

**THE PROXIMATE DETERMINANTS OF
FERTILITY IN SHASHEMENE**

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The Proximate Determinants of Fertility in Shashemene

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Abstract

The study attempted to show that the spatial variation in the total fertility rate in the town of Shashemene was largely due to the variation in the proximate determinants of fertility (marriage, contraception and post-partum amenorrhoea) based on primary data generated through a sample survey of women in their childbearing ages (15-49 years).

From a preliminary analysis of the data, a clear spatial differential in ethnic and religious affiliations as well as educational attainment and type of employment was obtained using an index of residential dissimilarity.

Before the detailed analysis was made, however, the data were examined for consistency using available demographic techniques. Then, both bi-variate and multivariate statistical techniques were applied in the analysis of the data. Principal components analysis was employed to identify the spatial pattern of the proximate determinants and the socio-cultural variables. Multiple regression analysis was made to examine the effect of the proximate variables on the total fertility rate. Finally, the Bongaarts model was used to evaluate the relative importance of each of the proximate variables to explain differentials of fertility in the town and to examine the applicability of the model to the Shashemene data.

The research found out that the variation in the proximate determinants of fertility was mainly due to the variation in the socio-cultural variables among Kebeles. Based on the spatial differentials of these variables, the study identified some favorable and unfavorable conditions for high fertility in each Kebele. Marriage and post-partum amenorrhoea were identified as the most important proximate variables for fertility differentials among Kebeles in Shashemene. The effect of contraception on total fertility rate was found to be very small. It was also found out that the Bongaarts model has fitted the data in most Kebeles of the town. Finally, the study suggested some population policy options that would serve as a stepping-stone for future detailed researches.

Preface

The main objective of this thesis is to examine the level and differentials of fertility among Kebeles in the town of Shashemene. To this effect, the research focuses on the proximate (intermediate) fertility variables and their socio-cultural correlates. To date detailed studies are not conducted on this issue in the town. This research therefore tries to fill in this gap based on primary data gathered through a sample survey.

The thesis is organized in Five chapters. Chapter One introduces the problem, gives an overview of the study area, reviews the literature, defines the objectives and presents the hypotheses to be tested. Chapter Two considers the data collection procedure including sample design, the evaluation and adjustment of the data as well as the various techniques used in the analysis of the data. Chapter Three assesses the spatial pattern of the proximate and socio-cultural fertility variables using bivariate analysis. In chapter Four, first the pattern of the proximate and socio-cultural fertility variables is analysed using principal component analysis and this is followed by the analysis of the effects of the proximate variables on total fertility rate using multiple regression and the Bongaarts model. Finally, chapter Five presents summary of the main findings of the study and policy recommendations.

Many people have, directly or indirectly, contributed to the preparation of this research. In this regard, I would like to extend my gratitude to Dr. Alula Abate, Department of Geography, Addis Ababa University, for his guidance during the preparation of the proposal for this project. I am also greatly indebted to my thesis supervisor, Dr. Assefa Hailemariam for his critical comments and advice throughout my work in the preparation of this research. In spite of his work load, Dr. Assefa was always willing and cooperative to help me.

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At last, I would like to extend my deep appreciation to the staff of the Municipality of Shashemene, the interviewers and the respondents in the town without whose cooperation and participation, this project would have not been possible.

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CHAPTER I

Introduction

1.1 The Problem

In the West, at the initial stage of the demographic transition, both mortality and fertility were high and in general population growth rate was small. However, improved diet, environmental sanitation, personal hygiene and the advances in medical technology led to a decline in mortality while fertility was lagging behind. Although the causes are different, the same pattern has repeated in the developing countries today. Mortality decline started in most of the developing countries while fertility remained at high levels and this has resulted in rapid population growth rates.

Ethiopia is also one of the developing countries that has started experiencing rapid population growth rates due to high and some times rising fertility and moderately declining mortality. The Central Statistical Authority¹ (CSA, 1988), for example, shows that total fertility rate in the country increased from 5.8 children per woman in 1970 to 7.5 children per woman in 1981. The total population of the country was 42,019,418 in 1984 and reached 49,312,504 by 1988 (CSA, 1989). Very recently (1990) the population of the country was estimated to be 50,973,900 (CSA, 1990); growing at an average rate of 3.2 per cent per annum between 1984 and 1990.

Fertility is high in both urban and rural areas of the country and that the difference between urban and rural fertility is not much. For instance, in 1981 rural fertility was 7.7 children per woman while in the urban centres it was 6.2 children per woman. The difference is about 1.5 children and such differences have been

¹It was formerly called Central Statistical Office, CSO.

observed between urban and rural areas in most developed countries at the initial stage of their fertility transitions (UN, 1987; 1990). Despite the relatively smaller fertility in the urban centres of Ethiopia, the growth rate of the population is higher (4.2 per cent per annum) than that of the rural areas (3.0 per cent per annum) (UN, 1989; Abdurahman, 1987, OPHCC, 1991) due partly to rural-to-urban migration (Hailu, 1983; Alula, 1989) and partly to natural increase. For instance, the crude birth rate was 37.9 per thousand and the crude death rate was only 5.7 per thousand in 1984 in the urban areas of Ethiopia resulting in a natural rate of increase of 3.2 per cent per annum (OPHCC, 1991:208; 216). If the present rate of growth continues, the urban population of the country will double in about 16 years.

The Gross Domestic Product, on the other hand, grew at the rate of 1.4 per cent per year between 1980 and 1988 (World Bank, 1990), while the per capita Gross National product has declined from US \$ 140 in 1981 to US \$ 120 in 1991 (World Bank, 1983; 1991). On top of this, employment opportunities in the urban centres of Ethiopia are very limited. The manufacturing industries have not yet developed fast enough to absorb the rapidly growing urban labour force and the majority of the working age population are unemployed (ILO, 1982; 1985; Eshetu and Teshome, 1983; Alula, 1985; World Bank, 1985). Consequently, the urban centres of the country have become places of chronic social problems.

In order to bring the rate of growth of the population in balance with that of the economy, it is necessary to reduce the level of fertility. The realization of this problem has recently led the government to review its pronatalist stand (Office of the National Committee for Central Planning, 1988). The realization of the problem alone, nevertheless, cannot reverse the present fertility trend in the country. In order to do that, the causes of high fertility must first be identified. Although there have been a number of studies on the fertility differentials in the country in recent years (Kebede, 1986; Kassahun, 1986; Bekele, 1988; Assefa, 1990), these studies, largely dealt with the socio-economic variables (such as education and occupation, among

others) and ignored the proximate determinants of fertility (such as marriage, contraception and lactation).

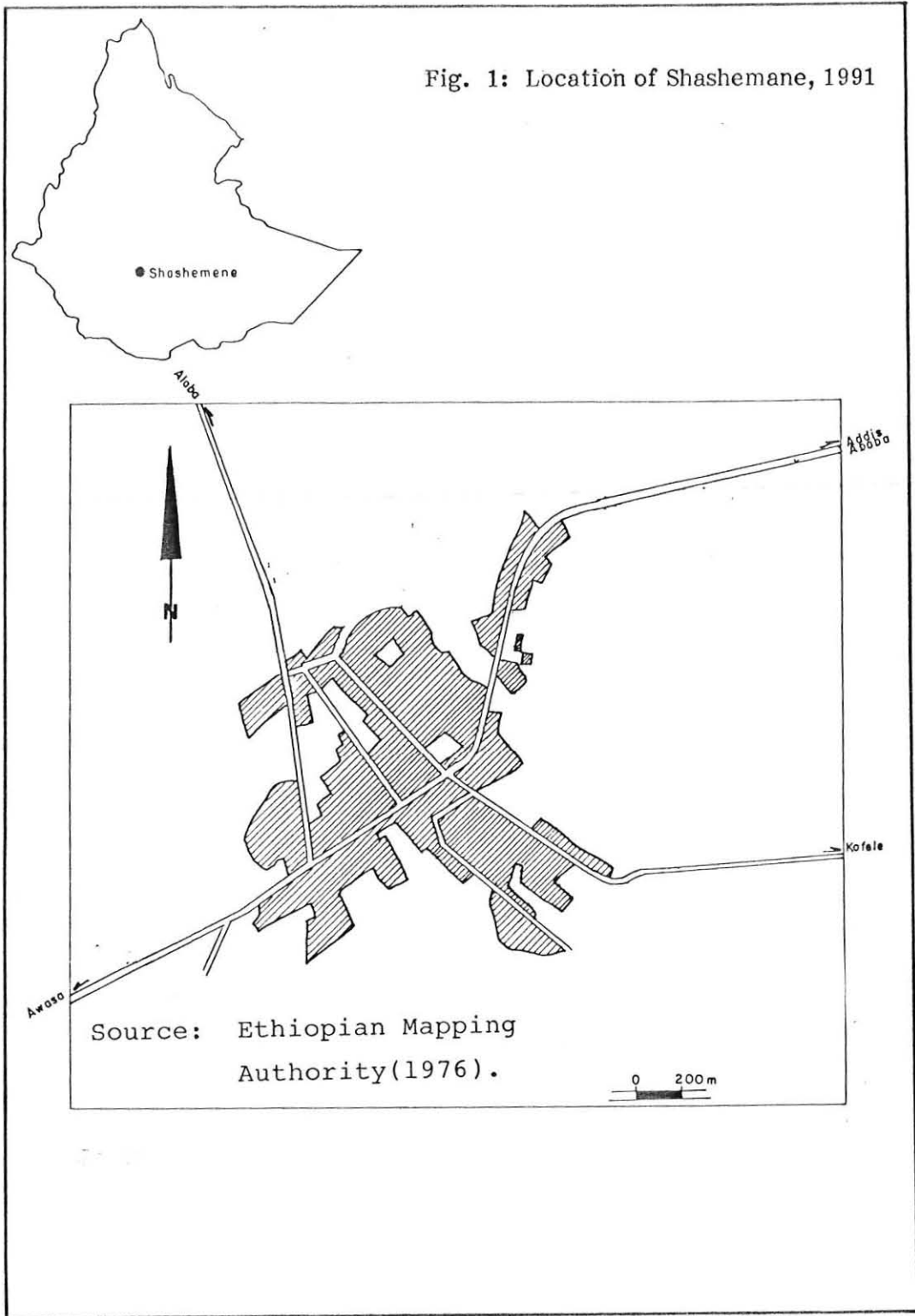
Recent empirical researches in other developing and developed countries, on the other hand, indicate that marriage, contraception, induced abortion and length of the postpartum non-susceptibility period are the direct causes of fertility differentials. The United Nations (1987), for instance, indicates that about 96 per cent of the variations in total fertility rates among 41 developed and developing countries were due to four major proximate fertility variables. The effects of these variables on the fertility level of the Ethiopian population, however, have not yet been explored although Abdulahi(1988) mentions the effects of the proximate variables on the fertility differentials between Alemaya, Addis Ababa and Metu. Moreover, the spatial aspect of the problem has been neglected although the works of Genet (1987), Alemtsehay (1988), Abdulahi (1988) and Assefa (1990) indicate the existence of regional variations in fertility.

This research differs from previous researches conducted so far in the country in that it largely deals with the proximate determinants of fertility and their socio-cultural correlates and their spatial pattern in the town of Shashemene, one of the fast growing urban centres in Ethiopia.

1.2 An Overview of the Study Area

The town of Shashemene is located in Southern Shewa at the junction of major roads from Arsi, Bale, North and South Omo Administrative Zones(Figure 1). It is favourably situated on the major road 250 kilometers south of Addis Ababa, the capital city of the country. It lies in the centre of the Great East African rift system. The town has an average altitude of 1800 meters above sea level with a comfortable annual average temperature (14°C to 20°C) and precipitation(1000 millimeters). It is adjacent to different ecological zones ranging from the hot lowlands of Bale and

Fig. 1: Location of Shashemane, 1991



Sidamo to the cool highlands of Arsi, Bale, Sidamo and Gamo Gofa producing different types of crops and raising livestock. Several state farms have also developed around the town.

As a result of this favourable location, the town has been growing very rapidly since its foundation in the middle of the second decade of the twentieth century (Benti, 1988). The population of the town was estimated to be 7,540 in 1968 and rose to 11,900 in 1970 (CSA, 1968; 1970). The 1984 population and Housing Census indicated a population figure of 31,884 (Office of the Population and Housing Census Commission, 1989) and five years later (1989), the total number of residents in the town reached 49,383². This shows that the population of the town has been growing very rapidly. It grew at an average rate of 15.2 per cent per year between 1968 and 1970 and then at 8.75 per cent per year between 1970 and 1984.

From the above it can easily be noted that the rate of population growth in the town was much higher during the 1960s and early 1970s. This was mainly due to very high rates of in-migration during the period. Before the 1974 revolution, the high rate of in-migration could be partly accounted for by high rate of tenancy in Shashemene Woreda where, as Stahl(1974) suggested the emergence of large scale mechanized agriculture evicted peasants from the land. However, after the land reform of 1975, the number of people moving to the urban centres did not decline as expected since the supply of cultivable land remained small relative to the fast growing population of the Woreda(Alula and Tesfaye, 1979).

The town of Shashemene has not only been growing in population size but it has also been expanding in terms of area. It had a built-up area of 2.71³ square

²Collected from the records of the Municipality of Shashemene.

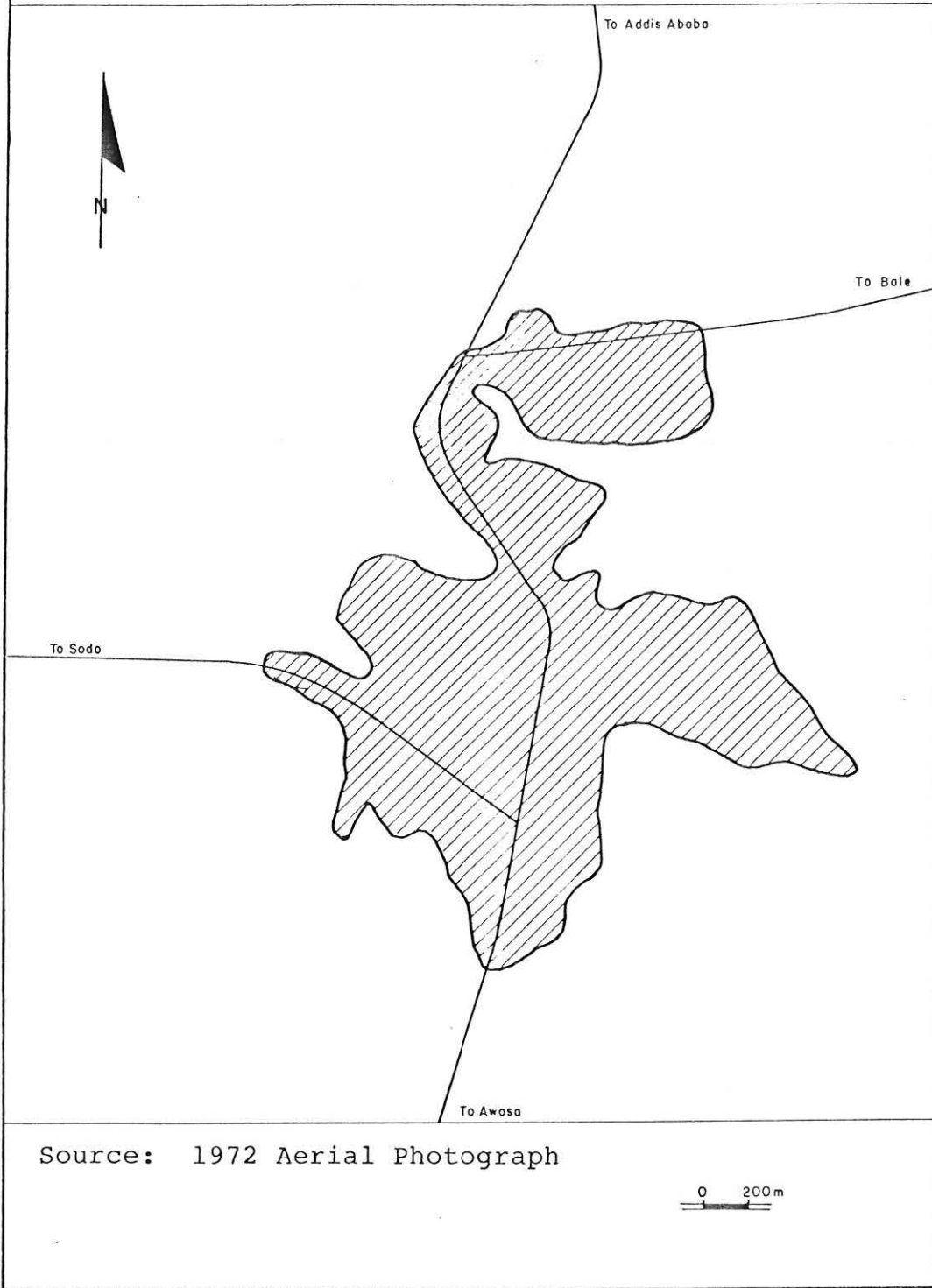
³Computed from the areal photographs of 1972 and 1986, respectively.

kilometer in 1972 most of which had a linear pattern following the main road(Figure 2). In 1986, however, the area had sufficiently expanded to 5.44³ square kilometers in all directions and covered the surrounding cultivable land (Figure 3). This shows an average annual growth of 18.2 per cent between 1972 and 1986 (Fig.4).

At present, for administrative purposes, the town is divided into two Kefetegns and ten Kebeles(Figure 5) and is settled by different ethnic groups. The dominant ethnic groups appear to be the Amhara (35.7 per cent), the Guraghe(18.7 per cent), the Oromo(16.6 per cent) and the Wolaita(13.4 per cent). There are also other ethnic groups(such as Kembata, Hadya, Tigre, Sidamo, Worji, Dorze, Kulo Konta, Adere, and Somali) residing in the town (Table 1.1).

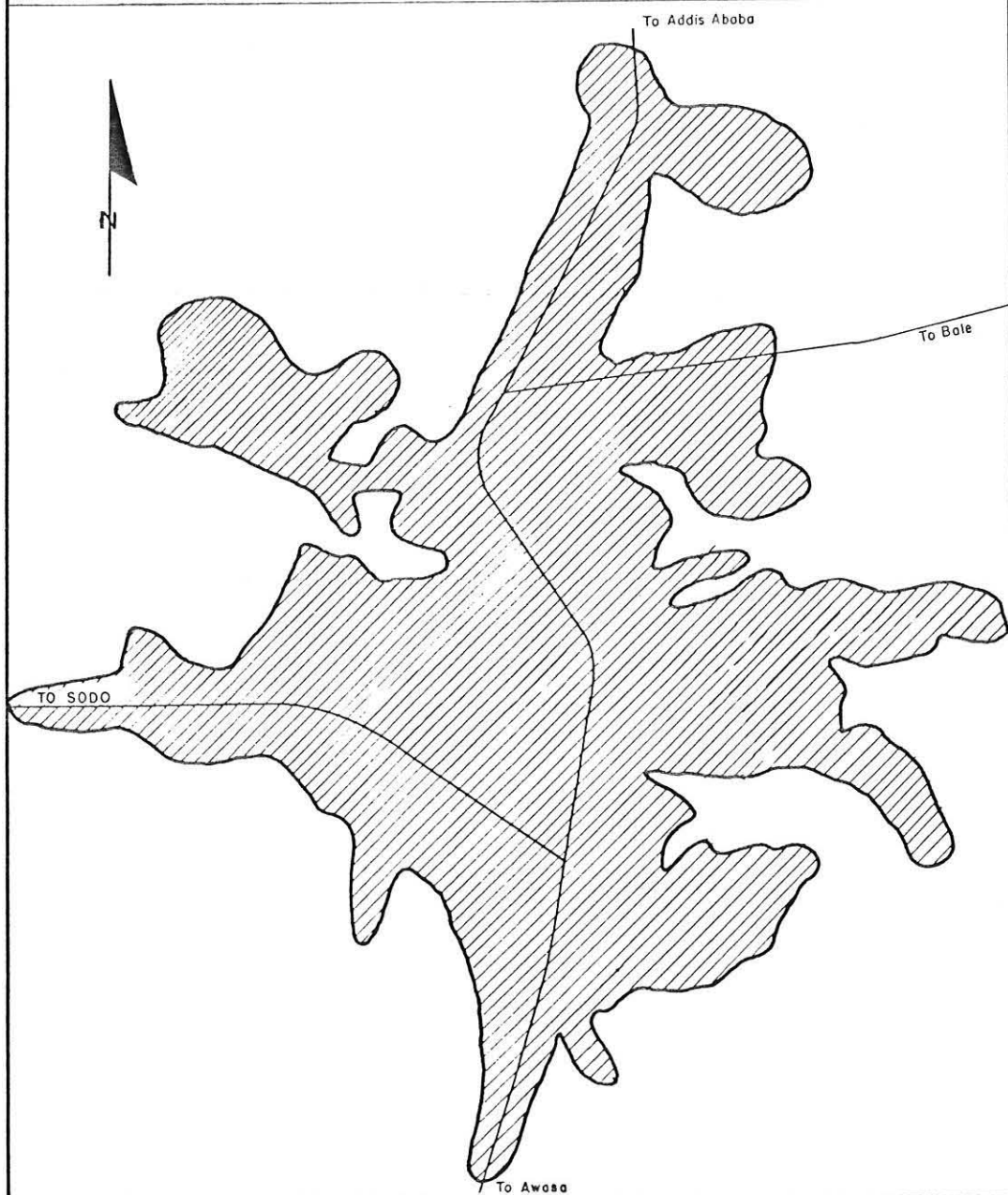
The distribution of these ethnic groups appear to vary from Kebele to Kebele (Table 1.1). The reasons for the variations seem to be the differences in land use among Kebeles in the town. Following the main road, business and trade appear to be the dominant activities. Immediately next to this, the residential section becomes dominant. Open markets, stores and warehouses, on the other hand, occupied the outskirts of the town (Figure 6). The Guraghes predominate the zone of business and trade while the Oromos and the Amharas tend to dominate areas where government offices and other occupations are prevalent. Kebeles 08, 09 and 07 are generally dominated by trade and business activities and, thus, the Guraghes appear to be more dominant in these areas. Whereas Kebeles 01, 02, 03, 04 and 10 are generally dominated by government offices, open markets, stores and warehouses and they are largely settled by the Amharas and the Oromos(Table 1.1).

Fig. 2: Built-up Area : SHASHEMENE 1972



Source: 1972 Aerial Photograph

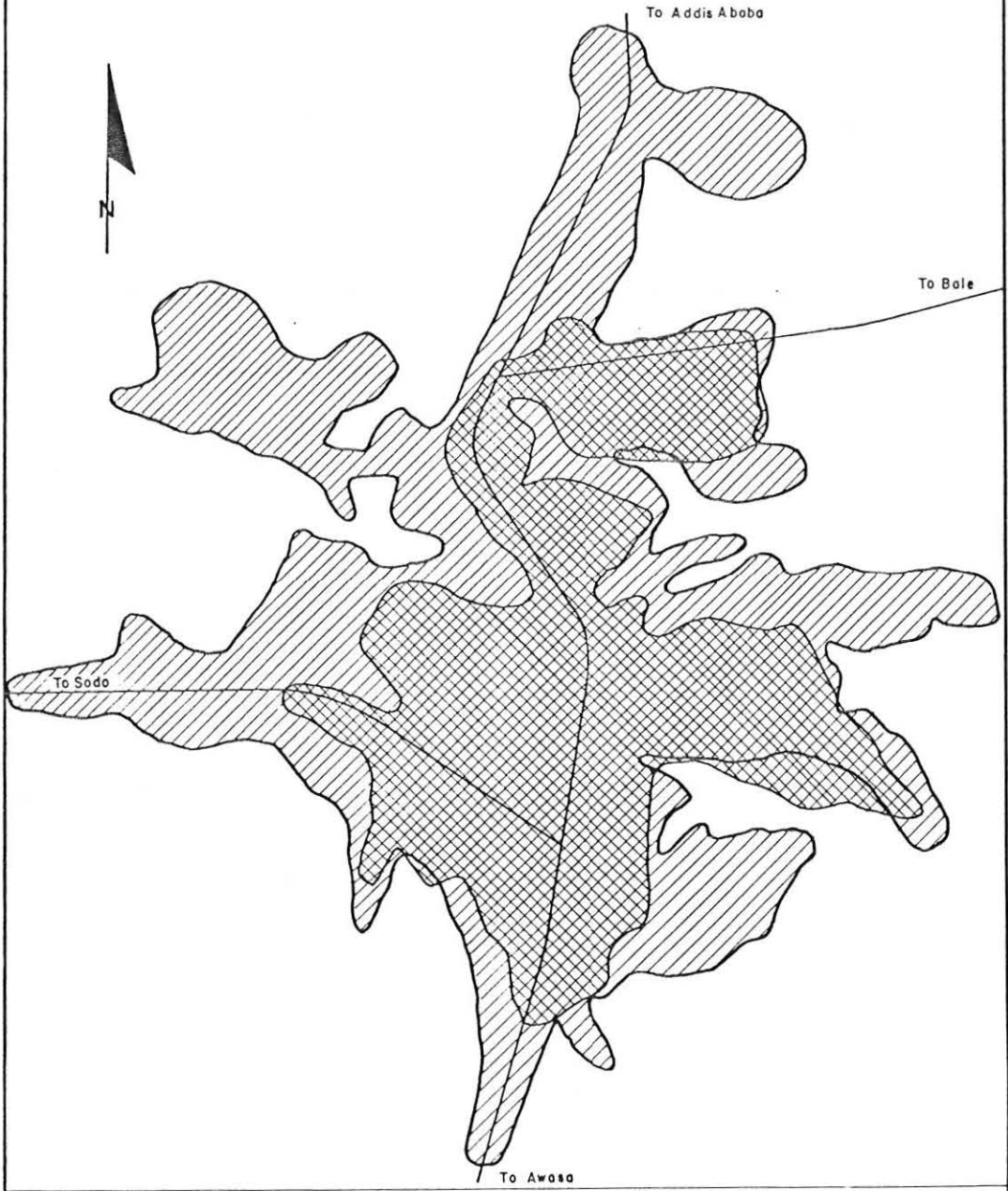
Fig 3: Built-up Area : SHASHEMENE 1986



Source: 1986 Aerial Photograph



Fig. 4: COMPOSITE MAP OF 1972 & 1986



Source: Figs. 2 and 3

LEGEND

-  Shashemene 1986
-  Shashemene 1972

0 200m.

