28.1	40.3
1	8.1	27.7	35.8
2	8.0	25.2	33.2
3	5.8	30.0	35.8
4+	6.6	28.4	35.0

Source: 1. Table 8.2
2. Table 9.2

have higher demand than their counterparts residing in rural areas and other zones. As expected, the demand for family planning increases as the education of the woman or her partner's education rises. It is interesting to note that women with secondary education or above have a demand of more than twice (63 per cent) that of women without formal education (29 per cent). Obviously, this pattern is influenced by the high percentage of users among educated women or women with educated partners. There is also a positive relationship between the number of living children and the demand for family planning. The demand is lowest (seven per cent) for women without a child and highest (57 per cent) for women with seven children.

It can be concluded, therefore, that the analysis indicates that type of place of residence, zone of residence, a woman's education, her partner's education and the number of living children a woman has are highly associated with the demand for family planning in the expected direction. Women stated to be working in "white" collar jobs, manual and non-manual jobs, and farmers have higher demand than traders and women stated to be unemployed. However, as noted earlier, the occupation categories (particularly unemployed and farmers) reflect what a woman considers herself to be doing rather than what she is actually doing. The other covariates given in Table 9.5 do not appear to be related to total demand. Nevertheless, the demand for family planning is observed to be highest for Protestants, women in monogamous marriages, women married more than once, women in the age range 25-44 years and women without dead children, compared with other women.

9.8 Concluding Remarks

This chapter has demonstrated the magnitude of unmet need for contraception in Tanzania applying Westoff's (1988) methodology to the 1991/92 Tanzania Demographic and Health Survey data. The total unmet need is estimated to be 27.9 per cent among currently married

women. Most of these have an unmet need for spacing births (17.2 per cent) rather than for limiting births (10.7 per cent). The sum of the unmet need and current contraceptive use (10.4 per cent) gives a total demand for contraception of 38.3 per cent. It seems, therefore, that Tanzania has a moderate demand for family planning according to sub-Saharan African standards.

The same covariates observed to be associated with unmet need elsewhere (i.e. age, education, number of living children and residence of women) are also found to have a significant effect in Tanzania. It should be noted however that the 1991/92 TDHS reveals that zone of residence is a stronger predictor of unmet need than rural/urban residence. Furthermore, zones with relatively high contraceptive prevalence seem also to have higher levels of unmet need than other zones. Other covariates noted to affect unmet need significantly include women's occupation, religion, and number of dead children. To sum up, the highest probabilities of having unmet need are observed for young women, women with at least three living children, women with upper primary education and women working in the agricultural sector. The National Family Planning Programme needs to target these women if a considerable rise in contraceptive acceptance rate is to be realised in the near future.

Chapter Ten

Summary and Conclusions

10.1 Issues Involved

As in most African countries, fertility in Tanzania is very high by world standards. Unfortunately, nothing much has been done to understand fertility and its determinants at national-level despite the Government of the United Republic of Tanzania (URT) being aware and concerned about the high levels of fertility. This fertility level has played a significant role in causing a high population growth rate, estimated to be around 3.0 per cent per year. As a consequence, the Government of URT has established a Tanzanian National Population Policy (TNPP), which, among other things, encourages a reduction in fertility.

It is essential therefore to study the prevailing situation of fertility so as to be able to assess the TNPP in the future. The completion of the 1991/92 Tanzania Demographic and Health Survey (TDHS) provides the first set of data suitable for a detailed study of fertility and the use of family planning methods at the national-level. The TDHS interviewed a nationally representative sample of 9,238 women aged between 15 and 49 years. The responses given by these women have been used to examine reproductive behaviour for Tanzanian women and to suggest possible measures which can be taken in order to reduce fertility. In addition to the 1991/92 TDHS, data from 1967, 1978 and 1988 Censuses have been used to study fertility trends in Tanzania. Other issues discussed in detail in this study include birth interval dynamics, breastfeeding practices, and contraceptive use.

Other scholars have cautioned not to generalize from the experience of other parts of the world in determining the probable trends of fertility in sub-Saharan Africa. Indeed, the review of literature has shown major differences in factors affecting fertility and its components in different countries. We hypothesize that the factors observed elsewhere to influence fertility or its components also do so in Tanzania, and then test the effects

by fitting the appropriate statistical models. The summary of the results are given in the next section.

