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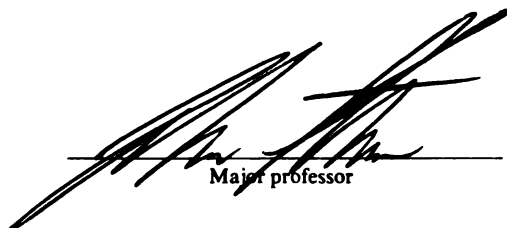
INCREASES IN WOMEN'S EDUCATION AND FERTILITY DECLINE:
EVIDENCE FROM NIGERIA

presented by

Agatha Dadzie Awuah

has been accepted towards fulfillment
of the requirements for

PH.D degree in ECONOMICS



Major professor

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**INCREASES IN WOMEN'S EDUCATION AND FERTILITY DECLINE: EVIDENCE
FROM NIGERIA**

By

Agatha Dadzie Awuah

A DISSERTATION

**Submitted to
Michigan State University
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ABSTRACT

INCREASES IN WOMEN'S EDUCATION AND FERTILITY DECLINE : EVIDENCE FROM NIGERIA

By

Agatha Dadzie Awuah

Fertility transition has been slow in sub-Saharan Africa. Recently, however, there is evidence to suggest a fertility transition in some countries and some major regions in sub-Saharan Africa. Notable among these is Nigeria where Cohen (1993) asserts that there has been a drop of 1.3 in the total fertility rate. Reinis et al (1991) also suggest a 10 percent drop in fertility among women in the Southwest and possibly the Southeast.

Using Nigeria Demographic and Health Survey data, 1990, this study investigates if fertility has indeed fallen and if so among which socio-economic groups. Using both bivariate and multivariate techniques, the study starts out by looking at the trend in female schooling over recent years. The data suggest a tremendous increases in female schooling. Secondly, the study investigates the fertility behavior of women in the survey as a whole and also with reference to the three major regions in Nigeria, the Southeast, Southwest and the North. From the retrospective birth histories, we reconstructed cumulative fertility at various attained ages. A look at fertility using such indicators as cumulative fertility at various attained ages, first marriages and first births at various attained ages does not reveal any decisive decline in fertility. Among the two youngest cohorts there is some evidence of a decline in the Southwest and the Southeast for

cumulative fertility at ages 18 and 23 but there is no evidence of a decline at ages 28 and beyond, for older cohorts.

Our regression analysis reveals a powerful negative relation between female schooling and fertility among women who have completed primary and beyond. At lower levels of schooling the relation is either positive or nonexistent. Our results also suggest that female schooling alone accounts for between 23 to 61 percent of the decline in fertility among the youngest cohorts. Among women of different socio-economic status, it is women with seven or more years of schooling for whom we observe a decisive decline in fertility. Fertility has in fact risen among women with either no schooling or 1-6 years of schooling. For women with seven or more years of schooling we also observe delays in the onset of first births and first marriages.

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This dissertation is dedicated to: My late father Papa Kofi Faasemkye., my mother Maame Ama Ata and my husband, Emmanuel Baffour Awuah

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CHAPTER 1

INTRODUCTION

1.1. INTRODUCTION TO THE PROBLEM SETTING

There is a close relationship between the population growth rate and economic growth and development even though how population issues should be handled is subject to debate amongst development economists. One of the arguments for a reduction in the growth rate of population is that a reduction is good in itself because it raises the per capita Gross National Income (GNP). Those who argue for a natural growth rate in population maintain that labor is a key ingredient in the production process. More could be achieved for every one, if the polluters of the environment are made to clean the environment or degradation of forest could be restored if new trees are planted. A nation's population determines among other things the potential labor supply and the labor force participation rate. However, the quality of the labor force as measured by the level of education and technical training is most important to any economic growth process. In spite of these controversies, it is clear that regions with high population growth rate and high total fertility rates are also the poorest in the world.

Sub-Saharan Africa seems to lag behind the fertility transition that has begun in every other major region in the developing world since 1965. For example, by 1997 figures, the population growth rate between 1990-95 for sub-Saharan Africa was 2.6 percent. This compares with 1.6 percent average growth rate for all low and middle

income countries, 0.3 percent for Europe and Central Asia, 1.7 percent for Latin America and Caribbean and 0.7 percent for high-income countries. On the other hand about 31 out of the 49 low-income countries are sub-Saharan African countries. Only two out of the 41 countries classified as middle income countries are from sub-Saharan Africa. South Africa and Gabon are the only sub-Saharan Africa countries that fall within the upper-middle income category. Most sub-Saharan African countries had a negative growth rate in GNP for the period between 1985-95. Sub-Saharan Africa as a region recorded -1.1 percent growth rate, in comparison, that of all low-income countries was 0.4 percent, Latin America and Caribbean was 0.3 percent and the United States 1.3 percent (World Development Report, 1997).

Population issues seem to be a major factor in sub-Saharan Africa's development (Caldwell, 1995). Many reasons are given for Africa's resistance to a fertility transition. Key amongst these reasons are unique cultural and religious practices in the continent which promote the demand for larger families (Caldwell and Caldwell, 1987, 1990). Some also argue that Africa lags behind because her level of development is not at par with that of other regions where fertility transition has taken place (World Bank, 1984, 1986).

However, in spite of these problems many researchers have found that even in high fertility regions like sub-Saharan Africa, fertility differentials exist among different socio-economic groups (Cochrane and Farid, 1990). Botswana, Zimbabwe and Kenya are often cited as the vanguard of the fertility transition in sub-Saharan Africa. Recently however, from Cohen (1993) extensive fertility analysis of African countries, it has

become apparent that fertility transition is underway in other African countries besides Botswana, Kenya and Zimbabwe, and some major regions in Africa. Notable among these countries is Nigeria. By 1991, there was evidence to suggest a 10 percent decline in fertility in the southwest and possibly the southeast Nigeria (Reinis, Rutstein and Ajayi, 1991). The claim of a fertility decline in Africa is however, met with skepticism because of problems associated with data collection in the region. Moreover, by 1985 World Fertility Survey (WFS) on Nigeria, her total fertility rate was 5.7 and according to 1997 figures this has risen to 6.2, which represents an increase but not a decline in fertility (Scott and Chidambaram, 1985; Population Reference Bureau, 1997).

The present study focuses on Nigeria. Our aim is to track fertility in Nigeria to see if it has indeed fallen and if so among which socio-economic group. Verification of this recent drop in fertility in the southwest and southeast subregions in Nigeria is of interest because by 1991 census data, southwest Nigeria was over 36 million, which is more populous than any sub-Saharan country outside Nigeria, except Ethiopia, South Africa and Zaire. In addition southwest and southeast Nigeria together is larger than any sub-Saharan country in Africa.

1.2. OBJECTIVES OF THE STUDY

Using the Nigeria Demographic and Health Survey (NDHS), 1990 data, we have three objectives in this study.

- * First to track fertility trends in Nigeria to see if it has indeed fallen, by examining the fertility behavior in Nigeria using key correlates of fertility such as

cumulative fertility, age at first marriage and age at first birth. A sustainable fertility decline must be accompanied by younger women marrying later and having their first births later as compared to the older women. The usual practice of comparing the fertility of women at two points in time, for instance, eight and four years before a survey, may be an inaccurate measure of a fertility decline. Our objective in this study is to do a cohort analysis to see how fertility patterns are changing from the oldest to the youngest women in the survey. To investigate if younger women consistently differ in their fertility behavior from the older women.

* Second, if fertility has indeed fallen, we would like to investigate further among which socio-economic group fertility has fallen using female schooling as our measure of social stratification. This we hope to accomplish by doing fertility analysis for women with different levels of education.

* Third, to find out how much of the decline in fertility is accounted for by female education. Using Oaxaca (1973) decomposition as applied to male-female wage discrimination, we will decompose the decline in fertility if any, into that which is explained by female schooling and hence by other factors besides female schooling which may affect fertility exogenously.

We begin by examining the consistency and reliability of the data. We also investigate the trend in female schooling to find out if younger women have received higher education relative to the older women. If so, whether the increases in female schooling may account for the any possible decline in fertility.

1.3. SIGNIFICANCE OF THE STUDY

First the study provides an alternative to the use of children ever born (CEB) as the dependent variable in regressions that seek to find the determinants of fertility. There is a problem with this approach that the present study seeks to address. We use cumulative fertility at various attained ages as our dependent variable.

There are immediate advantages to the new approach. It avoids censoring problems and the age at which the relationship between female schooling and fertility diminishes can easily be captured even without multivariate regression analysis.

Research in this line has not been done for an African country even though Lam, Sedlacek and Duryea (1992) have done this using Brazilian data. However, doing it for an African country such as Nigeria is of interest in itself. With a population which is 14 percent of the Africa's total population and a population growth rate of 3.1 percent, Nigeria offers herself as a good starting point for research which has a substantial bearing on Africa's population future.

It is also the first of its kind which offers a systematic quantification of female schooling on fertility as applied to an African country. If policy makers are to put some emphasis on female schooling as a vehicle for a reduction in fertility, then it is important to know how much an increase in female schooling will lead to a decline in fertility. It is also important to know the age in a woman's life-cycle an intervention in her education is necessary to yield maximum results on her fertility decisions.

The study will also contribute in general to the theoretical, empirical and policy discussions on the relationship between maternal education and fertility. Studies on

fertility and education are many but none or very few seek to quantify the influence of female schooling on fertility. Knowing how much of a decline in fertility is accounted for by female schooling alone is significant for policy making which seeks to put some emphasis on female schooling. This is beneficial for Africa in general where private investment in girls' education is low. The study will also benefit the international community that seeks to advance the potentials of women through education and reproductive health.

1.4. ORGANIZATION OF THE STUDY

The rest of the study is organized as follows: Chapter 2 presents a brief background information on Nigeria, making reference to its history, geography, economy, population, education, and population policies. Chapter 3 reviews some of the relevant theoretical and empirical literature, with particular reference to some of the stylized facts on the relationship between female schooling and fertility. It also discusses some of the empirical work done from both the World Fertility Surveys and Demographic and Health Surveys on Africa and other parts of the world. Finally it discusses some of the empirical work on Nigeria.

Chapter 4 investigates some of the potential measurement errors in the NDHS, 1990 data, with particular emphasis on data collection on birth histories, age at first marriage and age at first birth, and completeness of information on age of respondents, and the proportion of dead live-births. Chapter 5 provides the descriptive statistics on the

trends in female schooling and fertility trends in Nigeria with reference to cumulative fertility at various attained ages, first marriage and first births at various attained ages.

Chapter 6 deals with multivariate regression analysis capturing the dynamic influence of female schooling, community variables such as urban residence and religious background, polygyny and husband's education on fertility, age at first marriage and age at first birth. Chapter 7 investigates further among which socio-economic group fertility may have indeed fallen by running regressions over levels of female schooling for both cumulative fertility at various attained ages, first marriage and first birth at various attained ages. Chapter 8 provides the summary, conclusions and implications and suggestions for further research.

CHAPTER 2

BACKGROUND INFORMATION ON NIGERIA

2.1. HISTORY

The history of the present day Nigeria dates largely from 1914 when the previously distinct northern and southern Nigerian protectorates were amalgamated under British rule. Nevertheless, oral traditions of the various ethnic groups, documentary sources and archaeological evidence reveal the long existence of various dynamic and interacting kingdoms within its boundaries thousands of years before the influence of the Europeans. Documentation exists for example on the iron-making culture such as the Nok who were living on the Jos Plateau as early as the 300 BC. Other important kingdoms were the northeastern kingdoms of Borno, the Hausa city-state kingdoms of Katsina, Kano, Zaria, and Gobir in northern-central Nigeria, the Yoruba city-state kingdom of Ife, Oyo and Ijebu in southwestern Nigeria, the southern kingdom of Benin and the Igbo communities of eastern Nigeria (Europa Publications, 1996: NewAfrica Yearbook, 1997-98; Oyewole, 1987).

Contacts between the peoples of Nigeria and Europeans date at least to 1480 when two Portuguese ships explored along the Bight of Benin and bought slaves. Soon European powers were exchanging cloth, hardware, guns and gunpowder for slaves along the West African Coast. The abolition of slavery by the British in 1807 cleared the way for the expansion of trade in agricultural produce from Africa to Europe.

At the end of the 19th century, Britain began aggressive military expansion in the region. A protectorate was declared over Lagos, other parts of the south and in the northern areas from 1885-1900. The North and the South were formally consolidated in 1914. In the North, the British limited Christian missions, restricted education, and reinforced the feudal rulers. In 1939, Eastern and Western Nigeria were separated leading to the structure of three separate regions which was in place at the time of independence in 1960. Within each region, one ethnic group predominated, the Hausa-Fulani in the North, the Yoruba in the Southwest and the Igbo in the Southeast.

On October 1, 1960, Nigeria became an independent nation. Three years later in October 1963, it became the Federal Republic of Nigeria, severing all links with the British, while retaining its membership in the Commonwealth. The political scene leading up to independence was dominated by three regionally based parties, the National Council for Nigeria and Cameroon (NCNC) in the east, the Action Group (AG) in the west, and the conservative Northern People's Congress (NPC) in the north. Independent Nigeria was almost immediately confronted by a series of foreseeable problems.

A complex series of political events, constitutional difficulties, ethnic allegiances and social unrest followed by corrupt elections in 1964 and 1965, paved the way for the first of six unplanned changes of government which have occurred since Nigeria became independent. In 1966, the middle-ranking members of the Nigerian military staged an attempted coup. This was suppressed by federal troops, but resulted in the installation of a military junta, led by Igbo officers. Regional animosities flared, promoting massacres of Igbo-speaking people living in the north. The following year, eastern leaders

responded by declaring a separate Republic of Biafra, igniting a 30-month civil war from May 1967 to January 1970, which claimed two million lives. Since 1960 Nigeria has been run by a civilian government by slightly less than 10 years (Europa Publications, 1996: NewAfrica Yearbook, 1997-98; Oyewole, 1987).