Fig. 5: Kebeles of Shashemene, 1991

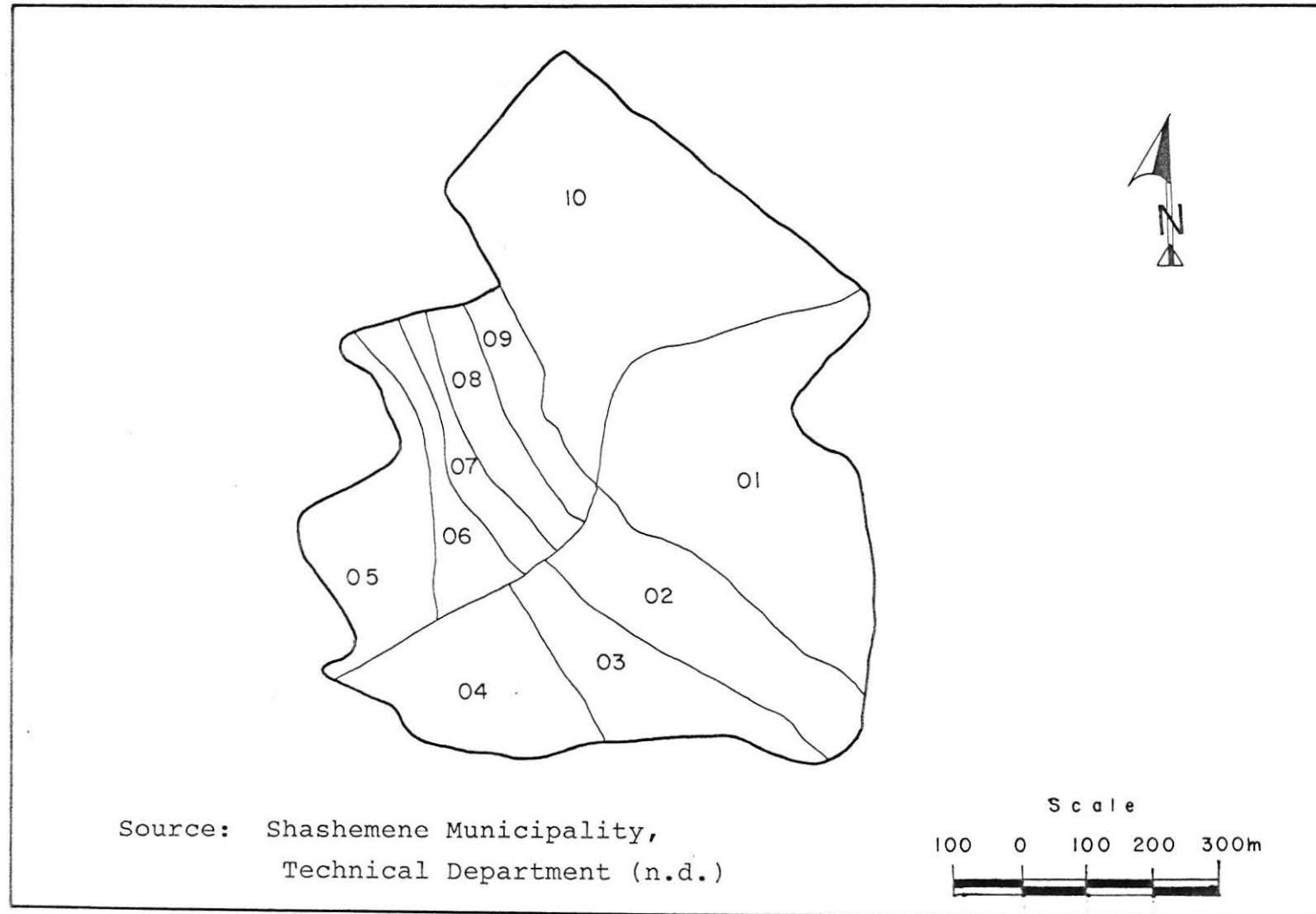


Fig. 6: Landuse Pattern: Shashemene, 1991

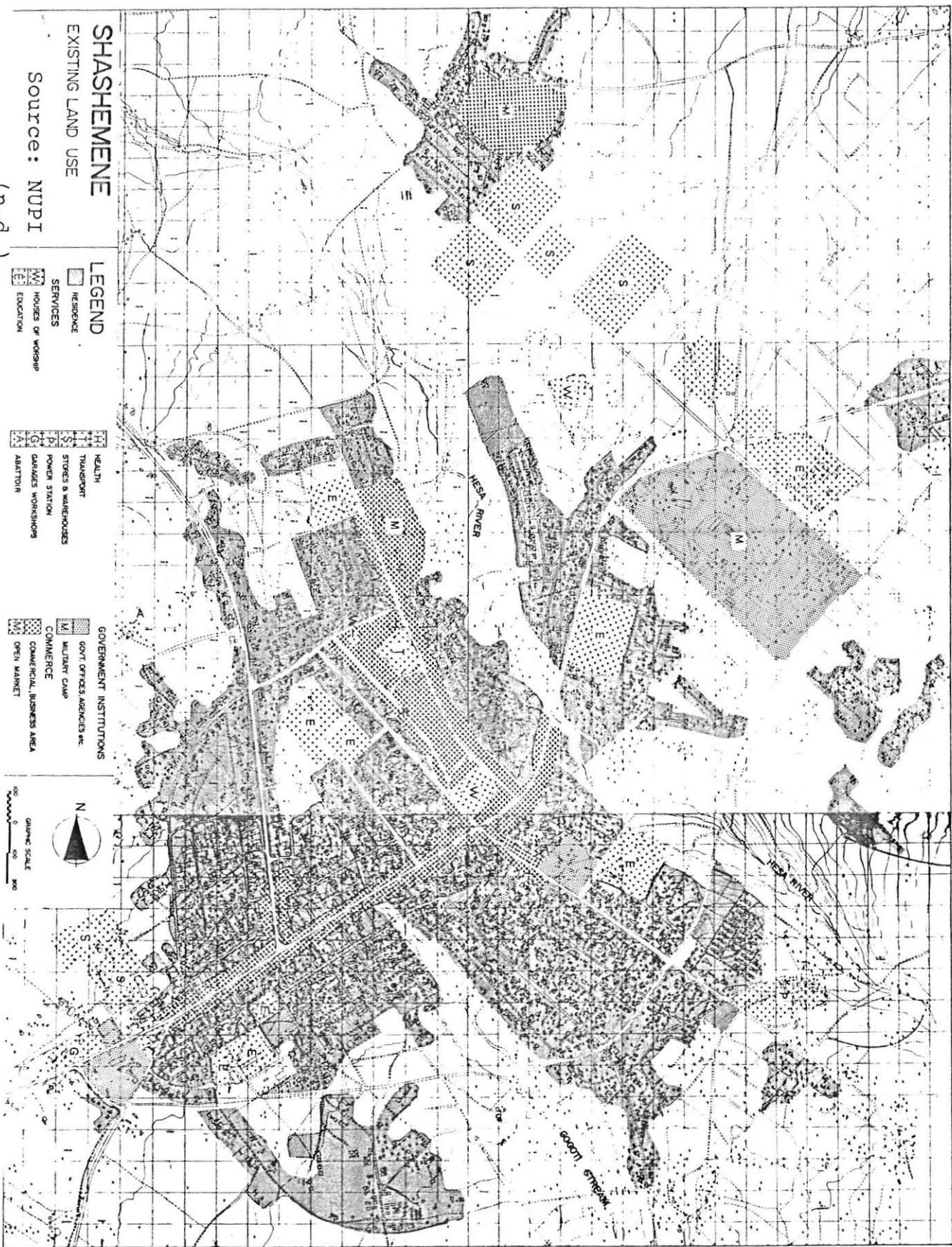


Table 1.1

Percentage Distribution of the Respondents by Ethnic
Affiliations and Kebele: Shashemene 1991

Kebele	Amhara	Guraghe	Oromo	Wolaita	Others	Total
01	54.55	6.06	18.18	9.09	12.12	100.0
02	41.77	6.33	21.52	16.46	13.92	100.0
03	53.57	7.14	19.64	5.36	14.29	100.0
04	37.14	15.71	21.43	2.86	22.86	100.0
05	39.74	17.95	17.95	12.82	11.54	100.0
06	32.73	21.82	12.73	20.00	12.73	100.0
07	23.88	31.34	13.43	11.94	19.40	100.0
08	23.21	37.50	5.36	16.07	17.86	100.0
09	21.15	42.31	7.69	23.08	5.77	100.0
10	34.25	5.48	23.29	16.44	20.55	100.0
Shashemene	35.70	18.74	16.64	13.41	15.51	100.0

Source: Survey Data

The spatial concentration of ethnic groups was assessed using the index of dissimilarity (D_s) given by the following formula.

$$D_s = \frac{\sum |x_i - y_i|}{2}$$

where; x_i and y_i are the individual percentages of each ethnic groups;

D_s is an index of dissimilarity.

The theoretical value of the index is zero, where there is no segregation at all. In this case, every Kebele would have equal proportion of each ethnic group. The index, on the other hand, becomes 100 where there is complete dissimilarities of Kebeles with regard to the distribution of ethnic groups. This result is possible where a Kebele is occupied by one ethnic group only, say the Amharas. Higher value of the index, thus, suggests higher spatial concentration of the ethnic groups.

On the basis of Duncan's value of 30 as a clear residential segregation (Cited by Carter and Wheatley, 1980), the Guraghes show very high spatial dissimilarities with the Oromos ($D_s = 43.3$) and the Amharas ($D_s = 39.2$) while the Amharas and the Oromos seem to have similar residential location ($D_s = 9.9$). The Wolaitas, on the other hand, tend to have more or less, similar residential pattern with the three ethnic groups such as the Guraghes ($D_s = 27.6$), the Amharas ($D_s = 26.1$) and the Oromos ($D_s = 25.9$) (Table 1.2).

Table 1.2

Index of Spatial Dissimilarity for Major Ethnic Groups
in Shashemene, 1991

Ethnic Group	Index of Dissimilarity
Amhara and Guraghe	39.2
Amhara and Oromo	9.9
Amhara and Wolaita	26.1
Guraghe and Oromo	43.3
Guraghe and Wolaita	27.6
Oromo and Wolaita	25.9

Source: Computed from the Survey data.

As it has already been indicated earlier, the ethnic division of labour seems to be the major factor for the residential segregation of ethnic groups in the town. This could be confirmed by Bjerer's migration study of Shashemene (Table 1.3).

Table 1.3

Proportion of Male Household Heads in Four Largest Ethnic Groups by Type of Occupation: Shashemene 1970

Occupation	Amhara(%)	Wolaita(%)	Oromo(%)	Guraghe(%)
Farmer	60	24	65	13
Trader	27	15	20	70
Petty trader	9	12	10	12
Daily labourer	4	49	5	5
Total	100	100	100	100

Source: Adapted from Bjerer, 1985, p. 143.

As new migrants moved into the town they tend to look for their own ethnic types and end up settling in the part of the town occupied by their ethnic types.

Ethnic affiliations and type of occupation, however, are not the only factors affecting the residential segregation of people. Educational status and religious affiliations also appear to be important variables which affect the distribution of people in Shashemene (Table 1.4).

Table 1.4

Index of Residential Dissimilarity by Religion and Educational Attainments of the Respondents: Shashemene 1991

Religion	Index of Dissimilarity
Orthodox and Islam	21.9
Orthodox and Protestant	28.6
Islam and Protestant	42.8
Education	
Illiterates and 1-6 grades	16.2
Illiterates and 7-13 grades	49.8
Illiterates and > 12 grades	60.5
1-6 and 7-12 grades	18.8
1-6 and > 12 grades	48.4
7-12 and > 12 grades	44.6

Source: Survey Data

Based on religion, the highest index of residential dissimilarity was observed among the muslims and the protestant christians ($D_s = 42.8$) followed by Orthodox and Protestants ($D_s = 28.6$). Furthermore, substantial residential dissimilarity was found among the Orthodox and the Muslims ($D_s = 21.9$)

Remarkable residential dissimilarity among different educational classes was also discovered in the town. The highest was among the illiterates and those with post-secondary education ($D_s = 60.5$). The second highest residential dissimilarity

was found between the illiterates and those with junior and senior secondary education ($D_s = 49.8$). On the other hand, the illiterates and those with primary education (1-6 grades) manifested comparatively low residential differences ($D_s = 16.2$). From Table 1.4, it can be generalized that as educational attainment increases, residential separation from the less educated group becomes more apparent.

The study population, therefore, manifested spatial differentials in some of the socio-cultural attributes (such as ethnicity, religion, education and employment, among others). The spatial variations of these are the basis for the analysis of fertility and its proximate determinants in the town.

1.3 Review of Related Literature

The concept of the proximate (intermediate) determinants of fertility was initiated by Davis and Blake (Davis and Blake, 1956). They identified around eleven variables which could be generalized into three major categories such as intercourse variables, exposure to conception and variables which affect gestation and successful births. The idea was further subjected to mathematical manipulations by Bongaarts (1978). Bongaarts identified eight proximate fertility variables such as proportion married, contraception, Induced abortion, lactational in-fecundability, frequency of intercourse, sterility, spontaneous intra-uterine mortality and duration of the fertile period. The first four variables are considered as the major proximate fertility variables and the remaining four are neglected because the pressure these determinants exert on fertility mostly do not vary much between communities⁴. As

⁴Although a number of studies(see for example Adadevoh, 1974; Frank, 1983) indicated that pathological sterility is one of the principal proximate fertility determinants in Sub-Saharan Africa, the Shashemene Data do not reveal this.

a result, Bongaarts treated the first four variables in his model. Since then, a growing body of inquiries have been conducted to test the model in various milieus (Bongaarts, 1981; 1982; 1984; Lesthaeghe et al., 1981; Gaslonde and Carrasco, 1982; Bongaarts and Potter 1983; Ferry and Page, 1984; Gaisie, 1984; Hobcraft, 1985; United Nations, 1987). These studies generally confirmed that the proximate fertility variables are the direct causes of fertility variations among populations.

Age at first marriage, for instance, varies from place to place between different populations and among groups of the population in the same locality. Differences in age at first marriage and duration of marriage are important proximate variables which affect exposure to sexual intercourse. A fecund woman is biologically capable to conceive between the age of 15 and 49 years, after which menarche and menopause set in respectively. Females who entered into union early and who stayed in the union longer would have, Ceteris paribus, more children than women who married late or who did not marry at all.

The use of effective contraceptives can prevent females from having unwanted pregnancies. Extended period of lactation (breast-feeding) prolongs the postpartum amenorrhea. Consequently, the postpartum non-susceptibility period and birth intervals are elongated. Moreover, sexual abstinence is an important proximate variable which reduces fertility in a traditional society.

The proximate variables are, however, influenced by different socio-cultural factors. The major ones are educational attainments, occupation, ethnic and religious affiliations, migration, infant and child mortality and population density. A review of the available works done so far on these relationships is given below.

1.3.1 Educational Attainment, the Proximate Variables and Fertility

Much has been written regarding the relationship between fertility and the educational attainments of couples, particularly females. There is, however, no unanimity of views among scholars. It is argued that education prolongs the age of entry into unions. Casterline (1985) seems to support this view indicating that the Egyptian fertility declined between 1960 and 1980 largely as a result of raising age at first marriage. The reason for this late marriage was said to be the extended period of schooling. Moreover, mass education is likely to weaken the traditional organizations in which marriage was decided by parents and not by the spouses themselves. The weakening in traditions brought about changes so that women became more independent and they would be in a position to select their own partners. The opportunity in getting the right partners, of course, depends on the physical attractiveness and the economic position of the individual. In this respect, some women may not get partners at all (Davis and Blake, 1956; McDonald 1985). Besides, as the educational attainment of the couples increases, the parents tend to send their children to school. The rearing and educating of large number of children would be expensive. At the same time the child's labour required for the family would decline with mechanization and industrialization (Cochrane, 1979; Caldwell, 1980; 1981; 1986; Boserup, 1985; UNECA, 1987; Cochrane, Khan and Osheba, 1990). As a result, the couples tend to control their family size through the use of birth control techniques. The relationship between education and fertility is, thus, believed to be inverse.

Hobcraft (1985), on the other hand, suggested that although education increases the age at first marriage, this may not have a substantial impact on fertility in some countries, such as Kenya and West Africa, where premarital sexual intercourse is practiced. Mosley, Werner and Becker (1982) seem to have confirmed this idea based on data from the Kenya fertility survey. Moreover, although schooling could postpone age at first marriage, fertility may not necessarily decline.

The rise in age at first marriage would improve the health of the mothers. As a result, the death of infants associated with teenage motherhood such as low birth weights, miscarriages and other complications would be reduced (Adadevoh, 1974; UNECA, 1983). Also, in less developed countries, the educational attainment of couples is likely to increase their income⁵. Higher income enables the couples to rear and educate more children. Better education and income are important to reduce maternal deaths, miscarriages and infertility through improved diets and sanitation (Frank, 1983; UNECA, 1983; Casterline, et al., 1984; Aygeni and Mbamanya, 1989). In this respect, Mackay (1979) in Polland and Mosley, Werner and Becker (1982) in Kenya found that the rich had relatively more children than the poor. UNECA(1983) in Kenya and Lesotho, Johnson and Elmi (1989) in Somalia and Rahman and Phillips(1988) in Bangladesh also indicated that more educated women are largely engaged not in polygamous marriage but in monogamous marriages. Polygyny is suggested to have a depressing effect on fertility. Although strong evidences have not yet been forwarded, it has been indicated that when a husband has many wives the frequency of intercourse for the women would be low, due to separate living arrangements and the husband has to visit each wife on round. Also, the biological factors such as wider age differences between the husband and the wives appear to reduce coital frequency (Mosley, Werner and Becker, 1982). The man who is able to marry more than one wife appears to be at relatively older ages when his sexual capacity to accommodate many wives is reduced. Consequently, fertility for these women may be lower. However, no conclusive findings to date are indicated.

Educated women are more likely to reduce the duration and intensity of breast-feeding because they are likely to engage themselves in jobs outside home.

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Since data on income are mostly not reliable, in this research the effects of income are assessed on surrogate variables such as education and employment.

The shortened period of breast-feeding tends to reduce the postpartum infertility period by reducing the time needed for the resumption of ovulation. As a result, the intervals between births are reduced. In the developed countries, the prevalence of contraception appears to offset the reduced period of postpartum infertility whereas in the developing countries the prevalence of contraception is generally low (Farid, 1987; Singh, Casterline and Cleland, 1985). It has also been indicated that the effects of education on fertility vary from country to country. In Africa and Asia, the primary education appears to have very low effects on fertility. The secondary education, on the other hand, tends to have substantial impact on fertility while in Latin America and the Caribbean, a small increase on women's education appears to reduce fertility (Singh and Casterline, 1985). The educational attainment per se is not, therefore, important for the reduction in fertility. For education to have spectacular impacts on fertility, behavioral changes must take place (Caldwell, 1982).

Recent investigations in Ethiopia indicate that education and fertility in general have an inverse association. As the educational attainment of the women increases, fertility tends to decline (Asmerom, 1983; 1987; CSA, 1984a; 1977; Blacker, 1986; Kesteren and Markos, 1989, Alemseghed, 1989; Assefa, 1990 and Azbaha, 1990).

The present research however attempts to assess the impact of female education on the use of contraceptives, postpartum amenorrhoea and marriage patterns and the effects of the latter variables on fertility.

1.3.2 Employment, the Proximate Variables and Fertility

There is no unanimity of views on the relationship between the employment of females, on the one hand, and the proximate variables and fertility, on the other. Employed women are likely to postpone marriage until they get the right partners. Moreover, marriage for employed women may not be for economic benefits as the

women themselves are earning money (UNECA, 1987). Besides, women employed in the modern economic sector are usually away from home for longer duration. Child bearing and rearing for these women would be difficult. In this respect, a woman would have two roles to perform at the same time: her role as a mother and her role as a worker (Mason and Palan, 1981). When these roles are not compatible, the woman tends to control her fertility through the use of modern birth control techniques (Chernichovasky and Meesook, 1981; Johnsson, 1987). In this case an inverse relationship between employment and fertility is suggested. This relationship has been found in most developed countries such as Belgium, Czechoslovakia, Finland, France, Italy, the Netherlands, United States of America and United Kingdom (UNECE, 1984).

The effects of employment on the use of contraception, however, appear to vary from population to population. The United Nations (1987:273), for example, indicates that:

... in only 11 out of 30 countries is the occupation variable statistically significant in explaining variations in current contraceptive use. In 8 of the 30 countries, the proportion of women using contraceptives is less in modern occupations than in the "no work" category, when other factors are controlled.

Moreover, some researchers argue that the two roles of a woman can be compatible, particularly in Africa, where the extended family is dominant. Relatives and older children available at home could assist working mothers during their absence. The rearing of children, thus, would not be difficult for the working mothers (Caldwell, 1982; Standing, 1983). Moreover, the results of the World Fertility Survey in Latin America and the Caribbean countries indicate that the fertility of women employed in the informal economic sector was higher than the fertility of women who have never worked (Singh and Casterline, 1985). The employment of mothers reduces duration and intensity of breast-feeding while

reduced breast-feeding shortens the interval between subsequent births (Gray, 1981). In the developed countries the use of effective contraceptives and increased age at first marriage appear to counter-balance the positive effect of reduced period of lactation on fertility. In the developing countries particularly in Africa, however, the use of effective contraceptives is very low (Singh, Casterline and Cleland, 1985).

Age at marriage, in the developing countries, is low even among employed females and that was why Caldwell (1981) found higher fertility among employed women in Nigeria. In this respect, the fertility transition theory revealed that at the initial level of the transition, the fertility of employed women was higher because they could afford to live in a relatively healthy and hygienic environment (Singh and Casterline 1985). As a result Mosley, Werner and Becker (1982) point out that the fecundity of the employed women in Kenya appears to be higher. Also, the employed women may not be willing to use modern birth control techniques at this initial stage of the transition as the adoption of any innovation has always a time lag for adoption (Woods, 1979; 1982; Caldwell, 1982, Celade and CFSC, 1972).

In Ethiopia's urban centres, a high proportion of the female population are unemployed and among the employed ones, the dominant proportion are engaged in the informal sector (ILO, 1985; Alula, 1985; 1989). Even for the women employed in the modern sector, the bearing and rearing of children would not be very difficult. Older children in the house can look after the infants because schools in Ethiopia operate in shifts. Besides, government employees are entitled to six week maternity leave with full pay (Daniel and Erku, 1976). Employed women also are likely to earn money and thus can afford to pay baby-minders and cover the cost of the children. Contrary to this, recent investigations in different places in Ethiopia indicate lower fertility among the employed women (Abdulahi, 1988; Kesteren, 1989; Kesteren and Markos, 1989; Alemseghed, 1989).

1.3.3 Ethnic and Religious Affiliations, the Proximate Variables and Fertility

Available literatures suggest that fertility varies among different ethnic and religious groups (Caldwell, 1980; 1981; Caldwell and Caldwell, 1981; Schoenmaeckers et.al., 1981; UNECA, 1983; Bongaarts et al., 1984). Different ethnic groups have different beliefs and cultural practices. The duration of postnatal sexual abstinence, for instance, varies from culture to culture. The longest period of abstinence was found among the Yoruba of Nigeria and the Javanese of Indonesia (UN, 1987). Schoenmaeckers et.al. (1981) indicated that in general the longest sexual abstinence were in western Africa and the shortest were in Eastern Africa. Moreover, Gaisie(1984) found that sexual abstinence varied among different ethnic groups in Ghana, west Africa. The same situations were found among ethnic groups in Kenya by Mosley, Werner and Becker(1982). Moreover, among some ethnic groups in Nigeria and Ghana, the women abstain from sexual intercourse permanently after they have attained the status of grand-mother because it is considered unfair to compete with their own daughters and daughters-in-law (Caldwell and Caldwell, 1981; Gaisie, 1981; Lesthaeghe, et al., 1981).

There are also different forms of marriage, such as monogamy and Polygamy, which vary from culture to culture. Such different forms of marriage have been found out to bring fertility variations. Chaudhury(1982), for example, indicated that in some countries of West and East Africa, the dominant forms of marriage are polygamous in order to have more children and increase the family labour. However, Caldwell and Caldwell(1981), and Santow and Bracher(1981) found that in Ibadan, Nigeria, the longest postpartum abstinence was observed among women in polygyny.

Different ethnic groups may also have different preferences with regard to the sex of their children. Chaudhury(1982) found that in general males are preferred in South-east Asia whereas females are preferred in West Africa. In this case, couples

would continue to have more children until they attain the required sex composition. As a result, the use of modern birth control techniques is adversely affected(Stephen, Rindfuss, and Bean, 1988).

According to some analysts, the failure of family planning programmes in some countries such as Kenya, Nigeria and Sri Lanka can be accounted for by ethnic heterogeneity. Each ethnic group tries to keep its numbers as high as possible so as to be dominant over other ethnic groups. Wilks(1970), for example, indicated that the Kikuyu in Kenya constituted the highest number and they were at the same time more resistant to the use of family planning services, fearing that they would lose their political dominance. Similar problems were identified in Nigeria (Smith 1973), Sri Lanka(Kodikara, 1973) and Fiji(Hull and Hull, 1973).

Religion is another cultural element that may bring in fertility differences. Both christianity and Islam maintain that children are the gifts of God and having a large number of children is a virtue. Amin and Farguee(1980), for example, found that fertility regulation in Bangladesh was hampered by the muslims. Among muslims marriage is early and in many cases polygamous. The use of modern birth control techniques is strictly prohibited. Moreover, islamic religion promulgates very short period of postpartum abstinence, for example, only 40 days after the birth of a child in many countries of Africa (Schoenmaeckers, et al. 1981) implicating higher fertility among the muslims.

Available evidences, however, show opposing results in different countries. The National Fertility Survey of Nigeria indicated that the mean number of children ever born was lower for the Muslims than for the Christians (National Population Bureau, 1984). Chaudhury(1971) by contrast found no substantial fertility differences between the Muslims and Hindus in Bangladesh. But very high fertility was found among Muslims in the Middle East, Central Asia and India(Chaudhury, 1982).

In Ethiopia various ethnographic works indicate that age at first marriage and forms of marriage vary among different ethnic groups (Cittadini, 1966; Shack, 1963; 1973; Tippet, 1970; Asmerom, 1973; Fekadu, 1972; 1973; Holcomb, 1973; Levine (1974). None of these works, however, indicate the duration of postpartum sexual abstinence among different ethnic groups of the country, although Lewis (1955; 1973); Messing(1973) and Murdock(1967) indicated that long periods of abstinence were observed among the Somalis of the Ogaden and the Bako tribes of south west Ethiopia.

The use of modern contraceptives has been found to differ among ethnic and religious groups in Ethiopia. Kebede(1986) and Fikreab(1989), for example, found that fewer Oromo Muslims used contraceptives than Amhara Christians while fewer Oromo christians used contraceptives than the Amhara christians. These studies, therefore, found higher fertility among the Oromos than the Amharas. Abate and Morgan(1986), on the other hand, associated the difference to the relatively higher prevalence of infertility among the Amhara women while Assefa(1990) ascribes the differences to the age at marriage and stability of marriage. Moreover, Abdulahi(1989) suspects infertility to be the main reason for the fertility differentials among ethnic and religious groups in Alemaya, Addis ababa and Mettu.

Ethiopia is a country of many ethnic and religious groups. The attitudes of each of these groups towards the use of modern birth control techniques are different, as indicated earlier. Moreover, the levels and patterns of breast-feeding and postpartum infecundity period vary among different ethnic and religious groups.

1.3.4 Rural-to-Urban Migration, the Proximate Variables and Fertility

Empirical investigations to date do not show similar results with regard to the fertility of rural and urban women. In many Latin American countries, the fertility

of rural women appears to be higher than the fertility of urban women (United Nations, 1977). Chernichovasky and Meesook(1981), on the other hand, found lower fertility in the rural areas of Indonesia and these types of rural-urban fertility differences have been identified by the United Nations(1984) in Liberia, Pakistan and Nepal. Although these works indicate the rural-urban fertility pattern contrary to expectation, it is generally agreed that the behavior of women in the rural and urban settings can vary in relation to family sizes (United Nations, 1987). In rural areas, in general, marriage is early and nearly universal, the use of modern birth control techniques is relatively low and the duration of breast-feeding is longer. Moreover, rural-to-urban migration implies the movement of young people from rural to urban areas (Caldwell, 1968; Lattes, 1975; Monsted and Walji, 1978; Castello, Leinbach and Ulack, 1987), and as the young new migrants join the population of an urban-centre, the age structure of the urban population changes. The preponderance of youngsters in the urban areas thus implies higher fertility potential. Furthermore, the duration and intensity of breast-feeding tends to be reduced among the new migrants without the compensating effect of modern birth control techniques (Caldwell, 1981; Singh and Ferry, 1984; Singh, Casterline and Cleland, 1984; Pettus and Giles, 1987; Sufian and Johnson, 1989). As a result, higher fertility can be observed among the migrants. A study in nine Latin American cities, for example, identified higher than average fertility among couples who had originated from rural areas (Centro Latinoamericano de Demografia, (CELADE and Community and Family Study Centre, CFSC, 1972).

In the urban centres of Ethiopia, the proportion of young persons in the population is very high. In 1980, for example, around 54 per cent of the urban population were under 20 years of age (Aynalem 1984; Alula, 1985; Asmerom 1988; Mehari, 1988).

The migrants are also likely to settle in those parts of the town occupied by people of their ethnic and religious origin (Shack, 1973). As a result, it seems likely that spatial differences in relation to ethnicity and religion can be observed even in

medium sized towns such as Shashemene. Consequently, spatial differentials of fertility tend to be observed. In general, at the initial stage an increase in the proportion of urban population through migration tends to raise the fertility of the urban centre. This tendency has been found in Latin American and some countries of Southeast Asia (Singh and Casterline, 1985).

1.3.5 Population Density, Infant and Child Mortality, the Proximate Variables and Fertility

Environment is one of the most important factors that can influence the behavior of people. Altitude and the resulting differences in temperature, for instance, have been identified as factors which can influence the fertility of women. In her study in Wollo and Illubabor, Alemtsehay(1988) indicates lower fertility in the highlands than in the lowlands. Seiver(1985;1988), on the other hand, pointed out that a temperature above the normal value reduces the fertility of women in the United States of America.

Population density is an additional important aspect of the environment. In areas of high population density, other things being equal, pressures on the available resources and facilities tend to increase. As a result, access to essential services such as water supply, clinics, toilets, waste disposal, housing and family planning services is often worse in high population density districts. Besides, pollution is often more serious in areas of high population density. The health of the inhabitants of such districts can thus be adversely affected (Thomas, 1960; Fuller, 1974; Walmsley and Lewis, 1984; Akin and Schwartz, 1988). For example, Mata (1985) in Costa Rica and Kulkarni(1983) in Ahmedabad city of India, found higher infant and childhood mortality rates in the high population density and poor environments. In such districts, the death of lactating infants interrupts breast-feeding and reduces the duration of post-partum amenorrhoea. Moreover, the death of children can affect the attainment of desired family sizes. To fulfill the intended family size, therefore,

couples in high population density districts and poor environmental sanitation tend to have many offspring. Also, in areas of high population density with high infant and child mortality rates, couples naturally try to have as many children as they can to mitigate the risk of death(Ekanem, 1972; Gray, 1981; Chaudhury, 1982; Pettus and Giles, 1987; Sufian and Johnson, 1989). In such situations, use of contraceptives appears to be low and a positive relationship between fertility and infant/child mortality is expected.

In areas of high population density and poor environmental sanitation, inadequate supply of food and prevalence of disease may result in high maternal mortality and miscarriages and these also tend to reduce fertility(Pollani and Kephart, 1989). Moreover, Frisch(1981) and Mata(1985) both indicate the biological capacity of females to conceive tends to be affected by the prevalence of diseases, hard work and the nature of the diet. Well fed girls tend to reach their menarche earlier than poorly fed ones. Singh and Ferry(1984:9) appear to further justify this point that "One trend that has been observed in developed countries is a decline in the mean age of menarche over time, since modernization presumably leads to improvements in health and nutrition". Moreover, Frank(1983) in tropical Africa and Abate and Morgan(1986) in Ethiopia seem to suggest a positive correlation between female infertility and the high prevalence of venereal diseases. Besides, Assefa(1990: 222) suggests that "The higher prevalence of sexually transmitted diseases in the urban areas might have also contributed to the higher proportion of low parity women". The prevalence of STD is likely to be higher in high density areas since contact between people is higher. Finally, it may well be the case that lack of dwelling houses in the high population density areas of urban Ethiopia is likely to force the spouses to postpone marriage. This is reflected in the fertility differentials between women living in a dwelling unit with fewer rooms and those living in a house with more rooms. Abdulahi(1988:238-240) indicates that "...women in households with only one room housing unit had about two children less than those from households with four or more housing units".

In Ethiopia, infant and child mortality rates are very high(CSO 1984a; 1988; Tesfayesus, 1985, Assefa, 1990), and several studies have indicated that the differentials in infant and child mortality are due to the uneven distribution of the essential facilities. For example, Yohannes (1990), Bekele(1988) and Kassahun(1986) have pointed out that the availability of water with in the compound can reduce mortality by more than 50 per cent compared to households which depend on river or well water supply.

1.4. Objectives

The study is conducted in Shashemene, one of the fast growing urban centres of the country. The population of the town has been increasing rapidly. This has already created shortages in the provision of housing, water, medical and sewerage facilities, among others(Water Supply and Sewerage Authority, 1988). In order to mitigate the fast growth rate of the population, therefore, the factors contributing to the growth rate should be identified. This research, thus, tries to assess the level of fertility and its differentials among Kebeles in the town. In order to do that the research emphasizes on the proximate determinants of fertility and their spatial pattern among Kebeles as they are affected by different socio-cultural variables.