10.2 Summary of Findings

The initial step was to examine current levels and recent trends in fertility in Tanzania. Basing on the four years prior to the 1991/92 TDHS, a Tanzanian woman bears 6.1 children before the end of her childbearing years. This level of fertility is moderate when compared with other African countries. However, there does appear to have some decline in fertility during the recent past. The 1978 population census data give a TFR of 7.2 which is consistent with the TFR given by 1991/92 TDHS for the period 1980-84 of 7.0. The TFR for mid-1980s calculated from both data sources i.e. the 1988 census and 1991/92 TDHS is 6.5. Therefore, it can be concluded that the Tanzanian fertility has declined by about one child per woman from early 1980s (or late 1970s) to early 1990s. This can be regarded as a substantial decline in fertility by sub-Saharan African standards. It should be stressed, however, that this level of fertility is still very high.

The major proximate determinant of fertility in Tanzania is universal and prolonged breastfeeding through its effect on postpartum infecundability, and the second is marriage. As it is in many other sub-Saharan African countries, the use of contraception is not wide-spread in Tanzania and therefore its effect in reducing fertility is minimal. Unfortunately, the importance of induced abortion as a fertility-inhibiting variable could not be assessed in this study because of non-availability of data. This is likely to affect the estimation of total fecundity rate as induced abortion is known to be rising in Tanzania (Justesen et al., 1992; Mpangile et al., 1993).

The analysis of the determinants of the number of children ever born suggests that the decline in fertility in the recent past is a result of a rise in the age at first marriage for women, a decline in infant and child mortality, a rise in the percentage of literate population (particularly for women), and rural development. It has been observed that women in monogamous

marriages have higher fertility than women in polygamous marriages even after controlling for other variables. Similar results were found by Henin's (1979) study on Tanzania. This can be due to the fact that women in polygamous marriages have a reduced frequency of sexual intercourse compared with women in monogamous marriages.

The study of over-all fertility gives a general outlook of the situation prevailing in a country. In order to provide further insights into mechanisms underlying fertility change, the components of fertility need to be examined. The determinants of birth intervals are studied for this purpose. Other things being constant, prolonging intervals between births reduces the number of children a woman can have during her childbearing period. Therefore factors found to prolong birth intervals should be encouraged if a programme of lowering fertility is to be successful. The application of the proportional hazards model to 1991/92 TDHS data has shown that breastfeeding practices is one of the major determinants of fertility in Tanzania. It is interesting to note that the effect of breastfeeding on birth intervals is stronger even beyond postpartum amenorrhea and postpartum abstinence.

A birth interval is observed to be shorter for mothers whose index child is dead than if the child is alive. The effect of death of a child on birth intervals is noted to be independent of cessation of breastfeeding. Unfortunately, the use of contraception could not be included in the analysis because the timing of use was not given for specific birth intervals. The DHS surveys conducted in countries where levels of contraceptive prevalence are high, asked questions about contraception for each calendar month. If such information is available, it is possible to examine the effect of use of contraception in each birth interval. However, it is important to encourage people to use modern family planning methods since breastfeeding at an individual level is not a very efficient contraceptive.

The study of birth intervals has shown that older women, who have at least secondary education, who reside in urban areas, who are in polygamous marriages, and whose index child is a boy have much longer birth intervals

than other women. All these findings are as expected. Women residing in rural areas and those who are not educated or have low education tend to space their children close together than women residing in urban areas and those who are more educated if other factors (such as breastfeeding) are controlled. It is not surprising for older women to have longer birth intervals since as a woman grows older her fecundity declines. Also, most of the women in polygamous marriages will adhere to traditional customs and values and these are in favour of long intervals between births (at least in African context). Further, there are differentials of birth interval lengths according to zone of residence: women residing in Coastal and Southern zones have shorter intervals between births than other zones. This study suggests that programmes geared to prolong birth intervals should target the regions separately and special emphasis should be given to young mothers residing in rural areas.

As noted above, the universal and prolonged breastfeeding in Tanzania has been noted to play a major role in lengthening birth intervals and consequently lower fertility levels. Also there are several health benefits of breastfeeding for the mother and the child. Since the Government of the URT has taken positive measures in encouraging breastfeeding, it is worthwhile studying the factors affecting breastfeeding in Tanzania. This analysis has considered only the determinants of duration of breastfeeding due to the fact that almost all Tanzanian women breastfeed their children; with a median duration of about 21 months. Retrospective data on the duration of breastfeeding as well as current status on whether a child is breastfeeding or not at the time of 1991/92 TDHS have been utilized, and the proportional hazards model is the multivariate technique applied for both data sets.