2.2 GEOGRAPHY

The Federal Republic of Nigeria is located in West Africa surrounded by Niger on the North, Cameroon on the East, and Benin on the West. It covers an area of about 923,768 square kilometers, an area roughly twice the size of California and nearly four times that of the United Kingdom. It has about three percent of Africa's land surface but nearly 14.1 percent of its population, making her by far the most populous country in Africa. Figure 2.1 is a map of Nigeria showing the major regions of Nigeria and its neighboring countries.

Nigeria is situated in the tropics with an average temperature of 90⁰ F (32⁰C). Annual rainfall varies from 98" (2.5m) in the southeast to 24" (0.6m) in the north. Coastal forests cover the southern regions, giving way to savanna in the north. The Niger River flows from the northwest to join the Benue River in central Nigeria, then turns south forming a fertile delta as it empties into the Gulf of Guinea. About 35.6 percent of the land is arable and 12.4 percent is wooded. (Europa Publications, 1996; NewAfrica Yearbook, 1997-98).

2.3 ECONOMY

The Nigerian economy is based primarily on agriculture and minerals.

Agriculture and Livestock accounted for about 35.3 percent of the Gross Domestic Product (GDP) in 1992. Crude petroleum which accounts for about 12.9 percent of her GDP and 97.9 percent of total export earnings makes Nigeria the sixth largest producer of crude oil in the world and the second largest in Africa after Libya. The development of the petroleum industry in the 1960s and the 1970s radically transformed Nigeria from an agriculturally based economy to a major oil-exporter.

The oil boom came at a time when Nigeria was concerned with the task of postwar reconstruction. By 1966 oil was already Nigeria's main source of foreign exchange earning, accounting for a third of her total exports. Export earning from petroleum generated high levels of economic growth, and by mid-1970s Nigeria's economy had become the dominant economy in sub-Saharan Africa. The oil boom had three components, the increase in oil output in the early 1970s, and the oil price shocks of the 1973-1974 and 1979-1980.

The decline in agriculture was dramatic in the period from 1972 to 1985. Production of rubber and cocoa, which had been growing at over 10 percent and 6 percent per annum respectively in the period from 1950 to 1966 declined to around 6 percent per annum. By 1981 agriculture's share of GDP, which was almost two-thirds in the periods from 1960 to 1965, had fallen to 28 percent. Export crops declined in aggregate relative to services from 100 percent in 1966 to 11 percent in 1981.

The decline in world oil prices from 1981 to 1986, led to a remarkable decline in export revenue from crude oil. The oil shock was compounded by the unsustainability of previous borrowing. Not only could the flow of borrowing not be sustained, but the accumulated debt had to be serviced. As a result foreign exchange fell and with it a fall in the imports of raw materials for her manufacturing industries. The fall in oil revenue led to a drastic fall in economic activities with most of Nigeria's industries operating below capacity as a result of shortages of imported materials and production and wages plummeting. Cumulatively, the losses from the oil shock and the reduction in net capital inflow during the five years were around 120 percent of Gross Domestic Expenditure (Bevan, Collier and Gunning, 1992; Europa Publications, 1996; Oyewole, 1987).

2.4. POPULATION

By 1991 census figures, Nigeria's population was estimated to be 88.5 million and by 1996 her population had grown to nearly 103.9 million, making her the most populous nation in Africa and the eighth most populous nation in the world (Population Reference Bureau, 1996). This represents about 15.4 million increase in population over a five-year period, an annual growth rate of nearly 3.1 percent. This is among the highest even by sub-Saharan African standards.

Her population is concentrated heavily in the southwestern, southeastern and the north-central parts of the country. Whilst still predominately rural, the population has become more urbanized, increasing from 19 percent in 1963 to 24.9 percent in 1990, making her the seventh most urbanized country in Sub-Saharan Africa.

It is one of the most ethnically diverse countries in Africa, about 395 mutually unintelligible languages are spoken and roughly about 434 ethnic groups exist in Nigeria. Many of these groups have only a few thousand members, with the result that Nigeria's population is dominated by the Hausa-Fulani, the Yoruba and the Igbo, concentrated in the north, the southwest and southeast respectively. These three groups comprise about 57.8 percent of the total population (Bevan, Collier and Gumming, 1992; Myers, 1989)

In 1990-95, the estimated life expectancy at birth was 54.28 years for women and 52.50 years for men (Keyfitz and Flieger, 1990). By world standards, this means that mortality was somewhat responding to efforts by the international health community but that mortality was still high and out of control. The Net Reproduction Rate in 1990-95 was estimated as 2.57 daughters per woman surviving to the mean age of childbearing (Keyfitz and Flieger, 1990). This means that the next generation of daughters will be 157 percent larger than the current one, a very high rate of reproduction indeed. This study will relate those demographic realities to the social and economic structure in which they are embedded.

2.5. EDUCATION

Education in Nigeria is partly the responsibility of the state governments, although the federal government has played an increasingly important role since 1970. Primary education begins at 6 years of age and lasts for six years. Secondary education begins at 12 years of age and lasts for a further 6 years, comprising two six-years cycles. Education to junior secondary level (from 6-15 years of age) is free and compulsory. In

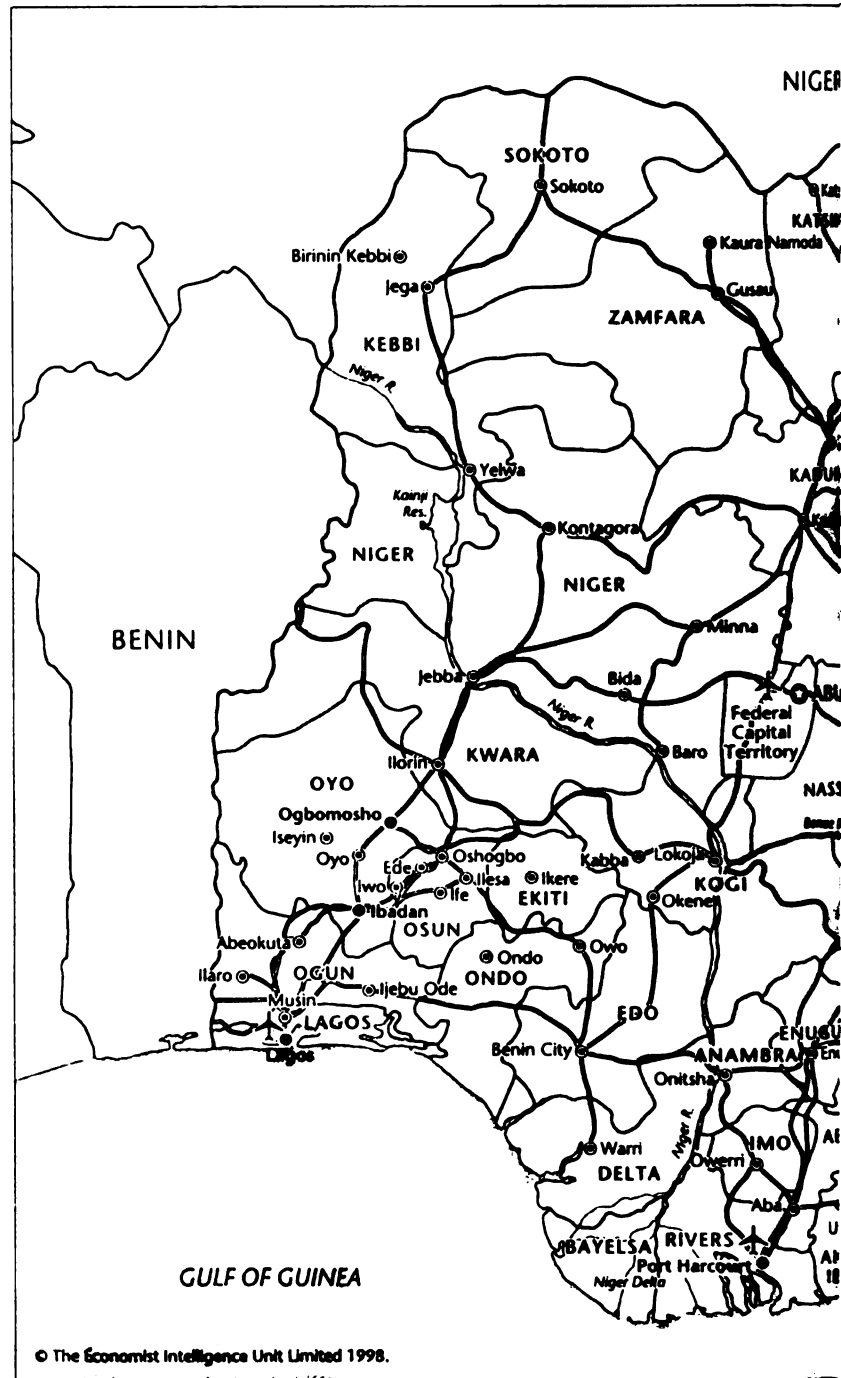
1991 about 76 percent of school aged children attended primary school (79 percent of boys and 62 percent of girls). In comparison, only about 23 percent attended secondary school (24 percent boys and 17 percent girls). In 1993, about 54 percent of the adult population were literate, about 64.7 percent male and 43.8 percent female. In 1994, Nigeria had about 38 universities and education was allocated 4.1 percent of the total expenditure in the 1990 federal budget. A once distinguished university system has deteriorated due to repression and under funding (Europa Publications, 1996; NewAfrica Yearbook, 1997-1998)

2.6. POPULATION POLICIES

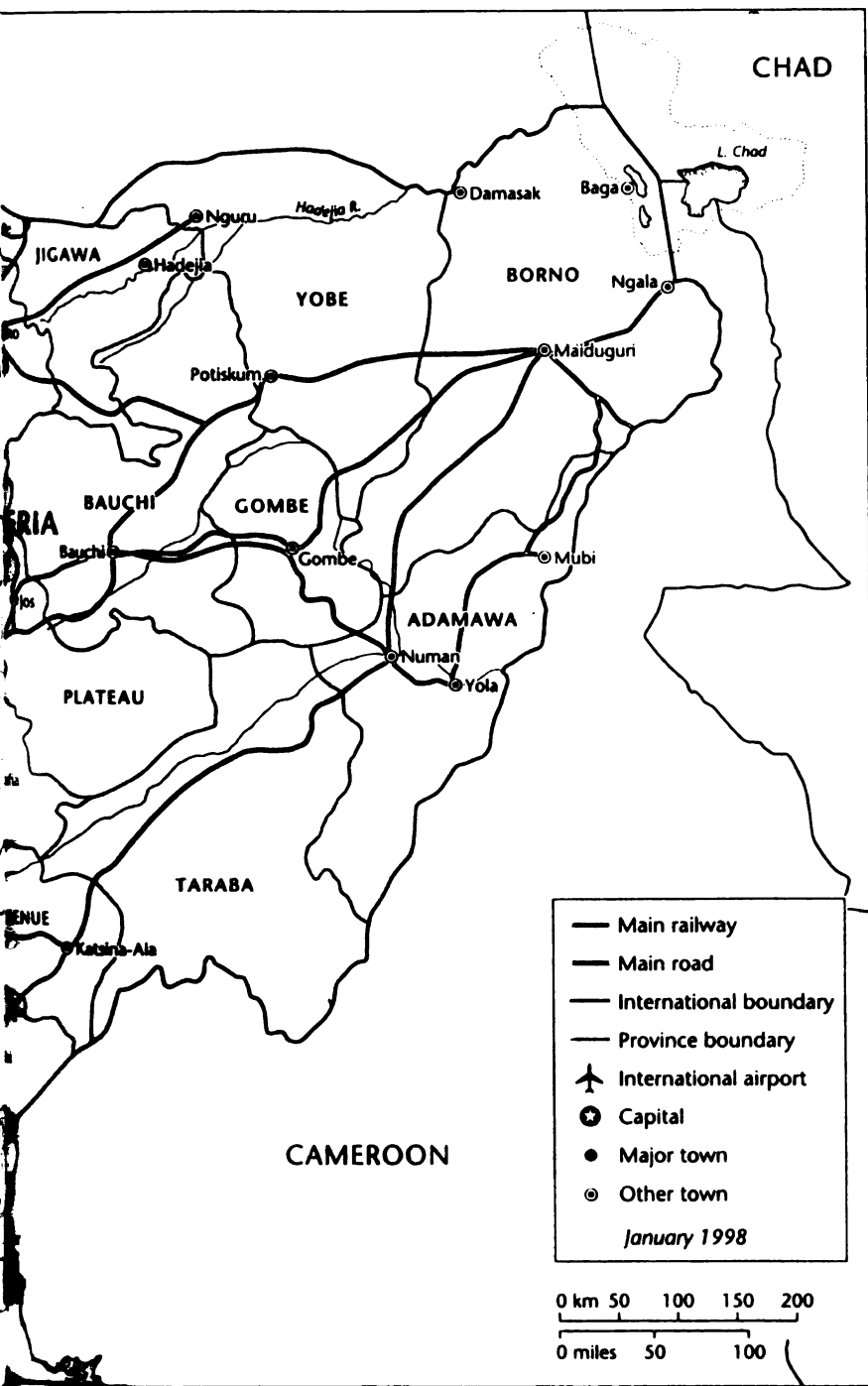
For over three decades now, Nigeria's population had been growing rapidly. Policy makers have long recognized that Nigeria's population was growing at a rapid rate. However, the policy emphasis was economic growth and development first, and then it was believed fertility decline could follow naturally. With the world's oil price decline and the deterioration in Nigeria's economy, it became apparent that something drastic needed to be done about the rapid population growth. In 1988, an official Family Planning Program was formulated and launched by the Federal Government through its Ministry of Health. Nongovernmental agencies such as United Nations Fund for Population Activities (UNFPA) and the International Planned Parenthood Federation (IPPF) through its Nigerian affiliate, the Planned Parenthood Federation of Nigeria (PPFN), operate family planning clinics in all states, supplementing the efforts of the Federal Ministry of Health.

The population policy is predicated on the right of couples and individuals to decide fully the number and spacing of their children, and the access to information, education, and the means to exercise this right. The objectives of the policy and its implementation are described in details elsewhere (Feyisetan and Ainsworth, 1994, NDHS, 1992).