The specific objectives of the research are:

1. To examine the spatial pattern of the four major proximate determinants of fertility in the town of Shashemene. Each of these proximate variables would be correlated with the total fertility rate in each Kebele. This is expected to lead to the identification of the most important variables which could account for the highest variance in total fertility among Kebeles.
2. To investigate the spatial pattern of the proximate determinants of fertility and their socio-cultural correlates in the town. The proximate variables are affected by different socio-cultural factors such as religion, ethnicity, literacy,

occupation, mortality and population density. These factors are not uniformly distributed among the Kebeles and the population in the town. Hence, varying spatial pattern may be observed. Thus, by indicating the social and cultural characteristics of the population in the town, this study contributes towards the understanding of the social geography of urban centres in Ethiopia.

3. To appraise the policy implications of the proximate determinants of fertility and their socio-cultural correlates. The interplay between these two sets of variables affects the fertility level of the population.

As indicated earlier, the government has begun to feel the problems associated with high fertility. The factors contributing to the level of fertility, however, are not yet clearly stated. With regard to age at marriage, for example, the civil code states that the minimum age of entry into first marriage should be 15 years for females and 18 years for males (Daniel and Erku, 1976). Although the civil code states 15 as the minimum age at first marriage, in some parts of the country girls are usually forced to marry earlier than this age. Researches conducted in Sub-Saharan Africa, however, indicate that women generally have a very low level of fecundity before the age of 18(see, for example Adadevoh, 1974). In this regard, it can be argued that the postponement of first marriage up to the age of 15 can increase fertility by reducing the infertility of women caused by complications as a result of premature sexual intercourse. Besides, intrauterine mortality and miscarriages would be reduced. These are very essential, of course. To reduce fertility, nevertheless, the age at first marriage for females must be raised well above the age of 15 years. It is, therefore, very essential to assess the fertility implications of the indicated civil code which endorses first marriage at the age of 15 and to suggest alternative minimum age of first marriage which will have a substantial impact on fertility.

4. To assess the magnitude of the potential demand for family planning services in the town. The factors which affect the use of modern birth control techniques are examined in each Kebele and among different socio-cultural groups. Based on this, an assessment of the future desire of the town's population towards the use of modern birth control techniques is made.

5. To test the applicability of Bongaarts model of the proximate determinants of fertility. Bongaarts(1978) developed a multiplicative model which expresses total fertility rate as a product of the four proximate determinants, marriage, contraception, post-partum non-suseptibility and induced abortion. The model is given by the following equation:

$$TFR = C_m \cdot C_c \cdot C_i \cdot TF \cdot C_a^6$$

where;

TFR	=	Total fertility rate
C_m	=	Index of marriage
C_c	=	Index of contraception
C_i	=	Index of post-partum non-susceptibility period
TF	=	Total fecundity rate
C_a	=	Index of induced abortion

The model has not yet been widely used for fertility research of small localities except in a few cities such as Ibadan, Nigeria. In Ibadan, Bongaarts(1981:111-129) indicated that the TFRs estimated by the model and the observed were 6.3 and a little over 6, respectively and thus, the model fitted the situation well. Moreover, Rahman and Phillips (1988) showed that the model fitted

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In the questionnaire, questions relating to induced abortions were included but no woman have reported the practice of induced abortions. Hence, C_a is not used in this research.

well to the observed fertility in two of the three areas they studied in Bangladesh. Singh, Casterline and Cleland(1985: 113-135), on the other hand, applied the model to the World Fertility Survey data from 29 countries in Africa, Latin America/Caribbean and Asia and arrived at a conclusion of "...the limited extent to which observed variations in sub-national fertility can be attributed solely to concomitant variations in the three proximate determinants, marriage, contraception and lactational infecundability". This research, thus attempts to evaluate the applicability of the model to a micro-level study of fertility, in the town of Shashemene.

1.5 Hypotheses

To assess the spatial pattern of the total fertility rate and the proximate determinants of fertility in the town, the following hypotheses are put forward.

Hypothesis 1: The proximate determinants of fertility vary among Kebeles in the town because of the variations in their socio-cultural correlates

The hypothesis is based on the assumption that an urban centre which has immigrants with diverse socio-cultural characteristics would be heterogeneous with respect to ethnicity, religion, occupation, education and mortality rates. The heterogeneity in the socio-cultural variables are expected to affect the spatial distribution of the proximate determinants of fertility.

Hypothesis 2: The spatial pattern of total fertility rate in the town is the direct reflection of the major proximate determinants of fertility.

The major proximate determinants of fertility included in the survey are marriage, contraception and length of postpartum amenorrhoea.

Hypothesis 3: The Bongaarts model of the proximate determinants of fertility can be applicable to micro-level fertility research such as in Shashemene.

CHAPTER II

Data and Methodology

As the study is primarily a geographical appraisal of the effects of the proximate determinants on fertility, data collected from a well defined spatial units are required. However, the data were not readily available to the researcher prior to the survey. The research is, therefore, based on primary data gathered through a sample survey taking Kebeles as its spatial units. Based on the lists of the Kebeles, a proportionate sample of dwelling units were taken from each Kebele in the town.

The actual data collection was preceded by the selection, and training of female enumerators and the pilot survey. During the training period, the questionnaire was discussed thoroughly until the enumerators understood all of the questions and during data collection the enumerators were carefully supervised by the researcher himself and a male employee of the municipality of Shashemene.

The data have been scrutinized both by comparison with the 1984 census data and other relevant previous works and by the use of indices such as the Myers blended index for digit preferences on age. Moreover, the demographic models such as the P/F ratios and the Relational Gompertz function are applied to the data in order to detect any error of omission of children ever born or errors of reference period. After the data are evaluated and adjusted, the spatial pattern of the proximate variables and their socio-cultural variates are discussed using the principal components analysis as this method identifies groups of spatially interrelated variables. Furthermore, multiple regression and correlation models are used to assess the effects of the proximate variables on the total fertility rate. The Bongaarts model is used to evaluate the proportion of the variance in total fertility rate which could be accounted for by each of the proximate variables (marriage, contraception

and post-partum amenorrhoea). Details of the data collection procedure, and the method of analysis employed are discussed in the sections that follow.

2.1 Data Collection

2.1.1 Survey Design

During the preliminary field survey in the middle of September 1990, it was found that information about the female population between the age of 15 to 49 years was not available for each Kebele. But the number of dwelling units was available. The lists of dwelling units in each Kebele were, therefore, used as a sampling frame.

There were 6,459 dwelling units in the town in September 1990 and it was decided to select roughly ten per cent of the dwelling units(646) and to interview all eligible females (women in reproductive age; 15-49 years old) in the selected dwelling units. A small sample size may be adequate for fertility research of homogeneous populations to minimize the cost (UNECA, 1971; Scott, 1968). However, since the population in Sahshemene was heterogeneous in terms of ethnic⁷, religious and social characteristics, a larger sample was deemed necessary in order to capture the characteristics of the target population. This sample size was, therefore, arrived at as a trade-off between cost and adequate coverage.

As no information concerning ethnicity, religion, age, education, occupation and migrant composition of the target population was available at Kebele level, the Kebeles constituted the stratum for random sampling. Then the total sample of 646 dwelling units were allocated to each Kebele proportionately (Table 2.1)

⁷In this survey, ethnic classification was based on the mother-tongue of the respondents.

Table 2.1

Proportionate Sample Size by Kebele: Shashemene 1991

Kebele	Total Dwelling Units	Proportionate Sample Size
01	332	33
02	800	80
03	586	59
04	797	80
05	806	81
06	575	57
07	735	73
08	552	55
09	521	52
10	755	76
Total	6,459	646

Source: Collected from the Records of the Municipality of Shashemene.

Out of the 646 sample dwelling units, 619 eligible women in 615 dwelling units (95 per cent) provided the required information. Two eligible women per house were found in four dwelling units. Eligible women in 31 dwelling units (5 per cent of total sample) were not available during visits for interview.

2.1.2 Selection of Sample Dwelling Units

The dwelling units were selected from the list of dwelling units in each Kebele using simple random sampling techniques. After the numbers of the dwelling units were selected from lists, the enumerators were sent to search, identify and locate the dwelling unit. Since the houses were not numbered consecutively, the enumerators found it difficult and time consuming to locate the dwelling units.

2.1.3 Recruitment and Training of Interviewers and the Pilot Survey

The actual data collection was preceded by the selection and training of female enumerators. Females were preferred because the respondents were females and thus it is expected that the respondents will be more open and relaxed in the presence of female enumerators. Female enumerators were used in similar fertility surveys in several countries, for example, Nigeria, the Sudan and Turkey and reliable results were obtained (National Population Bureau, Nigeria 1984).

Female enumerators were selected from among students who had completed grade 12. The selection was based on motivation, sufficient command of the Amharic language and ability to conduct the interview satisfactorily. Applicants were interviewed and screened and the best twelve were selected. They had undergone an intensive five days training on the art of posing questions and eliciting answers. During the training, all the questions were reviewed until the interviewers understood the meaning and intention of the questions.

After the training period, a pilot survey of 30 households, proportionately allocated to each Kebele, was under-taken. The pilot survey was very essential to assess the appropriateness of the questionnaire with regard to the wordings of the questions, content, logical flow, clarity and length of the interview. Consequently, the

questionnaire was modified in such a way that some questions were omitted and new ones were added for the final survey.

During the final survey all the enumerators were deployed to undertake the data collection in different zones of a Kebele and were closely supervised by the researcher and an employee of Shashemene Municipality. This type of deployment of the enumerators was thought to be more effective than distributing the enumerators to every Kebele. Firstly, data errors which would arise from differences in interviewing would be equally distributed among Kebeles. Secondly, it would facilitate the supervision of the enumerators.

2.1.4 The Questionnaire

The survey questionnaire was prepared in Amharic, the lingua franca of the country, because it was believed that most people in the urban areas of the country, at the very least, are able to understand this language.

The questionnaire is divided into seven parts. After identifying the residential address of the respondents such as Kefteгна and Kebele, the first part of the questionnaire dealt with the characteristics of the women such as age, place of birth, literacy, ethnic and religious affiliations. Part two obtained information related to the nuptiality history of the respondents followed by the natality questions in part three. The natality part contained questions on the total number of children ever-born by the respondents. However, to mitigate the problem of recall lapse and misreporting of children ever born, the respondents were asked three types of questions:

1. The total number of male and female children born by the respondent who were living at home at the time of the survey;
2. The total number of male and female children born by the respondent who were living away from home at the time of the survey; and

3. The total number of male and female children who had died.

The sum of the children obtained through these questions gave the number of children ever born by the respondents. To obtain the current fertility, on the other hand, the total number of children born alive in the 12 months prior to the interview was required. This is, however, often affected by reference period errors. Births that occurred before the reference period may be included and this would inflate the births of the reference period; or some of the births that occurred during the reference period may be excluded which may under-estimate the actual number of births in the reference period. There is also the problem of short (i.e. less than 12 months) reference period that could bias the estimates of current fertility downwards.

To circumvent this problem, the respondents were asked to provide on birth history information (i.e., starting from the oldest to the most recent child), sex of children, month and year of births of each child and mortality history of children (see the English version of the questionnaire in appendix I). Although birth history information has problems of forward and backward displacement of dates of births (Potter, 1977).

Breast-feeding information was asked in part four followed by questions on attitude, knowledge and use of contraceptives in part 5. In part 6, questions related to the desired number of children were asked and in the last part the characteristics of the husbands of those married respondents were asked. The questionnaire has 111 questions and the interview lasted on the average 60 minutes.

Also, information on sexually transmitted diseases (STD), such as gonorrhoea and syphilis, are very essential in this type of study. Previous researches in Ethiopia indicate that STD can cause either primary or secondary sterility (see, for example, Abate and Morgan, 1986; Abdulahi, 1988; Nebiat, 1989). However, as it is very hard

to get reliable information on STD directly from the respondents, efforts were made to collect the information from the clinical records of those respondents who had no children at all. Repeated attempts were made to locate the records of these women in the Shashemene health Centre as well as in Shashemene Hospital. But because of inappropriate filing system, it was difficult to locate the records. At any rate, the number of childless women, aged 35 and above, was found to be very small, i.e. only 4 women (0.6 per cent of total respondents).

2.2 Data Evaluation and Adjustments

Available empirical research indicates that demographic data obtained through sample surveys or censuses in the developing countries are subject to various types of errors (Brass and Coale, 1968; Van de Walle, 1968, Shryock, et.al, 1976; UNECA, 1971; 1988; UN, 1983). It is therefore, essential to examine and evaluate the data before any in-depth analysis is done.

Errors in survey research are both of the omission and commission types. The total number of children born by a woman may not be reported accurately. Those children who do not dwell with their parents during the survey are liable to be excluded. Children who died at an early age may be excluded while still births may be included. As older women are liable to memory lapses, they may not report the number of their offspring accurately. Misreporting of age is a particularly common problem amongst women in developing countries. Records of date of births are not usually kept and very few households celebrate the birth days of their children (UNECA, 1988). Thus, one of the most important sources of age misreporting is the ignorance of the respondents about their date of births. Figures ending with digits such as "0" and "5" are usually preferred. These digit preferences tend to result in surplus of persons in some ages and deficit in others.

2.2.1 Age Misreporting

In order to detect the presence of digit preferences in this survey, the Myers' blended index was calculated (Table 2.2). "The theoretical range of Myers' index is 0, representing no heaping and 90 which would result if all ages were reported at a single digit, say zero" (Shryock et al., 1976:118). The Myers' index for the Shashemene data is calculated to be 12.4. Compared with results from previous researches, such as the census results for Shewa(index of 29.3) (Office of Population and Housing Census Commission, 1989); for the town of Neghelle (index of 21.2; Bekele et. al., 1990) and for urban females of Arsi and Shewa (index of 16.2; Assefa, 1990), the figure for Shashemene appears to be fairly accurate.

Table 2.2

Age Preference Indices for Terminal Digits by Myers' Blended
Method, Shashemene 1991

Digit	Population With Terminal Digit		Weights for		Blended Population	% Distribution	Deviation of % from 10 ⁹
	Starting at Age 16 ⁸	Starting at Age 26	Column 1	Column 2			
0	101	78	1	9	803	15.4	5.4
1	57	30	2	8	354	6.8	3.2
2	62	39	3	7	459	8.8	1.2
3	52	37	4	6	430	8.2	1.8
4	37	17	5	5	270	5.2	4.8
5	82	44	6	4	668	12.8	2.8
6	65	58	7	3	629	12.1	2.1
7	60	51	8	2	582	11.2	1.2
8	58	48	9	1	570	10.9	0.9
9	45	36	10	0	450	8.6	1.4
Total	619				5,215		24.8
Summary index = Total + 2							12.4

Source: Survey Data

⁸Since no respondent aged 15 was captured by the survey, 16 was taken as a starting age and the respondents aged 16, 26, 36 and 46 were summed to obtain the total respondents who reported their age with terminal digit "6". The same procedures were followed for all digits 0-9 see Shryock et. al. 1976:117-118 for procedures of computation.

⁹The absolute value of the deviation was considered.

Terminal digit zero was reported by the highest proportion of women (16.3 per cent) followed by terminal digit 5 (13.3 per cent) (Table 2.3) and this appears to be in line with previous researches in Ethiopia (Abdulahi, 1988; Office of Population and Housing Census Commission, 1989).

Table 2.3

Percentage Distribution of Respondents by Terminal
Digits: Shashemene 1991

Digit	0	1	2	3	4	5	6	7	8	9
Percent	16.3	9.2	10.0	8.4	6.0	13.3	10.5	9.7	9.4	7.3

Source: Survey data

The lowest number of respondents was found for terminal digit four (6 per cent) followed by terminal digit nine (7.3 per cent) and three (8.4 per cent).

2.2.2 Omission of Children

The number of children ever born by a woman may be affected by omission mainly due to recall lapses. "The symptoms of such omission are average parities that fail to increase rapidly enough as age increases; and in some cases, average parities for women aged 40-44 and 45-49 may actually fall below that for women aged 35-39 even when there is no reason to suppose that fertility has been rising" (UN, 1983:28). The average parity data for Shashemene (Table 2.4) show erratic values from age to age and from Kebele to Kebele.

Table 2.4

Average Parities by Age and Kebele: Shashemene 1991

Kebele	Age Group						
	15-19	20-24	25-29	30-34	35-39	40-44 ¹	45-49 ¹
01	1.000	1.8571	4.000	4.2500	4.200	11.2000	10.0000 ²
02	0.6667	2.2500	3.7500	3.7647	4.5000	6.5000	10.0000 ²
03	0.2500	2.0714	2.9000	3.8750	6.0000	7.2857	8.5000
04	0.0000	2.5000	3.4167	6.2778	5.3333	6.25000	5.8571
05	0.2000	1.8235	3.1667	4.5833	6.8333	7.7059	7.3333
06	0.5000	2.1818	3.0000	3.5000	4.5000	6.5710	6.8333
07	1.0000	1.8333	6.6429	5.5556	6.8462	8.090	7.2857
08	0.6667	1.4444	3.2500	4.0000	6.4375	10.5000	9.0000
09	0.7500	1.8750	4.4444	6.2500	6.0000	6.0000	7.7500
10	0.0000	2.2222	3.2500	3.4000	8.0000	5.2222	6.4000
Total	0.4444	2.0000	3.8130	4.6810	6.2018	7.3253	7.3953

Source: Survey Data

¹Average parities for some Kebeles are very high because of small number of respondents.

²Based on one woman.

In Kebele 01, for example, the average parity abruptly increases from 1.86 children for the age group 20-24 to 4.00 children for the age group 25-29. Then it

declines from 4.25 children per woman for women in the 30-34 to 4.20 for those in the age group 35-39. The same patterns are also observed for Kebeles 04, 07, 08, 09 and 10 (Table 2.4). These may partly be due to errors in reporting children ever born or due to small number of women in these age groups.

The average parities for the town as a whole, however, appear not to be affected much by errors of omission. The mean parities monotonically increase with the age of the respondents as expected. Moreover, comparison with the 1984 census data also reveals that the data for Shashemene appear to be less affected by omission of children ever born (Table 2.5)

Table 2.5

Average Parity for Urban Centres¹⁰ by Age: Ethiopia 1984

Age Group	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Average Parity	0.1457	1.0578	2.3125	3.3726	4.2379	4.5584	4.6148

Source: Adapted from Table 4.3 of Office of the Population and Housing Census Commission(OPHCC, 1991); The 1984 Population and Housing Census of Ethiopia: Analytical Report at National Level. Addis Ababa, p. 200.

The Office of Population and Housing Census(1991) implicitly indicates that the wide gap between the current (6.3 children per woman) and the retrospective (4.6 children per woman) fertility may imply omission of children ever born by the older women. The Shashemene data, on the other hand, show a very small difference between the current fertility (TFR of 6.98 children per woman) and retrospective fertility (average parity of 7.40 children per woman aged 40-49).

¹⁰Census parity data for the town of Shashemene was not available to the researcher.

However, the existence of erratic values for average parities by age, as indicated earlier suggests the presence of errors in the data. It is also apparent from the current fertility data that some of the reported total fertility rates by Kebele seem to be implausible (Table 2.7). The total fertility rate for Kebele 08, for instance, appears to be very high (9.85 children per women), even compared with the highest rural total fertility in Ethiopia (Table 2.6). The highest rural total fertility (9.2) was in Bale followed by Arssi (8.1 children per women), (Table 2.6).

Table 2.6

Reported Total Fertility Rates by Rural/Urban and Region:
Ethiopia 1984

Region	Rural	Urban
Arsi	8.1	5.0
Bale	9.2	5.9
Eritrea	-	4.2
Gamo Gofa	6.9	5.1
Gojjam	7.0	4.6
Gondar	6.6	2.3
Hararghe	7.4	4.9
Illubabor	6.8	5.3
Keffa	6.7	4.8
Shewa	6.5	4.7
Sidamo	5.9	5.5
Tigray	-	4.0
Wollega	5.8	5.3
Wollo	5.2	3.7
Addis Ababa	-	2.2
Assab Administration	-	3.4
Total	6.6	4.2

Source: OPHCC(1991:208).

The highest urban total fertility rate(5.9) was in Bale and, although the census indicated extremely low total fertility rates in urban areas, for example in Addis Ababa(2.2) and in Gondar(2.3), the reported total fertility rate in some Kebeles of Shashemene appear to be relatively high. Besides, total fertility ranges from 9.85 (Kebele 08) to 4.57 (Kebele 02). A difference of 5.3 children per woman in such a very small area is less likely to occur unless the data are affected by errors. As a result, it appear to be more preferable to adjust the observed total fertility rates.

Table 2.7

Adjusted and Unadjusted Total Fertility Rate by Kebele:
Shashemene 1991

Kebele	Adjusted P_2/F_2	Adjusted RGM	Reported TFR
01	7.539	5.843	8.845
02	6.971	5.741	4.567
03	5.918	6.101	5.562
04	7.775	6.998	7.958
05	6.866	7.746	4.804
06	6.661	5.714	8.101
07	8.338	8.084	7.602
08	6.800	8.245	9.854
09	8.797	5.847	5.799
10	7.070	5.252	7.382
Shashemene	7.892	7.805	6.983

Source: Computed from the Survey Data.

Table 2.8

Brass P/F Ratios: Shashemene 1991

Age Group	P_i/F_i
15-19	1.16
20-24	1.15
25-29	1.19
30-34	1.05
35-39	1.07
40-44	1.10
45-49	1.06

Source: Computed from the Survey Data.

The indirect techniques of fertility estimation such as the Brass P/F ratio and the relational Gompertz function were applied to the data (Table 2.7) to detect errors and to adjust fertility. The P/F ratio, however, is not a suitable method of fertility adjustment in areas where the population is affected by higher rate of migration. As Shashemene is affected by migration the calculated P/F ratios show erratic values which depart from one (Table 2.8). This may also occur due to errors in the data.

In this regard, Ntozi (1985:507-523) states that "... if P/F ratios are close to unity, it would indicate consistency between current and retrospective data and hence the data is fairly reliable. On the other hand, if the P/F ratios depart from this pattern, it would imply errors in the data. For example, if the ratios are declining with age, it would mean deficiency of retrospective data arising out of memory lapse".

The UN(1983:35) also adds that: "Naturally, the more consistent the set of [P/F] ratios obtained, the more confidence one can have in the adjustment factor

selected. Certain patterns of variations of the ratios with age may also reveal the types of problems present. For example, a recent decline in fertility tends to produce a sequence of P/F ratios that increases with age". Zaba(1981), on the other hand, indicates that the assumptions of constant fertility in the recent past and invariable reporting errors with age may not be essential in the use of the relational Gompertz model. Brass(1981:345-362) also adds that:

The modification of the traditional P/F ratio method through the intermediary of the relational Gompertz model has some modest but useful advantages. The model is fitted to the rates from the past year using the $Z(x)$... Thus, the assumption is that the scale error is the same for the relevant younger women and not necessarily at all ages ... Since the fitting "averages" the current rates, the estimated F's are less vulnerable to chance and erratic errors in the measures at under 25 than with the traditional P_2/F_2 correction.

Thus, the total fertility rates adjusted by the relational Gompertz model (appendix II) are used for the analysis of the data in this research.

2.3 Methods of Analysis

The data analysis involved a number of procedures. Cross-tabulations, graphs and simple correlation were used in order to assess the pattern of the socio-cultural and proximate variables. Then the analysis proceeded to test the stated hypotheses.

The first hypothesis, that is that the proximate determinants of fertility vary among Kebeles due to the variations in the socio-cultural variables, was examined using principal components analysis. Principal components analysis is a statistical technique that can identify the spatial pattern of interrelated phenomena. It has been said that "... in components analysis we are simply transforming the original variables into the new set of linear combinations(the components)" (Stevens, 1986:338)). This method sorts out each variable and classifies them into similar

groups. The variables in a group will have higher spatial correlations while the correlations between groups are near zero. The groups are therefore new variables derived from the original variables. These new variables are the principal components. Since the correlation among the new variables (components) is near zero, the problem of auto-correlation is minimized. Moreover, in a situation where large number of variables are involved, it is difficult to discern a general pattern from the simple correlations. For example, in this research 23 variables are considered. The total number of simple correlations among these variables, therefore, is 253. Hence, a technique to generalize the pattern is required and the principal components analysis is used to this effect reducing the original variables "... into a set of uncorrelated variables(the components). The hope is that a much smaller number of these components will account for most of the variance in the original set of variables, and of course that we can meaningfully interpret the components"(Stevens, 1985:339). The interpretation of the components, however, is dependent on the nature of the correlations between the original variables and the components (the new variables). These correlations are called component loadings and the higher the loading of a variable on a component, the more important the variable is in the interpretation of that component. Like any other correlation coefficients, "The sum of these squared loadings therefore indicates the total variance accounted for by the component. This value is known as the eigen value ..."(Johnston, 1978:138).

The component loadings, however, represent the correlation matrix of the original variables and the components. These do not indicate the values of each component per observation, Kebeles in this case. For example, values for the following original variables were collected for each Kebele.

The variables are:

x_1 = per cent married

x_2 = per cent contraceptors

x_3 = average length of postpartum amenorrhoea(in months)

- x_4 = per cent illiterates (cannot read and write)
- x_5 = per cent with primary education (1-6 grades)
- x_6 = per cent with junior and senior secondary education (7-12 grades)
- x_7 = per cent with post secondary education (> 12 grades)
- x_8 = per cent Amhara
- x_9 = per cent Guraghe
- x_{10} = per cent Oromo
- x_{11} = per cent Wolaita
- x_{12} = per cent other ethnic groups
- x_{13} = per cent Orthodox
- x_{14} = per cent Protestant
- x_{15} = per cent Catholic
- x_{16} = per cent Muslims
- x_{17} = per cent non-migrants
- x_{18} = per cent migrants
- x_{19} = mean number of children who have died
- x_{20} = per cent in government employment
- x_{21} = per cent self-employed
- x_{22} = per cent unemployed
- x_{23} = population density(persons/room)

The new variables or components must also be derived for each Kebele. These are the component scores. The component scores are obtained in such a way that a Kebele which has high value on the original variable with high loading on a component will have also high component score (Johnston, 1978:150). The component scores are calculated using:

$$S_{ik} = \sum_{j=1}^n D_{ij} L_{ik}$$

where, S_{ik} = the score of observation i on component k.
 D_{ij} = the standardized value for observation i on variable j.
 L_{ik} = the loading of variable j on component k.

Furthermore, if a Kebele has positive component scores on a component, it indicates that this Kebele has higher values than the average which is indicated by the component. Conversely, if a Kebele has negative component scores, the original values for this kebele are less than the average values for the principal component. The component scores are very important in geographical researches.

As Johnston(1978:153) puts it:

In much geographical work, the observations in the data matrix are places, and so it is maps which are being correlated with each other. The component scores are then often an important part of the output of the analysis, since they provide data for a new set of maps, representing the combinations of variables which make-up the components ... Such maps are useful representations of the general patterns in a series of maps and they may be used, for example, as sampling frameworks for further hypothesis testing.

In this research, therefore, the component scores are calculated to show the general spatial patterns of the variables indicated earlier. The patterns are depicted on a series of maps. It is with this purpose in mind that the principal components analysis is used.

The second hypothesis, that is, total fertility varies among Kebeles in the town because of variations in the proximate variables, was examined using multiple regression analysis given by:

$$X_0 = a + b_1x_1 + b_2x_2 + b_3x_3$$

Total fertility rate (TFR), that is the total number of children a woman would have at the end of her reproductive period if she gives offspring according to the current age specific fertility rate, was used as the dependent variable (X_0) and the proportion married (X_1), proportion contracepting (X_2) and average duration of post-partum amenorrhoea (X_3) were used as independent variables. a is the intercept, b_1 , b_2 and b_3 are the partial regression coefficients or the regression slopes (Kmenta, 1986).

The contribution of each independent variable to the total variance in the total fertility rate was assessed based on the value of the beta coefficients. This is because the independent variables are scaled in different units. Marriage and contraceptors, for example, are in percentages whereas average length of post-partum amenorrhoea in months. Thus, standardization is required to make comparisons easier. Moreover, partial and multiple correlation coefficients were calculated and significant tests are made to test the hypothesis.

Finally, the Bongaarts Model was used to test the third hypothesis that states that the Bongaarts model can be used for a micro-level study of fertility. The model states that $TFR = C_m \cdot C_c \cdot C_i \cdot TF$

where;

TFR = Total fertility rate (as defined earlier).

C_m = Index of marriage. It includes all types of union which expose the women for regular sexual contacts. These are legal, religious, customary and consensual marriages. The dissolution of marriage through separation, divorce or widowhood, is also an important variable of the index.

The index (C_m) is calculated using the formula

$$C_m = \frac{\sum m_a \cdot g_a}{\sum g_a t}$$

where, m_a = age specific proportions married
 g_a = age specific marital fertility rates

The value of the index varies between zero, where nobody is married, to one, where every women between the age of 15 to 49 years are married. In other words, a small value of the index indicates that the effect of non-marriage on the total fertility is high. In this case, total fertility is expected to be low.

C_c = Index of contraception and is expressed by $C_c = 1 - 1.18 \mu e$

where, 1 = potential fecundity

1.18 = correction factor for primary sterility

μ = Proportion of married women using contraceptives

e = Average contraceptive effectiveness¹¹. The value of the index (C_c) varies between zero, where all fecund women use 100 per cent effective contraceptives, and one, where no fecund women uses contraceptives.

C_i = Index of postpartum infecundability period(in months) and is calculated using; $C_i = \frac{20}{18.5 + i}$

where;

i = average length of postpartum amenorrhoea(in months)

20 = average length of birth intervals (in months) without lactation, as follows:-

- a. Immediately following a birth, a female is said to be infecund for about 1.5 months, whether or not lactating.
- b. Waiting time for conception which starts at the first ovulation following a birth and ends with conception. Its average duration is about 7.5 months.
- c. An average of 2 months is added due to intra-uterine mortality.

¹¹Since no data were available on contraceptive effectiveness for the population of the study area, an average contraceptive effectiveness for the developing nations(0.85) is used (Bongaarts, 1978). It is also said that "... at low levels of contraceptive use the fertility estimates are insensitive to errors in e" (Bongaarts, 1981:118).

- d. The normal gestation period, on average 9 months. The average birth interval without lactation is thus $1.5 + (7.5 + 2 + 9) = 20$ months (see Bongaarts, 1978: 105 - 132).

The value of the index varies between one, where there is no lactation (that is $i = 1.5$ months) and zero, where lactation extends indefinitely.