The duration of breastfeeding for a Tanzanian women is mainly determined by her rural/urban residence, her zone of residence, her age and her parity. This is true for both types of data utilized. Women giving birth at an old age (30 years or beyond), at parity beyond fourth and residing in rural areas breastfeed for longer durations than their counterparts who give birth at a young age, at parities 1-4 and reside in urban areas respectively. It seems the erosion of the duration of breastfeeding is more serious in West Lake and

Central zones, where women breastfeed for shorter durations compared with other zones. Probably short breastfeeding durations is a predictor for relatively shorter birth intervals observed in the West Lake zone.

It is important therefore to design programmes focusing on urban mothers, young as well as mothers with few children in order to maintain the long durations of breastfeeding already existing in Tanzania. The results for the study of breastfeeding also suggest a possibility of regional differentials. It should be noted however that the social and economic differentials in the duration of breastfeeding are rather small in Tanzania.

Another area of much concern in studies of reproductive behaviour is the consequences of the different reproductive patterns to the wellbeing of the population. This is even more important in Tanzania where the main rationale for providing family planning through the Ministry of Health has been to improve the health of mothers and children. It is important therefore to study the effect of change of reproductive patterns on infant mortality. That is, if we assume the National Family Planning Programme (NFPP) to be very successful and reduce (or eliminate) the high-risk births, what is going to happen on infant mortality rates?.

The analysis has shown a strong association between family formation patterns and infant mortality in Tanzania. The current maximum potential reduction in infant mortality if all births to high-risk groups are eliminated is 7.8 per cent. The potential impact of postponing births with short birth intervals on infant mortality is the highest followed by eliminating teenage births. This analysis shows that a very small reduction (1 per cent) in infant mortality levels will be achieved if the family formation pattern of Tanzania changes to follow that of Zimbabwe, which is considered more favourable. However, if the family formation pattern of Tanzania follows that of Brazil (which is less favourable), infant mortality rate will be higher by 9.8 per cent. The implication of this finding is that encouraging people to maintain the practise of traditional spacing methods should be integrated with policies to encourage the use of modern contraceptives.

Levels and determinants of contraceptive use are discussed in Chapter Eight. Women are analysed in two separate groups: never-married women and currently married women. The 1991/92 TDHS reveals that 10.4 per cent of currently married women and 5.9 per cent of never-married women were using some sort of contraception at the time of interview. These levels are very low compared with the level of knowledge of contraception which is 80 per cent for currently married women and 56 per cent for never-married women. The recent (1994) Tanzania Knowledge, Attitudes and Practices Survey (TKAPS), however, has indicated that contraceptive use in Tanzania has almost doubled (to 20.4 per cent) in a period of less than three years among currently married women (Weinstein et al., 1995).

Family planning methods are mainly used for spacing purposes in Tanzania; the pill being the leading method. Whilst female sterilization is also popular among the older women, use of condoms was stated to be the second popular modern method (after the pill) among never-married women. It is interesting to note that never-married women mainly use the calendar method. This is suggested to be a consequence of the lack of family planning services offered to these women. Young women who are not married used not to have access to family planning clinics. Although the Government has tried to reverse its decision on these women, still it looks awkward for, say, a teenage school girl to visit a family planning clinic. It is essential therefore for the NFPP to focus on young and unmarried women as premarital sexuality and childbearing seem to be a serious problem in sub-Saharan Africa (Meekers, 1994).

The determinants of contraceptive use in Tanzania are very similar to those found elsewhere. Rural women, with no schooling, married to a man with no schooling, unemployed or working in farms, involved in polygamous marriages, married only once, and without a living child are less likely to use contraception than other women. The differential of contraceptive use by zone of residence is also substantial. Women residing in Zanzibar, West Lake, and Southern Highlands and Western zones are less likely to use contraception than other zones. Furthermore, unmarried women who are young are less likely

to use contraception than older unmarried women. All these women need to be given special attention by the NFPP in order for the contraceptive acceptance rate to rise in Tanzania.