Current contraceptive prevalence rate that was only one percent among currently married women a decade ago has since 1988 risen to 6 percent by 1990, 3.5 percent modern and 2.5 percent traditional (NDHS, 1992). Since at the time of the survey in 1990, official family planning had been in operation for less than two years, this is too short a time for family planning policies to have a considerable effect on fertility decisions of women of childbearing age. Furthermore, contraceptive use of 6 percent among currently married women is still relatively low to result in a drop in fertility of the magnitude that data reveals.



FIGURE



CHAPTER 3

REVIEW OF LITERATURE

3.1 INTRODUCTION

This chapter has two objectives. First, it presents a review of the relevant literature on the correlates of fertility decline, particularly the relationship between women's education and fertility. Second, it presents the hypotheses of the present study.

The inverse relationship between women's education and fertility is well established in the empirical research on fertility (Birdsall, 1988; Caldwell, 1980; Cochrane, 1979; Schultz, 1997). Empirical studies have consistently point to education, that of the wife and to a lesser extent that of the husband, as an important factor accounting for fertility differentials within populations. Education, therefore has been an important part in investigative work that concerns fertility differentials by socio-economic status and also in the search for casual explanations of fertility levels and changes in fertility. A knowledge of the link between education and fertility is especially relevant for development planning because education can directly be influenced by government policy (United Nations, 1987). There is some evidence from surveys preceding both the World Fertility Survey (WFS) and the Demographic and Health Surveys (DHS) of a connection between education and desired fertility. The WFS and the DHS programs have greatly increased the amount of information available on the relationship between education and fertility (United Nations, 1981; Ainsworth, Beegle and Nyamete, 1996; Thomas and Maluccio, 1996).

Education, especially women's education can act both directly and indirectly towards the reduction in fertility. By delaying the age at first marriage and at first birth, schooling shortens the reproductive span of a woman thus limiting her potential supply of children (Bulatao and Lee, 1983). Education may change attitudes, values and beliefs toward a small family norm and towards a style of childrearing that is relatively costly to parents in time and money (higher "child-quality" that we discuss below). Education may thus reduce marital fertility by altering a woman's choices for the demand for children. We will look at some of the stylized facts about women's education and fertility.

3.2 WOMEN'S EDUCATION AND FERTILITY.

First, schooling raises the opportunity cost of women's time in raising children. This is because education raises the marginal productivity of women in the formal labor market, which raises the "price" of children by raising the wage that women can earn in the labor market. If time spent working at the labor market and time in child care are mutually exclusive, then wage measures one of the principal opportunity costs of childrearing. It is, therefore, likely that the higher the price of time, the lower should be the desired number of children (Becker, 1960; Willis, 1973). However, this may not be as true in Africa, where work need not conflict with child care, since employment of low cost substitutes for the mother's time, such as services provided by relatives, are readily available (Farooq, 1985; National Research Council, 1993).¹

¹ Caldwell(1982) envisions a larger role for education than that considered in the simple economic model. In his view, education serves as a vehicle for the adoption of Western ideas regarding the family. It encourages a more child-centered view of one's parental responsibilities. Education may alter the definition of what constitutes acceptable child care, giving greater weight to the time spent by the mother with her child, compared to the time given by the mother substitutes.

Second, women's schooling effectively decreases the cost of obtaining information concerning the use of contraceptives. Education enhances the effectiveness of obtaining information pertaining to the use of contraceptives. Thus the more educated women can contracept better than the uneducated, reducing the number of unwanted pregnancies. (Ainsworth, Beegle and Nyamete, 1996; Bongaarts, Frank and Lesthaeghe, 1984; Thomas and Maluccio, 1996).

Third, women with more education have better access to information regarding their own health and that of their children. The better educated woman is more likely to produce healthier children, leading to a greater child survival ratio, as a result both infant and child mortality declines. This makes it possible for couples to have fewer children to achieve their ideal family size (Okojie, 1991; Preston, 1978; Schultz, 1997).

Fourth, there is the quantity-quality trade off argument. In a number of societies that have experienced a fertility transition, changes in the perceived benefit and cost of child schooling have played a key role in the transition. The impetus for fertility change originates in the economic returns associated with schooling. In the course of modernization, an economy begins to display significant differentials in earnings by schooling levels. Parents then come to regard schooling as an avenue to a better life for their children and as a human capital investment that may, over the long term pay dividends to the parents themselves. Yet education is costly in terms of both direct costs and opportunity cost of foregone child labor. It generally remains too costly for parents to give each child the desired schooling and continue to bear the customary number of children. One element of household expenditures must give way, and typically fertility

falls as investment per child increases (Becker and Lewis, 1973; Becker and Tomes, 1976; Montgomery, Kouame and Oliver, 1995; National Research Council, 1993; van de Walle and Foster, 1990).

Finally, women's education may also influence the within household distribution of authority. More educated women may earn income for themselves and with it some form of autonomy in the household. Consequently, they will become part of the decision making process in the household. Decisions pertaining to fertility may thus be made jointly, enabling women to make fertility decisions that may affect their own health (Caldwell, 1980, 1986, 1995).

Some researchers, however, argue that female schooling may indirectly raise the natural fertility level through its influence on improved nutrition, personal hygiene and maternal health. Female schooling may also reduce the duration of breastfeeding and its contraceptive benefits (Bongaarts, Frank and Lesthasghe, 1984; World Bank, 1984). The breastfeeding, abstinence and mortality effects act to increase the supply of children, raising the possibility that the net effect of education on the number of births or surviving children may not always be negative. Education may also be associated with increased fecundability, lower pregnancy wastage and longer reproductive span for women through better nutrition and health. Evidence that link fertility to nutrition and health is however, sparse and conflicting. It is not clear that these latter factors have an important effect on aggregate fertility (Bongaarts and Potter, 1983; Gray, 1993; Nag, 1983).

3.3 RESEARCH ON EDUCATION AND FERTILITY.

The relationship between female schooling and fertility may not be linear. The inverse correlation between education is much more consistent for urban rather than rural areas, the better educated rather than the least educated (Ainsworth, Beegle and Nyamete, 1996; Rodriguez and Cleland, 1980; Cochrane, 1979; United Nations 1987). Education may bring fewer employment opportunities in the rural areas, the net cost of children is relatively lower in rural areas. On the other hand, high density, an industrial occupational structure and greater exposure to many aspects of modernization in the urban areas, implies high social and economic costs of children (Behrman and Deolalikar, 1988).

Studying 20 countries who participated in the World Fertility Survey (WFS), Rodriguez and Cleland (1980) found that the total fertility of rural residence exceeds that of urban dwellers in all WFS countries. In Latin America and Caribbean, the differential was as large for the married women as it was for all women, but in four countries the disparity in marital fertility was noticeably smaller, indicating that later age at first marriage among the urban population was a major differentiating factor between the two sectors (Kenya, Jordan, Philippines and Thailand). In three countries the differential was reversed, with rural women having lower marital fertility (Bangladesh, Indonesia and Pakistan). There was also regional variation in the size of the differential, Latin America, the Middle East, Kenya and a few countries in Asia (Korea, Philippines and Thailand) have the largest differences of two to three children in the total fertility rate, and about one to two children in the recent marital fertility. Other Asian countries and some

African countries for which data was available (Lesotho, North Sudan and Senegal) show either much smaller differences or a reversal of the marital fertility.

Using Demographic and Health Surveys (DHS) data from fourteen African countries, Ainsworth et al (1996) find differential impact of female schooling in urban and rural areas. Fertility declines with increases in female schooling in both rural and urban areas, particularly after primary schooling. The early years of primary schooling are associated with higher fertility in urban Nigeria and Uganda, but are otherwise insignificant. The differential between women with eleven or more years of schooling and those with no schooling is often greater in rural than urban areas (Cameroon, Kenya, Niger, Nigeria, Uganda and Zambia). In general, at every level of schooling urban women have lower fertility than rural women. At the highest levels of female schooling, fertility declines more rapidly in rural areas and lower than urban areas in Nigeria. Fertility in urban and rural areas converges however, at higher levels of female schooling in Botswana, Kenya and Uganda. Differentials between urban and rural fertility when controlling for female schooling are quite small in Botswana, Cameroon, Nigeria and Zambia, but remains large in Ghana, Senegal and Togo.

It is sometimes argued that a negative impact of female schooling on fertility emerges only when a certain minimum level of education is attained (Cochrane, 1979). Rodriguez and Cleland (1980) find that in most Asian countries a few years of primary education make almost no difference in marital fertility, and only secondary education is associated with substantially lower fertility. However, in Latin America and the Caribbean, any formal schooling, even a few years of primary schooling, usually result in

lower fertility, and both upper primary and secondary education are associated with substantial reduction in fertility.

Using data on about 38 countries that participated in the WFS, fertility differentials were also observed for women with differential educational status (United Nations, 1987). Women with four to six or with seven or more years of schooling had substantially lower fertility on average than women with less education. For half of the countries the total fertility rate (TFR) for the highest educational groups falls in the range of 2.6 to 3.4 children. In sub-Saharan Africa, education differentials in fertility tend to be small and non-monotonic, with the highest fertility occurring in the intermediate educational categories. In most cases, within each education group TFR exceeds the fertility levels reported by older women. In Northern Africa, Latin America and the Caribbean and Asia and Oceania, the education differential in fertility is typically larger and is more often monotonic than in sub-Saharan Africa, and on average the differential is widening. The mean TFR difference between the extreme educational categories is 3.1 children in Asia and Oceania and 3.6 in Latin America and the Caribbean. In Bangladesh and Indonesia, fertility is higher in both intermediate and higher educational groups than the uneducated women. In Latin America and the Caribbean, the education differentials are usually monotonic. On average, the fertility difference between the two lowest educational categories is 0.3 child for children ever born (CEB) and 0.6 child for TFR. Women with seven or more years of schooling average 1.9 fewer children than those with from four to six years according to TFR, and 1.3 fewer according to CEB. The fertility of

women with one to three years of schooling is frequently as high as, or slightly higher than, the fertility of women with no schooling.

Ainsworth et al (1996) also using DHS data from fourteen African countries find that the number of years of female schooling is significant and negatively related to cumulative fertility in thirteen of the countries. They found that 1-3 years of schooling is not related to cumulative fertility in twelve countries, and has a positive relationship in two, Nigeria and Zambia. In half of the countries, women with 4 - 6 years of schooling have 0.2 to 0.4 fewer number of children than those with no education. The gap widens to 0.8 to 1.8 fewer children ever born for those with eleven or more years of schooling over those with no schooling. This suggests that only after certain thresholds of education have been reached will fertility decrease. Using DHS data from 26 African countries Martin (1995) also concludes that higher female education is consistently associated with lower fertility. However, a considerable diversity exists in the magnitude of the gap between upper and lower educational strata and the strength of association. In some countries with low levels of female literacy, fertility tends to be higher among women with small amounts of education.

In comparing fertility in Kinshasa (Zaire's capital) between 1955, 1975 and 1990, Shapiro (1996) finds that female schooling at the secondary level and beyond ultimately lead to a reduction in fertility. By holding age constant, fertility tends to be higher among women who had received only primary schooling, followed by women with no schooling. Among those who have received education beyond the primary level the average number of children ever born generally declines steadily as educational attainment increases with

a sharpest decline among women with upper level secondary education compared to those with lower levels of secondary schooling, and the lowest fertility among women with university-level education. For example, their regression analysis reveals that relative to women with primary schooling those with no schooling had on average 0.2 - 0.3 fewer children born in 1975 and 1990. In comparison, those with lower secondary education had about 0.5 fewer children. The fertility differential widens to 1.5 - 1.8 fewer children for women with upper-level secondary schooling and to 2.1 - 2.5 fewer children for those with higher education.

Shapiro and Tambashe (1994) using household survey data carried out in Kinshasa 1990, they also find fertility differentials among women with different educational attainment. Relative to women with primary schooling, women in all other schooling categories, including those with no schooling, have consistently lower numbers of children ever born. For instance, women with 1-4 years of secondary education have 0.52 fewer children. This compares with 1.4 fewer children for women with 5-6 years of secondary education and 1.95 fewer children for women with university education after controlling for age. When religion and employment status are controlled for, the coefficients are 0.5 fewer children for women with 1-4 years of secondary education, 1.34 for women with 5-6 years of secondary education and 1.77 for women with university education. They also found female schooling as a strong determinant of other correlates of fertility. For example, their empirical findings indicate that there is the tendency for increased female schooling to be associated with a significantly greater likelihood of using contraceptives. Schooling is highly significantly related to the use of modern

contraceptives, with university - level women showing by far the greatest likelihood of modern contraceptive usage. Women with upper-level secondary schooling are more likely to have had an abortion than those with no schooling. Women who are enrolled in school have a significantly lower probability of entering a first union than women with no school enrollment.

Many reasons are given in the literature for the higher fertility of women with some primary education over those with no schooling. Some argue that some primary education, by exposing women to basic rules of hygiene and better dietary habits may generate higher fecundity without influencing traditional family formation habits (Arowolo, 1976). However, the research on the link between nutrition and fertility is not conclusive. Bongaarts (1980) and Menken et al (1981) argue that there is little empirical support for the link between good nutrition and fertility. One may also argue that some primary education by exposing women to literacy opens the door for better and well paid husbands, and that the positive income effect from husband's education may outweigh the negative effect of wife's schooling on fertility. Thus at the lower levels of schooling the impact of schooling on fertility may be gender dependent. Ainsworth et al (1996) argue that literacy may not be achieved in a year or two years of schooling and, under the circumstances that prevail in most African settings, may not even be achieved until completion of primary school. The small group of women who completed only a few years of schooling are those who became pregnant, whose families wanted them to get married, or simply could not keep up and therefore stopped their schooling.

Female education may also have a differential impact on fertility depending on the woman's age. Some studies have found the strongest relationship among the middle-aged women 25-34. At older ages, especially for women in the age bracket 35-49, the influence of education on fertility differentials diminishes greatly suggesting a late catch-up effect on births at higher marriage durations (Farooq , 1985; Thomas and Maluccio, 1996; Ware, 1975).