In this research, the average length of postpartum amenorrhoea (in months) is used rather than breast-feeding. This is because the period of amenorrhoea is more related to postpartum non-susceptibility period. The length of postpartum amenorrhoea, however, depends on breast-feeding only up to a certain point in time. Page (1981:102) indicates that:-

...lactation provides a degree of contraceptive protection through the postpartum anovulation and amenorrhoea caused by elevated prolactin levels which inhibit the release of pituitary and ovarian hormones. However, it must be emphasized that the contraception protection [of lactation] is incomplete and diminishes with time, and it appears to be heavily dependent upon the frequency and intensity of suckling.

The average length of the postpartum amenorrhoea, i.e., the interval (in months) between birth and the resumption of menses, was calculated for the last open intervals.

TF = Total fecundity rate refers to the maximum potential of a woman to conceive and give offspring. It has been indicated that women are sterile for about 17 per cent of their total reproductive span (15-45). Taking the average birth interval, without lactation, as 20 months, a fecund woman could have about 15 children in her total reproductive period as indicated below:-

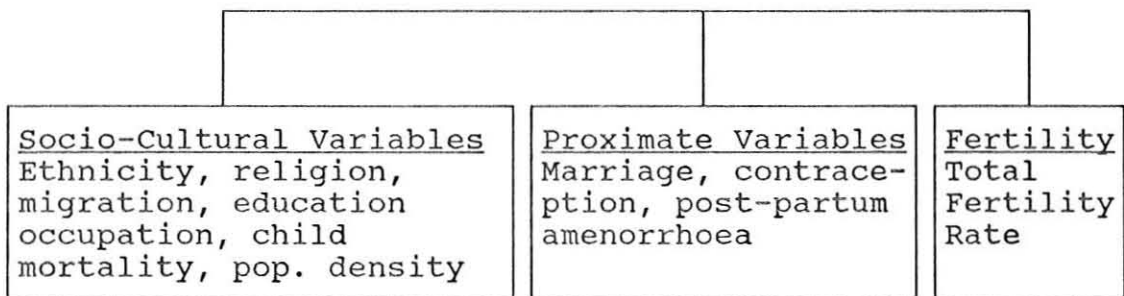
- a. the woman's reproductive period on average(15-45) = 30 years
- b. the woman is sterile for about 17 per cent of 30 = 5 years

- c. the woman is fecund for about $30-5 = 25$ years
- d. birth interval without lactation = 20 months
- e. the total offspring the woman would have = $\frac{25 \times 12 \text{ months}}{20 \text{ months}} = 15$

The total fecundity rate, thus, does not significantly vary from population to population unless infertility is prevalent. The value of TF, therefore, ranges between 13 and 18, the average being 15.3 (Bongaarts, 1978: 105-132). For the analysis of this research, TF is taken to be 15.3 as suggested by Bongaarts.

In general, the analysis of the survey data follows the following theoretical framework which is adapted from Bongaarts(1978).

Spatial Pattern Of



The data were processed using SAS computer programme in the School of Information Studies for Africa(SISA) at the main campus of the Addis Ababa University. The various indices and fertility rates were, however, computed using a hand calculator.

2.4 Limitations of the Study

During the Survey, the respondents were found to be suspicious of the questions on ethnic affiliations. This was due to the fact that the survey was conducted in the summer of 1991, immediately after the former Socialist Government was overthrown by the Ethiopian People's Revolutionary Democratic Front. As a result, political unrest was prevalent in the study area. The respondents thus thought that the survey was for political reasons. And rumors widely spread among the population that the non Oromo ethnic groups would be forced to leave Shashemene since it was originally an Oromo land. As a result, the response on ethnic affiliations might have been biased despite the fact that efforts were made to explain the purpose of the survey.

Furthermore, the survey was thought to be for the purpose of distributing aid from the Government. The respondents consequently opted to inflate the number of children ever born by including the adopted children as well as children of the husband born by women other than the respondents. However, this problem was mitigated by telling to the respondents about the aim of the survey.

The research, moreover, is a geographical appraisal of fertility in a very small area, that is, in the town of Shashemene. The town, as indicated earlier, has only 10 Kebeles on which observations were made and subsequent analysis were performed. Furthermore, the findings in this study can not reflect the conditions in other urban centers of the country due to the fact that the number of observation was small and that the conclusions arrived at in the study remain tentative because of the extremely small number of observations on which the results were based. A more detailed study based on a larger sample size may arrive at different results and conclusions.

CHAPTER III

Socio-cultural Variables and the Proximate Determinants of Fertility: Bivariate Analysis

It has been indicated that the proximate determinants of fertility (marriage, contraception and postpartum in fecundability) appear to be influenced by different socio-cultural factors. Some of these are education, occupation, ethnicity, religion, migration, infant/child mortality and population density. The chapter attempts to examine and discuss the effect of these variables on the proximate determinant of fertility.

3.1 Socio-cultural Variables and Marriage Factors

Entry into marriage for females varies from population to population. In some societies, marriage appears to be universal while in others, a substantial proportion of women remain unmarried. Moreover, the age at which marriage starts also varies from population to population due to socio-cultural variations. In this section, therefore, the effects of the socio-cultural variables on the marital status of the respondents and the age at first marriage will be considered.

3.1.1 Migration and Marital Status

Migration is likely to affect the marital status of women because migrants would have various cultural backgrounds depending on the diversity of their origin. Migrants with rural origin, for example, have rural background which appears to favour early entry into marriage. The data in the town of Shashemene revealed that the proportion of ever-married women varied from 90.9 per cent in Kebele 01 to 98.5 per cent in Kebele 07 with a coefficient of variation of 2.76 per cent. The proportion of the never married women also varied from Kebele to Kebele. The highest

proportion of never married women (9.1 per cent) was in Kebele 01 and the least proportion (1.5 per cent) was in Kebele 07 (Table 3.1). The distributions of the migrants and the non-migrants by Kebele level was such that the smallest proportion of the non-migrants (13.9 per cent) was found in Kebele 02 and the highest proportion (51.9 per cent) appeared to be in Kebele 09 with a coefficient of variation of 40.51 per cent (Table 3.1).

Table 3.1

Percentage Distribution of the Respondents by Migration, Marital Status and Kebele:Shashemene 1991

	Non-Migrants	Migrants	Total	Never-Married	Ever-Married	Total
01	21.2	78.8	100(33)	9.1	90.9	100(33)
02	13.9	86.1	100(79)	8.9	91.1	100(79)
03	25.0	75.0	100(56)	7.1	92.9	100(56)
04	20.0	80.0	100(70)	5.7	94.3	100(70)
05	21.8	78.2	100(78)	3.8	96.2	100(78)
06	29.1	70.9	100(55)	7.3	92.7	100(55)
07	40.3	59.7	100(67)	1.5	98.5	100(67)
08	41.1	58.9	100(56)	3.6	96.4	100(56)
09	51.9	48.1	100(52)	3.9	96.1	100(52)
10	26.0	74.0	100(73)	8.2	91.8	100(73)
Shashemene	28.3	71.7	100(619)	8.1	91.1	100(619)

Note: The numbers in parenthesis represent total sample size.

Source: Survey Data

The migrants, on the other hand, revealed an opposite pattern. The highest proportion of the migrants (86.1 per cent) were living in Kebele 02 and the lowest proportion of them were in Kebele 09 with a coefficient of variation of 16.57 percent.

The data suggest a significant direct relationship between proportion of non-migrants and proportion ever married. A correlation coefficient of 0.69 was obtained when proportion of non-migrant was correlated with proportion ever married. Women who had lived in the town since birth were likely to form union than women who migrated from other places. This appeared to be confirmed by the negative correlation ($r=-0.69$) between the proportion migrants and the proportion married.

3.1.2 Ethnicity and Marital status

Ethnic affiliation is another aspect of the cultural factors which influences the pattern of marriage. In Kebele 09, the Guraghes were dominant (42.3 per cent) and the least proportion of the Guraghes (5.5 per cent) was in Kebele 10 (Table 3.2), with a coefficient of variation of 71.92 per cent.

Table 3.2

Percentage Distribution of the Respondents by Ethnic Affiliation,
Marital Status and Kebele: Shashemene 1991

Kebele	Amhara	Guraghe	Oromo	Wolaita	Never-Married	Ever-Married
01	54.6	6.1	18.2	9.1	9.1	90.9
02	41.8	6.3	21.5	16.5	8.9	91.1
03	53.6	7.1	19.6	5.4	7.1	92.9
04	37.1	15.7	21.4	2.9	5.7	94.3
05	39.7	18.0	18.0	12.8	3.8	96.2
06	32.7	21.8	12.7	20.0	16.4	92.7
07	23.9	31.3	13.4	11.9	1.5	98.5
08	23.2	37.5	5.4	16.1	3.6	96.4
09	21.2	42.3	7.7	23.1	9.6	96.1
10	34.3	5.5	23.3	16.4	16.4	91.8
Shashemene	35.7	18.7	16.6	13.4	8.11	91.9

Source: Survey Data

Previous researches indicated that marriage among the Guraghes was early and relatively stable (see for example, Shack, 1973; Bjerer, 1985) and that Table 3.3 show that, in general, in Kebeles where the Guraghes were dominant the proportion of ever-married woman was higher. This was further confirmed by a strong positive correlation coefficient($r = 0.82$). Around 67 per cent of the variations in marriage

among Kebeles appeared to be accounted for by the variations in the proportion of the Guraghe women.

The proportion of the Amhara varied from 54.6 per cent in Kebele 01 to 21.2 per cent in Kebele 09 with a coefficient of variation of 32.51 per cent. Compared with the spatial distribution of the Guraghes, the Amharas manifested lower spatial concentrations. Moreover the relationship between the proportion of the Amhara and the proportion ever married was found to be negative($r=-0.71$).

The Oromos had higher proportion in Kebele 10(23.3 per cent) and lower proportion in Kebele 08(5.4 per cent) with a coefficient of variation of 37.70 per cent. The association between the proportion of the Oromo ethnic groups and the proportion of ever-married women was found to be negative ($r=-0.62$). With regard to the Wolaitas the relationship appeared to be extremely weak($r=0.10$).

3.1.3 Religion and Marital Status

Religious affiliations are additional factors affecting the nature of marriage. Islam and Orthodox Christianity advocate universal marriage to their followers. Moreover, among the muslims marriage is usually polygamous.

The Shashemene data revealed that the spatial variations among different religious groups were spectacular(Table 3.3). Also the proportion of the ever-married women by Kebele level appeared to follow the pattern of the different religious groups. The proportion of Orthodox christians was the highest (87.9 per cent) in Kebele 01 and the proportion of ever-married women was the lowest (90.9 per cent) in this Kebele. The proportion of Orthodox christians was the least (61.2 per cent) in Kebele 07 and the proportion of ever-married women was the highest(98.5 per cent).

Table 3.3

Percentage Distribution of the Respondents by Religious Affiliations, Marital Status and Kebele: Shashemene 1991

Kebele	Orthodox	Protestant*	Catholic*	Muslim	Never-Married	Ever-Married
01	87.9	3.0	3.0	6.1	9.1	90.9
02	77.2	8.9	3.8	10.1	8.9	91.1
03	85.7	7.1	1.8	5.4	7.1	92.9
04	75.7	2.9	2.9	18.6	5.7	94.3
05	74.4	10.3	0.0	15.4	3.8	96.2
06	81.8	0.0	0.0	18.2	16.4	92.7
07	61.2	1.5	0.0	37.3	1.5	98.5
08	62.5	7.1	0.0	30.4	3.6	96.4
09	65.4	17.3	1.9	15.4	9.6	96.1
10	74.0	9.6	0.0	16.4	16.4	91.8
Shashemene	74.0	6.9	1.3	17.8	8.1	91.9

*Excluded from analysis due to small sample size.

Source: Survey Data

This was further confirmed by the negative correlation coefficient($r=-0.82$). While the relationship between proportion Muslim and proportion ever married was positive and strong($r = 0.78$) which is in line with the expectation that among Muslims, marriage is universal.

3.1.4 Education, Employment and Marital Status

Educational attainment and occupational status of females are important variables affecting the pattern of marriage. Marriage tends to be early and universal in populations where the level of literacy is low and where employment is dominantly in the traditional sector of the economy such as agriculture.

Table 3.4

Percentage Distribution of the Respondents by Level of Education, Occupational Status and Marriage by Kebele: Shashemene 1991

Kebele	Illiterate	1 - 6 Grades	7 - 12 Grades	> 12 Grades	Un-employed	Self-Employed	Govt't Employed	Ever-Married
01	9.1	66.7	21.2	3.0	18.2	69.7	12.1	90.9
02	20.3	34.2	43.0	2.5	11.4	68.4	20.3	91.1
03	21.4	33.9	44.6	0.0	7.1	69.5	23.2	92.9
04	12.9	57.1	28.6	1.4	57.1	75.7	17.1	94.3
05	19.2	50.0	29.5	1.3	11.5	68.0	20.5	96.2
06	23.6	52.7	23.6	0.0	9.1	76.4	14.6	92.7
07	32.8	47.8	19.4	0.0	3.0	94.0	3.0	98.5
08	30.4	51.8	17.9	0.0	1.8	94.6	3.6	96.4
09	26.9	48.1	23.1	1.9	3.9	90.4	5.8	96.1
10	31.5	46.6	21.9	0.0	11.0	76.7	12.3	91.8
Shashemene	23.3	47.8	27.9	1.0	8.2	78.0	13.7	91.9

Source: Survey Data

The Shashemene data shows that the relationship between the proportion of women with primary level (1-6 grades) education and the proportion of ever-married

women was very weak but positive($r=0.04$), (Table 3.4), suggesting that the effect of education on marriage before the completion of junior and senior secondary education is small. The relationship between the proportion of illiterates and the proportion of married women, on the other hand, was fairly strong($r=0.50$). As expected, the effects of education above the primary level (1-6 grades) on marriage appeared to be negative. This could be observed from the inverse association between proportion married and proportion of women with junior and senior secondary education ($r=-0.42$); and between proportion married and proportion of women with post-secondary education($r=-0.37$). This is in line with previous findings in developing countries that the negative effects of education on marriage becomes more pronounced after the completion of the primary level(see, for example, McDonald, 1985:87-114; Singh et.al. 1985:119). The effects of education on marriage could also be manifested through the type of employment. Better educated women are more likely to be employed in a modern sector which would enable the women to postpone marriage.

The Shashemene data indicated that well above three-fourths of the respondents were self-employed (Table 3.4). The spatial distribution of the respondents who were self-employed varied from 68 per cent in Kebele 05 to 94.6 per cent in Kebele 08 with a coefficient of variation of 13.6 per cent. Compared with the proportion of women in government jobs(coefficient of variation of 54.8 per cent), the variations among self employed was smaller (13.6 per cent against 54.8 per cent). Moreover, the association between proportion of women in government jobs and the proportion of ever-married, as expected, was negative($r=-0.57$). Women who are employed in the modern sector of the economy are more likely to earn more money to support themselves. They are also more likely to be free from their parents tight control. As a result, they are likely to have the freedom to decide on their own to marry or not to marry.

Unemployment, on the other hand, appeared to have an inverse relationship

with the proportion of ever-married women($r=-0.76$) in the town. The data suggested that unemployed women do not attract the males for marriage.

So far, the discussions have largely concentrated on the variations of marital status of the respondents among Kebeles as affected by different socio-cultural factors. Since marriage factors are affected by age in addition to socio-cultural factors the following section examines marriage pattern by age at first marriage.

3.1.5 Age at First Marriage

Table 3.5 presents the distribution of the surveyed women by marital status. It may be observed that 36.1 percent of the women in the 15-19 age group were ever married at the time of the survey. This appears to be higher than the results reported by the CSA for some of the urban centres. For instance, the CSA (1991: 29) reported that only 3.6 per cent of the women aged 15-19 years in Addis Ababa, 10 per cent in other urban centres and 40 per cent in rural areas of Ethiopia were married in 1990. From the table it may be observed that the proportion of ever-married women increases as age increases. By age 30 and over 97 per cent of the respondents were married. This indicates universal marriage.

Table 3.5

Percentage Distribution of the Respondents by Age Group and Marital Status¹⁰: Shashemene 1991

Age	Never-Married	Currently Married	Separated	Divorced	Widowed
15-19	55.6	36.1	2.8	2.8	2.8
20-24	18.3	78.0	1.8	0.9	0.9
25-29	5.7	86.2	2.4	4.1	1.6
30-34	2.6	87.1	2.6	4.3	3.4
35-39	0.0	89.9	1.8	4.6	3.7
40-44	0.0	86.7	1.2	2.4	9.6
45-49	0.0	69.8	4.7	11.6	14.0

Source: Survey Data

The proportion of never married women was highest in the age group 15 - 19 (55.6 per cent) followed by the 20 - 24 (18.3 per cent). By the age of 35, no respondents remained single in Shashemene. The proportion of the divorced and the widowed, on the other hand, increased with the age of the respondents. In the age group 45-49, for example, 11.6 per cent of the respondents were divorced and 14 per cent were widowed. The proportion of the separated, nevertheless, did not indicate a consistent trend with age (Table 3.5).

¹⁰The Classification of ever-married women by age at first marriage and kebele was avoided because of small sample size.

From the data in Table 3.6, the singulate mean age at marriage (the average number of years spent in the single state) for the town is calculated to be 19.1 years. Olmstead(1976) indicated similar results(19.1 years) for the Dorze in the Gamo Highlands. Recent surveys(CSA, 1991:29) found a singulate mean age at marriage of 18.4 for females in rural areas, 22.5 in urban centres and 24.8 years in Addis Ababa. From these, it could be said that the singulate mean age at marriage in Shashemene resembles that of the rural areas perhaps because of the dominance of the town's population by migrants from rural areas.

Examination of the singulate mean age at first marriage by Kebele indicates remarkable variations among Kebeles in the town of Shashemene(Table 3.6). The singulate mean age at marriage was, the highest in Kebele 10 (23.2 years) and the lowest in Kebele 08 (17.2 years). The differences in the singulate mean age at marriage among Kebeles in the town appeared to be impressive and factors for this were the socio-cultural variables such as ethnicity, religion, education, employment and migration.

Table 3.6

Singulate Mean Age at Marriage by Kebele¹¹: Shashemene 1991

Kebele	SMAM (in years)
01	19.1
02	19.8
03	17.3
04	20.0
05	17.3
06	19.9
07	19.2
08	17.2
09	19.4
10	23.2
Shashemene	19.1

Source: Survey Data

The socio-cultural factors affecting the age of entry into first marriage must, therefore, be evaluated.

¹¹Singulate mean age at marriage(SMAM) by ethnic affiliations and kebele was not presented due to small sample size

a. Ethnicity, Religion and Age at First Marriage

As indicated in Table 3.7, Kebele 08 appeared to be settled largely by the Guraghes(37.5 per cent of the respondents) and this Kebele had the lowest singulate mean age at marriage(17.2 years). Kebele 10, on the other hand, had the lowest proportion of the Guraghes (5.5 per cent) and it had the highest singulate mean age at marriage(23.2 years). In general, Kebeles with higher proportion of Gurghes had lower singulate mean age at first marriage compared to those with higher proportions of other ethnic groups. A correlation of -0.30 was obtained between proportion Guraghe and singulate mean age at first marriage which further confirms the fact that the Guraghes marry much earlier than other ethnic groups. The correlation between proportion Amhara and the singulate mean age at marriage by Kebele indicated also an inverse but weak relationship($r=-0.13$). The correlation between proportion Oromo and the singulate mean age at marriage, on the other hand, was found to be positive ($r=0.44$). This was also true for the Wolaita ($r=0.23$).

Table 3.7

Percentage Distribution of the Respondents by Ethnic and Religious¹²
Affiliations, Singulate Mean Age at Marriage and Kebele: Shashemene 1991

Kebele	Amhara	Guraghe	Oromo	Wolaita	Orthodox	Muslim	SMAM
01	54.6	6.1	18.2	9.1	87.9	6.1	19.1
02	41.8	6.3	21.5	16.5	77.2	10.1	19.8
03	53.6	7.1	19.6	5.4	85.7	5.4	17.3
04	37.1	15.7	21.4	2.9	75.7	18.6	20.0
05	39.7	18.0	18.0	12.8	74.4	15.4	17.3
06	32.7	21.8	12.7	20.0	81.8	18.2	19.9
07	23.9	31.3	13.4	11.9	61.2	37.3	19.2
08	23.2	37.5	5.4	16.1	62.5	30.4	17.2
09	21.2	42.3	7.7	23.1	65.4	15.4	19.4
10	34.3	5.5	23.3	16.4	74.0	16.4	23.2
Shashemene	35.7	18.7	16.6	13.4	74.0	17.8	19.1

Source: Survey Data

The singulate mean age at marriage seems to be less affected by religion in Shashemene. The simple correlation coefficient between singulate mean age at marriage and the proportion of Orthodox christians, for example, appeared to be extremely weak ($r=0.04$). The positive correlation, however, indicated that among the followers of Orthodox christianity marriage was relatively late compared to the

¹²Protestant and Catholic Christianity are excluded since the number of respondents by Kebele was too small.

Muslims in the town($r=-0.03$). Studies elsewhere have also found lower age at marriage among Muslim women (McDonald, 1985; UN, 1987). The effect of ethnicity and religion on age at first marriage can also be assessed based on age at which the women actually started union rather than the singulate mean age (Table 3.8).

Table 3.8

Percentage Distribution of Ever Married Women by
Ethnicity, Religion and Age at First Marriage: Shashemene 1991

Ethnic Group	Age at First Marriage(Years)			Total
	<15	15 - 19	>19	
Amhara	37.7	49.7	12.6	100(N = 199)
Guraghe	28.8	59.6	11.5	99.9 ¹³ (N = 104)
Oromo	36.5	50.0	13.5	100 (N = 96)
Wolaita	21.5	55.7	22.8	100 (N = 79)
Others	29.3	57.6	13.0	99.9 ¹³ (N = 92)
Total	32.3	53.7	14.0	100.0 (N = 570)
Religion				
Orthodox	36.1	52.4	11.5	100 (N = 427)
Islam	24.5	57.1	18.4	100 (N = 98)
Protestant	10.3	61.5	28.2	100 (N = 39)
Catholic	33.3	33.3	33.3	99.9 (N = 6)
Total	32.3	53.7	14.0	100(N = 570)

¹³Do not add to 100 because of rounding. Catholics are ^{not} considered because of small sample size.

Source: Survey Data

The Amhara and the Oromo had more or less similar pattern of ages at first marriage. For instance, among these women about 50 per cent reported to have married at ages of 15-19 years. About 12.6 per cent of the Amharas and 13.5 of the Oromos entered into their first marriage at the age of 20 years or later. The Wolaitas, on the other hand, appeared to marry later than other ethnic groups in the town. The proportion of the Wolaita who entered their first marriage before the age of 15 years was the least(21.5 per cent of the ever married women) while the proportion who married at the age of 20 or late was the highest(22.8 per cent (Table 3.8).

Religion wise the highest proportion of ever-married women who started their first marriage at the age of 20 or over were among the protestants(28.2 per cent) followed by the muslims(18.4 per cent). The smallest proportion of women who married at the age of 20 or over were among the Orthodox christians(11.5 per cent). This was because the dominant proportion of the followers of Orthodox christianity were Amharas as indicated by a strong positive correlation($r=0.91$) between the two and the Amharas are known to marry early(Table 3.8).

b. Education, Employment and Age at First marriage

The most potent factors for differentials in age at first marriage are level of education and employment of women outside home(McDonald, 1985:97). The results of the present study, however, revealed that the relationship between age at first marriage and education was weak. A correlation coefficient of 0.19 was obtained when singulate mean age at first marriage was correlated with proportion illiterate, and when it was correlated with proportion of women with primary education, the value was 0.06, while for those women with junior high or higher education it was -0.21 (Table 3.9).

Table 3.9

Percentage Distribution of the Respondents by Education, Employment,
Singulate Mean Age at Marriage and Kebele: Shashemene 1991

Kebele	Illiterate	1-6 Grades	7-12 Grades	> 12 Grades	Unemployed	Self- employed	Gov't Employed	SMAM
01	9.1	66.7	21.2	3.0	18.2	69.7	12.1	19.1
02	20.3	34.2	43.0	2.5	11.4	68.4	20.3	19.8
03	21.4	33.9	44.6	0.0	7.1	69.5	23.2	17.3
04	12.9	75.1	28.6	1.4	7.1	75.7	17.1	20.0
05	19.2	50.0	29.5	1.3	11.5	68.0	20.5	17.3
06	23.6	52.7	23.6	0.0	9.1	76.4	14.66	19.9
07	32.8	47.8	19.4	0.0	3.0	94.0	3.0	19.2
08	30.4	51.8	17.9	0.0	1.8	94.6	3.6	17.2
09	26.9	48.1	23.1	1.9	3.9	90.4	5.8	19.4
10	31.5	46.6	21.9	0.0	11.0	76.7	12.3	23.2
Shashemene	23.3	47.8	27.9	1.0	8.2	78.0	13.7	19.1

Source: Survey Data.

The effects of the employment of women on age at first marriage also were very small for the study population. The correlation between singulate mean age at marriage and the proportion unemployed was 0.25 and that between singulate mean age and the proportion of women in self-employment was -0.05. The same negative weak correlation was observed when singulate mean age was correlated with the proportion of women in government jobs($r=-0.08$).

Age at first marriage also varies with cohorts. Different age cohorts may enter marital union at different ages. Table 3.10 shows that the younger and older age cohorts entered marriage at different ages. The proportion of ever-married

women in the town who entered into their first union before the age of 15 increased as the age of the women advanced except for age group 40-44.

Table 3.10

Percentage Distribution of Ever-married Respondents by Age of First Marriage and Age at Survey: Shashemene 1991

Current Age	Married at Age (years)		
	< 15	15 - 19	> 19
15 - 19	11.8	88.2	-
20 - 24	23.6	57.3	19.1
25 - 29	28.4	51.7	19.8
30 - 34	34.5	51.3	14.2
35 - 39	39.4	50.5	10.1
40 - 44	27.7	56.6	15.7
45 - 49	53.5	46.5	0.0
Total	32.3	53.7	14.0

Source: Survey Data.

Women currently aged between 15 - 19 years who reported to be married before they were 15 were very small (11.8 per cent). For women currently aged 45-49, on the other hand, the proportion who married before the age of 15 appeared to be very high(53.5 per cent). The proportion of ever-married women who entered

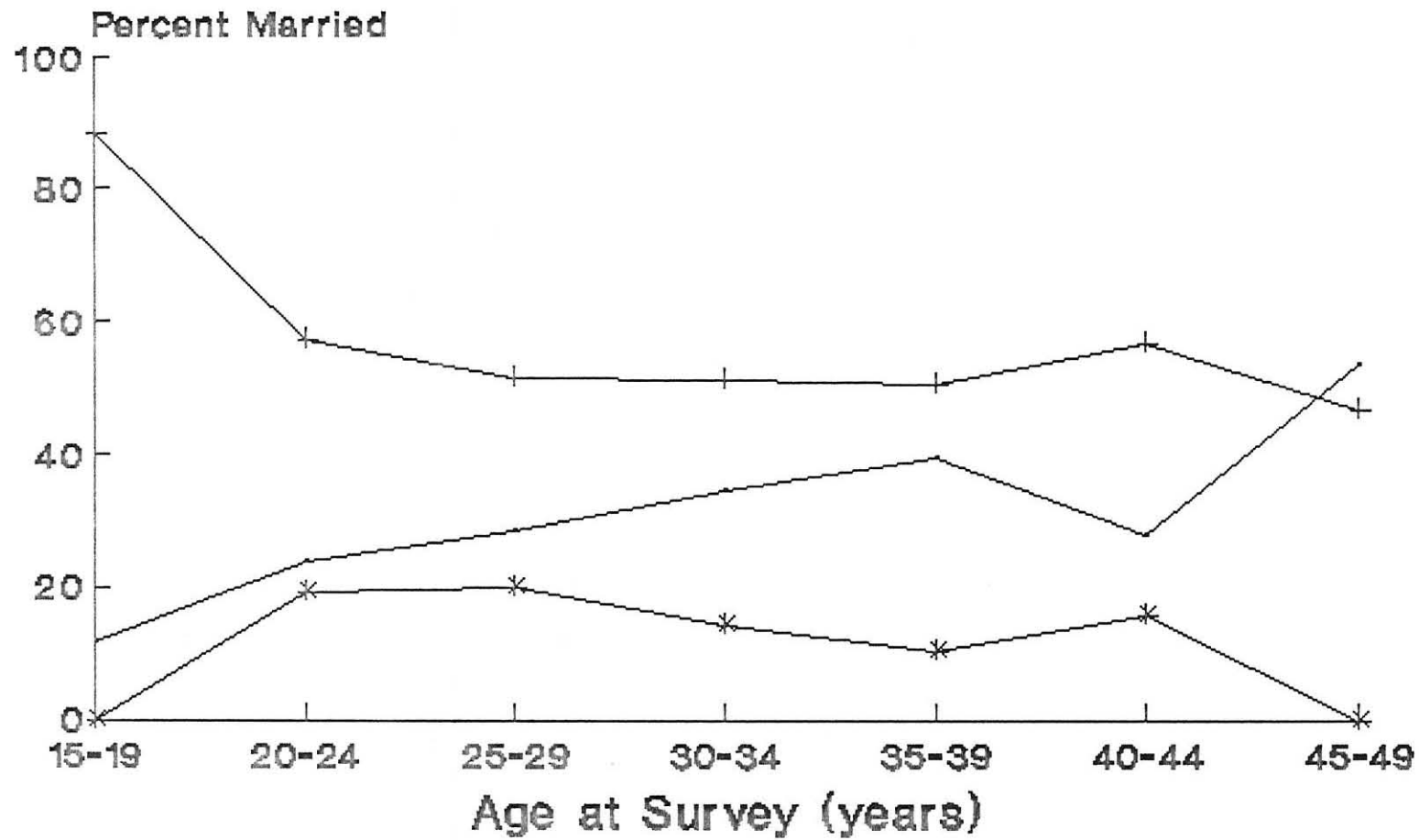
into marriage at the age bracket of 15 - 19 years, on the other hand, declined as the current age of the respondents increased except for age group 40 - 44. It ranged from 88.2 per cent for the younger cohorts (15 - 19 years old) to 46.5 per cent for the older women (45 - 49 years old). (Table 3.10 and Figure 7). This suggests that fewer and fewer women entered into marital union at early ages among the younger cohorts. The differentials among the younger and older respondents in age at first marriage could be explained by the educational attainments and type of employment. The highest proportion of women who married before the age of 15 years was observed among self-employed women (34.1 per cent) and the lowest proportion was

Table 3.11
Percentage Distribution of Ever-married Respondents by Employment Status,
Education and Age at First Marriage: Shashemene 1991

Employment Status	Married At Age (years)			
	< 15	15 - 19	> 19	Total
Unemployed	30.0	62.5	7.5	100 (N = 40)
Self-employed	34.1	54.5	11.4	100 (N = 448)
Government employed	23.2	45.1	31.7	100(N = 82)
Total	32.3	53.7	14.0	100(N = 570)
Education				
Illiterates	34.5	52.1	13.4	100(N = 142)
1-6 Grades	37.8	53.0	9.2	100(N = 283)
7 and more grades	19.3	56.6	24.1	100(N = 145)
Total	32.3	53.7	14.0	100(N = 570)

Source: Survey Data

Fig. 7 % Dist. of Ever-Married Respond.
by Age at First Marriage & Age at Survey



Source: Table 3.10 — < 15 — + — 15 - 19 — * — > 19

found among government employees(23.2 per cent) (Table 3.11) suggesting that employment of women in the modern sector of the economy is an important factor for the postponement of first marriage because women employed in this sector are less likely to be economically dependent. Moreover, the educational levels of women employed in the modern sectors are likely to be higher. As the educational attainment of women increases, the age at first marriage tends to increase, too. The data revealed that more than 34 per cent of the illiterates and 38 per cent of those with elementary education married before the age of 15 years. The corresponding figure for women with above elementary education was only 19.3 per cent. More than 24 per cent of those with junior or higher education reported to marry at the age of 20 or over (Table 3.11).