The last analytical chapter deals with unmet need and demand for family planning. A major focus was to examine the proportion of women exposed to the risk of pregnancy but are not practising contraception. In most societies this has been a very serious problem since the impact of unmet need on fertility over a period of time may be very significant even if the magnitude of unmet need at any point in time is small. The method developed by Westoff (1988) and later adopted as DHS methodology (Westoff and Ochoa, 1991) was applied to investigate the unmet need for family planning for Tanzanian women.

The total unmet need is estimated to be 27.9 per cent among currently married women. Most of these women have an unmet need for spacing births (17.2 per cent) rather than for limiting births (10.7 per cent). The total demand for family planning in Tanzania is therefore 38.3 per cent. Women observed to have the highest probability of having an unmet need are young, with at least three living children, with upper primary education, and working in the agricultural sector. The zone of residence is also found to be a stronger predictor of unmet need. It is evident from the findings that the areas with highest percentage of contraception users also have highest percentage of women with unmet need. This suggests that satisfying the existing unmet demand for family planning might have a "knock-on" effect.

10.3 Policy Implications

This study has attempted to shed some light on Tanzanian fertility and the related aspects. The individual-level analysis carried out has answered a number of questions on the levels, trends and determinants of fertility in Tanzania. A very clear point from this study is that fertility in Tanzania is still very high, but has started to decline. The effort by the Government of URT to encourage a reduction of fertility among her people should be supported fully so as to reduce the population growth rate. The imbalance between the

population growth rate and the economic growth in Tanzania has been discussed elsewhere (see for example Mturi and Hinde, 1995).

The study has also shown that various sub-groups of the population are less disadvantageous in terms of controlling their reproductive patterns. The level of awareness of family planning methods is high but few women are using contraception. The NFPP has a task of providing family planning services to all those who need them. If every woman who is a potential contraceptive user is given the facilities, the contraceptive prevalence rate will raise to at least 38 per cent. It seems therefore that among the motivated women to delay or to limit their births, the majority do not have access to the family planning services. As an initial step, this group of women should be targeted.

The issue of unmarried women should be addressed more critically since most of these women (although young) are sexually active. Because contraceptive use by teenagers has remained low, the high prevalence of premarital sexuality will be reflected in an increase in premarital childbearing. As noted earlier, these women are still not free to use contraceptives even if they want to, let alone the problem of the lack of knowledge on the availability of contraceptives. The thinking of many people (particularly MCH and UMATI members of staff) that family planning services are for married women should be criticized very strongly. Different ways of motivating young women who are sexually active to use contraception should be developed. Among the first attempts perhaps should be to introduce sex education in primary and secondary schools.

It is important for the Government to maintain the existing levels of breastfeeding durations. Tanzania is one of the leading countries in terms of the duration women breastfeed their children. The long intervals between births observed in Tanzania are mainly due to postpartum infecundability which is a result of prolonged breastfeeding. If it happens that Tanzania experiences a decline in breastfeeding durations, the task of NFPP to reduce fertility will even be more difficult because any rise in contraception use will only compensate the decline in breastfeeding. The Government of URT

should therefore continue to encourage women to breastfeed their children for longer durations.

10.4 Further Work

There are various areas which need further research. This study has just given a highlight of Tanzanian fertility at national-level as this type of study has not been conducted before. Many issues discussed therefore need a further analysis to understand better the reproductive behaviour of Tanzanian women. The onset of fertility transition observed in this study is by no means conclusive. Efforts should be made to confirm the magnitude of fertility decline and the factors responsible for this decline. There is a need to use prospective data for this purpose. Since regional variations in fertility have been observed, a thorough understanding as to why the differences between the regions appear should be addressed. This will assist planners and policy makers to distribute the limited resources sensibly.

The analysis of breastfeeding data need to be done more closely. The attempt to compare retrospective data and current status data done here encourages a further analysis. Perhaps prospectively collected data will help to understand better the determinants of breastfeeding in Tanzania. This approach can also take care of the problem of heaping observed in retrospective data. In other words, a prospective study will tell if the preference of digits which are multiples of six are genuine or not.

It has been stated that the rationale for providing family planning services in Tanzania is to improve the health of mothers and children. The present study has examined only one aspect, that is, the relationship between infant mortality rates and family planning policy. It will be interesting also to examine the relationship between maternal mortality rates and family planning policy. This area has not received much attention in the literature because of a lack of data on maternal mortality. But, there is a chance that family planning programmes are effective in reducing maternal mortality rates. It is particularly important to investigate if reduction of higher parity

births and higher maternal age births have any impact on maternal mortality.