Okojie (1991) using data on Bendal state in Nigeria finds, however, an inverse relationship between education and fertility even beyond the age 35. This also suggests that education may have different effect on fertility depending on the age cohort of the woman, what is known as the "cohort effect" on fertility. The very young women 15-24 are too young and are just at the beginning of their childbearing years and some may not have completed their education, so the influence of schooling on fertility may be insignificant. On the other hand the oldest women 35-49 have completed their education and are very close to the end of their childbearing years. The incentive to delay births for more education may not be great. In addition, for biological reasons their capacity of having more births is greatly reduced, so again extra schooling may not alter their preferences for children that much. The greatest impact of female schooling is on the middle cohort, 25-34, the most fecund group. These are in their prime childbearing period and most of whom are still engaged in schooling or at the end of their schooling. Education is beginning to pay off occupationally so the opportunity cost of childbearing may be quite high. Thus the marginal effect of education on fertility is most significant

for this age group. Thus the “cohort effect” may interact with female schooling producing the differential effect of education on fertility.

Female education also has a differential impact on the timing of first marriages and first births. Using Zimbabwean Demographic and Health Survey, 1988 data and the Situation Analysis Study, 1992, Thomas and Maluccio (1996) found that women who complete primary school have their first child about seven months later than those with no schooling. Women who complete eleven or more years of schooling wait another two years before having a child. They found the biggest effect among women with twelve or more years of schooling, they delay childbirth for five years relative to those without any schooling. They also found that birth spacing tends to rise with education and the effect is significant only among the better educated younger and urban women.

Cleland and Chidambaram (1981) also using WFS data found differentials in the female education-fertility relation in terms of the tempo of childbearing at different marital durations. Fertility is uniform across educational groups in the early stages of marriage but begins to diverge from the duration 5-9 years onward as better educated groups use contraceptives to restrict family size. This pattern was representative of Peru and other Latin American countries, and several other Asian countries as well. However, for Indonesia, Kenya and Pakistan, there is a positive education-fertility relationship at early marital duration, reverting to a negative relationship at durations greater than 10 years.

The positive association between female schooling and contraceptive use is also well established in the empirical literature. Ainsworth et al (1996) found that urban

women and women with more schooling have higher rate of contraceptive use than the rural and less educated women. The major increase in current contraceptive use occurred with early years of female schooling in Burundi, Ghana, Niger, Senegal and Tanzania. However, marginal increases in the use of contraceptives for additional female schooling is relatively smaller even for countries like Botswana, Cameroon, Kenya and Zambia, which record high relationships between contraceptive use and female schooling.

Apart from education, there are also social and community variables that may affect a couple's desire for children. Notable among these are race and ethnicity, religion and type of union. Research indicate that women in polygamous marriage on average have fewer children. Namfua (1981) in studying polygyny in Tanzania, found the average mean age of a woman in a polygamous marriage to be higher than that of women in monogamous marriage. In addition the age at first marriage for women in a polygamous marriage was also higher than their counterparts in monogamous marriage. On average women in polygamous marriages have longer birth intervals than their counterparts in monogamous marriage. When schooling is controlled for, the results indicates that for women with no schooling, about 82.6 percent are in polygamous marriage, whereas only 69.6 percent are in monogamous marriage. In comparison, for women with 5-8 years of schooling only 4.4 percent are in polygamous marriage and 10 percent are in monogamous marriage. None of the women with twelve or more years of schooling is in polygynous union.

A couple's religious status connotes a system of values that can influence fertility via two routes: 1) directly, by imposing sanctions on the practice of birth control or

legitimizing the practice of less effective natural methods only, or 2) indirectly, by indoctrinating its followers with a moral and social philosophy of marriage and family that emphasis the virtues of reproduction (Westoff, 1959). Substantial religious differentials in fertility have been empirically documented in large number of countries. For example, in Lebanon, Egypt, Israel, Soviet Union, Jordan, India and tropical Africa (Yankey, 1961; Rizk, 1963, 1973; Matras, 1973; Mazur, 1967; Sinha, 1957; Caldwell, 1968). All these studies have found significantly higher fertility rates for Muslims than for non-Muslims. In the West, religious affiliation has been found to have a significant effect on fertility. For example, religious fertility differential have been found in Europe, Canada, United States, South Africa, Australia and New Zealand. Studies have shown that Catholics have higher fertility than non-Catholics (Glass, 1968; Chou and Brown, 1968; Nixon, 1963; Burch, 1966; Ryder and Westoff, 1971; Higgins, 1964; Day 1964, 1968). Usually Catholics have been found to have higher fertility than Jews or Protestants, with Jews having the lowest fertility among the three groups.

However, in some rural areas the religion-fertility relationship is somehow mixed. For instance, Yankey (1961) noted similar fertility levels for Muslims and Christians in rural areas of Lebanon. Rizk (1963) also found this to be the case in rural Egypt. Busia (1954) noted no difference between Muslim and Christian fertility in Ghana.

Women's education may also have a different impact on fertility depending on one's racial and ethnic background. In countries such as South Africa where the population is divided among sharp racial and ethnic lines, the relationship between education and fertility differs accordingly. For example, using multivariate regression

analysis, Thomas (1996), finds the greatest impact of female education on fertility among black and colored women. Among the black women, the negative association between fertility and education is relatively weak at the bottom of the education distribution and is significant only among the women with at least three years of schooling. Among the colored, fertility appears to rise with women's education until around four years of schooling (standard 4). However, among colored women with more than five years of schooling there is a powerful negative association between education and fertility. For the Indian women, fertility increases with education until around the completion of primary school and then falls dramatically until ten years of schooling at which point fertility tends to stabilize with female education. They made similar observations for the white women as they did with the Indian women. For example in his study, he finds that a year of female schooling reduces fertility by 0.12 among black women in South Africa. The correlation is almost as large for the colored, about half as large for Indians, and only about 0.04 for white women.

Abu Bakar et al (1985) using a Household Survey data, 1979, also found fertility differentials among the three major ethnic groups in Malaysia. After holding constant ethnic and demographic variables, Malays and Chinese consistently have higher cumulative fertility than Indians. For example, among all the female sample, the recent fertility recorded by Malay women is 1.16, that of the Chinese is 1.05 and for the Indian is 0.96.

3.4 RESEARCH STUDIES ON NIGERIA

Interest in African fertility issues has stirred up a tremendous amount of research, especially with the availability of data from countries participating in the DHS data collection. Nigeria is one such country that has attracted research on fertility issues, in part because there had not been any reliable census data since the civil war from 1967 to 1970. However, with the availability of data from DHS, the adoption of a National Family Planning Program and compulsory primary education, Nigeria has become the focus of recent research.

Using NDHS , 1990, Feyisetan and Ainsworth (1994) examined the determinants of contraceptive use and fertility in Nigeria. They found that female education and contraceptive use are positively related and that the more educated women have fewer children. The influence of education on contraception is higher for the rural areas than the urban areas, and in the Northern areas compared to other areas. They also found a strong negative association between female schooling and fertility. An additional year of female schooling is associated with the greatest increase in contraceptive use in rural Southwest and rural Northwest and smallest increase in the urban Southeast and Northeast. The marginal effect of an increase in female schooling of one year on current contraceptive use is 0.13 in urban Southwest and 0.24 in rural Southwest. It is 0.14 in urban Northwest and 0.24 in rural Northwest. Similarly it is 0.03 in urban Southeast and 0.14 in rural Southeast, 0.05 in urban Northeast and 0.15 in rural Northeast.

In estimating the fertility response to child survival rate in Nigeria, using Bendel State as a case study, Okojie (1991) finds an inverse association between female education and children ever born for women who are over 35 years of age in her multivariate analysis. Female fertility declines monotonically with higher levels of education, even after controlling for age-education interaction. The negative relationship between education and fertility is highly significant among women in the age group 35-50 but insignificant for the younger age group 15-24. She finds child survival ratio negatively related to fertility for all women and for all age groups. It is more significant for women in the age group 25-34, women who are in their prime childbearing period.

Adewuyi and Feyisetan (1988) using a survey of mothers residing in Lagos, analyzed fertility differentials among three major ethnic groups, the Igbos, the Yorubas and the Hausas residing in Lagos. They found in their bivariate analysis that for all ethnic groups, women with secondary education have the lowest mean number of children ever born upon arrival in Lagos. For example, among the Hausa, women with no education have on the average 5.1 mean number of children ever born (CEB), those with primary education have 3.3 and those with secondary and above have 2.7. Similar results are found among the Igbo and the Yoruba. Schooling made a difference in fertility both in the pre-arrival and post-arrival number of births. They also found that urban life has a depressing effect on fertility. Respondents acknowledged that raising children in the urban setting was more expensive. They also found fertility differentials among the different ethnic groups. For instance, among the three ethnic groups residing

in Lagos, the Hausas had 3.9 mean CEB, the Igbos had 3.6 and the Yorubas 3.8 mean CEB.

Ebigbola and Omideyi (1988) also analyzed the fertility behavior in an urban city using ever- married women in Ilesa, Oyo State, Nigeria. They also found a negative relationship between female education and the mean number of CEB. For example, on average, women with no education have 5.5 CEB, women with primary education, 4.0, those with secondary education 3.5, and those with post-secondary education 2.7. This observation was made for all age groups except for women in the age group 45-49 where those with secondary education have higher number of births than those with primary education.

Using a survey of women in Ibadan, Arowolo (1976), analyzed the determinants of fertility among ever- married Yoruba women aged 15-49 in Nigeria. His bivariate analysis suggests that female education has a depressing effect on fertility. For example women with no schooling had on the average 4.1 mean number of CEB, those with primary had 3.7, those with high school education have 3.5 and those with University education had 3.1 mean number of CEB. This observation was made among all women in the different age groups with the exception of those in the 40-44 age groups where women with no schooling have lower number of births than those with any level of education.

Orubuloye (1981) using a survey of rural women in Ibadan and Ekiti Division of Western Nigeria, found a negative relation between fertility and level of female schooling. For example, in Ibadan, the results indicate that in almost all age groups

(except women ages 30-39), women with primary education had lower cumulative marital fertility than women with no schooling. However, in Ekiti villages, it was only women ages 30-44 with primary education who had fewer cumulative marital fertility.

Orubuloye (1981) also found that in both villages and for all women age groups, women in polygamous marriage had fewer cumulative marital fertility than women in monogamous marriage.

Obadike (1968), found that currently married Muslim and traditional worshipers in Lagos were 10.5 percent more fertile than the Christians, and that Catholics were slightly less fertile than Protestant and far less so than Muslims. In contrast Lucas (1976) investigation among Lagos women show that Yoruba Christians reported a higher mean number of births than Muslim counterparts. Similarly, Christians in Ibadan were also found to have a higher mean number of births than the Muslims, this was particularly so among the older women (Sembajve, 1981). It has also been found that Christians in Ekiti villages have lower fertility than non-Christians. In contrast, the non-Christians in the Ibadan villages appeared to have smaller number of children than the Christian population (Orubuloye, 1981). It is also argued that Muslims amongst the Yorubas are very different from the Northern Hausa Muslims in fertility matters.

It has been widely argued that the social environment in which the people lives is a paramount factor in fertility analysis (Freedman, 1975). Fertility is a complex phenomenon and may vary greatly from one population to another regardless of the socio-cultural identification of individuals. Birthplace is also known to influence a woman's fertility. A survey of Yoruba immigrants women shows that they have a lower

mean number of births than the Yoruba who were born in Lagos or have lived in Lagos for 10 years or more (Lucas, 1976)

Nearly universal marriage and long period of postpartum infecundability appear to be the major determinants of fertility among the Yoruba. In Orubuloye (1981) analysis, approximately 80 percent of the total fertility variation is explained by the effect of non-susceptible period, while the effect of non-marriage accounts for the remaining 20 percent of the variation. Contraception and induced abortion had no measurable impact.

3.5. PROBLEMS ASSOCIATED WITH EMPIRICAL WORK ON FERTILITY.

The research work on female education and fertility is extensive. Most researchers use the total number of CEB as the dependent variable with a number of regressors including female education, age and age squared, husband's education along with other community variables which affect fertility exogenously. There is a problem with this approach that the present paper seeks to address. As mentioned by Ainsworth, Beegle and Nyamete (1996), different women in the survey have different durations of exposure to childbearing. The younger women have not completed their fertility, so this creates a censoring problem. One way of dealing with the problem as they suggest is to predict the completed fertility of the younger women based on the completed fertility of the older women (Ainsworth et al, 1996). The problem with this approach is that it will restrict the analysis to the older women who are the least educated and confound life-cycle with historical changes in the relationship between fertility and education. The

comparison of fertility over different age cohorts is lost when using the mean number of children ever born.

The approach we propose in this study is to take a snapshot of the women, in particular birth cohorts at different ages over the years and look at how fertility is changing with education across and within cohorts. For example, for each woman in the sample we calculate how many children had been born at ages 18, 23, 28, 33, 38 and 43. For each of these variables we look at the relationship between fertility and education and also how fertility is changing from one cohort to another overall and within education groups. We reconstructed the cumulative fertility at various attained ages using the retrospective birth histories of women in the survey. Comparison of fertility across cohorts, which can not be done when using total number of children ever born by survey data, can thus be done with this approach, although we have assumed no time effect, since cohort, time and age effects are not all simultaneously identified. The added advantage is that for each level of cumulative fertility, the women in the relevant sample have equal exposure to the risk of childbearing. The age at which the relationship between education and fertility diminishes can also be captured easily.

Research in this line has been undertaken by Lam, Sedlacek and Duryea (1992) using Brazilian data and there exist numerous time dynamic studies as well. From the birth histories, they reconstructed cumulative fertility at various attained ages. Using both descriptive and multivariate analysis, Lam et al (1992) were able to show that female education and that of their spouses accounted for about 40-80 percent of the fertility decline in Brazil. Our descriptive and regression analysis will fully capture the

predictive influence of female education on fertility and also to help find out if fertility has fallen and over which level of education. We will also explore for what cohort the influence of female education on fertility diminishes. The multivariate analysis fully captures the dynamic relationship between female schooling and fertility controlling for age cohort, husband's education and community variables such as area of residence and religious affiliation and type of marriage of the respondents.