As women are more educated and employed in the modern sectors, they are more likely to earn income which could make them free from their parents' tight control. The freedom from the control of parents appears to be a more likely reason for the differentials in age at first marriage among the younger and the older women. The young are more likely to be educated and employed in the modern sector than the older women. As a result, the younger women appear to be more independent. Marriage for the younger women, thus, is arranged by the would be partners themselves (Table 3.12). The pattern by the current age of ever-married women in Shashemene revealed that forced marriage was low among the younger cohorts(76.5 per cent) and increased with the age of the respondents except at ages 20-24. First marriage arranged by the would be partners themselves, on the other hand, steadily declined from the younger to the older age groups. The age groups 20-24 (23.6 per cent) and 15 - 19 (23.5 per cent) had the highest proportion of women who started their first unions through self-arrangement.

Table 3.12

Percentage Distribution of Ever-married Respondents by Type of Arrangement of First Marriage and Current Age: Shashemene 1991

Current Age	First Marriage			Total
	Family Arranged	Self-Arranged	Other	
15 - 19	76.5	23.5	0.0	100(N = 17)
20 - 24	74.2	23.6	2.2	100(N = 89)
25 - 29	79.3	18.1	2.6	100(N = 116)
30 - 34	87.6	12.4	0.0	100(N = 113)
35 - 39	93.6	4.6	1.8	100(N = 109)
40 - 44	95.2	4.8	0.0	100(N = 83)
45 - 49	90.7	4.6	4.7	100(N = 43)
Total	86.0	12.4	1.6	100(N = 570)

Source: Survey Data

The least proportion (only 4.6 per cent) of self-arranged marriage was observed for the oldest respondents (Table 3.12).

c. Migration and Age at First Marriage

The data indicated that substantial differences existed among the migrants and non-migrants in age at first marriage (Table 3.13).

Table 3.13

Percentage Distribution of Ever-married Respondents by Migration Status and Age at First Marriage: Shashemene 1991

Migration Status	Age at First marriage (years)			Total
	< 15	15 - 19	> 19	
Non-migrant	18.8	66.9	14.3	100(N = 154)
Migrant	37.3	48.8	13.9	100(N = 416)
Total	32.3	53.7	14.0	100(N = 570)

Source: Survey data

The proportion of ever-married women who started their first marriage before the age of 15 years was the lowest (18.8 per cent) for the non-migrants and the highest (37.3 per cent) for the migrants in the town. In other words, the proportion of the migrants who entered into their first union before the age of 15 years was more than twice that of the non-migrants (Table 13.3). A substantial proportion (66.9 per cent) of the non-migrants appeared to marry largely in the ages of 15-19 years compared to the migrants (48.8 per cent).

The difference between the non-migrants and migrants in age at first marriage in Shashemene was as expected. It is more likely for the migrants to come from

rural areas. The rural migrants usually go to an urban centre with their rural mentality which favors early marriage (United Nations, 1987:198-200).

3.2 Socio-cultural Variables and Contraception

Contraception is an important proximate determinant of fertility because fertility variations among countries are mainly due to variations in the use of effective contraceptives (United Nations, 1987:291). However, before the impact of contraception on the fertility level of the study population is considered, it is deemed advisable to assess the determinants of contraceptive prevalence.

It has already been indicated that socio-cultural factors are very important determinants of contraceptive prevalence. Educational attainment of females, for example, is an important variable for the adoption of contraception. Employment of women outside home is an additional factor that may affect the adoption of modern birth control methods. Women who are employed in the modern jobs tend to have two roles. The role as mothers and as workers. These roles are usually conflicting. The rearing of children seems to be difficult for the working mothers. In this case, working women may prefer to avoid unwanted pregnancies through the use of contraception. Ethnic and religious affiliations of women also seem to be very important variable affecting the use of contraceptives. The sections that follow discuss the effect of these and other socio-cultural variables on knowledge and prevalence of contraception.

3.2.1 An Over-view of Knowledge and use of Contraception

Knowledge of contraceptive methods is an important prerequisite for the adoption of contraception. The data for the town indicate that a good proportion of the respondents (54.6 per cent) had heard of some method of modern contraceptives (Table 3.14). This figure is low-compared with the proportion who had contraceptive

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knowledge (61.8 per cent) in Ethiopia in 1990(CSA, 1991:39) and with those women in Addis Ababa in 1989(Kesteren and Markos, 1989). This proportion, however, varies among Kebeles. The highest proportion of the women who heard of modern contraceptives at the time of the survey was in Kebele 03 (64.3 per cent) followed by Kebele 02 (63.3 per cent).

Table 3.14

Percentage Distribution of the Respondents by Knowledge, Current Use of Contraceptives and Kebele: Shashemene 1991

Kebele	Heard of a Method	Current Users	Non-users
01	51.5	18.2	81.8
02	63.3	26.6	73.4
03	64.3	23.2	76.8
04	60.0	18.6	81.4
05	57.7	16.7	83.3
06	56.4	21.8	78.2
07	38.8	9.0	91.0
08	51.8	3.6	96.4
09	50.0	11.5	88.5
10	49.3	12.3	87.7
Shashemene	54.6	16.3	83.7

Source: Survey Data

The proportion of current contraceptors was highest in Kebele 02 (26.6 per cent) and lowest in Kebele 08 (3.6 per cent). The pattern among Kebeles, in general, reveals that knowledge and use of contraception have strong and positive correlation ($r=0.76$). This suggests that awareness is a very important prerequisite for the adoption of contraceptives.

The pattern of current use also indicates that the most favored contraceptive was the oral pill as 70.3 per cent of the current users were applying this method at the time of the survey (Table 3.15). This is true in many populations. For instance around 46.1 per cent of the respondents in Addis Ababa (Kesteren and Markos, 1989:16), 68 per cent in Egypt, 30 per cent in Kenya and 67 per cent in Sudan (United Nations, 1987:146) were reported as users of the pill. In other words, the pill has been the most widely used method of contraception and the Shashemene data also confirms this. Less than 30 per cent of the current contraceptors were using other methods of contraception which include intra uterine devices(IUD) (10.9 per cent of users), injection(2 per cent), female sterilizations (2 per cent), rhythm (13 per cent) and abstinence (2 per cent).

Table 3.15

Percentage Distribution of Current Contraceptors by
Method and Kebele: Shashemene 1991

Kebele	Pill	Others	Total
01	100.0	0.0	100(N=6)
02	66.7	33.3	100(N=21)
03	69.2	30.8	100(N=13)
04	61.5	38.5	100(N=13)
05	61.5	38.5	100(N=13)
06	66.7	33.3	100(N=12)
07	66.7	33.3	100(N=12)
08	100.0	0.0	100(N=2)
09	83.3	16.7	100(N=6)
10	77.8	22.2	100(N=9)
Shashemene	70.3	29.7	100(N=101)

Source: Survey Data

The spatial pattern suggested a remarkable differentials in the type of methods used among Kebeles. In two Kebeles(01 and 08), the pill appeared to be the only method used by the respondents (Table 3.15).

The prevalence of contraception by ever-use and future use is presented in Table 3.16. About 25 per cent of the total respondents in the town reported to have used any type of contraceptives before the time of the survey. The proportions of ever-users were more than the current users of contraceptives by 8.4 per cent.

Table 3.16

Percentage Distribution of the Respondents by Ever-use, and Future Use of Contraception and Kebele: Shashemene 1991

Kebele	Ever-users	Future users
01	24.2	36.4
02	39.2	51.9
03	35.7	53.6
04	32.9	45.7
05	20.5	32.1
06	23.6	36.4
07	13.4	41.8
08	17.9	37.5
09	13.5	38.5
10	19.2	31.5
Shashemene	24.7	40.7

Source: Survey Data

The pattern among Kebeles indicated that the highest proportion of ever-users(39.2 per cent) were found in Kebele 02 followed by Kebele 03 (35.7 per cent). The lowest proportion of ever-users were in Kebele 07 (13.4 per cent) followed by Kebele 09 (13.5 per cent). The pattern of ever-use of contraception had a strong positive correlation($r=0.83$) with the proportion of current-users of contraceptives. Kebeles with higher proportion of ever-users of contraceptives had higher proportion

of current users.

The percentage of respondents who intend to use in the future was around 40.7 per cent (Table 3.16). This figure is 2.5 times more than the proportion of current users in Shashemene and it is higher than the figure reported for two Kebeles of Addis Ababa (33 per cent) (Kesteren and Markos, 1989:17). Kebeles 10 (31.5 per cent) and 05 (32.1 per cent) had the lowest proportion of future users of contraception (Table 3.16).

The prevalence of contraception varied not only among Kebeles in the town but also among age groups of the respondents. It is natural for women to control unwanted pregnancies after they have achieved the desired number of offspring by applying contraceptives. The prevalence of contraception, thus, tends to increase with age up to the age of 30-40 years and then starts to decline (United Nations, 1987: 137). At the lower ages (15-24 years), the use of contraception is low because the couples need to satisfy their demand for more children. Contraception tends to decline at the older ages (40-49 years) partly because the women have very low risk of exposure to conception due to decline in fecundability at older ages. It is noted that "During maturity, fecundability remains high and decreases first very slowly then, approaching the end of childbearing period, tends to zero rapidly" (UN, 1986: 71-74). Moreover, it is likely for the older women to be strongly attached with customs and beliefs which are not favorable for the use of contraceptives.

Table 3.17

Percentage Distribution of Current-Users of Contraceptives
and Ever-married Women by Age: Shashemene 1991

Age	Current Contraceptors	Ever-married
15 - 19	6.9	3.0
20 - 24	19.8	15.6
25 - 29	21.8	20.4
30 - 34	26.7	19.8
35 - 39	15.8	19.1
40 - 44	6.9	14.7
45 - 49	2.0	7.5
Total	100.0 (N=101)	100.1*(N=570)

*: Exceeds 100 because of rounding

Source: Survey Data

The result that comes out from the data is the progressively increasing trend in the prevalence of contraception up to the age of 35 years (Table 3.17). The highest proportion of current users of contraception were in the 30-34 age group while the lowest proportion was in the 45-49. Women in the age group 25-39 appear to be more contraceptors because they probably have achieved the desired goal of reproduction. At ages 40-49 years, the proportion of current users is very low probably because of infecundity since women in these age group are approaching the end of their reproductive years.

Marital status is an additional reason for the variations in the use of contraceptive among different age groups. Marriage increases with the ages of the respondents. In societies where reproduction takes place within wedlock exposure, conception tends to increase among married than the never married couples. The use of contraception to prevent unwanted pregnancies may increase among the married respondents. This is further confirmed by the simple correlation coefficient of 0.8 between the proportion of current contraceptors and proportion of ever-married women in each age group (Table 3.17 and Fig. 8).

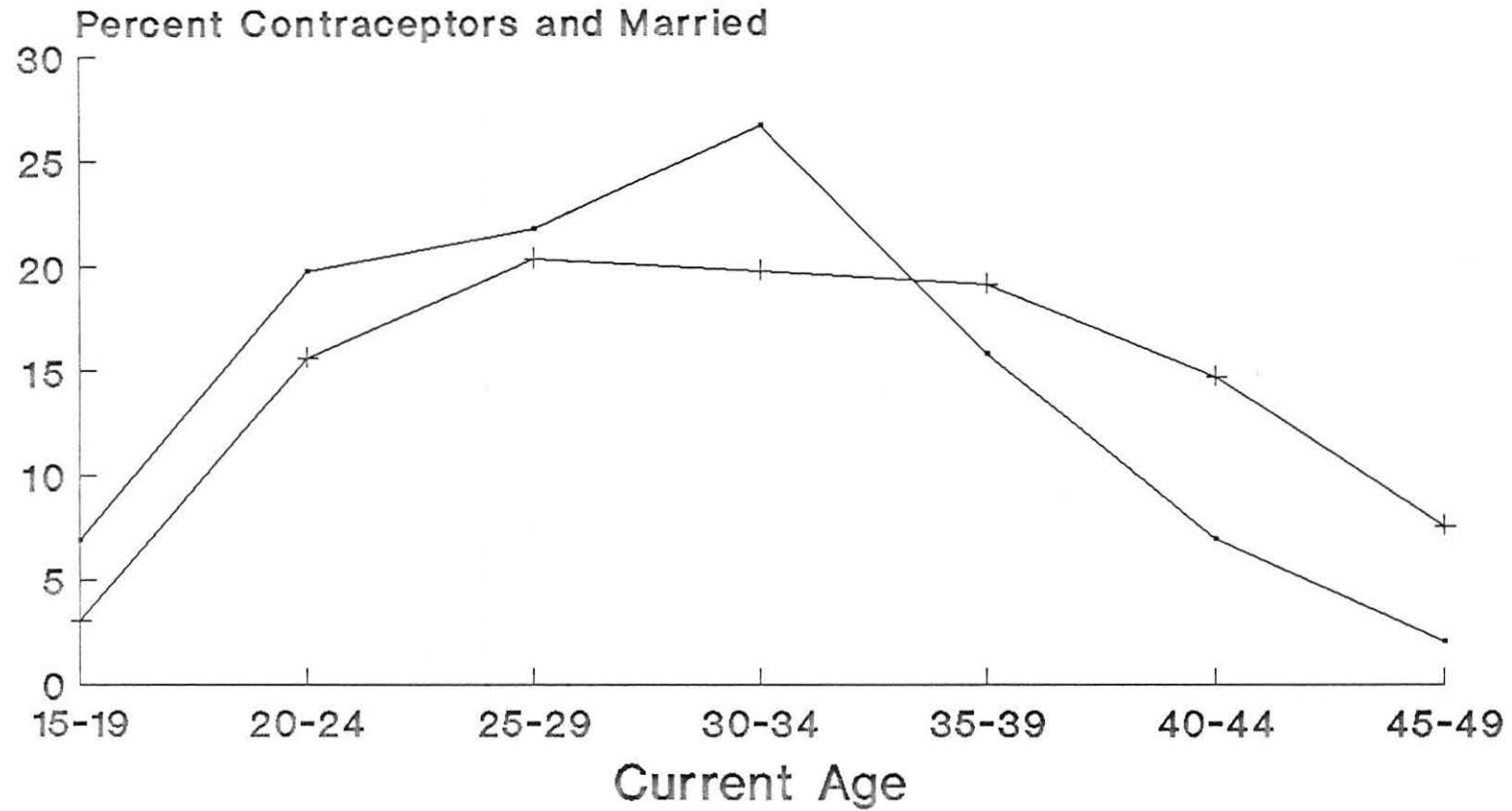
The emphasis so far concentrated on the prevalence of contraception in Shashemene and its variations among Kebeles. Next, we consider the socio-cultural factors affecting the prevalence of contraception.

3.2.2 Education and Contraception

Educational background is an important factor to bring differences in use of contraception. More educated women are in a better position to get acquainted with new ideas and innovations. The exposure to new ideas and innovations are naturally the prerequisites for adoptions. Some innovations, however, can be accepted more easily. Medical facilities, for example, are adopted faster than family planning services because of the fact that nobody wants to die. The time needed for the adoption of contraceptives, however, varies among the different educational categories.

The data for the town reveal that differences among Kebeles in the use of contraception and educational attainments do exist (Table 3.18).

Fig 8 % Dist. of Current Contraceptive Users Among Ever-Married Women by Current Age



Source: Table 17 — Current contraceptive — Ever-married

Table 3.18

Percentage Distribution of the Respondents by Educational Attainment, Contraception and Kebele: Shashemene 1991

Kebele	Illiterate	1 - 6 Grades	7 - 12 Grades	> 12 Grades	Current Contraceptors
01	9.1	66.7	21.2	3.0	18.2
02	20.3	34.2	43.0	2.5	26.6
03	21.4	33.9	44.6	0.0	23.2
04	12.9	57.1	28.6	1.4	18.6
05	19.2	50.0	29.5	1.3	16.7
06	23.6	52.7	23.6	0.0	21.8
07	32.8	47.8	19.4	0.0	9.0
08	30.4	51.8	17.9	0.0	3.6
09	26.9	48.1	23.1	1.9	11.5
10	31.5	46.6	21.9	0.0	12.3
Shashemene	23.3	47.8	27.9	1.0	16.3

Source: Survey Data

The highest proportion of the illiterates(32.8 per cent) was in Kebele 07 and this Kebele had the second-lowest(9.0 per cent) proportion of current contraceptors. Kebele 01, on the other hand, had the lowest proportion of illiterates (9.1 per cent) and relatively higher proportion of current contraceptors(18.2 per cent). This is

confirmed by a fairly strong negative correlation coefficient($r=-0.67$). Around 37 per cent of the variations in the use of contraception is accounted for by the variations in the proportion of illiterates. This is in line with previous findings in many developing countries(United Nations, 1987:236). The relationship between the proportion of women with primary education and the proportion of current contraceptors is also negative($r=-0.32$). As the proportion of women who attained primary education increases, the prevalence of contraception tends to decrease. A remarkable effect of education on the use of contraception is obtained by women who have attained junior and senior secondary educations. This is indicated by a strong positive correlation($r=0.79$). Although the respondents with post-senior secondary education were very small and some Kebeles had no respondents in this educational category, the relationship between educational attainments of the women and contraception remains positive($r=0.37$).

3.2.3 Employment and Contraception

The various categories of employment for women have been reported to affect the prevalence of contraception. With this regard, it was said that employed women have two roles to play namely the roles as a mother and a worker. When the two roles are incompatible, the women may be forced to avoid their roles as mothers through the use of contraception. This however is not true for Shashemene as the data in Table 3.19 show. A fairly strong correlation($r=0.57$) between proportion contracepting and proportion unemployed suggests that contraceptive use increases with proportion unemployed. This relationship, although hard evidences are not available at the moment, is likely to be explained by the fact that the costs of child rearing may be expensive for the unemployed women. As a result they may be forced to limit their fertility through contraception. The relationship between the proportion of self-employed women and proportion of current users of contraception, on the other hand, was found to be negative($r=-0.85$). As the proportion of self-employed women increases, the proportion of contraceptors tends to decrease(Table 3.19).

Table 3.19

Percentage Distribution of the Respondents by Employment,
Contraception and Kebele: Shashemene 1991

Kebele	Unemployed	Self-employed	Government Employed	Current Contraceptors
01	18.2	69.7	12.1	18.2
02	11.4	68.4	20.3	26.6
03	7.1	69.6	23.2	23.2
04	7.1	75.7	17.1	18.6
05	11.5	68.0	20.5	16.7
06	9.1	76.4	14.6	21.8
07	3.0	94.0	3.0	9.0
08	1.8	94.6	3.6	3.6
09	3.9	90.4	5.8	11.5
10	11.0	76.7	12.3	12.3
Shashemene	8.2	78.0	13.7	16.3

Source: Survey Data

The highest proportion of self-employed women(94.6 per cent) was in Kebele 08 followed by Kebele 07(94.0 per cent). These Kebeles had, on the other hand, the lowest proportion of contraceptors(3.6 per cent and 9.0 per cent, respectively). The negative association ($r=-0.85$) between self-employment and prevalence of contraception is, thus, expected because the works are usually performed at or near the residences of the women. The women are likely to handle both roles at the same

time. Moreover, women who generate regular incomes are in a position to have baby-minders. The presence of younger siblings and relatives also is likely to ease the load of child-rearing for the working mothers. On the contrary, the effect of employment in government jobs on the prevalence of contraception was strong and positive($r=0.86$). Kebele 03 had the highest proportion (23.2 per cent) of women employed in government jobs and it had the second highest proportion of current contraceptors (23.2 per cent). Kebele 07 had the lowest proportion of government employees(3.0 per cent) and the second lowest proportion of contraceptors(9.0 per cent).

In general, the spatial pattern of the prevalence of contraception in Shashemene was found to increase positively with proportion in government employment and proportion unemployed and negatively with proportion self-employed.

3.2.4 Ethnicity and Contraception

The use of contraception varies among different ethnic groups. Different ethnic groups may have various beliefs and traditions which affect the adoption of contraceptives. Moreover, ethnic plurality has been found to be an obstacle for the success of family planning programmes in many developing countries (Chaudhury, 1982:107-114).

The data in this study also reveal that use of contraception varied with ethnicity. (Table 3.20).

Table 3.20

Percentage Distribution of the Respondents by Ethnicity,
Contraception and Kebele: Shashemene 1991

Kebele	Amhara	Guraghe	Oromo	Wolaita	Current Users
01	54.6	6.1	18.2	9.1	18.2
02	41.8	6.3	21.55	16.5	26.6
03	53.6	7.1	19.6	5.4	23.2
04	37.1	15.7	21.4	2.9	18.6
05	39.7	18.0	18.0	12.8	16.7
06	32.7	21.8	12.7	20.0	21.8
07	23.9	31.3	13.4	11.9	9.0
08	23.2	37.5	5.4	16.1	3.6
09	21.2	42.3	7.7	23.1	11.5
10	34.3	5.5	23.3	16.4	12.3
Shashemene	35.7	18.7	16.6	13.4	16.3

Source: Survey Data

The Amhara were highest(54.6 per cent) in Kebele 01 and the proportion of current contraceptors in this Kebele was fairly large(18.2 per cent). When the proportion of Amharas was correlated with proportion of contraceptors, a significant and positive correlation was obtained ($r = 0.71$) suggesting that among the Amharas, relatively higher proportion use contraception. The relationship between the proportion of the Oromos and the proportion of current contraceptors was also positive($r=0.63$). The

relationship between the proportion of the Guraghes and the proportion of current contraceptors, on the other hand, was found to be negative($r=-0.70$). As the proportion of the Guraghe increases, prevalence of contraception appears to decrease. Kebele 08, for example, had the second highest proportion of the Guraghes(37.5 per cent) and the lowest proportion of current contraceptors(3.6 per cent)(Table 3.20). The same inverse relationship was also revealed between the proportion Wolaita and the proportion current contraceptors($r=-0.25$) although it was very weak.

Generally, the prevalence of contraception among Kebeles in the town had the tendency to increase with an increase in the proportion of the Amhara and the Oromo and, conversely, it tends to decrease with an increase in the proportion of the Guraghe and the Wolaita. Religious affiliations appear to be the reason for this differential.

3.2.5 Religion and Contraception

Different religions propagate different morals and ethics to their followers. In this regard, Catholic christianity is said to encourage its followers to have many children because of the belief that children are the gifts of the creator. The use of mechanical contraceptives, thus, is adversely affected (see Chaudhury 1982:121-122).

In Shashemene, the data suggest that differentials in the use of contraceptives among different religious groups were remarkable(Table 3.21). The correlation among the proportion of Orthodox and proportion of current contraceptors is positive and strong($r=0.80$). As the proportion of women belonging to the Orthodox faith increases, the prevalence of contraception tends to increase. Kebeles 01 and 03 had higher proportion of Orthodox christians (87.9 and 85.7 per cent respectively) and they had higher proportion of current contraceptors(Table 3.21).

Table 3.21

Percentage Distribution of the Respondents by Religion,
Contraception and Kebele: Shashemene 1991

Kebele	Orthodox	Protestant	Catholic	Muslims	Current Users
01	87.9	3.0	3.0	6.1	18.2
02	77.2	8.9	3.8	10.1	26.6
03	85.7	7.1	1.8	5.4	23.2
04	75.7	2.9	2.9	18.6	18.6
05	74.4	10.3	0.0	15.4	16.7
06	81.8	0.0	0.0	18.2	21.8
07	61.22	1.5	0.0	37.3	9.0
08	62.5	7.1	0.0	30.4	3.6
09	65.44	17.3	1.9	15.4	11.5
10	74.0	9.6	0.0	16.4	12.3
Shashemene	74.0	9.6	1.3	17.8	16.3

Source: Survey Data

The positive correlation between Orthodox Christians and current contraceptors is expected because Orthodox Christians appear to be more literate. The correlation between proportion of Orthodox and proportion of women with junior and senior secondary education resulted in a value of $r=0.50$ indicating a positive and significant relationship between the two variables. Moreover, significant positive correlation ($r=0.74$) was obtained between proportion Orthodox Christians

and proportion in government jobs implicating that higher proportion of them were in government jobs. As indicated earlier, this type of employment had strong positive association with the prevalence of contraception.

The association between proportion muslims and current contraceptors, on the other hand, was found to be negative($r=-0.74$). Kebeles with higher proportion of muslims appear to have lower prevalence of contraception. Kebele 07, for example, had the highest proportion of muslims(37.3 per cent) and the second lowest proportion of current contraceptors(9.0 per cent). Unlike the Orthodox christians, the muslims had acquired lower level of education. This was indicated by a strong positive correlation between proportion of muslim women and proportion of illiterates($r=0.66$). As a result, most of the muslims were engaged in self-created jobs. Hence, the relationship between proportion muslims and proportion self-employed was positive and significant. On the other hand, the correlation between proportion muslims and proportion in government jobs was strong and negative($r=-0.73$). Moreover, the muslims in Shashemene were dominantly non-migrants as implied by a fairly strong positive correlation($r=0.56$) between the two variables.

3.2.6 Migration Status and Contraception

As indicated in the literature review, migrant and non-migrant differential in the use of contraception appear to exist. The rural-urban migrants usually move to the urban centres with their rural attitude. The attitude strongly adhere to traditional beliefs which are against the use of contraception.

Contrary to expectations the Shashemene data reveal that in general use of contraception was high among the migrants(Table 3.22). The prevalence of contraception increases with an increase in the proportion of migrant women among Kebeles. Kebeles with high proportion of migrants had higher proportion contracepting. For instance, Kebele 02 had the highest proportion of migrants and it was found that 26.6 per cent of the women were contracepting. Kebele 09, on the

other hand, had the lowest proportion of migrants(48.1 per cent) and the proportion of contraceptors was also small(11.5 per cent). This is further confirmed by a correlation coefficient of 0.74.

Table 3.22

Percentage Distribution of the Respondents by Migration Status, Contraception and Kebele: Shashemene 1991

Kebele	Non-migrants	Migrants	Current Users
01	21.2	78.8	18.2
02	13.9	86.1	26.6
03	25.0	75.0	23.2
04	20.0	80.0	18.6
05	21.8	78.2	16.7
06	29.1	70.9	21.8
07	40.3	59.7	9.0
08	41.1	58.9	3.6
09	51.9	48.1	11.5
10	26.0	74.0	12.3
Shashemene	28.3	71.7	16.3

Source: Survey Data

This unexpected out come of the data may be explained by the fact that the migrants, to a great extent, were in a better position than the non-migrants. A simple correlation suggested that there were negative relationship($r = -0.65$) between

proportion migrants and proportion illiterates and positive correlation($r=0.57$) between proportion migrants and proportion of women with junior secondary or higher level of education. Consequently, the migrants appeared to be employed in government jobs($r=0.81$). It could also be due to the small number of cases covered in the study. Or most of the migrants of this town were originated from other urban centres.

Ethnicity also have a substantial impact on the non-migrant/migrant differentials in the use of contraceptives. As indicated earlier, the Amharas were more contraceptors. The migrants were dominated by Amharas (77.4 per cent) compared to the Guraghes (62.9 per cent) (Table 3.23). The non-migrants, on the other hand, were dominated by the Guraghe ethnic groups(37.1 per cent) compared to the Amharas (22.6 per cent). And the Guraghes were less contraceptors.

As shown earlier (see section 3.2.5) the two religious affiliations, Orthodox and Islam, had different influences on contraception in the town. Followers of Orthodox christianity were more contraceptors than followers of Islam and the migrants were more of Orthodox christians(76.4 per cent) compared to the muslims (50.9 per cent) (Table 3.23) while the non-migrants were dominated by muslims($r=0.56$). As a result, the migrants were more contraceptors than the non-migrants in Shashemene.

Table 3.23

Percentage Distribution of the Respondents by Migration,
Ethnicity and Religion: Shashemene 1991

Ethnicity	Migrant	Non-migrant	Total
Amhara	77.4	22.6	100(N=221)
Guraghe	62.9	37.1	100(N=116)
Oromo	63.1	36.9	100(N=103)
Wolaita	74.7	25.3	100(N=83)
Others	76.0	24.0	100(N=96)
Total	71.7	28.3	100(N=619)
Religion			
Orthodox	76.4	23.6	100(N=458)
Islam	50.9	49.1	100(N=110)
Others	74.5	25.5	100(N=51)
Total	71.7	28.3	100(N=619)

Source: Survey Data

Child mortality may be an additional factor for the migrant/non-migrant differentials in the use of contraceptives. The deaths of children were found to be relatively higher in areas where the non-migrants were dominant. As indicated below (section 3.2.7) it seems difficult for women to adopt contraception under conditions of high childhood mortality.