The analysis of trends and determinants of contraceptive use can be done using the 1994 TKAPS data. The most interesting aspect will be to examine the changes in the effects of explanatory variables between the 1991/92 TDHS and the 1994 TKAPS. Furthermore, the levels and determinants of unmet need for family planning and demand for family planning can be repeated using the 1994 TKAPS. Unfortunately, the 1994 TKAPS data set was not available at the time of conducting this study.

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Appendices

Appendix 1. Calculation of Age Specific Fertility Rates (ASFRs)

Usually ASFRs are computed by dividing the number of births by the number of women in each five-year age group of women in a calendar year. That is,

$$ASFR(i) = Births(i)/Women(i) \qquad (A1.1)$$

where *i* stands for five-year age groups 15-19, 20-24, ..., 45-49, *Births(i)* stands for births to women in age group *i* and *Women(i)* stands for number of women in age group *i*. However, equation (A1.1) can only be used if the number of births and the number of women in each age group are known in a calendar year. This is not the case when dealing with survey data. The denominator of equation (A1.1) for survey data needs to be replaced by the woman-years of exposure in each age group, during a specified period of time. Therefore equation (A1.2) is more appropriate for the computation of ASFRs using the survey data.

$$ASFR(i,t) = Births(i,t)/Exposure(i,t) \qquad (A1.2)$$

where *t* is the time period under consideration and *exposure(i,t)* is the woman-years of exposure among women in age group *i* during time period *t*.

The fertility rates have been calculated for three four-year periods prior to the survey. The most recent period (April 1988-March 1992) was considered separately because of the different interview dates for women. The TDHS was conducted from October 1991 to March 1992, and women reported their reproductive history up to the date of interview. For the computation of exposure period therefore, the

woman's age was computed at the beginning of the period (i.e. April 1988) after which the period each woman spent in different age groups was computed by taking into account her interview date. For instance, consider a woman aged exactly 14 years in April 1988 and interviewed in October 1991. She will contribute to only 15-19 age group for the period April 1989 to October 1991, that is, 2.58 years. A woman aged exactly 18 years in April 1988 and interviewed in February 1992 will contribute 2.00 years to the age group 15-19 and 1.83 years to the age group 20-24. The sum of all exposure periods in each age group forms the denominator of equation (A1.2). The numerator of the equation includes all births born in the period April 1988-March 1992.

The woman-years of exposure for the other two periods (April 1980-March 1984 and April 1984-March 1988) were computed using a method previously used by Madise (1993) since the beginning and the end of the period is the same for all women. The initial step was to get the distribution of women in single years at the end of each period. The contribution for women of each age is considered separately to each age group in the entire four year period. For example, the number of woman-years of exposure for age group 15-19 will be:

$$0.5W_{15}+ 1.5W_{16}+ 2.5W_{17}+ 3.5W_{18}+ 4.0W_{19}+ 3.5W_{20}+ 2.5W_{21}+ 1.5W_{22}+ W_{23}$$

where W_{15} is the number of women aged 15 years at the end of the period, W_{16} is the number of women aged 16 years etc. The number of births to women aged 15-19 will be:

$$0.125B_{15}+ 0.375B_{16}+ 0.625B_{17}+ 0.875B_{18}+ B_{19}+ 0.875B_{20}+ 0.625B_{21}+ 0.375B_{22}+ 0.125B_{23}$$

where B_{15} is the number of births to women aged 15 years at the end of the period. A ratio of the births to the woman-years of exposure gives the ASFR for women in age group 15-19. This can be repeated to

all other age groups of women. However, due to the problems explained in the text, ASFRs are computed for only five age groups of women: 15-19, 20-24, 25-29, 30-34 and 35-39. These formulas assume that the births are evenly distributed across the interval and also assumes that women aged 15 at the end of interval, for example were on the average 15.5 years old. This implies that one eighth of the births born to women aged between 15 and 19 years in the four years prior to the survey are assumed to have been born to women aged 15.5 years.