Furthermore many of the research on Nigeria cited above restrict their analysis to a particular region of the country, which may not be representative of the broad spectrum of the Nigerian population. Some of them also restrict the study to ever-married women. These women are at a higher risk of pregnancy than the unmarried, however childbearing outside marriage is an acceptable practice in African societies including Nigeria, so looking at fertility for the unmarried women is also of concern for policy issues. The NDHS, 1990 covers the whole of Nigeria and looking at the fertility issues for the whole country and the added advantage of comparison of fertility among the different areas and regions of residence is something worth researching. This is the gap we hope to fill in the empirical literature using Nigeria as a case study from Africa.

CHAPTER 4

POTENTIAL MEASUREMENT ERRORS IN THE NIGERIA DEMOGRAPHIC AND HEALTH SURVEY, 1990.

4.1. INTRODUCTION.

Survey design and implementation techniques have improved greatly over recent years. Greater sophistication and accurate demographic measures have also evolved over the last several decades. The Demographic and Health Surveys have incorporated the latest innovation in survey design and research techniques and the state of the art demographic measurements. Nevertheless, all survey data contain measurement errors that can affect demographic estimates. Before any conclusions can be drawn from any survey one needs to assess the validity and reliability of the survey data (Andoh, 1980; Arnold, 1990).

The Demographic and Health Surveys are a primary source of data for both fertility and mortality analysis. Reliable fertility estimates heavily depend on complete and accurate reporting of age of respondents and the total number of live births they have had. Accurate reporting of age of respondents, age of the children ever born, age at first marriage and age at first birth are particularly important, since many of the estimates derived from surveys, especially fertility rates depend heavily on age. Fertility estimates may be affected by underreporting or overreporting of number of children ever born as well as errors regarding date of birth or age (Arnold, 1990).

Unfortunately, age misreporting is a major source of measurement error in most censuses and surveys from African countries. In populations where reliable vital

statistics are not available and where ages and dates are not required daily, individuals often lack documents indicating age. Most problems of age misreporting are due to the respondents' ignorance of their exact ages and ignorance of the ages of their children. These problems are even compounded further in the African situation by low levels of education among the oldest women (Ewbank, 1981; Rutstein and Bicego, 1990)

The literature on the origins of age misreporting also suggests that unknown ages of respondents are usually estimated by interviewers on the basis of such personal characteristics as the appearance of the respondent, marital status, the number of children the respondent has ever born alive, the age of her last born child and so on. However, these personal characteristics are very subjective.

This chapter looks at some of the potential measurement errors in the Nigerian Demographic and Health Survey (NDHS), 1990. In what follows we look at the accuracy of the reporting of date of birth of the respondents and their birth histories. Section II looks at the data and how information on age and birth histories was collected. Section III first looks at some of the problems reported by the staff on the NDHS. Second it discusses some of the measurement errors we encountered when using the data in our descriptive chapter on fertility trends in Nigeria. Finally in Section IV we conclude the chapter.

4.2. DATA COLLECTION

The data for the present analysis are derived from the 1990 NDHS. This is a national random sample of women ages 15-49. The NDHS was a joint project undertaken between the Federal Government of Nigeria, which is represented by the Federal Office of Statistics (FOS) and the USAID. The survey was conducted by the FOS with technical support from the Institute for Resource Development (IRD) Macro International Inc. Overall 5,999 households were interviewed and about 8,781 women of reproductive age were interviewed and information on the health of their 8,113 children under five years of age was collected. The survey was designed to elicit information from the respondents on birth histories, marriage patterns, the use of contraceptives and a few socio-economic characteristics, among other things. Three questionnaires were administered in the main fieldwork for the NDHS: the household questionnaire, the individual questionnaire, and the service availability questionnaire.¹

Age Reporting

For every woman in the survey information was sought on her age. Respondents' ages in the individual questionnaire were obtained by asking for both the date of birth (year and month) and age in completed years. The interviewer was instructed to 'make a serious effort' to reconcile the answers if inconsistent. If the respondent could not give either her date of birth or age, the interviewer was instructed to request a document indicating the respondent's age or to probe by estimating the respondent's age in relation

¹For a complete description of sampling procedures see NDHS final report 1992.

to the ages of other members of the household. Or the interviewer was asked to estimate the respondent's age in relation to the date of her first marriage or first birth. If all else failed, the interviewer was instructed to guess the respondent's age or age was estimated by imputation.²

In societies where the level of education of the respondents is very low and displacement of documents indicating date of birth is common, DHS interviewers in addition to detailed questioning and probing techniques have resorted to historical calendars. Historical calendars are individualized calendars of major historical events that have happened in the history of the country, such as major earthquakes, famine, civil war, and so on. This is to help respondents to remember their date of birth and help improve the memory of the respondents. However, there was no use of historical calendars in the data collection process used by the field staff of the NDHS, 1990 (personal communication with Bert Themme).³

² For key events in the respondent's life, dates have been imputed when full date of the event was not provided by the respondents or in some cases if dates are inconsistent. These events are the date of birth of the respondent, the date of birth of each child of the respondent, the date of conception of current pregnancy, and so on. All dates in the imputation process are used in the form of a Century Month Code (CMC) which is the number of months from the start of the century to the month of the event. Imputation is done in three stages. The first stage an unconstrained range is constructed from the available information. If month and year are both available, the upper and lower bounds of the range will be the same. If only a year is available, the unconstrained range will cover 12 months. If no years is given the unconstrained range will cover the full range of possible dates (50 years before the survey). In the second stage, ranges are adjusted to satisfy certain isolated constraints (constraints affecting the date in question). In the third stage, ranges are adjusted to satisfy neighboring constraints (other events in the respondent's life). At the end of the process the logical range should be either negative, zero or positive. If negative, the date is inconsistent, and is corrected manually. If it is zero the date is consistent, and if it is positive the date is consistent but not complete. For a complete description on imputation procedures, see the DHS processing manual (Institute for Resource Development, 1989).

³Bert Themme works at the DHS head office.

Birth Histories

The respondents were asked to report all live births, including births of children who have died, first in terms of the aggregate number of children ever born (CEB), and in terms of specific questions about each live birth (birth history). The CEB data were collected in a series of six questions about the number of sons and daughters who are living at home, the number of sons and daughters living elsewhere, and the number of each sex who has died.

The birth history data were collected in chronological order, starting with the first birth and ending with the most recent birth. Data were collected on the date of birth, sex, survivorship status, current age and whether living with the mother (for living children) or age at death (for dead children). Following the birth history, the interviewer checked the consistency of the CEB and the birth history and reconciled the differences. When complete information on year and month of birth was not reported, the dates were assigned by imputation. Once again the use of historical calendars would help respondents, especially the older women and the least educated to put the dates of births of their children in historical perspective, but this procedure was also not used in the collection of the birth histories.

Age at First Marriage

From a sociological point of view, marriage may be defined as a “legally sanctioned relationship involving economic cooperation as well as normative sexual activity and childbearing, that people expect to be enduring,” (Macionis, 1997).

However, the African conception of " customary marriage" is a "union of a man and a woman, for the duration of the woman's life, being normally the gist of a wider association between two families or set of families." (Atado,1988; Orji, 1983).

Under the Nigerian legal system, four kinds of marriages exist: the Customary Law, Islamic Law, Christian Law, and Statutory Law. The Customary and Islamic Laws promote polygamy, whereas that of Christian and Statutory Laws promote monogamy. The primary purpose of marriage in the African context is for procreation and secondarily for companionship(Atado,1988; Orji, 1983). The emphasis on procreation is so great because of cultural and religious reasons such that childbearing outside of marriage is an acceptable act in society. This situation sometimes confounds data collection that probes into when marriage legally started. Is it the time when the customary rights began or when the two partners started living together? In the NDHS, 1990, taking cognizance of the existence of informal unions, marriage was defined as legal or formal marriage or cohabitation. Legal marriage was recognized when couples were living together under customary marriage or marriage under any of the other three coexisting marital laws, and cohabitation was recognized when the respondent started living with her partner even though no formal marital ceremony had been performed.

Information on marriage was collected in a series of questions. Women were first asked whether they have ever been married or have lived with a man. Those who report having had a husband or partner were then asked about their current union status and whether they had been in one or more than one union. Finally, respondents were asked to provide the month and year they started living with their first husband or partner. If

the woman could not provide a year of first union, she was then asked to give her age at the time of the first union. Therefore, errors in measuring a woman's age at interview are correlated to some extent with those in measuring her age at first union.

Age at First Birth

Age at first birth is seen as a more appropriate indicator of the beginning of exposure to childbearing than age at first marriage, especially in countries where informal unions and premarital births are acceptable. Information on a respondent's childbearing history was gathered by two procedures in the DHS surveys. First, each respondent was asked about the number of sons and daughters she had living with her, sons and daughters living elsewhere, and sons and daughters who had died. Then she was asked to provide a full live birth history in which the name, date of birth, sex, survival status, and age at last birthday, or age at death, was collected for each birth

Age at first birth is calculated by subtracting the woman's birth date from the birth date of her first child. Thus the accuracy of information on age at first birth depends on the accuracy of the respondents reporting of both her own date of birth and that of her first child. When the respondent's own date of birth and that of her first born are missing the information was imputed.

4.3. MEASUREMENT ERRORS

In this section of the paper we present some of the measurement errors we found in the NDHS, 1990 concentrating primarily on age of respondents and their birth histories, age at first marriage and at first birth.

4.3.1 Age Heaping

Respondents Age

Age heaping is the tendency to report ages ending in certain preferred digits especially, zero or five. The greater the amount of this 'age heaping', the lower the confidence in the quality of age data. Fertility analysis is very age-specific, and age heaping may lead to serious biases in the estimation of age-specific fertility rates or age-specific mean number of children ever born. The problem of age-heaping is thus very crucial in our fertility analysis in chapters 4, 5 and 6 of this present study.

According to Figure 4.1, there are age spikes at 15, 20, 25, 30, 35, 40 and 45 years of age. For example about 7.2 percent of the women said that they were 20 years old and as high as 9.5 percent said they were 30 years of age. In all as Table 4.1 demonstrates, about 21.4 percent of all the women reported their ages with figures ending in five (15, 25, 35, and 45), in addition about 22.6 percent also reported their ages ending with zero (20, 30 and 40).

To understand the extent of this age heaping we decided to calculate the Whipple's Index for age concentration on the digits "0" and "5" for the age group 18-49 . The Whipple's Index is a measure of the reliability of the recorded age distribution It is

calculated by summing the population between the ages 23 and 62 whose ages end in "0" and "5" and dividing the result by one fifth of the total population between 23 and 62, and then multiplying the result by one hundred. The result should vary from 100, representing no concentration on "0's" and "5's" to a maximum of 500, representing absolute concentration of the entire population at these ages. Between these two extremes the following categories for estimating the reliability of age distribution have been recommended by the United Nations : a) Highly accurate -- less than 105 b) Fairly accurate --- 105 - 109.9 c) Approximate -- 110-124.9 d) Rough 125-174.9 and e) Very Rough --175+.⁴ The Whipple's Index for the NDHS, 1990 was 224.6 which indicates that age reporting by the respondents was very inaccurate.⁵

When dealing with fertility analysis the traditional age grouping has been 15-19, 20-24, 25-29 and so on. If evidence, however, suggests age heaping then centering age groups on preferred digits would prevent biases in demographic estimation based on age groups. Since the NDHS has serious age heaping problems as indicated by the Whipple's Index, we decided to regroup the age variable centering on "0" and "5" in our fertility analysis. To give equal probability of occurrence for both digits we used the women in the age group 18-47, so for our five-year age groupings we had 18-22, 23-27, 28-32 and so on.

⁴ See United Nations Demographic Yearbook, 1992. Since our data covers women ages 15-49, and to make sure both digits "0" and "5" have the same chance of inclusion we calculated our Whipple's Index for women in the age group 18-49.

⁵ The Whipple's Index is after imputation, since reported ages as is in the data is after all imputation has been done.

Age at First Marriage and Age at First Birth

According to Table 4.1, there is also evidence of heaping of age at first marriage and also at first birth. For example, about 2.9 percent of the respondents reported to have been married at age 10, as high as 15.4 percent gave their age at first marriage as 15, and 7.1 percent at age 20. We do not see much of heaping at 25 or age 30.

Age heaping at first birth is not that pronounced. We see some heaping at age 15, about 10.1 percent of the women in the survey reported to have had their first births at 15, but similarly high percentage of 10.6 reported to have had their first births at age 17. Age heaping in the age at first marriage and at first birth is normally hard to detect because first marriage and at first birth are usually highly concentrated in a narrow age range. To see the extent of age heaping at first marriage and first birth we decided to calculate the Whipple's index for the reporting of age at first marriage and first birth. The Whipple's Index for age at first marriage was 121.73 and that for age first birth was 112.78, which by the United Nations standard is approximate. This indicates that age heaping is not as much of a problem in the age at first marriage and at first birth as with the respondents' age.

There was another problem with the reporting of age at first marriage and first birth. First, about one percent of the respondents reported to have been married before age 10, and about 3.8 percent reported to have had their first births by age 12. This could be real or pure measurement error especially in the African setting where young girls could be betrothed at even an infant age but do not coreside until much later. For example, in most arranged marriages, it is possible for girls to be betrothed at an infant

age. In such circumstances it is difficult to know when actual marriage started, that is whether marriage is defined when betrothal took place or when the couple started living together. However, this argument may not hold for age at first birth since this cannot be misinterpreted so the problem with age at first birth at age ten and less could be real or pure measurement error.