3.2.7 Child Mortality and Contraception

The death of children tend to reduce the number of ever-born children to the couples. This adversely affects the desired number of children to be reproduced by the couples. Thus, the couples prefer to have as many children as they can so as to minimize the risk of high child mortality. The use of contraceptives, thus, appears to be low among women with child loss experience.

The data in Table 3.24 confirm the expectations that use of contraception was very small in Kebeles where child mortality¹³ was higher as the relationship between the two variables manifested negative and significant correlation($r=-0.81$).

¹³It was obtained by adding the total number of children ever born and who had died in a kebele and divided by the total respondents in the same kebele

Table 3.24

Mean Population Density (Persons Per room), Children Dād and
Contraception by Kebele: Shashemene 1991

Kebele	Population Density Persons Per Room	Mean Number of Children Dead	Current users (Per cent)
01	3.09	0.94	18.2
02	2.63	0.63	26.6
03	2.41	0.45	23.2
04	2.63	0.56	18.6
05	2.74	0.64	16.7
06	3.01	0.60	21.8
07	3.40	0.85	9.0
08	2.87	1.11	3.6
09	3.59	1.04	11.5
10	3.12	0.85	12.3
Shashemene	2.89	0.75	16.3

Source: Survey Data

The deaths of children varied from Kebele to Kebele(Table 3.24). Variations in Population density were the most important factors for the differentials. As the number of people living in a room increases, prevalence of infections and various diseases caused by unhygienic environment tend to increase. This would accelerate the sickness and subsequent deaths of children. The Shashemene data suggest that there was a strong positive correlation between child mortality and population

density($r=0.71$). Kebele 09 had higher population density(3.59 persons per room) and this Kebele had the second highest average number of children ever died (1.04). Kebele 03, on the other hand, had the lowest population density (2.41 persons per room) and the lowest mean number of children dead (0.45).

3.3 Socio-cultural Variables and Postpartum Amenorrhoea

Breast-feeding is an important factor which affects the duration of postpartum amenorrhoea(Lesthaeghe et al. 1981:7). The duration of breast-feeding and postpartum amenorrhoea, however, appear to be affected by various socio-cultural factors. Some of these factors are education, employment, ethnic and religious affiliations. The following sections are devoted to the analysis of the factors affecting the length of the postpartum amenorrhoea in Shashemene.

3.3.1 Education and Postpartum Amenorrhoea

The effect of women's education on the length of post-partum amenorrhoea has been reviewed earlier.

The data for this study reveal that the relationship between the educational attainments of the respondents and length of postpartum amenorrhoea has come out to be contrary to expectations. For example, the correlation between the proportion of illiterates and mean length of postpartum amenorrhoea was negative($r=-0.28$). The association between the proportion of women with post-secondary education and mean length of postpartum amenorrhoea, on the other hand, was strong and positive($r=0.62$). This may be due to errors of reporting but also as generally understood the shortened period of breast-feeding may not necessarily result in reduced period of postpartum amenorrhoea. It can be seen from previous findings that in Thailand(1970), for instance, lactation lasted, on average, for 17.7 months while the duration of amenorrhoea, on average, was 11.4 months. In Senegal(1971) lactation had an average duration of 24.3 months whereas amenorrhoea lasted only

for 10.8 months (cited by Gray 1981:100). From this, it can be said that the less educated women in Shashemene may breast-feed for longer duration but the length of postpartum amenorrhoea may remain short.

Table 3.25
Distribution of the Respondents by Length of Postpartum
Amenorrhoea, Education and Kebele: Shashemene 1991

Kebele	Illiterate	1-6 Grades	7-12 Grades	> Grade 12	Mean Length of PPA
01	9.1	66.7	21.2	3.0	10.3
02	20.3	34.2	43.0	2.5	10.7
03	21.4	33.9	44.6	0.0	9.0
04	12.9	57.1	28.6	1.4	10.3
05	19.2	50.0	29.5	1.3	8.4
06	23.6	52.7	23.6	0.0	8.6
07	32.8	47.8	19.4	0.0	7.5
08	30.4	51.8	17.9	0.0	8.0
09	26.9	48.1	23.1	1.9	12.0
10	31.5	46.6	21.9	0.0	10.7
Shashemene	23.3	47.8	27.9	1.0	10.7

PPA = Postpartum Amenorrhoea(months)

Source: = Survey Data

The data reveal spatial variations in the mean length of postpartum amenorrhoea(Table 3.25). Kebele 09, for example, had the longest postpartum

amenorrhoea (12 months) while Kebele 07 had the shortest postpartum amenorrhoea(7.5 months). The average length of postpartum amenorrhoea, for all Kebeles, was 10.7 months. This is in line with previous finding in developing countries that "... the mean duration of amenorrhoea was over 10 months, on average, with a range of about 7-13 months .." (United Nations, 1987:120-124). The educational attainments of the respondents above the secondary level was found to explain most of the variations in the length of postpartum amenorrhoea among Kebeles($r^2 = 38$ per cent).

3.3.2 Employment and Postpartum Amenorrhoea

Employment is also said to affect the duration of postpartum amenorrhoea through its effects on the duration of breast-feeding. Women who are employed outside home appear to breast-feed for shorter durations while for those who are self-employed breast feeding tends to be longer.

The data in the study area (Table 3.26) show that the relationship between the proportion of unemployed and mean length of postpartum amenorrhoea was positive but weak($r=0.30$).

Table 3.26

Distribution of the Respondents by Employment Status and Length of Amenorrhoea and Kebele: Shashemene 1991

Kebele	Unemployed	Self-employed	Government Employed	Length of PPA
01	18.2	69.7	12.1	10.3
02	11.4	68.4	20.3	10.7
03	7.1	69.6	23.2	9.0
04	7.1	75.7	17.1	10.3
05	11.5	68.0	20.5	8.4
06	9.1	76.4	14.6	8.6
07	3.0	94.0	3.0	7.5
08	1.8	94.6	3.6	8.0
09	3.9	90.4	5.8	12.0
10	11.0	96.7	12.3	10.7
Shashemene	8.2	78.0	13.7	10.7

Source: Survey Data

The highest proportion of unemployed women were found in Kebele 01(18.2 per cent) and this Kebele had longer duration of postpartum amenorrhoea(10.3 months). The lowest proportion of unemployed women were in Kebele 08 and this Kebele had relatively short period of postpartum amenorrhoea. Kebeles 08 and 07 had the highest proportion of self-employed (94.6 per cent and 94.0 per cent, respectively) and the shortest period of postpartum amenorrhoea(8 months and 7.5

months respectively). This is contrary to expectation that breast-feeding generally increases among unemployed and self-employed women. Consequently, longer amenorrhoea is expected among these women. It is, however, indicated that "... this does not mean that the duration of breast-feeding strictly determines, the length of amenorrhoea. While, on one hand, women who do not breast-feed may remain amenorrhoeic for months, on the other hand, an increasing proportion of women begin menstruating while still breast-feeding ..." (UN, 1986:54). Thus, self-employed women might breast-feed for longer durations but amenorrhoea might be short.

3.3.3 Ethnicity and Postpartum Amenorrhoea

The literature indicate that different ethnic groups have different practices of breast-feeding. The differences being influenced by the differences in access to education and employment among different ethnic groups.

The distribution of ethnic affiliations and length of postpartum amenorrhoea among Kebeles in Shashemene is presented in Table 3.27.

Table 3.27

Distribution of the Respondents by Major Ethnic Group, Length of Postpartum Amenorrhoea and Kebele: Shashemene 1991

Kebele	Amhara	Guraghe	Oromo	Wolaita	Length of PPA
01	54.6	6.1	18.2	9.1	10.3
02	41.8	6.3	21.5	16.5	10.7
03	53.6	7.1	19.6	5.4	9.0
04	37.1	15.7	21.4	2.9	10.3
05	39.7	18.0	18.0	12.8	8.4
06	32.7	21.8	12.7	20.0	8.6
07	23.9	31.3	13.4	11.9	7.5
08	23.3	37.5	5.4	16.1	8.0
09	21.1	42.3	7.7	23.1	12.0
10	34.3	5.5	23.3	16.4	10.7
Shashemene	35.7	18.7	16.6	13.4	10.7

Source: Survey Data

The proportion of Amhara varied from 54.6 per cent in Kebele 01 to 21.2 per cent in Kebele 09 . The longest period of postpartum amenorrhoea, however, was found in Kebele 09 (12.0 months) and the shortest postpartum amenorrhoea in Kebele 07 (7.5 months). The effects of the Amhara ethnic group on the spatial variation in the length of postpartum amenorrhoea was revealed to be extremely weak($r=0.11$). The distributions of the Guraghes and average length of post-partum

amenorrhoea, furthermore, was discovered to have negative and insignificant correlation($r=-0.18$). The highest proportion of the Guraghes (42.3 per cent) were found in Kebele 09 and the longest amenorrhoea (12.0 months) was reported to be in this Kebele. The lowest proportion of the Guraghes(5.5 per cent) were in Kebele 10 but this Kebele had longer period of postpartum amenorrhoea (10.7 months). The effects of the proportion of the Oromos and the Wolaitas on the length of postpartum amenorrhoea, like that of the Amharas, were positive($r=0.25$ for the Oromos and $r=0.21$ for the Wolaitas).

In general, the relationship between ethnicity and the mean duration of post partum amenorrhoea appear to be very small.

3.3.4 Religion and Postpartum Amenorrhoea

The data (Table 3.28) reveal that Orthodox christianity was less important as a factor in the spatial variations of post-partum amenorrhoea among Kebels as indicated by the weak correlation coefficient($r=0.20$). The effect of Islam, on the other hand, was found to be substantial($r=-0.57$). Around 32 per cent of the variations in the length of postpartum amenorrhoea among Kebeles were accounted for by the proportion of muslim women.

Table 3.28

Distribution of the Respondents by Religious Affiliation, Length of Postpartum Amenorrhoea and Kebele: Shashemene 1991

Kebele	Orthodox	Protestant	Catholic	Muslims	Length of PPA
01	87.9	3.0	3.0	6.1	10.3
02	77.2	8.9	3.8	10.1	10.7
03	85.7	7.1	1.8	5.4	9.0
04	75.7	2.9	2.9	18.6	10.3
05	74.4	10.3	0.0	15.4	8.4
06	81.8	0.0	0.0	18.2	8.6
07	61.2	1.5	0.0	37.3	7.5
08	62.5	7.1	0.0	30.4	8.0
09	65.4	17.3	1.9	15.4	12.0
10	74.0	9.6	0.0	16.4	10.7
Shashemene	74.0	6.9	1.3	17.8	10.7

Source: Survey Data

From Table 3.28, it can be said that the effects of the different religious groups in Shashemene on the spatial variations of postpartum amenorrhoea seem to be very small.

The discussions thus far have largely been concentrated on the description of the spatial relationships of the proximate fertility variables and their socio-cultural

factors using cross-tabulations and simple correlation model. The nature of the relationships, however, reveal that the correlations between most of the independent variables are very high. In other words, multicollinearity is apparent among the variables (Appendix 3). It is because of this problem that the use of multiple regression model has been avoided. However, to circumvent the problem, and to assess the general spatial covariations of the variables which are considered in this study, principal components analysis has been employed and this is considered in the following Chapter.

CHAPTER IV

Multivariate Analysis

This chapter summarises the spatial interrelationship between the proximate and socio-cultural variables using principal component analysis. The chapter is divided into two sections. Section 4.1 considers the variables and their component structure. This is followed by the discussion of the component scores and the identification of the socio-cultural and proximate variables that are favourable/unfavorable for high fertility. Section 4.2 examines the effects of the proximate variables on fertility using multiple regression analysis and the Bongaarts model.

4.1 Aspects of the Proximate and Socio-cultural Fertility Variables: Principal Components Analysis

In section 4.1.1, the variables included in this study and their component structures are considered. This is followed by the component scores in section 4.1.2.

4.1.1 The Variables and Component Structure

The variables used in the analysis are not exhaustive since some socio-economic variables such as income, housing condition, household possessions such as radio and television sets among others, are not included. Nevertheless, an attempt is made to group the variables included in the study and indicate their component structure of the variables that capture most of the variation (Table 4.1).

Table 4.1

The Variables Included in the Analysis: Shashemene 1991

- I. Socio-economic Factors
 - Percent illiterates
 - percent with 1 - 6 grades of education
 - percent with 7 - 12 grades of education
 - percent with post-secondary education
 - percent non-migrants
 - percent migrants
 - percent in government employment
 - percent self-employed
 - percent unemployed
- II. Socio-behavioral Factors
 - percent married
 - percent contraceptors
 - length of amenorrhoea(months)
 - mean number of children died
 - population density(persons per room)
- III. Socio-cultural Factors
 - percent Amhara
 - percent Guraghe
 - percent Oromo
 - percent Wolaita
 - percent other ethnic groups
 - percent Orthodox
 - percent Protestants
 - percent Catholic
 - percent Muslims

These variables were analysed and the following initial results were obtained (Table 4.2).

Table 4.2

Aspects of Proximate and Socio-cultural Fertility Variables in Shashemene 1991: Component Structure

Variable	Component	Eigen-value	Percent of Variance Explained	Cumulative Percent
X ₁ percent married	1	12.146	52.8	52.8
X ₂ percent contraceptors	2	3.617	15.7	68.5
X ₃ mean length of amenorrhoea	3	2.600	11.3	79.8
X ₄ percent illiterates	4	1.319	5.7	85.6
X ₅ percent with 1-6 grades	5	1.224	5.3	90.9
X ₆ percent with 7-12 grades	6	0.668	2.9	93.8
X ₇ percent with post-secondary	7	0.595	2.6	96.4
X ₈ percent Amhara	8	0.466	2.0	98.4
X ₉ percent Guraghe	9	0.364	1.6	100.0
X ₁₀ percent Oromo	10			
X ₁₁ percent Wolaita	11			
X ₁₂ percent others	12			
X ₁₃ percent Orthodox	13			
X ₁₄ percent Protestants	14			
X ₁₅ percent Catholics	15			
X ₁₆ percent Muslims	16			
X ₁₇ percent non-migrants	17			
X ₁₈ percent migrants	18			
X ₁₉ mean children died	19			
X ₂₀ percent gov't employed	20			
X ₂₁ percent self-employed	21			
X ₂₂ percent unemployed	22			
X ₂₃ mean population density	23			

Source: Survey Data.

Table 4.2 reveals that only nine variables (components) seemed to capture all of the variances in the original variables. Out of these, however, the first five components appeared to account for a substantial part of the variations(90.9 percent) in the original variables. Moreover, these components have eigenvalues of greater than one. The analysis therefore considers the first five components (Table 4.3).

Table 4.3

Aspects of Proximate and Socio-cultural Fertility Variables in Shashemene
1991: Component Loadings (Varimax Rotation)

Variables	Components				
	I	II	III	IV	V
X ₁	-0.874	0.100	-0.205	-0.165	0.033
X ₂	0.638	-0.611	0.249	-0.040	0.143
X ₃	0.254	0.126	0.633	0.644	0.032
X ₄	-0.503	0.147	-0.694	0.461	-0.098
X ₅	0.108	0.755	0.254	-0.534	0.042
X ₆	0.272	-0.917	0.208	0.156	0.015
X ₇	0.289	0.121	0.871	0.085	0.182
X ₈	0.743	-0.382	0.298	-0.285	0.024
X ₉	-0.874	0.312	-0.095	0.036	0.320
X ₁₀	0.717	-0.346	0.135	0.049	-0.511
X ₁₁	-0.143	0.362	-0.293	0.607	0.494
X ₁₂	-0.031	0.007	-0.234	-0.257	-0.925
X ₁₃	0.837	-0.285	0.196	-0.258	0.192
X ₁₄	-0.211	-0.079	0.232	0.774	0.282
X ₁₅	0.242	-0.259	0.877	0.090	-0.077
X ₁₆	-0.702	0.343	-0.434	-0.173	-0.311
X ₁₇	-0.763	0.401	-0.175	0.224	0.320
X ₁₈	0.763	-0.401	0.175	-0.224	-0.320
X ₁₉	-0.394	0.790	0.081	0.247	0.102
X ₂₀	0.610	-0.744	0.125	-0.076	0.023
X ₂₁	-0.837	0.450	-0.211	0.098	-0.054
X ₂₂	0.917	0.121	0.276	-0.101	0.084
X ₂₃	-0.319	0.757	-0.053	0.306	0.220

Source: Survey data

Component I has high loadings on migration status, marriage, contraception, ethnic and religious affiliations. This component can, therefore, be labelled as "the socio-cultural factors" dimension. Component II, on the other hand, loads high on many of the behavioral and social factors of fertility. This component can, thus, be indexed as "the socio-behavioral factors" dimension. Component III has high loadings on percent illiterates and percent with post-secondary education. It can, therefore, be identified as "the literacy factors" dimension. Since the patterns for the last two components are not clear, only the first three components are discussed.

The variables which appear to have high positive loadings on component I are: percent Amhara(0.74), percent Oromo(0.72), percent Orthodox(0.84), percent migrants(0.76), percent in government jobs (0.61) and percent contraceptors(0.64). As a result, these variables have spatial convariation with component I. Not only with the component but also spatial convariations appear among these variables themselves. The Amharas and the Oromos are dominantly migrants, employed in government jobs and they are Orthodox Christians. Moreover, the Amharas and the Oromos are more contraceptors. Conversely, the variables with negative loadings on component I are: percent self-employed(-0.84), percent married(-0.87), percent Guraghe(-0.87), percent Muslims(-0.70) and percent non-migrants(-0.76). These variables, thus, manifest inverse variations with the variables loaded positive on component I but they suggest that there is covariations among the variables themselves. In other words, the Guraghes; being dominantly non-migrants, self-employed and Muslims, appear to have higher proportion of married women.

Component II has positive loadings on percent of women with elementary education(0.76), mean number of children dead(0.79) and average population density(0.76). These variables manifest similar spatial distributions with component II. In other words, in areas where higher proportion of women with elementary education are dominant, population density and child mortality tend to increase.

Component III has higher positive loadings on percent of women with post-

secondary education(0.87), per cent Catholic(0.88) and mean length of postpartum amenorrhoea(0.63). It can be inferred that these variables have spatial covariation with the component. In other words, in areas where the proportion of Catholic women with post-secondary education are dominant, the postpartum amenorrhoea appears to be longer. Component III has high negative loadings on per cent of illiterate women(-0.69) suggesting that in Kebeles where the illiterates are predominant, the postpartum amenorrhoea tends to be shorter. Moreover, the illiterates apparently manifest residential segregation from the more educated groups.

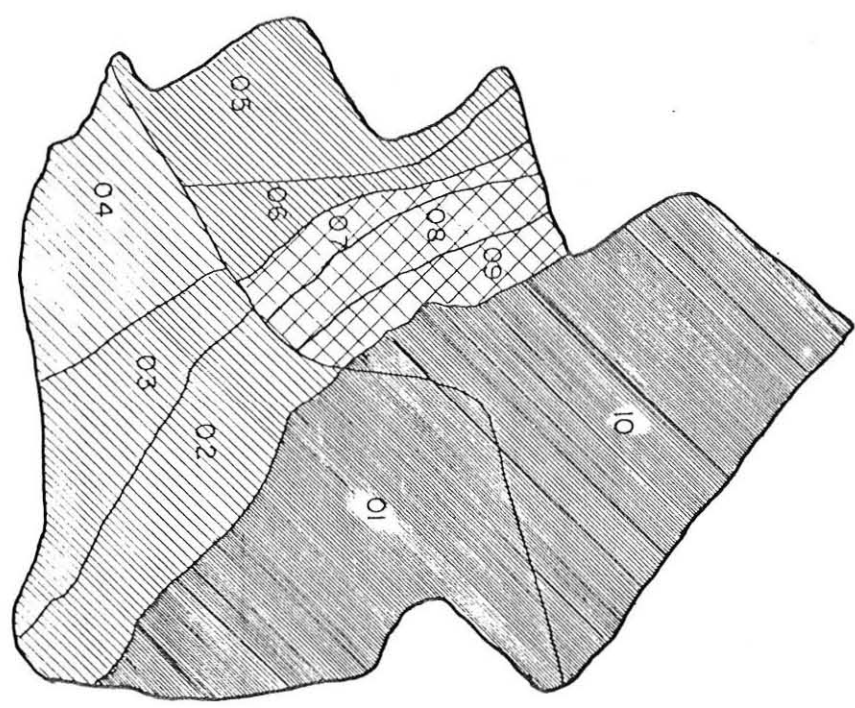
Generally, the five components, as indicated earlier, capture more than 90 per cent of the variations in the original variables. As a result, it can be said that the spatial variations of the major proximate determinants of fertility in Shashemene are due to the variations in the socio-cultural variables of fertility. This is explained further by the component scores.

4.1.2 The Component Scores

Kebele 01 has the highest positive score on component I (1.36) (Table 4.4) indicating that this Kebele has above average values on the variables loading positive on component I. The variables, as indicated earlier, are the proportion of Amhara, Oromo, Orthodox, migrants, women in government jobs and current contraceptors. The Kebele, on the other hand, has below average values on the variables loading negative on component I (see Fig. 9). These variable are proportion self-employed, married, Guraghes, non-migrants and contraceptors.

In general, Kebeles 01, 02, 03, 05, 06 and 10 have positive scores on component I suggesting that the Amhara and the Oromo, being largely in government jobs, migrants, Orthodox christians and more contraceptors, appear to reside in these Kebeles(Fig. 9). Kebeles 04, 07, 08 and 09, on the other hand, have negative scores on component I which suggest that the Guraghes, being dominantly self-employed, non-migrants, muslims and married, seem to settle in these areas.

Fig. 9: Scores for component I: SHASHEMENE 1991.



Source: Table 4.4

LEGEND

	> 1
	0 - +1
	-1 - 0
	< -1

0 100m

Kebeles 01, 06, 07, 08, 09 and 10 have scored positive on component II. These areas, thus, appear to be dominated by women with elementary education, high population pressure and death of children ever-born while Kebeles 02, 03, 04 and 05, have negative scores on component II implicating that these areas have low proportion of women with elementary education, low population pressure and hence low child deaths(See Fig. 10).

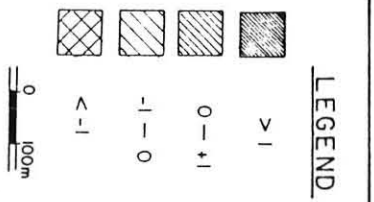
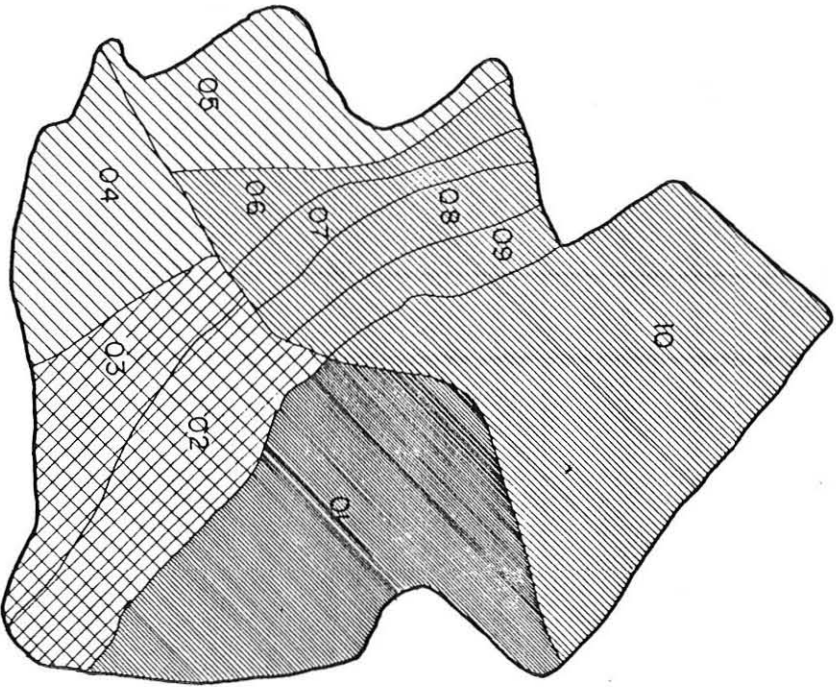
Table 4.4

Aspects of Proximate and Socio-cultural Fertility Variables:
Component scores by Kebele: Shashemene 1991

Kebele	Component Scores		
	Component I	Component II	Component III
01	1.36	1.38	1.33
02	0.56	-1.11	0.79
03	0.17	-1.98	-0.29
04	-0.31	-0.36	1.25
05	0.26	-0.50	-0.35
06	0.67	0.17	-1.33
07	-1.27	0.44	-0.77
08	-1.35	0.55	-0.51
09	-1.22	0.55	1.00
10	1.13	0.85	-1.12

Source: Survey data

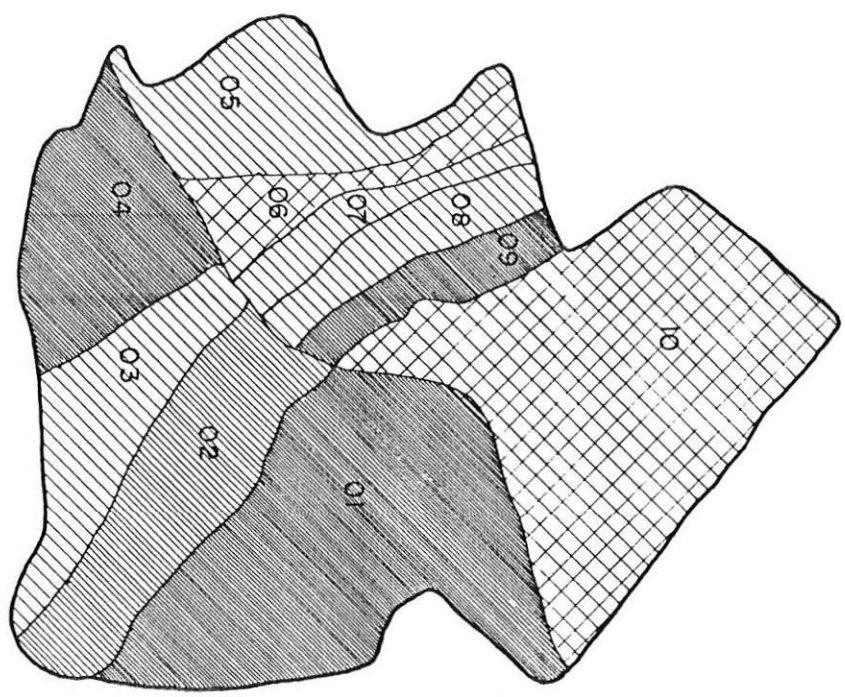
Fig. 10: Scores for component II : SHASHEMENE 1991.



Source: Table 4.4.





Kebeles 01, 02, 04 and 09 have positive scores (Table 4.4) on component III suggesting that these Kebele are dominated by women with post-secondary education, Catholic christians and longer duration of postpartum amenorrhoea. Conversely, Kebeles 03, 05, 06, 07, 08 and 10 have negative scores on component III (Fig. 11) indicating that women in these kebeles are less literate and have shorter duration of postpartum amenorrhoea. The spatial pattern of the proximate and socio-cultural fertility variables is summarised in Tables 4.5 and 4.6.

Fig. 11: Scores for component III: SHASHEMENE 1991.



Source: Table 4.4.

LEGEND

	> 1
	0 - +1
	-1 - 0
	< -1

0 100m

Table 4.5

Summary of Socio-cultural Fertility Variables by Kebele:
Shashemene 1991

Kebele	Conditions Favorable For	
	High Fertility	Low Fertility
01		High Proportion of Unemployed, in government jobs, women with post-secondary education, Amhara, Oromo, Orthodox, Catholic and Migrants.
02		High proportion of women with junior and senior secondary education, Catholic, in government jobs, unemployed, Amhara, Oromo, Orthodox and migrants.
03	Higher proportion of illiterates	High proportion of women with 7-12 grades gov't employed, unemployed, Amhara, Oromo, Orthodox and migrants.
04	Higher proportion of self-employed, Guraghe, non-migrants and muslims	Higher proportion of women with 7-12 grades, post-secondary education and Catholics.
05	Higher proportion of illiterates	High proportion of women with 7-12 grades, unemployed, government employed, Amhara, Oromo, Orthodox and migrants.
06	Higher proportion of women with 1-6 grades, child mortality, population density and illiterates	High proportion of women with 7-12 grades, unemployed, government employed, Amhara, Oromo, Orthodox and migrants.
07	Higher proportion of women with 1-6 grades, illiterates child mortality, population density, self-employed, Guraghe, Muslims and non-migrants.	
08	Higher proportion of women with 1-6 grades, illiterates, child mortality, population density, self-employed, Guraghe, Muslims and non-migrants.	
09	Higher proportion of women with 1-6 grades, child mortality, population density, self-employed, Guraghe, Muslims, and non-migrants	Higher proportion of women with post-secondary education and Catholics.
10	Higher proportion of women with 1-6 grades, child mortality, population density and illiterates.	Higher proportion of government employed, unemployed, Amhara, Oromo, Orthodox and migrants.

Table 4.6

Summary of Proximate Determinants of Fertility by
Kebele: Shashemene 1991

Kebele	Proximate Determinants Favourable for	
	High Fertility	Low Fertility
01		Higher contraception, lower marriage and longer postpartum amenorrhoea
02		Higher contraception, lower marriage and longer postpartum amenorrhoea
03	Shorter postpartum amenorrhoea	Higher contraception and lower marriage
04	Higher marriage	Higher contraception and longer postpartum amenorrhoea
05	Shorter postpartum amenorrhoea	Higher contraception and lower marriage.
06	Shorter post-partum amenorrhoea	Higher contraception and lower marriage.
07	Lower contraception, higher marriage and shorter postpartum amenorrhoea.	
08	Lower contraception, higher marriage and shorter postpartum amenorrhoea.	
09	Lower contraception and higher marriage.	Longer postpartum amenorrhoea.
10	Shorter postpartum amenorrhoea.	Higher contraception and lower marriage.