Appendix 2. Data Used to Estimate the Bongaarts' Model

A. Estimation of C_m

Age of women	ASFR	m(a)	g(a)
15-19	0.195	0.254	0.2924
20-24	0.267	0.685	0.3898
25-29	0.251	0.795	0.3157
30-34	0.208	0.806	0.2581
35-39	0.170	0.840	0.2024
40-44	0.103	0.842	0.1223
45-49	0.030	0.784	0.0383
Total	1.224	0.653	1.619

B. Estimation of C_c

Method (m)	u(m)	e(m)	e(m) x u(m)
Pill	0.034	0.90	0.0306
Sterilization	0.016	1.00	0.0160
Condom	0.007	0.62	0.0043
IUD	0.004	0.95	0.0038
Other	0.043	0.70	0.0301
Total	0.104		0.0848

Source: 1991/92 TDHS

Note: 1. The method specific use-effectiveness levels, *e(m)*, were obtained from Bongaarts and Potter (1983, p.84).
2. Explanation for the computational procedure and notations is given in the text.

Appendix 3: The Procedure Used to Construct a Multiple Classification Analysis (MCA) Table.

Retherford and Choe (1993) have shown that the most convenient way to present the effects of the predictor variables on the response variable in a multinomial logit regression is in the form of a Multiple Classification Analysis (MCA) table. This Appendix reproduces (from Retherford and Choe, 1993) the procedure used to construct an MCA table by using an example of a response variable with three categories and two predictor variables.

Suppose that the response variable is unmet need for family planning:

P_1 = estimated probability of having unmet need for spacing births

P_2 = estimated probability of having unmet need for limiting births

P_3 = estimated probability of having a met need (that is, no unmet need).

Suppose also that the predictor variables are education (low, medium and high) and ethnicity (Indian and Fiji):

M: 1 if medium education, 0 otherwise

H: 1 if high education, 0 otherwise

I: 1 if Indian, 0 otherwise

The interest is to examine how education and ethnicity influence unmet need for family planning. The multinomial logit model then consists of two equations plus a constraint:

$$\log (P_1/P_3) = a_1 + b_1M + c_1H + d_1I \qquad (A3.1)$$

$$\log (P_2/P_3) = a_2 + b_2M + c_2H + d_2I \qquad (A3.2)$$

$$P_1 + P_2 + P_3 = 1 \qquad (A3.3)$$

where a_1, b_1, c_1, d_1, a_2, b_2, c_2, and d_2 are coefficients.

Equation (A3.1) and (A3.2) can be written as

$$P_1 = P_3 \exp(a_1 + b_1M + c_1H + d_1I) \quad \text{(A3.4)}$$

$$P_2 = P_3 \exp(a_2 + b_2M + c_2H + d_2I) \quad \text{(A3.5)}$$

Also, we have the identity

$$P_3 = P_3 \quad \text{(A3.6)}$$

Recall that $P_1 + P_2 + P_3 = 1$, we get

$$1 = P_3 \Sigma\{\exp(a_j + b_jM + c_jH + d_jI) + P_3 \quad \text{(A3.7)}$$

Solving (A3.7) for P_3, we obtain

$$P_3 = 1 \; / \; 1 + \Sigma\{\exp(a_j + b_jM + c_jH + d_jI)\} \quad \text{(A3.8)}$$

Substituting (A3.8) into (A3.4) and (A3.5) and repeating (A3.8), we obtain

$$P_1 = \exp(a_1 + b_1M + c_1H + d_1I)/1 + \Sigma\{\exp(a_j + b_jM + c_jH + d_jI)\} \quad \text{(A3.9)}$$

$$P_2 = \exp(a_2 + b_2M + c_2H + d_2I)/1 + \Sigma\{\exp(a_j + b_jM + c_jH + d_jI)\} \quad \text{(A3.10)}$$

$$P_3 = 1/1 + \Sigma\{\exp(a_j + b_jM + c_jH + d_jI)\} \quad \text{(A3.11)}$$

where the summations range from j=1 to j=2.

Equations (A3.9), (A3.10) and (A3.11) are calculation formulae for P_1, P_2, and P_3 respectively. A shortcut for calculating P_3 is to calculate P_1 and P_2 from (A3.9) and (A3.10) and then obtain P_3 as $1-(P_1+P_2)$. The MCA table is constructed by substituting appropriate combinations of ones, zeros and mean values in equations (A3.9), (A3.10) and (A3.11). For example, the formulae for P_1, P_2, and P_3 for

those with high education are obtained by substituting M=0, H=1 and $I=\bar{I}$ in (A3.9), (A3.10), and (A3.11); the formulae for P_1, P_2, and P_3 for Fijians are obtained by substituting I=0, M=M, and H=H in (A3.9), (A3.10), and (A3.11).

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