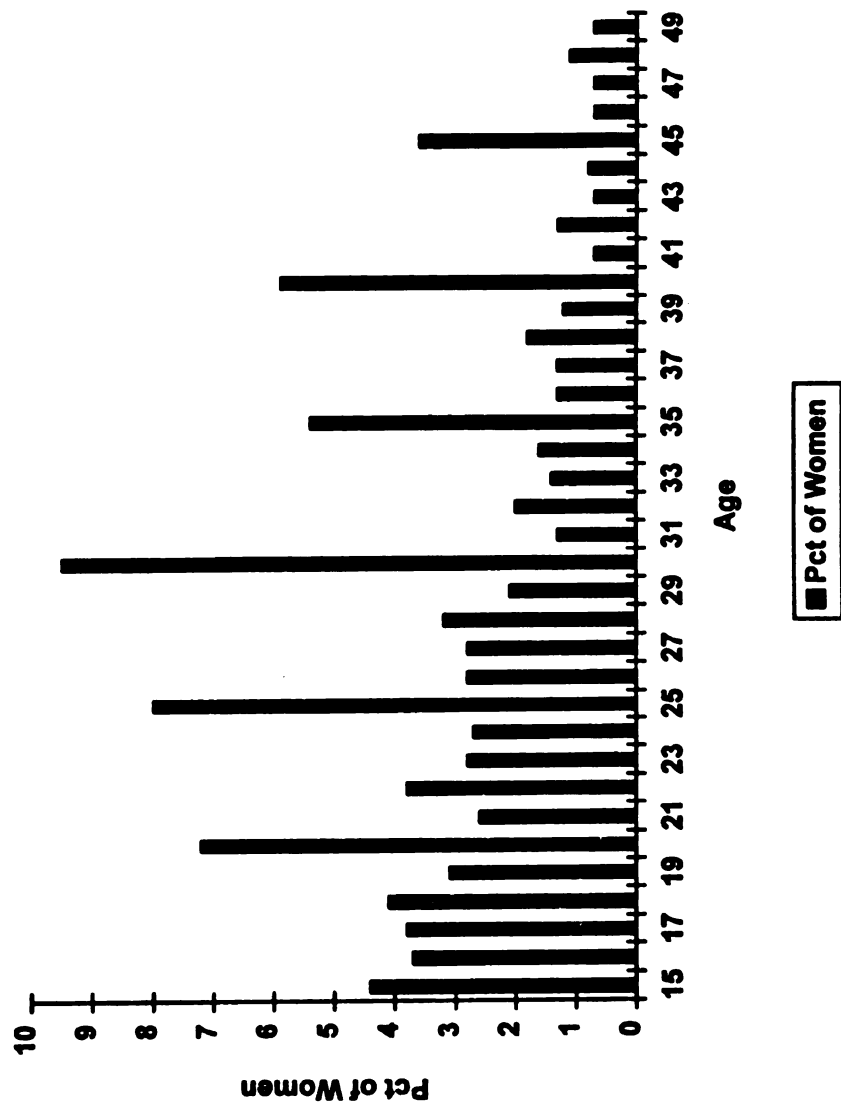


Figure 4.1 - Age Distribution of Respondents. Nigeria, 1990

TABLE 4.1- Distribution of Age of the Respondents, Age at First marriage and Age at First Birth.

Age of Respondent	%	Age at First marriage	%	Age at First Birth	%
15	4.4	6	0.1	6	0.0
16	3.7	7	0.2	7	0.0
17	3.8	8	0.3	8	0.0
18	4.1	9	0.4	9	0.1
19	3.1	10	2.9	10	0.7
20	7.2	11	2.2	11	1.0
21	2.6	12	6.7	12	2.0
22	3.8	13	7.2	13	3.3
23	2.8	14	11.3	14	5.2
24	2.7	15	15.4	15	10.1
25	8.0	16	8.0	16	9.2
26	2.8	17	7.6	17	10.6
27	2.8	18	7.8	18	9.3
28	3.2	19	6.6	19	9.2
29	2.1	20	7.1	20	9.7
30	9.5	21	4.2	21	6.2
31	1.3	22	3.4	22	5.8
32	2.0	23	2.3	23	4.1
33	1.4	24	1.7	24	2.9
34	1.6	25	1.8	25	2.5
35	5.4	26	0.9	26	2.1
36	1.3	27	0.7	27	1.5
37	1.3	28	0.5	28	1.0
38	1.8	29	0.2	29	0.9
39	1.2	30	0.3	30	0.6
40	5.9	31	0.1	31	0.4
41	0.7	32	0.0	32	0.4
42	1.3	33	0.0	33	0.2
43	0.7	34	0.0	34	0.3
44	0.8	35	0.0	35	0.1
45	3.6	36	0.0	36	0.1
46	0.7	41	0.0	37	0.1
47	0.7	42	0.0	38	0.0
48	1.1			39	0.0
49	0.7			40	0.0
				41	0.0
				45	0.0
				46	0.0
8781	100.0	7080	100.0	6477	100.0

4.3.2 Incentives for Misreporting by Enumerators

Recent claims of a fertility transition in certain countries in Africa are met with skepticism by some researchers because data collection in tropical Africa gives rise to an appearance of fertility decline in the years immediately prior to a survey (Caldwell and Caldwell, 1992). Arnold (1990) reports that interviewers in their attempt to decrease their workload may be inclined to change the birth dates of selected children so that children may not be included in the survey. For example, with the Nigeria Demographic and Health survey, 1990, immunization and other health related questions were asked about children who were born since January 1985, that is children born within five years of the survey. If a child is born six or more years before the survey, then the over 48 questions on health related issues would not be filled by the interviewer. Thus interviewers who want to cut down their workload are more likely to displace births which occurred within the fifth year before the interview. To analyze the interviewer effect on birth displacement, we turn to the NDHS, 1990 final report on the reporting of birth and data quality.

Analysis in this section is based on Table D4 and Figure 3.2 of the NDHS, 1990 final report (see NDHS, 1992, pages 28 and 163). In Figure 3.2, the dots represent births in single calendar years and the solid line is a profile of a five-year moving average of the number of births. The profile rises uniformly and then levels off sharply in the five years preceding the survey instead of continuing to rise. The single births which are represented by the dots are very close to the profile for moving average except for the years immediately closer to the interview. We see the greatest deviation of single

births from the moving average profile in the fifth and sixth years before the interview.

This evidence is also supported by Table D4, notice in particular that the total number of children born (both living and dead) was about 1,730 a year before the survey. It fluctuates in the 1,600s the second to the fourth years before the survey. It then drops sharply and reaches 1,434 the fifth year before the survey, and rises abruptly to its peak of 2,072 the sixth year before the survey. There is therefore, evidence to support the fact that there is underreporting of births the fifth year before the survey and overreporting of births the sixth year before the survey. Interviewers are likely to displace births in the fifth year to the sixth year before the survey.

4.3.3. Underreporting due to Memory Lapse by Respondents

As with any data where retrospective information is required, the accuracy of answers the respondents give is very important. Respondents may deliberately provide wrong answers for cultural or religious reasons. Answers to questions may be wrong because the respondent's memory fails, or probably she may not know the right answer. Response errors arising from memory lapses affect greatly questions which have either time reference or questions which refer to events that took place in the distant past.

Another source of response errors may be from the forward age-telescoping, which is known in the literature as forward displacement of events which occurred in the distant past. Respondents tend to report their date of birth and ages closer to the survey period than they actually occurred. If this is the case older women may consistently underreport their ages and that of their children. To investigate the extent to which

response errors by the respondents were affected by memory failure or age telescoping, we decided to look at the completeness of information making reference to age of the respondents and the accuracy of their birth histories

Completeness of Information on Date of Birth of Respondents

In Table 4.2 we begin to document the completeness of information on the date of births given by the respondents in the NDHS, 1990. According to Table 4.2, for all the women in the sample, on average only about 60 percent provided complete information on their date of birth. The percentage of women with a complete date of birth is about 75.4 percent for the youngest cohort 15-17. This falls steadily from the youngest to about 44.3 percent for women ages 38-42, and then rises for the next two oldest cohorts.

Female schooling, however, improves the memory of the respondents. For example, in the lower panel of Table 4.2 we look at the completeness of age reporting by years of schooling. Among women with no schooling, on average about 42.4 percent provided complete information on their date of birth. This falls, sharply from 53.9 percent for women ages 15-17 to 44.9 percent for women ages 18-22, then continues to drop gradually to 35.4 percent for women in the 38-42 age group, then rises with the older women 43 years and over. Cell size is not a problem in this schooling group so we can not use that as the argument for sudden improvement in memory for women ages 43-49, this may be a sign of misreporting by the oldest cohort, since memory lapse possibly increases with age. The overall drop in the percentage of women with complete

information on date of birth is about 12.4 percent from the youngest to the oldest cohort, with the sharpest decreases among the two youngest cohorts.

Recall improves with 1-5 years of schooling such that on average about 59.3 percent of women in this schooling category reported complete dates of birth. About 72.9 percent of the youngest cohort 15-17 provided complete information on their date of birth. This again drops sharply to 56 percent for the women in the 18-22 age. The percentage stays around the upper 50's and then peaks at 65.4 percent for women in the 33-37 age group, thereafter it starts to drop to around the lower 50's for the next three older cohorts. Small cell size for the oldest cohort 48-49 may account for the drop from the 43-47 age group to the oldest cohort. Notice in particular, that the overall drop in the percentage of women with complete information on date of birth for this schooling group is about 18.4 percentage from the youngest to the oldest cohorts. This indicates a bigger drop in the completeness of information for this schooling group over those with no schooling.

Memory improves still further for women with six years of schooling such that on the average above 69.0 percent of women with six years of schooling provided complete information on their date of birth. In particular about 77.4 percent of the youngest cohort 15-17 provided complete information on their date of birth, this drops again sharply to 67.4 percent for the 18-22 age group. It then stays fairly constant around the upper 60's and peaks at 74.2 percent for the 43-47 age group, then falls sharply with the oldest cohort ages 48-49. Small cell size for the oldest cohort in this schooling group may account for the sudden drop in the reporting of information regarding their

date of birth. The overall drop in the completeness of information from the youngest to those in the 43-47 age group is about 3.2 percent and that from the youngest to the 48-49 age group is as high as 20.3 percent. This is in part accounted for by the huge drop from the 43-47 age group to the 48-49 age group which is probably the result of the small cell size mentioned above.

Recall improves dramatically for women with seven or more years of schooling such that on the average about 91.7 percent of the women furnished complete information on their date of birth. The percentage of women with complete information on date of birth increases faintly from 92.4 percent for women in the 15-17 age group to 92.9 percent for those in the 18-22 age group. It drops to 90.0 percent for the 23-27 age group and remains fairly constant around 90 percent over the next three older cohorts. It then reaches its lowest point at 77.4 percent for the 43-47 age group and rises to 100 percent for the 48-49 age. The small cell size for the two oldest cohorts in comparison with the other cohorts may account for the unusually accurate reporting by these two oldest cohorts. Ignoring the last two cohorts, we observe that the drop in the reporting of information on the histories is about 1.2 percent from the youngest cohort to women in the 38-42 age group, indicating a more gentle fall than women in the lower schooling groups. It should also be mentioned that when one of the date items was missing in all the schooling categories, it was more likely to be the month of birth as evident in column 3 of Table 4.2, but the year of birth was more likely to be consistent with the current age of the respondent.

TABLE 4.2

Percent Distribution of All Women by Completeness of information on Date of Birth, by Age Group and by Years of Schooling. Nigeria Demographic and Health Survey, 1990.

	Month and Year Reported, No Imputation	Month and Age Reported, Year Imputed	Year and Age Reported, Month Imputed	Year and Age Reported, Year Ignored*	Age Reported, Year & Month Imputed	Total	Sampl e Size
ALL WOMEN							
Age Group							
15-17	75.4	--	1.4	23.2	--	100.0	1039
18-22	69.3	0.1	1.0	29.7	--	100.0	1831
23-27	63.7	--	1.8	34.6	--	100.0	1684
28-32	55.0	--	1.8	43.1	0.1	100.0	1587
33-37	52.8	--	5.3	41.9	--	100.0	955
38-42	44.3	--	2.4	53.2	0.1	100.0	951
43-47	46.2	--	4.0	49.8	--	100.0	572
48-49	46.3	--	1.9	51.9	--	100.0	162
Total	59.9	0.0	2.2	37.9	0.0	100.0	8781
<u>0 yrs of Schooling</u>							
Age Group							
15-17	53.9	--	1.2	44.9	--	100.0	321
18-22	44.9	0.3	1.0	53.8	--	100.0	615
23-27	43.2	--	1.6	55.2	--	100.0	748
28-32	43.6	--	1.2	55.1	0.1	100.0	973
33-37	41.8	--	4.2	54.0	--	100.0	620
38-42	35.4	--	2.5	62.0	0.1	100.0	693
43-47	38.9	--	3.7	57.5	--	100.0	435
48-49	41.5	--	2.2	56.3	--	100.0	135
Total	42.4	0.0	2.1	55.6	0.0	100.0	4540
<u>1-5 yrs of Schooling</u>							
Age Group							
15-17	72.9	--	3.4	23.7	--	100.0	118
18-22	56.0	--	2.2	41.8	--	100.0	134
23-27	57.7	--	3.6	38.7	--	100.0	111
28-32	53.0	--	9.0	38.1	--	100.0	134
33-37	65.4	--	11.5	23.1	--	100.0	104
38-42	52.3	--	7.0	40.7	--	100.0	86
43-47	56.8	--	9.1	34.1	--	100.0	44
48-49	54.5	--	--	45.5	--	100.0	11
Total	59.3	--	6.1	34.6	--	100.0	742

TABLE 4.2 continues

	Month and Year Reported, No Imputation	Month and Age Reported, Year Imputed	Year and Age Reported, Month Imputed	Year and Age Reported, Year Ignored*	Age Reported, Year & Month Imputed	Total	Sam ple Size
<u>6 yrs of Schooling</u>							
Age Group							
15-17	77.4	--	0.5	22.1	--	100.0	199
18-22	67.4	--	2.0	30.5	--	100.0	347
23-27	69.0	--	2.4	28.6	--	100.0	294
28-32	66.2	--	1.7	32.0	--	100.0	231
33-37	65.9	--	7.3	26.8	--	100.0	123
38-42	66.0	--	--	34.0	--	100.0	103
43-47	74.2	--	1.6	24.2	--	100.0	62
48-49	57.1	--	--	42.9	--	100.0	7
Total	69.0	--	2.1	28.8	--	100.0	1366
<u>7+ yrs of Schooling</u>							
Age Group							
15-17	92.4	--	1.5	6.0	--	100.0	397
18-22	92.9	--	0.3	6.8	--	100.0	733
23-27	90.0	--	1.1	7.9	--	100.0	529
28-32	91.1	--	0.4	8.5	--	100.0	246
33-37	88.9	--	3.7	7.4	--	100.0	108
38-42	91.2	--	--	8.8	--	100.0	68
43-47	77.4	--	6.5	16.1	--	100.0	31
48-49	100.0	--	--	--	--	100.0	9
Total	91.7	--	1.0	7.4	--	100.0	2121

*Year and Age was given but the year of birth plus the age add up to the year of interview so the years was ignored.