The outcomes of the principal components analysis (three components solution) are presented in Table 4.5 and 4.6. In Kebeles 01 and 02, relatively higher prevalence of contraception, low prevalence of marriage and longer postpartum amenorrhoea are favorable conditions for low fertility. The socio-cultural factors responsible for this pattern tend to be the preponderance of the Amhara, Oromo, government employees, unemployees, Orthodox, Catholics, migrants and women with post-secondary education.

In Kebele 03, higher contraception and lower prevalence of marriage are favourable conditions for lower fertility but the postpartum amenorrhoea is shorter to raise fertility in this Kebele. Whereas employment in government office and unemployment appear to reduce marriage and to increase contraception in Kebele 03, while higher proportion of illiterates shorten the postpartum amenorrhoea

although this is contrary to expectations.

In Kebele 04 relatively higher contraception coupled with longer periods of postpartum amenorrhoea tend to depress fertility but higher prevalence of marriage appears to counter-balance this situation. Higher proportion of women with above elementary level of education is the reason for higher contraception and longer amenorrhoea in this Kebele. Higher proportion of self-employed women, predominated by the Guraghe, non-migrants and muslims may explain the higher prevalence of marriage in Kebele 04.

In Kebeles 05, 06 and 10 shorter durations of postpartum amenorrhoea are favorable for high fertility but this appears to be offset by higher proportion contracepting and low prevalence of marriage. Kebeles 07 and 08 have lower prevalence of contraception, higher proportion married and shorter period of postpartum amenorrhoea. Here, all the three proximate variables are favorable conditions for high fertility. The socio-cultural factors for this condition appear to be the prevalence of women with no or elementary education, women in self-employment, non-migrants, higher proportion of the Guraghes and Muslims (Tables 4.5 and 4.6).

In Kebele 09, lower proportion using contraceptives and higher prevalence of marriage do raise fertility but longer period of post-partum amenorrhoea appears to lower fertility in this Kebele. It is deemed advisable, therefore, to assess the level of fertility in the town as influenced by the three proximate determinants.

4.2 Fertility and Its Proximate Determinants

As it has already been indicated earlier, the proximate determinants of fertility are often said to be very important direct causes of fertility variations among populations, (Lesthaeghe et. al., 1981:3-23; United Nations, 1987:165-184). It is thus

essential to understand the relationship between the proximate variables, particularly marriage, contraception and postpartum non-susceptibility period and fertility in the study area.

4.2.1 Marriage and Fertility

Marriage is the most important variable affecting fertility. In some societies sexual intercourse for women begins with marriage (Gaisie, 1984:12). As a result, marriage marks the on-set of the risk of exposure to conception. This is particularly true of non-contracepting populations. The age at which the women enter into union and the proportion of women remaining married in their total reproductive spans appear to be very important variables for the total number of children a woman would have at the end of her reproductive period.

As indicated earlier, marriage in the town was early and universal since no single respondents were captured by the survey at the age of 35 and over. The highest proportion of married women (98.51 per cent) was in Kebele 07 followed by Kebele 08 (96.43 per cent). The highest total fertility rate (8.2 children per woman) was found in Kebele 08 followed by Kebele 07 (8.1 children per woman) (Table 4.7). A strong and positive correlation was obtained when proportion married and total fertility were correlated ($r = 0.81$). This indicates that about two-third of the variation in total fertility rate is explained by the proportion of women in union. As Table 4.7 shows, Kebeles with higher proportion of married women had higher total fertility.

Table 4.7
Distribution of Married Women by Total Fertility
Rate and Kebele: Shashemene 1991

Kebele	Married (Percent)	Total Fertility Rate
01	90.91	5.843
02	91.14	5.741
03	92.86	6.101
04	94.29	6.998
05	96.15	7.746
06	92.73	5.714
07	98.51	8.084
08	96.43	8.245
09	96.15	5.847
10	91.78	5.252
Shashemene	91.88	7.805

Source: Survey data.

The age at which the woman entered first marriage is also very important because age is an important biological variable which exposes the women to conception. Women are usually capable of conception, other things being equal, after menarche and before menopause (Ferry and Page, 1984; Singh and Ferry, 1984). Within this reproductive period, women who entered into marriage earlier are expected to have more offspring than women who entered into marriage very late.

Table 4.8

Distribution of the Respondents by Singulate Mean Age at Marriage(SMAM), Total Fertility, Rate (TFR) and Mean Number of Children Ever-Born(MCEB) by Kebele: Shashemene 1991

Kebele	SMAM	TFR	MCEB
01	19.1	5.843	4.606
02	19.8	5.741	3.924
03	17.3	6.101	4.000
04	20.0	6.998	4.857
05	17.3	7.746	4.623
06	19.9	5.714	3.745
07	19.2	8.084	5.896
08	17.2	8.245	5.036
09	19.4	5.847	4.904
10	23.2	5.252	4.411
Shashemene	19.1	7.805	4.601

Source: Survey data

The data reveal that the singulate mean age at marriage and total fertility rate vary inversely among Kebeles of the town($r=-0.604$). Similar inverse relationship ($r=-0.128$) between singulate mean age at marriage and mean number of children ever-born though weak, was also found. The highest singulate mean age at marriage (23.9 years) was found in Kebele 10 and this Kebele had the lowest total fertility

rate(5.3) children per women)(Table 4.8). Kebele 08, on the other hand, was found to have the lowest singulate mean age at marriage (17.2 years)and the highest total fertility rate(8.2 children per woman) with relatively higher number of children ever born(5.0). Generally, the difference in total fertility rates between Kebeles with the highest and lowest singulate mean age at marriage was around 3 children per woman.

The comparison among different age groups also indicated that women who entered into marriage after the age of 20 had fewer children than those who married before the age of 20(Table 4.9). A difference of around three children per woman was substantial.

Table 4.9

Distribution of Ever-married Respondents by Age at First Marriage and Mean Number of Children Ever-born: Shashemene 1991

Age at First Marriage(years)	MCEB
< 15	5.391
15 - 19	5.095
> 20	3.063
Total	4.905

Source: Survey Data

The difference in the mean number of children ever-born of women who married before the age of 15 and at the ages of 15-19 appeared to be very small(0.296 children per woman). This may suggest that marriage before or at the age of 15 years does not have a substantial impact on fertility since many girls are

not fertile until the age of 18 due to teen-age subfecundity.

In order to assess the precise impact of age at first marriage, the current age variations of the married respondents have to be eliminated by considering women who are approaching the end of their reproductive. Consequently, the relatively older cohorts(40-49 years old) are taken(Table 4.10).

Table 4.10

Distribution of the Respondents Aged 40-49 by Age at First Marriage and Mean Number of children Ever-born:Shashemene 1991

Age at First Marriage(years)	MCEB
< 15	7.196
15 - 19	7.537
> 20	6.923
Total	7.349

Source: Survey Data

The respondents aged 40-49 years, at the time of the study, who married before the age of 15 years reported to have born 7.2 children. Those who have reported to be married at ages 15-19 years had born more children(7.5) than the women whose marriage was before the age of 15. This further suggests that marriage for females before the age of 15 years does not necessarily lead to higher fertility in the town. Marriages of females at ages of 15-19, nevertheless, may lead to higher fertility(Table 4.10). The difference in the mean number of children ever born of

women who married at ages 15-19 and at ages 20 or over appeared to be substantial(0.6).

4.2.2 Contraception and Fertility

It has often been indicated that the variations in the use of contraceptives have substantial effects on the fertility differentials of populations(United Nations, 1987:165). As indicated earlier, the prevalence of contraception in the study area was very low. As a result, the effects of contraception on the fertility differentials among Kebeles was not very high as expected (Table 4.11).

Table 4.11

Distribution of the Respondents by Current use of Contraception and Total Fertility Rate(TFR) and Kebele: Shashemene 1991

Kebele	Current Contraceptors (per cent)	TFR
01	18.18	5.843
02	26.58	5.741
03	23.21	6.101
04	18.57	6.998
05	16.67	7.746
06	21.82	5.714
07	8.96	8.084
08	3.57	8.245
09	11.54	5.847
10	12.33	5.252
Shashemene	16.30	7.805

Source: Survey data

The data reveal that the Kebele with the highest proportion of women (26.58 per cent) using contraception had the third lowest total fertility rate (5.7 children per woman) and the Kebele with the lowest proportion of women using contraception had the highest total fertility rate(8.2 children per woman). The simple correlation between contraceptive use and total fertility rate was found to be fairly strong and

negative($r=-0.57$). It suggests that contraception captures around 32 per cent of the variation in total fertility rate among Kebeles in the town.

4.2.3 Postpartum Amenorrhoea and Fertility

Previous empirical findings suggest that the effects of lactation on the postpartum amenorrhoea are positive. As lactation extends for longer duration, the duration of amenorrhoea increases(United Nations, 1987:124; Gray, 1981:100). The Shashemene data also indicate that the duration of postpartum amenorrhoea increases with increasing duration of breast-feeding(Table 4.12).

Table 4.12

Distribution of the Respondents by Mean Length of Breast-feeding, Postpartum Amenorrhoea, Total Fertility Rate and Kebele: Shashemene 1991

Kebele	Mean Length of Breast-feeding(months)	Mean Length of Amenorrhoea (months)	TFR
01	15.3	10.33	5.843
02	16.3	10.71	5.741
03	19.4	8.98	6.101
04	16.4	10.28	6.998
05	16.5	8.39	7.746
06	15.4	8.59	5.714
07	18.5	7.54	8.084
08	16.0	7.98	8.245
09	24.3	12.03	5.847
10	16.3	10.67	5.252
Shashemene	17.3	10.67	7.805

Source: Survey Data

Kebele 09, for example, has the longest duration of amenorrhoea(12.03 months) and the longest period of breast-feeding(24.3 months). On the other hand, in Kebele 07, where the shortest period of postpartum amenorrhoea was reported, breast-feeding became the third longest(18.5 months). Consequently, the association between the two was positive but weak($r=0.39$). The reasons for this are not clear

at the moment although reporting errors are suspected.

Both the length of breast-feeding and postpartum amenorrhoea appeared to vary inversely with the total fertility rates among Kebeles(Table 4.12). The correlation between breast-feeding and total fertility rate, however, was found out to be very weak($r=-0.09$) compared to the correlation between postpartum amenorrhoea and total fertility rate($r=-0.72$). This was the main reason to use the postpartum amenorrhoea instead of breast-feeding in the analysis of the data.

So far, the discussion has been concentrated on the separate effects of the three proximate variables on the total fertility rate of the population in Shashemene. The next sections evaluate the combined effects of the proximate variables on the total fertility rate of the respondents. This is proceeded by the use of the multiple regression model followed by the application of the Bongaarts model of the proximate determinants of fertility.

4.2.4 The Combined Effects of Proximate Variables on Fertility

4.2.4.1 Multiple Regression Analysis

The assumption is that the total fertility rate varies among Kebeles in Shashemene because of the variations in the proximate determinants of fertility. The interplay among these variables is expected to bring variations in the total fertility rates. The bivariate correlation has also confirmed this expectation. The analysis, however, must proceed to identify the most important variables which accounted for the significant variations in total fertility rates (Table 4.13) and the unadjusted multiple correlations had come to be 0.889. This is a strong correlation suggesting that the three proximate variables(marriage, contraception and postpartum infecundability) together accounted for 81 per cent of the variations in total fertility rate in the town. The adjusted coefficient of multiple determination($R^2_{0.123} = 0.712$)

also suggests that more than 71 per cent of the variations on total fertility rate could be accounted for by the combined effect of marriage, contraception and postpartum amenorrhoea. This is found to be significant at 99 per cent level. Empirical findings for 29 developing countries "... indicated also that 70 per cent of the variation in observed TFRs was explained by the three proximate determinants, C_m , C_c , and C_i ..." (Casterline et al. 1984: Cited in UN, 1987: 167-168).

Table 4.13

ANOVA Table of Regression Model for Total Fertility Rate
(Three Predictors): Shashemene 1991

Source of Variation	Sum of Squares	Degrees of Freedom	Variance	F-Ratio
Model(Regression)	8.959	3	2.986	8.407
Error	2.131	6	0.355	
Total	11.091	9		

¹⁶Analysis of variance

Unadjusted $R^2_{0.123} = 0.808$; Adjusted $R^2_{0.123} = 0.712$

Significant at 0.01 level.

The data in Table 4.14 reveal that compared to marriage and post-partum amenorrhoea the effects of contraception on the total fertility rate in the town appeared to be low.

Table 4.14

Partial Regression and Correlation Coefficients for the Total
Fertility Rate Model Predictors: Shashemene 1991

Predictor	Partial Regression Coefficient(bi)	Beta weight(B)	Partial Correlation	Value of "t"	Significant "t"
Percent married(x ₁)	0.236	0.554	0.638	2.029	0.0888
Percent Contraceptors(x ₂)	-0.012	-0.076	-0.124	-0.307	0.7692
Length of PPA(x ₃)	-0.333	-0.436	-0.656	-2.131	0.0771
Constant (a)	-12.280	-	-	-1.017	0.3484

Source: Survey Data

The partial regression coefficient of -0.01 indicates the rate of change in total fertility rate as per change in the use of contraception among Kebeles(Table 4.14).

$$x_0 = -12.28 + 0.236x_1 - 0.012x_2 - 0.333x_3$$

Moreover, the partial correlation coefficient, that is the effect of contraception on total fertility rate controlling for marriage and postpartum amenorrhoea, was found to explain only 1.5 per cent of the variations in total fertility rates.

Postpartum amenorrhoea, on the other hand, was the most important factor to explain fertility variations in Shashemene. The partial regression coefficient of -0.333 suggested that postpartum amenorrhoea and total fertility rate are inversely related. This was significant at 92 per cent confidence level (Table 4.14). As the duration of postpartum amenorrhoea decreases, total fertility rate increases. The

partial correlation coefficient of -0.656 also suggested the important role of postpartum amenorrhoea in explaining fertility variations among Kebeles in the town.

Marriage was also an important factor to explain fertility variations among Kebeles in the town. The partial correlation coefficient ($r_{01.23} = 0.638$) controlling contraception and amenorrhoea, was found to capture around 41 per cent of the total variations in fertility among Kebeles and it was significant at 90 per cent. Its partial regression coefficient ($b = 0.236$) also suggested that total fertility rate would increase as the proportion of married women increases (Table 4.14).

It is, however, difficult to compare the unstandardized regression coefficients since marriage and contraception are in percentages while the postpartum amenorrhoea is in months. Consequently, standardization is deemed advisable and is indicated in Table 4.14 (beta weights, β). In this case, marriage (x_1) became the most important variable because the beta coefficient ($\beta = 0.554$) indicates higher rate of variations in total fertility rate as per change in the proportion of married women. Moreover, the effects of each proximate variable on the total fertility rate are assessed based on the indices calculated using the Bongaarts model (Table 4.15).

In the town, as a whole, around 27 per cent of the difference between the estimated total fertility rate and total fecundity rate was due to variations on proportion married. Around 16 per cent was because of contraception and around 29 per cent because of postpartum amenorrhoea. Some 72 per cent of the variations in total fertility rate was explained by the three indices together, C_m , C_c and C_i (Table 4.15).

The importance of each of the indices, however, varied from Kebele to Kebele. In Kebele 01, index of marriage ($C_m = 0.62$) appeared to be more important. Around 38 per cent of the reductions in fertility in this Kebele was due to non-marriage. Eighteen percent was because of contraception and 31 percent due

to postpartum amenorrhoea. The highest contribution(41 percent) of non-marriage ($C_m = 0.59$) to the reductions in total fertility rate was in Kebele 02 and the least

Table 4.15

The Pattern of Indices, C_m , C_c and C_i , by Kebele:
Shashemene 1991

Kebele	C_m	C_c	C_i	TF*
01	0.62	0.82	0.69	15.3
02	0.59	0.73	0.68	15.3
03	0.72	0.77	0.73	15.3
04	0.95	0.81	0.69	15.3
05	0.83	0.83	0.74	15.3
06	0.75	0.78	0.74	15.3
07	0.76	0.91	0.77	15.3
08	0.75	0.96	0.76	15.3
09	0.76	0.88	0.66	15.3
10	0.74	0.88	0.69	15.3
Total	0.73	0.84	0.71	15.3

*Total Fecundity rate is assumed to be 15.3 as defined earlier

Source: Survey Data

(5 per cent) in Kebele 04. The highest contribution (27 per cent) of contraception

to fertility reduction was observed in Kebele 02 and the least (4 per cent) in Kebele 08. With regard to index of postpartum amenorrhoea, the highest contribution (34 per cent) was found to be in Kebele 09 and the least (23 per cent) was in Kebele 07 (Table 4.15).

Table 4.16

Relative Percentage Contribution of each of the Indices to the
Difference between the Total Fecundity and Total Fertility
Rates by Kebele: Shashemene 1991

Kebele	Marriage C_m	Contraception C_c	Postpartum Infecundability C_i	Total
01	46	19	35	100
02	43	26	31	100
03	36	29	35	100
04	8	33	59	100
05	28	28	45	101*
06	34	30	36	100
07	44	15	41	100
08	48	7	45	100
09	33	16	51	100
10	38	16	46	100
Shashemene	38	21	41	100

*Exceeds 100 because of rounding.

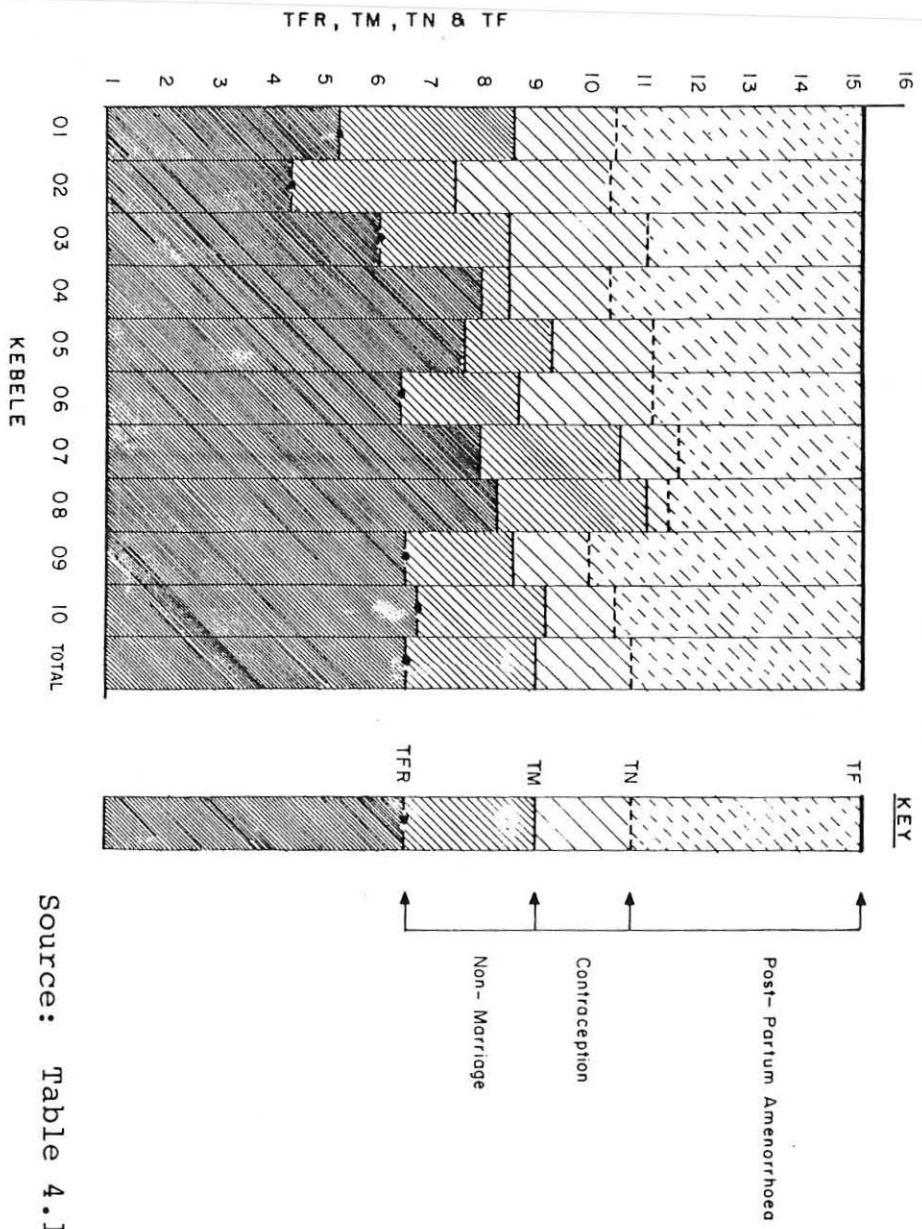
Source: Survey Data

The contribution of each index to the reduction in the total fertility rate had been indicated by subtracting the value of each index from one. For comparison purposes, however, the relative contribution of each index is needed. This was computed using the following formula.

$100[\log C_x / (\log C_m + \log C_c + \log C_i)]$; where for C_x values of C_m , C_c and C_i are successively employed (UN, 1987:173). The results are presented in Table 4.16). Seventy-nine per cent of the difference between the total fertility and total fecundity rates in the town was because of marriage (38 per cent) and postpartum amenorrhoea (41 percent). Only 21 percent of the difference appeared to be due to contraception (Table 4.16). Although it varied from Kebele to Kebele, the effect of the postpartum amenorrhoea on the reduction of fertility was remarkable. This could also be viewed from a different angle (Table 4.17).

Figure 12 : TFR, TM, TN and TF by Kebele

Shashemene 1991



Source: Table 4.17

Table 4.17

Total Fertility, Marital Fertility, Natural Marital Fertility and
Total Fecundity Rates by Kebele: Shashemene 1991

Kebele	Total Fertility Rate	Marital Fertility Rate	Natural Marital Fertility Rate	Total Fecundity Rate
01	5.367	8.657	10.557	15.3
02	4.481	7.595	10.404	15.3
03	6.192	8.600	11.169	15.3
04	8.124	8.551	10.557	15.3
05	7.800	9.397	11.322	15.3
06	6.623	8.831	11.322	15.3
07	8.148	10.721	11.781	15.3
08	8.372	11.163	11.628	15.3
09	6.754	8.712	10.098	15.3
10	6.875	9.290	10.559	15.3
Shashemene	6.662	9.125	10.863	15.3

Source: Computed using the Bongaarts model

$$\text{Total fertility rate} = 15.3 \times C_m \times C_c \times C_i$$

$$\text{Total marital fertility rate} = 15.3 \times C_c \times C_i$$

$$\text{Total natural marital fertility rate} = 15.3 \times C_i$$

The total fertility rate (6.7) in the town was less than the total fecundity rate (15.3) by 8.6 children per woman. Non-marriage appeared to have reduced 2.5 children per woman. In other words, if all women in their reproductive period were assumed to be in marriage, the total fertility rate would have risen to marital fertility rate (9.1 children per women). Total fertility would rise to natural fertility rate (10.9) if the effects of contraception were absent (Table 4.17 and Fig. 12). The effects of postpartum amenorrhoea was very impressive in this regard. The total natural marital fertility rate, for example, would rise to the total fecundity rate if the

effect of postpartum amenorrhoea was excluded. In other words, the total natural marital fertility rate would have been 15.3 rather than 10.9 if the effect of postpartum

amenorrhoea was not considered. This would have resulted in an increase of 4.4 children per woman(Fig. 12).

A look at the spatial pattern of the proximate fertility variables reveals the varying importance of each variable from Kebele to Kebele. The highest effect of marriage was found in Kebele 01 since the difference between TFR(5.4) and TM(8.7) was the highest(3.3). The lowest effect of marriage, on the other hand, was indicated in Kebele 04, where the difference between TM and TFR was very small(0.43). The effect of contraception appeared to be very small in Kebele 08, where the difference between TM and TN was also very small (0.7 children per woman). The effect of postpartum amenorrhoea, on the other hand, was found to be very substantial, specifically in Kebele 09 where the difference between the total natural marital fertility rate and total fecundity rate was very high(5.2 children per woman). The lowest effect of the postpartum amenorrhoea could be observed in Kebele 07(3.5 children per woman) but this was still comparatively higher (Table 4.17 and Fig. 12).

The three proximate determinants of fertility(marriage, contraception and postpartum amenorrhoea) were observed to be important variables for fertility variations among Kebeles in the town. The next section thus tries to evaluate the relevance of the Bongaarts model of proximate determinants of fertility to the Shashemene data.

4.2.4.2 The Bongaarts Model: An Application to the Data

Bongaarts(1978:105-132) suggested a multiplicative model for the analysis of the proximate determinants of fertility as follows:

$$TFR = C_m \cdot C_c \cdot C_a \cdot C_i \cdot TF$$

where;

TFR	=	Total fertility rate
C_m	=	Index of marriage
C_c	=	Index of contraception

C_a	=	Index of induced abortion
C_i	=	Index of postpartum infecundity period
TF	=	Total fecundity rate.

Various empirical investigations were conducted in different geographical milieu to test the applicability of the model. Bongaarts himself compared the observed and estimated total fertility rates in Ibadan and USA and found that the difference between the observed and estimated total fertility rates were 0.3 in Ibadan(Nigeria) and zero for the USA(Bongaarts, 1981:119). In this respect, the model fits well the observed total fertility rate. Rahman and Phillips (1988:411-421) applied the Bongaarts model to the fertility data of two rural communities of Bangladesh and found a difference of 0.8 children per woman between the observed and the estimated total fertility rates. In Ghana, the total fertility rates estimated by the model were 6.0 for large urban centres; 6.54 for other urban centres and 6.56 for the rural areas. The respective observed total fertility rates were 5.39; 6.29 and 6.80(Gaisie, 1984:43-44).

In Shashemene, the observed total fertility rate was 6.98 (unadjusted) 7.805(adjusted) and the estimated total fertility rate was 6.7. The unadjusted observed total fertility rate thus appeared to be very close to the estimated total fertility rate(Table 4.18). In other words, the estimated total fertility was 95.4 per cent of the unadjusted observed total fertility rate. Previous findings also indicated that "... fertility estimated by the model was on average 96 per cent of that observed"(Bongaarts, 1982: cited in Rahman and Phillips, 1988:417).

Table 4.18

The Pattern of the Observed and Estimated Total Fertility Rates by Kebele: Shashemene 1991

Kebele	Observed TFRo	Estimated TFR _e	TFRo-TFR _e
01	5.843	5.367	0.476
02	5.741	4.481	1.260
03	6.101	6.192	-0.091
04	6.998	8.124	-1.126
05	7.746	7.800	-0.054
06	5.714	6.623	-0.909
07	8.084	8.148	-0.064
08	8.245	8.372	-0.127
09	5.847	6.754	-0.907
10	5.252	6.875	-1.623
Total	Adjusted 7.805 unadjusted 6.983	6.662	1.185

Source: Survey Data

It is apparent from Table 4.18 that the model fits well to the data in most Kebeles of the town. This can be observed from the last column of the table. In Kebele 01, the observed and estimated total fertility rates were respectively, 5.8 and 5.4. The difference was thus, 0.5. The estimated total fertility rate was found to be around 92 per cent of the observed rate. In Kebeles 02, 04 and 10, the differences between the observed and the estimated rates were relatively higher. For Kebeles 03, 05, 07 and 08 the differences between the observed and estimated rates were

found to be very small. The observed total fertility rates, in these Kebeles, were around 99 per cent of the estimated (Table 4.18).

In summary, it can be said that the Bongaarts model fits fairly well to the observed data in the town. Most of the differences between the observed and estimated total fertility rates, in different Kebeles, lie in the range of less than ten per cent.

CHAPTER V

Summary and Recommendations

5.1 Summary

In this study an effort was made to show that the spatial variation in fertility was mainly due to the variation in the proximate determinants of fertility (marriage, contraception and post-partum amenorrhoea) using primary data obtained from a sample of (619) women in the childbearing age range (15-49) in the town of Shashemene.

The town was growing very rapidly and it was divided into ten Kebeles. There were numerous ethnic groups residing in the town. The four major ethnic groups were Amhara (35.70 per cent), Guraghe ((18.74 per cent), Oromo (16.64 per cent) and Wolaita (15.51 per cent). The index of dissimilarity was calculated to assess the residential distributions of the major ethnic groups in the town. It was found out that the Amhara and the Oromo were living more or less together while the Guraghe manifested a residential dissimilarity both from the Amhara and the Oromo. On the other hand, the Wolaita appeared to have more or less similar residential distribution in the town. The ethnic division of labour, religious affiliation and differences in educational attainment were found to be the main factors for the observed spatial distribution of ethnic groups. And distribution of ethnic groups was the basis for the analysis of the proximate determinants and fertility in the town.

Before the detailed analysis was made, the data were examined for consistency using available demographic techniques. Both bi-variate and multivariate statistical techniques were applied in the analysis of the data. Principal components analysis was used to identify the spatial pattern of the proximate determinants and the socio-cultural variables. Multiple regression analysis was used to examine the effect of the

proximate variables on the total fertility rate and finally the Bongaarts model was applied to evaluate the relative importance of each proximate variable in explaining fertility differentials among Kebeles and to assess the applicability of the model to the Shashemene data.

The analysis indicated that marriage in the study area was early and universal and its variation among Kebeles was due to the variations in various socio-cultural variables. The proportion of ever-married women varied directly with the proportion of non-migrants and inversely with the proportion of migrant women in the town. Kebeles with higher proportion of non-migrant women had higher proportion ever-married. Conversely, Kebeles with higher proportion of migrant women had lower proportion ever-married. The reasons for the differentials in marriage were variations among migrants and non-migrants in ethnic and religious affiliations, educational attainment and occupation.

The majority of the Guraghe women reported to be born in the town. Higher proportion of the non-migrants thus were Guraghes who were also dominantly Muslims. Moreover, the Guraghes were found to be less educated and were largely self-employed. They resided in the densely populated corners of the town that were characterized by higher child mortality rates. The migrants, on the other hand, were dominantly Amharas followed by the Oromos. The Amharas and the Oromos were dominated by Orthodox Christians and more educated women. As a result, they were largely employed in government jobs. They were also living in areas with a relatively low population density and low child mortality.

Variations in the proportion married and also in the singulate mean age at first marriage were observed between Kebeles. The singulate mean age at marriage ranged from 23.2 years in Kebele 10 to 17.2 years in Kebele 08, a difference of 6 years in such a medium-sized town. Variations in the socio-cultural variables appeared to be the causes of the variations in age at first marriage. The Amharas

and the Oromos reported to start marriage earlier than other ethnic groups in the town. Around 37.7 per cent of the Amhara and 36.5 per cent of the Oromo married for the first time before the age of 15 years. The corresponding figure for the Guraghe was 28.8 per cent. High proportion of the Guraghes reported to marry at ages of 15-19 years. The Wolaitas, on the other hand, seemed to marry much later than other ethnic groups. Some 23 per cent of the ever-married Wolaita women reported to marry after the age of 19 years. The effects of religion on age at first marriage, likewise, was that Orthodox christians were found to marry earlier than the Muslims and Protestants.

Age at first marriage also varied among the younger and older women irrespective of ethnic and religious affiliations. Among women aged 15-19 years at the survey only 11.8 per cent married before the age of 15 whereas 53.4 per cent of women in the current age group of 45-49 years reported to have started their first union before their 15th birthday. The major reasons for the variations were level of education and type of employment. More educated women spent more time in schools and employed in the modern sectors. As a result, their first marriage was postponed. The respondents with primary education and who were self-employed were found to marry earlier than the unemployed and those in government employment.

With regard to knowledge of contraception, the data indicated that well above 50 per cent of the respondents in the town reported to have heard of at least one method of contraception. Small proportion of this, however, attempted the use of contraception (24.7 per cent). The current users of modern contraception were very small (16.3 per cent). Furthermore, it was revealed that around three-fourths of the current users were using only one type of method (the oral pills).

Variations among Kebeles in the current use of contraception were also found and the variations were also due to the effect of various socio-cultural variables. The

Guraghes were less contraceptors than the Amharas and the Oromos because of the fact that these ethnic groups had different experiences in employment, education, religion, migration and child mortality. Contraception was found to be higher among the respondents in government employment and the unemployed than those who were engaged in self-employment. Besides, contraception was low among the illiterates and women with primary education and women with high child mortality experience. On the contrary, women with above primary level education were found to be more contraceptors.

The average length of postpartum amenorrhoea was found to vary from Kebele to Kebele in the town. The longest post-partum amenorrhoea (12.0 months) was in Kebele 09 and the shortest (7.5 months) in Kebele 07. The various socio-cultural variables mentioned earlier, however, failed to explain the spatial variations in the average duration of post-partum amenorrhoea excepting Islamic religion. Among the Moslems, postpartum amenorrhoea was short.

The principal components analysis indicated that five components explained more than 90 per cent of the variations in the proximate and socio-cultural variables. Three of these components which accounted for around 70 per cent of the variations were considered for the analysis. The component loadings were rotated so as to make the components interpretable. Consequently, component I was indexed as socio-cultural factors dimension; component II "socio-behavioral factors" dimension and component III was "literacy factors" dimension. Furthermore, the spatial pattern of the three components were shown by the component scores. The component scores were shown on three maps of the town. On the basis of this analysis, the study found out that some Kebeles had favorable conditions for low fertility (Kebeles 01 and 02) and some others had favorable conditions for high fertility (Kebeles 07 and 08).

The analysis of the spatial pattern of fertility and its proximate determinants

found that total fertility rate was relatively lower in Kebeles 10 (5.25 children per woman), 06 (5.71 children per woman), 02 (5.74 children per woman), 01 (5.84 children per woman) and 09 (5.85 children per woman). On the other hand, fertility was higher in Kebeles 08 (8.25 children per woman), 07 (8.08 children per woman) and 05 (7.75 children per woman).

Marriage was found to be a very important proximate variable for fertility variations in the town. The variations among Kebeles in the proportion married and singulate mean age at marriage had substantial impact on fertility. Around 66 per cent of the variations in total fertility rate was accounted for by variations in proportion married. Kebeles with higher proportion married had higher total fertility rate. The variations in singulate mean age at marriage also explained some 36 per cent of fertility differentials among Kebeles. Kebeles with higher singulate mean age at marriage had lower total fertility rate. Moreover variations in age at first marriage had remarkable impacts on completed fertility. Among women aged 40-49 at the time of the survey those who first married before age 15 had 4.3 per cent more children than those who married after the age of 20 years. Among these women, those who married at ages 15-19 had 8.7 per cent more children than women married at the age of 20 or more.

The length of postpartum amenorrhoea was another very important proximate variable for existence of fertility differentials among Kebeles. Around 52 per cent of the variations in total fertility rate was accounted for by variations among Kebeles in the average length of post-partum amenorrhoea. The effect of contraception on fertility differential in Shashemene, however, was found to be very low.

The multiple regression analysis also indicated that the three proximate variables (marriage, contraception and post-partum amenorrhoea) together explained about 81 per cent of the variations in total fertility rate among Kebeles. The proportion explained by the three proximate variables remained substantial (71 per

cent) after adjustments. Thus, the hypothesis, which stated that the proximate variables are the major factors for fertility differentials in the town, was accepted. However, the net effect of contraception on fertility, controlling marriage and post-partum amenorrhoea, was very low and insignificant. Marriage and post-partum amenorrhoea, on the other hand, remained very important in explaining fertility variations in the town. Controlling contraception and marriage, post-partum amenorrhoea alone accounted for 43 per cent of the variations in total fertility rate and this was found to be significant at 92 per cent level. Likewise, marriage controlling for amenorrhoea and contraception explained around 41 per cent of fertility differentials among Kebeles in the town.

Examination of the relative importance of each proximate variable based on the value of the indices (C_m , C_c and C_i) indicated that post-partum amenorrhoea (41 per cent) and marriage (38 per cent) were very important and together explained 79 per cent of the difference between the total fecundity and total fertility rates in the town. Contraception accounted only for 21 per cent of the variations.

When the Bongaarts model was applied to the data, it was found out that the model fitted extremely well to the data in some Kebeles, such as 01, 03, 05, 06, 07, 08 and 09.

5.2 Recommendations

The government of Ethiopia has realized that the population of the country is growing at a faster rate mainly due to high and constant fertility and high but declining mortality. The present level of fertility must, therefore, be reduced to curb the fast rate of population increase. To do that it appears very essential to have a clearly articulated target of fertility level. This would enable researchers to investigate into the most important variables which have the highest contributions to the present high fertility so that efforts could be directed to lower the effects of these variables.

Once the target is clearly indicated, one has to assess the ways and means of achieving the goal. This research found out that raising the age at first-marriage is one of the potential methods of reducing fertility in the country. The existing civil code states that the minimum age of first marriage for females is 15 years. Some researchers suggested the minimum age of first marriage for females to be raised to, at least, 18 years (see, for example, Assefa, 1990). The postponement of first marriage for females to 15 or 18 years would reduce miscarriage and spontaneous intra-uterine mortality. Because females who married before the age of 15 are not physically and psychologically mature to bear pregnancies to term (UN, 1986: 71-77). The raising of age at first marriage to 15 or 18 years tends to increase fertility by reducing involuntary abortions, primary and secondary infertilities of women. To reduce fertility, age at first marriage should be raised at least to the age of 20 years. This suggestion is based on the finding that the completed fertility of women married at the age of 20 or over was much smaller than those who married at ages of 15-19 years.

To set a clear policy, nevertheless, is easier than its implementations. For example, the civil code mentioned above indicates that 15 years as the minimum age at first marriage for females. The fact remains, however, that in some parts of the

country females are forced to marry far earlier than this age. To mitigate these problems, therefore, every effort has to be devoted on policies which ensure education to all children. Parents should be forced to educate their offspring up to a minimum of junior-secondary level. This will raise the age at first marriage because of schooling. Moreover, rearing large family will be costly to the couples so that they may opt to limit their fertility.

Employment of women in government jobs, as indicated earlier, enables females to be free from parental tight control. This reduces family arranged marriage. As a result, the women would be in a better position to decide on their own when and who to marry. In the mean time, first marriage will be postponed. In this case, some women may not get partner at all. Furthermore, employment in government jobs will create a sense of security at old ages because of the pension they will acquire at that period. Thus, the couples will be willing to limit their fertility.

It must, however, be stressed that child mortality has to be mitigated to reduce fertility. It was indicated earlier that use of contraception was low in Kebeles where mortality rate was higher. It is natural for the couples to have as many off-spring as possible in areas where mortality is high in order to secure some to reach adult age. Moreover, the death of lactating child reduces the period of breast-feeding and this would increase fertility because of the biological effect of lactation on amenorrhoea.

The other important method of controlling fertility lies in the use of contraception. At the moment, it was found out that in the study area contraception is very low and it has small impacts on the fertility of the population in the town. It is deemed advisable thus to raise the level of contraception by teaching the couples on the advantages of contraception to limit unwanted births and on the availability of different methods of contraception. Contraception is very important not only to space and or control births within marriage but also to avoid illegitimate births. It

was suggested earlier that age at first marriage should be raised to, at least, 20 years. This may lead to higher rate of premarital sexual intercourse and illegitimate births. Hence, contraception will be very important to reduce these problems. It is thus important to include subjects on family planning methods in the school curricula so that the youths can be reached easily.

Finally, the research has shed doubts rather than lights on the effect of breast-feeding on fertility in Shashemene since the simple correlation indicated a very weak negative correlation between the two variables. Likewise, the variations among Kebeles in the average length of postpartum amenorrhoea was not explained by the socio-cultural variables considered in this study. Moreover, the use of contraception was found to be positive and significant among the unemployed women in the town of Shashemene. Thus, future detail investigation along these lines appear to be very necessary.

Code _____

Appendix I

Addis Ababa University
School of Graduate Studies
Fertility Questionnaire: Shashemene 1991

Confidential

Respondents' Identification

1. Higher _____
2. Kebele _____
3. House Number _____
4. Number of Rooms in the House _____
5. Number of Permanent Residents _____
6. Name of the Respondent _____

7. Visits	1	2	Last
8. Date			
9. Length of Interview			

10. Interviewer's:- Name _____
Signature _____

Part 1: Characteristics of RespondentsSer.

<u>No.</u>	<u>Questions</u>	<u>Response and Code</u>	<u>Skip to</u> _____
1.	When were you born?	year _____	
2.	How old are you now?	Age/full years/_____	
3.	Have you been in Shashemene since your birth?	Yes _____ 1 No _____ 2	_____ 7
4.	How long have you lived in Shashemene Continuously	years/ _____	
5.	What was your age when you left your birth place for the first time	_____ /Age in full years/	
6.	What was your birth place?	Rural 1 Urban 2	
7.	Have you ever been to school?	Yes 1 No 2	_____ 10
8.	Can you read and write easily?	Yes 1 No 2	
9.	What grade have you completed?	_____ /grade/	
10.	To which ethnic group do you belong?	_____ /ethnic group/	

Third 3

Other 4

19. How many times did you
marry?/number of marriage/
20. What was your age at first
marriage?/full years/
21. How many years back did you
marry for the first time?/years ago/
22. What were the month and
year of your first /month/
marriage?/year/
23. What were the month and
year of your second/month/
marriage?/year/
24. What were the month and
year of your last /month/
marriage? /year/
25. How long did you stay in
the first marriage? /years/
26. Was your first marriage arranged
before or after you began before menstruation 1
menstruation? after menstruation 2
27. Who initiated and arranged your
first your marriage? family1
yourself2
others/specify/ - 3

Part 3: Natality

		Code _____
28.	Have you ever-born a child?	Yes 1
		No 2 — 34
29.	What was your age when your first child was born?	...../age in full years/
30.	How many of your male and female children are living with you at present?	...../males/ ...../females/
31.	How many of your male and female children are not living with you at present?	...../males/ ...../females/
32.	Has any of your children died?	Yes 1
		No 2 — 36
33.	How many of your male and female children have died?	...../males/ ...../females/
34.	Have you ever-had an involuntary abortion?	Yes 1
		No 2
		— 36
35.	How many times have you had involuntary abortions?	.../Number of abortions/
36.	Have you ever-had voluntary (induced) abortions?	Yes 1
		No 2
		— 38
37.	How many times have you had induced abortions?	.../Number of abortions/

38. Do you approve the practice of induced abortions ?
- Yes.....1
No.....2 _____40
39. If you do not approve the practice of induced abortions, what is your reason ?
- Religion...1
Husband.....2
Family.....3
Need for children....4
Others/specify/...5
40. Are you pregnant now ?
- Yes.....1
No.....2 _____42
Not certain...3 _____42
41. What is your preference of the sex of the child you are going to give birth ?
- Male.....1
Female...2
No preference...3

Questions 42-57 are only for women who have ever born children

Birth Orders	42 Male or Female	43 In which month or season was it born?	44 Year of birth	45 Is it alive?	46 If dead what was the age at its death?
1	Male ... 1 Female ...2	Month Season	Year ...	Yes ... 1 No ... 2	.....
2	Male ... 1 Female...2	Month Season	Year	Yes ... 1 No ... 2	.....
3	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
4	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
5	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
6	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
7	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
8	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
9	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
10	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
11	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
12	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
13	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
14	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....
15	Male ... 1 Female...2	Month Season	Year	Yes ...1 No. ...2	.....

Part 4: Breast-feeding

47. Did you breast-feed your child who was born before the last child? Yes1
No2 — 49
48. How long did you breast-feed the child?/months/ — 50
49. Why did not breast-feed the child? Work 1
Child refused..2
50. Did you give the child additional Food? Yes 1
No 2 — 52
51. At what age did you start to give the child additional food?/months/
52. Did you breast-feeding your last child? Yes 1
No 2 — 56
53. Are you breast-feeding the child at present Yes 1
No 2 — 56
54. How long did you breast-feed your last child?/months/
55. Why did you stop breast-feeding of your last child? Because of Work ...1
Child was sick2
Child has died3
Age of the Child...4
Became pregnant ...5
Others/specify/....6
56. How long did you stay after the last birth before you resume menstruation?/months/
Not yet resumed ...7
57. How long did you stay, on average, before the next pregnancy?/months/

Part 5: Contraception

58. Have you ever heard of any Family Planning methods? Yes 1
No 2

Code _____

59. What, in your opinion, is family planning?

Avoiding unwanted Pregnancies1
Spacing of births2
Others/specify/ 3

60. The followings are methods to control or to avoid pregnancies

Birth Control Methods	61. Have you ever heard of the method?	62. Have you ever used the method?
01. Oral pills	Yes 1 No 2	Yes 1 No 2
02. Intra Uterine Devices(IUD)	Yes 1 No 2	Yes 1 No 2
03. Injection	Yes 1 No 2	Yes 1 No 2
04. Jelly/Diaphragm	Yes 1 No 2	Yes 1 No 2
05. Condoms	Yes 1 No 2	Yes 1 No 2
06. Female Sterilization	Yes 1 No 2	Yes 1 No 2
07. Male Sterilization	Yes 1 No 2	Yes 1 No 2
08. Rhythm	Yes 1 No 2	Yes 1 No 2
09. Sexual abstinence	Yes 1 No 2	Yes 1 No 2

Questions 63-80 are for women who have ever-used at least one method of family planning.

63. Which of these methods did you use first
- | | |
|--------------------------|----|
| Oral pills | 01 |
| IUD | 02 |
| Injection | 03 |
| Diaphragm/Jelly | 04 |
| Condom | 05 |
| Female Sterilization ... | 06 |
| Male Sterilization | 07 |
| Rhythm | 08 |
| Sexual abstinence | 09 |
| Others/specify/ | 10 |
64. How long did you use this method continuously?
65. Have you used any birth control methods after the birth of your last child? Yes 1 No 2
66. Did you have any pregnancy while contracepting? Yes 1 No 2
67. Which of the methods were you using and yet got pregnant?
- | | |
|--------------------------|----|
| Oral pills ... | 01 |
| IUD | 02 |
| Injection | 03 |
| Diaphragm/Jelly.. | 04 |
| Condom | 05 |
| Female Sterilization ... | 06 |
| Male sterilization | 07 |
| Rhythm | 08 |
| Sexual abstinence | 09 |
| Others/specify/ | 10 |

68.	Are you using contraceptives at present?	Yes 1 No 2	_____ 70
69.	If yes which of the methods are you using?	Oral pills ...01 IUD .....02 Injection ...03 Diaphragm/Jelly..04 Condom 05 Female 06 Male sterilization .. 07 Rhythm 08 Sexual abstinence ... 09 Others/specify/ 10	
70.	Did you get the contraception free of charge or on payment?	Free 01 On payment 02	_____ 73
71.	How much did it cost you?	Price	
72.	In your opinion, was the price cheap or expensive	Cheap .....01 Expensive .....02	
73.	From where did you last get the method?	Clinic/Health Centre/Hospital ...01 Pharmacy .....02 Shop .....03 Others/specify/..04	
74.	How did you get to this area?	On foot 01 By bus/taxi 02 By private car ..03 Others/specify/..04	
75.	What time did the journey take you?	..... /minutes/	
76.	Do you think the day and time during which family planning	Yes 01 No 02	

- services are provided convenient?
77. Is there any moment when you return without getting the contraceptives you wanted? Yes 01
No 02
78. When you want additional services where do you like to get it from? Clinic/Health Centre/Hospital .. 01
Pharmacy 02
Shop 03
Others/specify/.04
79. Have you ever encountered problems while using birth control method? Yes 01
No02 ——— 81
80. What type of problems have you encountered? Health 01
Husband did not approve .. 02
Had been pregnant while Using the method 03
Others/specify/ 04
81. Do you wish to use any birth control method in the future? Yes 01
No 02 ——— 84
82. Which method do you wish to use in the future? Oral pill 01
IUD 02
Injection 03
Diaphragm/Jelly ..04
Condom 05
Female sterilization ..06
Male sterilization ... 07
Rhythm 08
Sexual abstinence 09
Others/specify/..... 10
83. When you want to know more about birth control methods, which of these communication systems are convenient for you? Radio 01
Television 02
News paper 03
Others/specify/... 04

84. You do not want to use any birth control methods in the future because Husband does not approve contraception .. 01
- Health problem 04
- Religion 05
- Others/specify/ 06

Part 6: Desired Number of Children

85. If you need an additional child do you think you and your husband can still produce one? Yes 01
No 02 — 89
86. What is your desire for additional children High 01
Medium 02
Low 03
87. Do you wish for a male or a female baby? Male 01
Female 02
No preference ..03
88. How many additional male and female Children do you want to have?/males/
...../females/
89. Have you ever-discussed with your husband the number of children that you need to have? Yes 01
No 02
90. How many children do you need to have in your life?/number/
God knows
91. Having given birth to the number of children you desired to have would you opt to have additional children only because you didn't continue to have children..01
Discontinue to

have the right have male/female children 02
 ratio you desired? Not yet decided03

Part 7: Respondents' Work Status and Husbands' Characteristics

92. Do you work at home? Yes 01
 No 02
93. Do you work outside home? Yes 01
 No 02
94. What type of work do you usually do?

95. On average how long do you work
 per day?/hours/
96. Are you self-employed, government self-employed...01
 employed or family employed? Government employed ..02
 Family-employed 03
 Others/specify/ 04
97. How many years have you been employed
 up to now? /years/
 Questions 98-111 are for married
 respondents only
98. Have you ever been employed outside Yes 01
 home after your marriage No 02
99. Have you ever been employed outside Yes 01
 home before marriage No 02
100. Has your husband ever been educated? Yes 01
 No 02
101. Can he read and write easily? Yes 01
 No 02
102. What grade has he completed (grade)
103. To which ethnic group does he belong?

have the right have male/female children 02
 ratio you desired? Not yet decided03

Part 7: Respondents' Work Status and Husbands' Characteristics

92. Do you work at home? Yes 01
 No 02
93. Do you work outside home? Yes 01
 No 02
94. What type of work do you usually do?

95. On average how long do you work
 per day?/hours/
96. Are you self-employed, government self-employed...01
 employed or family employed? Government employed ..02
 Family-employed 03
 Others/specify/ 04
97. How many years have you been employed
 up to now? /years/
 Questions 98-111 are for married
 respondents only
98. Have you ever been employed outside Yes 01
 home after your marriage No 02
99. Have you ever been employed outside Yes 01
 home before marriage No 02
100. Has your husband ever been educated? Yes 01
 No 02
101. Can he read and write easily? Yes 01
 No 02
102. What grade has he completed (grade)
103. To which ethnic group does he belong?

Code _____

104.	Does the approve of the use of contraceptives?	Yes 01 No 02	_____ 108
105.	Why doesn't approve of the use of contraceptives	Because of religion .. 01 Because of lack of information 02 He needs children 03 Others(specify) 04	
106.	Have you ever been forced by your husband not to use contraceptives?	Yes 01 No 02	
107.	Do you want your husband to receive some advice on the use of contraceptives?	Yes 01 No 02	
108.	Does your husband have a job?	Yes 01 No 02	_____ Ended
109.	What types of work does your husband do most of the time?	..... .....
110.	Is your husband self-employed, government employed or family employed?	self-employed ... 01 Government employed .. 02 Family employed 03 Others/specify/ 04	
111.	Does your husband have regular income?	Yes 01 No 02	

----- End -----

Appendix 2

Age Specific Fertility Rates (Brass Relational Compertz Model)
for Shashemene and its Kebeles, 1991

Kebele 01:- $\hat{Y}(x) = 0.211+0.908 Ys(x)$					Kebele 02:- $\hat{Y}(x) = 0.181+0.819 Ys(x)$			
Age (x)	$\hat{Y}(x)$	F(x)	Age Group	Age Specific Fertility Rate	$\hat{Y}(x)$	F(x)	Age Group	Age Specific Fertility Rate
20	-0.4167	1.2817	15-19	0.2563	-0.3852	1.3200	15-19	0.2640
25	0.2343	2.6485	20-24	0.2734	0.2020	2.5357	20-24	0.2431
30	0.8466	3.8048	25-29	0.2313	0.7543	3.5866	25-29	0.2102
35	1.5537	4.7287	30-34	0.1848	1.3921	4.4772	30-34	0.1781
40	2.5954	5.4222	35-39	0.1387	2.3318	5.2092	35-39	0.1464
45	4.5782	5.7826	40-44	0.0721	4.1201	5.6480	40-44	0.0878
50	-	5.8423	45-49	0.0119	-	5.7405	45-49	0.0185
TFR = 1.1685 x 5 = 5.843					TFR = 1.1481 x 5 = 5.741			
Kebele 03:- $\hat{Y}(x) = 0.794 Ys(x) - 0.085$					Kebele 04:- $\hat{Y}(x) = 0.271 + 1.15 Ys(x)$			
20	-0.6339	0.9263	15-19	0.1853	-0.5240	1.2929	15-19	0.2586
25	-0.0646	2.0995	20-24	0.2346	0.3005	3.3374	20-24	0.4089
30	0.7097	3.7308	25-29	0.3263	1.0760	4.9763	25-29	0.3278
35	1.0891	4.3575	30-34	0.1253	1.9715	6.0885	30-34	0.2224
40	2.0001	5.3287	35-39	0.1942	3.2909	6.7425	35-39	0.1308
45	3.7339	5.9567	40-44	0.1256	5.8022	6.9771	40-44	0.0469
50	-	6.1008	45-49	0.0288	-	6.9982	45-49	0.0042
TFR = 1.2201 x 5 = 6.101					TFR = 1.3996 x 5 = 6.998			
Kebele 05:- $\hat{Y}(x) = 0.873 Ys(x) - 0.25$					Kebele 06:- $\hat{Y}(x) = 0.115 + 0.885 Ys(x)$			
20	-0.8535	0.7403	15-19	0.1481	-0.4968	1.1044	15-19	0.2209
25	-0.2276	2.2068	20-24	0.2933	0.1377	2.3902	20-24	0.2572
30	0.3611	3.8583	25-29	0.3303	0.7345	3.5360	25-29	0.2292
35	1.0409	5.4411	30-34	0.3166	1.4237	4.4906	30-34	0.1909
40	2.0425	6.8034	35-39	0.2725	2.4390	5.2357	35-39	0.1491
45	3.9465	7.5974	40-44	0.1588	4.3716	5.6413	40-44	0.0811
50	-	7.7456	45-49	0.0296	-	5.7130	45-49	0.0143
TFR = 1.5492 x 5 = 7.7460					TFR = 1.1427 x 5 = 5.7135			

Kebele 07:- $\hat{Y}(x) = 0.172 + 0.444 Y_s(x)$					Kebele 08:- $\hat{Y}(x) = 0.447 Y_s(x) - 0.315$			
Age (x)	$\hat{Y}(x)$	F(x)	Age Group	Age Specific Fertility Rate	$\hat{Y}(x)$	F(x)	Age Group	Age Specific Fertility Rate
20	-0.1349	2.5740	15-19	0.5148	-0.6240	1.2754	15-19	0.2551
25	0.1834	3.5165	20-24	0.1885	-0.3035	2.1276	20-24	0.1704
30	0.4828	4.3616	25-29	0.1690	-0.0021	3.0268	25-29	0.1798
35	0.8286	5.2239	30-34	0.1725	0.3460	4.0637	30-34	0.2074
40	1.3380	6.2185	35-39	0.1989	0.8588	5.3975	35-39	0.2668
45	2.3075	7.3184	40-44	0.2200	1.839	7.0285	40-44	0.3262
50	-	8.0841	45-49	0.1531	-	8.245	45-49	0.2433
TFR = $1.618 \times 5 = 8.084$					TFR = $1.649 \times 5 = 8.245$			
Kebele 09:- $\hat{Y}(x) = 1.499 Y_s(x) + 0.815$					Kebele 10:- $\hat{Y}(x) = 0.011 + 0.395 Y_s(x)$			
20	-0.2213	1.6790	15-19	0.3358	-0.2621	1.4317	15-19	0.2863
25	0.8534	3.8188	20-24	0.4280	0.0212	1.9728	20-24	0.1082
30	1.8643	5.0074	25-29	0.2377	0.2875	2.4802	25-29	0.1015
35	3.0316	5.5715	3-34	0.1128	0.5951	3.0252	30-34	0.1090
40	4.7514	5.7966	35-39	0.0450	1.0483	3.6986	35-39	0.1347
45	8.0247	5.8450	40-44	0.0097	1.9108	4.5291	40-44	0.1661
50	-	5.8469	45-49	0.0004	-	5.2154	45-49	0.1445
TFR = $1.1694 \times 5 = 5.847$					TFR = $1.053 \times 5 = 5.2515$			
Shashemene:- $\hat{Y}(x) = 0.818 Y_s(x) - 0.1074$								
20	0.6729	1.0995	15-19	0.2199				
25	-0.0864	2.6235	20-24	0.3048				
30	0.4652	4.1652	25-29	0.3083				
35	1.1022	5.5992	30-34	0.2868				
40	2.0407	6.8540	35-39	0.2510				
45	3.8269	7.6369	40-44	0.1566				
50	-	7.8050	45-49	0.0336				
TFR = $1.561 \times 5 = 7.805$								

Notes:-

- $Y_s(x)$ is taken from table A1 of Brass 1981.
- $F(x)$ is computed using the relation $F(x) = T \cdot e^{-\hat{Y}(x)}$ where, $T = \text{TFR}$ which is, $T \cdot [\text{Exp}[-\text{Exp}[-\hat{Y}(x)]]]$
- The last column (age specific fertility rate) is computed by differencing the model $F(x)$ and dividing by 5; that is

$$\frac{F(x) - F(x-5)}{5}$$

APPENDIX 3

Correlation Matrix

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	X ₂₀	X ₂₁	X ₂₂	X ₂₃	
X ₁	1.000																							
X ₂	-.690	1.000																						
X ₃	-.475	.259	1.000																					
X ₄	.502	-.610	-.280	1.000																				
X ₅	.041	.318	-.004	-.407	1.000																			
X ₆	-.415	.790	.160	-.326	-.727	1.000																		
X ₇	-.371	.372	.623	-.704	.273	0.180	1.000																	
X ₈	-.708	.712	.107	-.737	-.024	0.592	0.373	1.000																
X ₉	.816	-.700	-.184	.518	.139	-0.547	-0.234	-.855	1.000															
X ₁₀	-.616	.632	.252	-.439	-.181	0.527	0.205	.679	-.914	1.000														
X ₁₁	.101	-.253	.213	.550	-.125	-0.325	-0.040	-.605	.487	-.537	1.000													
X ₁₂	.042	-.199	-.319	.143	.057	-0.124	-0.434	-.059	-.242	.375	-.527	1.000												
X ₁₃	-.824	.800	.195	-.727	.070	0.495	0.312	.907	-.797	.594	-.392	-.160	1.000											
X ₁₄	.113	-.169	.568	.230	-.365	0.156	0.239	-.224	.246	-.162	.455	-.522	-.295	1.000										
X ₁₅	-.522	.588	.635	-.691	-.050	0.528	0.800	.508	-.401	.378	-.319	-.155	.442	.090	1.000									
X ₁₆	.783	-.742	-.569	.659	.131	-0.618	-0.533	-.800	.672	-.523	.176	.440	-.840	-.255	-.607	1.000								
X ₁₇	.688	-.743	-.050	.646	.070	-0.571	-0.321	-.776	.901	-.846	.520	-.276	-.716	.337	-.437	.555	1.000							
X ₁₈	-.688	.743	.050	-.646	-.070	0.571	0.321	.776	-.901	.846	-.520	.276	.716	-.337	.437	-.555	-1.000	1.000						
X ₁₉	.329	-.805	.130	.385	.403	-0.750	0.103	-.550	.590	-.648	.494	-.163	-.586	.316	-.209	.411	.675	-.675	1.000					
X ₂₀	-.568	.858	.116	-.572	-.369	0.833	0.192	.758	-.751	.722	-.427	-.054	.744	-.021	.382	-.735	.814	.814	-.866	1.000				
X ₂₁	.736	-.846	-.218	.704	.113	-0.654	-0.400	-.867	.870	-.782	.377	.117	-.864	.083	-.440	.823	.889	-.889	.698	-.919	1.000			
X ₂₂	-.760	-.570	.302	-.683	.299	0.189	0.584	.763	-.780	.633	-.189	-.175	.778	-.150	.391	-.702	.730	.730	-.236	.520	-.814	1.000		
X ₂₃	.385	-.569	.208	.448	.341	-0.729	0.033	-.626	.589	-.503	.598	-.287	-.521	.208	-.286	.418	.736	-.736	.712	-.803	.645	-.216	1.000	

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DECLARATION

I, the undersigned declare that this thesis is my work and all the sources of material used for the thesis have been duly acknowledged.

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May, 1992