Completeness of Information on Birth Histories of Respondents

We again make reference to Table D4 of the NDHS final report (columns 1, and 5-7), which presents information on children ever born with complete date of births. According to Table D4 for children born in the year of the survey, about 97.9 percent had complete information reported on their date of birth. This declines steadily as we move further away from the year of the survey, for instance about 95.0 percent of children born a year before the survey had complete information on their date of birth. In comparison about 82.6 percent of children born four years before the survey had complete information on their date of birth and only 75.4 percent of those born nine years before the survey had complete date of birth.

Information on date of birth is more complete on children who are living than those who are dead for each calendar year before the survey. For example, among children born at the time of the survey and living, about 98.3 percent of them had complete information on date of birth, however for those children who were dead about 91.7 percent of them had complete information. The gap widens for births that occur several years before the interview. Notice in particular, for births that occurred five years before the survey, we had about 87.7 percent complete date of birth reported for those who were living and only 73.6 percent for children who were dead at the time of the survey. The lower percentage reporting of date of birth for children who are dead is consistent with either memory lapse or deliberate displacement of information on dead children, or unwillingness to talk about dead children for cultural and religious reasons. It should also be mentioned that complete information about the birthdate of a child could

also be inaccurate when parents are consistently displacing birth information which is hard to detect.

Proportion of Deaths

The importance of accurate reporting of birth histories in demographic research can not be overemphasized since most studies on fertility and mortality depend on this information. A number of factors may account for errors arising from the reporting of births, first as mentioned earlier, older women have more births to report than the younger women, so the younger women can report with a greater degree of accuracy. Memory lapse which is associated with old age becomes a problem for the older women. Older women, who should have higher child and infant mortality rates, may have difficulty remembering all of their live births, that subsequently died. If so, reported mortality rates would be biased downwards. To this end, we decided to look at the number of deaths per 1,000 live births to see if older women are reporting lower death rates. This could account for the underreporting of births we encountered when looking at the cumulative fertility at various attained ages.

Table 4.3 documents the proportion of deaths per 1,000 live births. We anticipate that in the absence of misreporting of birth histories, older women will report higher deaths than younger women, partly because of improvement in health and better nutrition for children born to younger women than the older women and also because of a rise in education with younger cohorts. For all women in the sample, the number of deaths

increases continuously from 116 with the 15-17 age group to 223 for women ages 43-47 and then drops slightly with women in the 48-49 age group.

Proportion of deaths per 1,000 live births for women with no schooling also increases at first from 114 with the youngest age group to 190 for women in the 23-27 age group, then drops suddenly with the 28-32 age group. Thereafter it continues to rise till the 43-47 age group and then falls with the oldest cohort. There is no cell size problems with the oldest women in either the all women or women with no schooling distribution of deaths, so it is possible that the oldest women are underreporting the number of dead live births. However, it could also be real reflecting some of the macroeconomic shocks that have hit the Nigerian economy such as the Nigeria Civil War (1967-70), the oil boom (1973-80) and subsequent oil crisis (1981-1986). As we can see later in the analysis, the drop in the deaths per 1,000 live births for women in the 28-32 age group is also consistent with number of births peaking with this age group for the all women sampled and women with no schooling.

We do not observe any definite pattern of deaths for women with 1-6 years and seven or more years of schooling. Consequently, we do not have any convincing evidence to support the fact that schooling improves the reporting of death rates since the pattern is not conclusive for women with 1-6 or seven or more years of schooling.

TABLE 4.3

Mean Number of Deaths per 1,000 Live Births by Years of Schooling, Nigeria, 1990.

Age Group	LEVEL OF SCHOOLING						SAMPLE SIZE		
	0 Years of		1-6 Years of		7+ Years of		ALL		7+ Years of
	Schooling	Schooling	Schooling	Schooling	Schooling	Schooling	SAMP:LE	Schooling	Schooling
15-17	116	114	71	230	152	113	28	13	
18-22	139	166	128	81	911	467	268	176	
23-27	144	190	112	82	1389	702	385	320	
28-32	150	169	143	80	1489	926	350	210	
33-37	174	210	130	70	926	596	225	105	
38-42	199	219	163	105	905	649	188	67	
43-47	223	253	148	80	550	414	105	31	
48-49	217	231	175	114	155	128	18	9	
Total	165	196	133	84	6477	3995	1545	931	

Cumulative Fertility at Various Attained Ages

Table 4.4 documents the cumulative fertility at various attained ages. From the birth histories we reconstructed cumulative fertility at ages 18, 23, 28, 33, 38 and 43. With these variables we then calculated the mean number of children ever born at each attained age for the different birth cohorts. This approach to the calculation of the number of children ever born depends heavily on the accuracy of the birth histories and accurate reporting of respondents' own age or birthdate. All other things being equal, in the absence of age misreporting or age forward telescoping by the respondents and that of their children, one should expect that the older women should have more children at each of the attained ages. This is because they have lower levels of schooling, and higher infant mortality rates. It is also possible that the oil boom and subsequent oil slump may have affected the younger and older women differently on the perception of childbearing. However, we observe an inverted-U shaped profile for cumulative fertility as we move from the oldest to the youngest women in the survey.

As Table 4.4 demonstrates, cumulative fertility at various attained ages first increases steadily as we move from oldest to the youngest women. For instance, cumulative fertility at age 18 rises steadily but gently from 0.31 with women ages 48-49 to 0.60 with the 28-32 age group and then declines over women in the next two younger age groups. Cumulative fertility at age 23 also rises steadily, for example, women in the 48-49 age group on average have 1.41 mean CEB age 23, this rises uniformly and peaks at 1.98 for women in the 28-32 age group and falls over the next youngest age group. Cumulative fertility at age 28, however rises steadily from 2.83 and peaks later at 3.56

with the 33-37 age group and begins to fall with the next younger women. We observe a continuous rise from the oldest to the youngest women for cumulative fertility at age 33.

A number of factors may account for the above distribution of cumulative births. First it is much easier for the younger women to remember and report with accuracy the number of children ever born because they have smaller numbers to report than the older women. Second since age is involved here, memory lapse associated with old age becomes more important. Third, younger women may have fewer child and infant deaths than the older women, and since there may be the tendency for mothers to underreport their dead children, underreporting of births would be greater for the older women than the younger women in the survey. A fourth reason may be social and cultural norms and taboos associated with bringing into memory of a dead child. Since older women may be more culture preservers than the younger women, they may adhere more to social and cultural norms and may underreport their dead children more than the younger women.

Another problem is age forward telescoping. This as mentioned earlier is the forward displacement of events that happened in the distant past closer to the survey period than they actually occurred. If older women are consistently displacing events closer to the survey, then we should expect underreporting of births by older women at younger ages and more accurate reporting at older ages. This may account for the initial rising trend in cumulative fertility among the older cohorts and then the subsequent fall in fertility among the younger cohorts we experience above. It may also explain why cumulative fertility at age 23 peaks with the 28-32 age group, they are more likely to remember with accuracy their cumulative fertility at age 23 than the older women before

them. This may also account for the fall in cumulative fertility at age 23 among the 23-27 age group and possible sign of accurate reporting of birth by women in this age group. This may also be a valid explanation for cumulative fertility at age 28 peaking with the 33-37 age group. However, our data cover only women in the 15-49 age group so we have fewer cohorts to observe and compare cumulative fertility at older ages.

Another reason for the inverted U-shaped birth distribution may be real economic shocks in the Nigerian economy, ranging from the Civil War, the oil boom and subsequent oil slump. The Nigerian Civil War from May 1967 to January 1970 may have delayed marriage for the older cohorts. This may have resulted in the late onset of first births and subsequent fewer number of children ever born for the older cohorts. The oil boom in the 1970's may have a differential impact on women in terms of their desire to have children. Women in the 28-32 age group would have been 11-15 years in 1973-74 when the oil boom period started lasting into 1979-80, making them 17-21. This may have made it more attractive for these young women to marry and have children than the long term investment in schooling and subsequent delay of marriage. This may also be true for cumulative fertility at age 28, which peaks with women in the 33-37 age group, and may also explain the inverted U-shaped distribution of cumulative fertility at various attained ages.

TABLE 4.4 - Cumulative Fertility At Various Attained Ages By Five-Year Age Group. Nigeria, 1990.

	<u>By Age</u>						Sample Size
	18	23	28	33	38	43	
<u>ALL WOMEN</u>							
Age Group							
15-17	--	--	--	--	--	--	1039
18-22	0.44	--	--	--	--	--	1831
23-27	0.53	1.73	--	--	--	--	1684
28-32	0.60	1.98	3.45	--	--	--	1587
33-37	0.53	1.85	3.56	4.97	--	--	955
38-42	0.52	1.65	3.10	4.60	5.63	--	951
43-47	0.48	1.63	2.98	4.41	5.71	6.51	572
48-49	0.31	1.41	2.83	4.19	5.33	6.14	162

Source: Calculated from Demographic and Health Survey, Nigeria, 1990

Cumulative Fertility at Various Attained Ages by Years of Schooling

We anticipated that schooling may improve the memory of women and thus improve the reporting of cumulative births at various attained ages. First the better educated women may have fewer number of children and thus may be able to report with greater accuracy than the less educated who have more births to report. Second since the problem with memory lapse increases with age, we should see less accurate reporting among the oldest women who are least educated than the better educated older women.

To investigate the influence of schooling on the memory of respondents, we decided to look at cumulative fertility at various attained ages for women with different levels of schooling. This we did over women with no schooling, 1-5 years of schooling, six years of schooling and seven or more years of schooling, the results are presented in Table 4.5. According to Table 4.5, cumulative fertility at the various attained ages for women with no schooling increases uniformly as we move from the oldest to the youngest cohort. For example, cumulative fertility at age 23 increases steadily from the mean CEB of 1.47 with women ages 48-49 to 2.32 with those ages 23-27. This rising trend is also observed for cumulative fertility at ages 28 and 33. However, for cumulative fertility at age 38 we observe first an immediate rise from 5.37 with the oldest cohort to 5.62 with the next oldest cohort and then drops to 5.50 with the 38-42 cohort. This may be consistent with the problems of forward age telescoping, in that births at older ages are closer to the survey period and may be remembered and reported with greater accuracy than births that occurred at younger ages and thus in the distant past. However, since we have only three cohorts to compare it is hard to draw any definite conclusions.

We do not see much of a pattern for cumulative fertility at age 18 for women with 1-5 years of schooling. Cumulative fertility at age 23 for women with 1-5 years of schooling first falls slightly from 1.64 with the oldest cohort to 1.61 with the next older cohort, thereafter it increases uniformly from the oldest to the youngest cohort reaching its highest point at 2.23 with the 23-27 cohort. We observe a steady increase in cumulative fertility at age 28 from the oldest cohort reaching its peak at 4.04 with the 33-37 cohort and then declines over the next younger cohort. For cumulative births at ages 33 and beyond we observe a uniform increase in fertility from the oldest to the youngest cohort.

As we move to women with six years of schooling, we observe a more pronounced inverted U-shaped distribution very similar to the aggregate pattern of the distribution of cumulative birth discussed in the previous section above. We do not see much of a pattern for cumulative fertility at age 18. However, cumulative fertility at age 23 increases steadily from 0.57 with the oldest cohort, reaches its maximum at 1.90 with the 33-37 cohort and then falls over the next two younger cohorts. Cumulative fertility at age 28 also reaches its peak at 3.75 with the 33-37 cohort and then falls with the next younger cohort. We observe a steady increases from the oldest to the youngest cohort for cumulative fertility at age 33. For cumulative fertility at age 38 we observe first a rise from 5.43 with the oldest cohort to 6.08 with the next older cohort and then falls to 5.92 with the 38-42 cohort. This is very similar to the pattern for cumulative fertility at age 38 for women with no schooling. As mentioned earlier this may be evidence to support age forward telescoping but again the number of cohorts to compare is very few.

The pattern of births for women with seven or more years of schooling is remarkably different from the other schooling categories discussed above. We do not see any definite pattern for cumulative fertility at age 18. Cumulative fertility at ages 23 and beyond, we see first an increase in fertility from the oldest cohort to the next older cohort and thereafter a steady decline in fertility from the oldest to the youngest cohort. The relatively small cell size for the oldest cohort for this schooling group may account for the initial rise in cumulative fertility. However, it is also possible that the oldest cohort is misreporting the number of births, an observation that is consistent with the reporting of births by the oldest cohorts with the no schooling, primary or some primary witnessed above. The distribution of cumulative fertility at various attained ages is very similar to the distribution of the percentage of "ever-married" at various attained ages that we discuss in chapter 4 of this study. This is very consistent with the data since first marriages and births are closely related.

In looking at the cumulative fertilities for the different schooling categories, we make several observations. First for women with no schooling we observe a steady increases in fertility from the oldest to the youngest cohort. This may be consistent with misreporting of births at various attained ages as a result of memory lapse. For cumulative fertility at age 38 we begin to see some slight evidence to support forward age telescoping, older people reporting better at older ages

We continue to see a rising trend in fertility from the oldest to the youngest cohort for women with 1-5 years of schooling for cumulative fertility at various attained ages, with the exception of cumulative fertility at age 28. At age 28 the pattern is more of an

inverted U-shape in form, it rises initially reaches its peak and then falls. This seems to suggest that women with 1-5 years of schooling may not be any different from women with no schooling in fertility decision making.

The cumulative fertility for women with six years of schooling exhibits an inverted U-shaped distribution and this is observed for cumulative fertility at ages 23 and beyond. However, for women with seven or more years of schooling we see a steady decline in fertility from the youngest to the oldest cohort.

Many factors may account for the observed distribution of births among women of different educational status. It is possible that women with no schooling, 1-5 years and six years of schooling are misreporting their age at each of their births, this being the case especially for the older women. Memory lapse associated with age may be a factor in the response given by women with no schooling, primary and some primary education. This is more likely since reporting of births improves drastically among women with seven or more years of schooling. The distribution of cumulative births among women with seven or more years of schooling may be real and may not reflect memory lapse or forward age telescoping. This is consistent with seven or more years of schooling improving drastically the completeness of reporting of respondents age discussed earlier.

Another factor may be age telescoping, the older women displacing their births forward and closer to the survey period than they actually occurred. This may explain the pattern of cumulative births at age 38 for women with no schooling and women with six years of schooling. We do not have enough evidence to support this argument since we have very few cohorts to compare at cumulative fertility at higher attained ages.

**TABLE 4.5. Cumulative Fertility At Various Attained Ages By Five-Year Age Group
and by Years of Schooling, Nigeria, 1990**

	By Age						Sample Size
	18	23	28	33	38	43	
<u>0 years of Schooling</u>							
Age Group							
15-17	--	--	--	--	--	--	321
18-22	0.84	--	--	--	--	--	615
23-27	0.87	2.32	--	--	--	--	748
28-32	0.77	2.26	3.71	--	--	--	973
33-37	0.61	1.92	3.59	4.97	--	--	620
38-42	0.58	1.67	3.03	4.49	5.50	--	693
43-47	0.54	1.65	2.97	4.34	5.62	6.48	435
48-49	0.33	1.47	2.90	4.25	5.37	6.16	135
<u>1-5 years of Schooling</u>							
Age group							
15-17	--	--	--	--	--	--	118
18-22	0.54	--	--	--	--	--	134
23-27	0.66	2.23	--	--	--	--	111
28-32	0.53	2.13	3.90	--	--	--	134
33-37	0.53	2.13	4.04	5.70	--	--	104
38-42	0.45	1.77	3.62	5.50	6.87	--	86
43-47	0.27	1.61	3.16	4.93	6.23	6.89	44
48-49	0.55	1.64	2.64	3.55	4.73	5.73	11
<u>6 years of Schooling</u>							
Age Group							
15-17	--	--	--	--	--	--	199
18-22	0.42	--	--	--	--	--	347
23-27	0.40	1.67	--	--	--	--	294
28-32	0.43	1.82	3.43	--	--	--	231
33-37	0.43	1.90	3.75	5.25	--	--	123
38-42	0.32	1.75	3.44	4.95	5.92	--	103
43-47	0.32	1.65	2.90	4.50	6.08	6.68	62
48-49	0.00	0.57	2.71	4.00	5.43	6.29	7
<u>7+ years of Schooling</u>							
Age group							
15-17	--	--	--	--	--	--	397
18-22	0.09	--	--	--	--	--	733
23-27	0.10	0.82	--	--	--	--	529
28-32	0.15	0.96	2.23	--	--	--	246
33-37	0.19	1.14	2.71	3.93	--	--	108
38-42	0.26	1.24	2.74	4.03	4.93	--	68
43-47	0.19	1.32	3.03	4.45	5.55	6.06	31
48-49	0.00	0.89	2.22	4.22	5.44	6.22	9

Some of the fertility patterns could also be real resulting from macroeconomic shocks namely, the Nigeria Civil War from May 1967 to January 1970, the oil boom in the 1970s and subsequent oil crisis in the 1980s. The oil boom may have made it attractive for women especially the least educated to marry and have children. In addition credit constraints and increasing bride price may have played a role in delaying marriages and subsequent onset of births. The oil boom, and the credit constraints and bride price may have affected women with different educational levels differently, which may explain the inverted U-shaped distribution that we encounter, in particular, for women with six years of schooling. The Nigeria Civil War may also have delayed marriage and onset of births for the older cohort.

In what follows we investigate in some details whether the Nigerian Civil war had any effect on fertility among the older cohorts.

Is There a Baby Boom Effect?

There is the tendency for fertility to decline during a war period and to surge years immediately after a war. This is partly because men are normally taken to war whilst the wives wait and also possible famine that may be associated with war periods. We decided to look at the mean CEB for women in the age group 43-49 around the Nigeria Civil War to see if there is any sign of war effect on the reporting of births. If there is war effect, which group of women experienced the greatest impact of the war, and if that could be the reason for subsequent underreporting of births. If there is no war effect could be a memory lapse or real macroeconomic shocks?

In Table 4.6 we document the mean number of children ever born three years (1964-66) before the Nigerian Civil War, three years (1968-70) during the Civil War and three years (1971-73) after the Civil War for women in the 43-49 birth cohort.⁶ As we move horizontally following each cohort of women for the three sub-periods around the Civil War, we notice that for the all women sampled, the mean CEB first rises from 0.70 three years preceding the war to 0.83 three years during the war and then drops to 0.79 three years after the war for women ages 43-47 in 1990. Mean CEB for the oldest cohort 48-49 remains constant at 0.85 for the three years preceding the war and three years during the war and then drops to 0.75 three years after the war.

In both of the age groups we see a drop in fertility after the war which could be either misreporting of the number of births or could be real economic shocks or systematic displacement of births by these oldest cohort which is hard to distinguish. We do not observe any surprises in the reporting of mean CEB as we move vertically among the age groups for the three subperiods around the war under study.

We decided to group women into years of schooling to investigate whether years of schooling improves the memory of women for births that occurred 17-23 years before the survey. For women with no schooling similar patterns are observed as we did with the overall women. Women ages 43-47 in 1990 experience a rise in fertility from the years before the Civil War to the years during the Civil War and then fertility drops three years after the Civil War. We observe a continuous fall in fertility for women in the 48-

⁶ The Nigerian Civil War was from May 1967 to January 1970. Because of the time it takes between conception and birth we decided to look at three years before the war, three years into the war and three years after the Civil War.

49 age group. For similar reasons given above, the two oldest cohorts 43-47 and 48-49 may be misreporting their mean CEB three years after the Civil War.

We begin to see a little bit of a baby boom effect for the fertility pattern of women with 1-5 years and six years of schooling. For example, women in the 43-47 age group, we begin to see a little bit of baby boom effect, in that fertility drops during the war period and then rises again after the war. Notice that for women with 1-5 years of schooling who were 43-47 in 1990, mean CEB drops from 0.91 before to the war to 0.80 during the war and then rises to 1.14 after the war. For women in the 48-49 age group we observe a continuous fall in fertility for the three subperiods, whereas for women with six years of schooling we observe a rise and then a fall in fertility over the three periods. The observed pattern for the oldest women in these two schooling category may be attributable to the small cell size problem or may be misreporting of mean CEB or from real macroeconomic shocks.

The observed pattern of fertility before, during and after the Civil War for the women with seven or years of schooling also rises during the war period and then falls after the war for women in the 43-49 birth cohorts. Again small cell size may account for the drop in fertility after the war for these birth cohorts or pure misreporting of births by women in this age group.

As we move vertically between the different age groups and the different schooling categories, again we do not see any surprises in the pattern of mean CEB for women with no schooling, six years of schooling and seven or more years of schooling. We see a sudden drop of mean CEB from women in the 43-47 to the 48-49 age groups for

women with 1-5 years of schooling. It could be either underreporting of births by the oldest cohort or the small cell size for the oldest cohort with 1-5 years of schooling.

From the analysis of children ever born before, during and after the Nigerian Civil War, we do not see evidence to support a baby boom effect. Since these three periods span a period of 17-23 years before the survey, one possible reason may be birth misreporting by these older women. We could not do comparison for the younger cohort since they were too young to have children over the period under study. We have already established the fact that memory lapse is greatest among the older cohorts in the sample, so misreporting of the number of births may be an important factor underlying the pattern of births we observe in our Civil War analysis.

TABLE 4.6 - Mean Number of Children Ever Born Three Years Prior, During and After the Nigerian Civil War

	CEB 1964-66	CEB 1968-70	CEB 1971-73	Sample Size
<u>ALL WOMEN (43-49)</u>				
Age in 1990				
43-47	0.70	0.83	0.79	572
48-49	0.85	0.85	0.75	162
<u>0 years of Schooling</u>				
Age in 1990				
43-47	0.67	0.83	0.73	435
48-49	0.87	0.81	0.76	135
<u>1-5 years of Schooling</u>				
Age in 1990				
43-47	0.91	0.80	1.14	44
48-49	0.64	0.55	0.36	11
<u>6 years of Schooling</u>				
Age in 1990				
43-47	0.82	0.73	0.84	62
48-49	0.86	1.43	0.57	7
<u>7+ years of Schooling</u>				
Age in 1990				
43-47	0.55	1.19	0.97	31
48-49	0.89	1.22	1.11	9

Source: Calculated from Demographic and Health Survey, Nigeria, 1990.

4.4. SUMMARY AND CONCLUSIONS

In this chapter we have examined some of the potential measurement errors in the NDHS, 1990, with particular reference to the age reporting by respondents, reporting of birth histories, age at first marriage and age at first birth. We found evidence to support age heaping. The Whipple's Index of age concentration on digit "0" and "5" was 224.6 which is very rough by the United Nations standards. This suggests that any estimates based on age grouping should be centered around the preferred digits to avoid serious bias estimates. We also found some slight evidence on age heaping for age at first birth and age at first marriage, but this is not as big a problem as the age heaping with the respondents age. The Whipple's index for age concentration was 121.73 and 112.78 for age at first marriage and age at first birth respectively, which is approximate by United Nations standards.

There was also evidence of problems associated with memory lapse with the oldest women and also women with no schooling or some primary education. Older women may be consistently underestimating their number of children ever born at various attained ages. For example, using the birth histories, we reconstructed retrospective cumulative fertilities at various attained ages, and for all the women sample, the older women consistently reported lower cumulative births at each of the attained ages than the younger women. Similar observations were made for women with no schooling, 1-5 years of schooling and six years of schooling. For women with six years of schooling, mean CEB eventually falls for the younger cohorts but the distribution first rises reaches its peak and then falls. Seven or more years of schooling

improve the memory of the respondents greatly even though the problem of misreporting of births for the oldest group 48-49 still remains. Small cell size of women ages 48-49 in this schooling group may account for the apparent underreporting of births.

In looking at the number of deaths per 1,000 live births, we also noticed that deaths drop suddenly from the 43-47 age group to the 48-49 age group for all women in the sample and for women with no schooling. This may be an indication of under-reporting of deaths by the oldest women, since chances are that earlier births by these women may have resulted in deaths. Moreover, the older women may have more recalls to do than the youngest women because of their longer exposure to childbearing.

We also anticipated that the Nigerian Civil War may have affected fertility in the years before the war, during the war and after the war. However, the war analysis restricts us to using the women ages 43-49 in 1990 since the analysis period is 17-23 years before the survey. We did not see any baby boom effect, this could be under estimation of the number of births by the women in this age groups because of the memory recalls involved or could be real shocks.

In our later analysis we decided to center ages around the digits "0" and "5" to correct for the problems with age heaping. We had done our analysis with the traditional age groupings 15-19, 20-24, 24-29 etc., and found our fertility analysis to be misleading so we decided to use the age grouping 18-22, 23-27, 28-32, etc., dropping the 15-17 and 48-49 to give equal probability of occurrence for the digits "0" and "5". We saw a significant improvement in our analysis which are presented in chapters 4 and 5 of the present study.

Demographic surveys have improved recently with more advanced data collection procedures. DHS data collection has been assessed by its staff and found the quality satisfactory. A comparison of DHS data with that of WFS by DHS staff often revealed a more complete reporting of ages by women in the DHS than in the WFS. Our analysis in this present chapter has been restricted however only to the NDHS, a more complete study is to do an independent comparative study of the NDHS and that of the Nigeria WFS, but this is beyond the scope of the present study. However, the evidence of age heaping especially that of the respondent age is overwhelming and we will recommend that correction for age heaping be done especially with fertility and mortality estimates which are based on age groupings

CHAPTER 5

FERTILITY TRENDS IN NIGERIA

5.1. INTRODUCTION

Since 1965 most parts of the world have experienced a fertility transition. Sub-Saharan Africa is yet to have undergone any major decline in fertility (National Research Council, 1993). Botswana, Kenya and Zimbabwe are often cited as the three sub-Saharan countries in Africa that have experienced an irreversible decline in fertility (van de Walle and Foster, 1990; World Bank, 1990). However, its extent and permanency is often debated in the empirical literature (Caldwell, 1992; Rutenberg and Diamond, 1993; Thomas and Muvanda, 1994)

Recently however, with the availability of data from countries participating in the Demographic and Health Surveys and more sophisticated fertility analysis, there is some evidence to support the idea of a fertility transition in some countries and regions in Sub-Saharan African countries besides Botswana, Kenya and Zimbabwe, notable among which is the Southwest and Southeast regions of Nigeria (National Research Council, 1993). Recent Nigeria Demographic and Health Survey data indicate that there has been a drop of 1.3 in the total fertility rate, within the period eight years and four years before the survey (Cohen, 1993). By 1991, there was evidence to suggest that there has been over 10 percent drop in fertility in the Southwest Nigeria and possibly in Southeast Nigeria (Nigeria/DHS, 1991; Reinis, Rutstein and Ajayi, 1991).

This chapter analyzes fertility behavior of women in Nigeria, with particular reference to the three regions, namely, the Southwest, the Southeast and the North. The chapter starts out first by looking at the trend in female schooling. Second, we examine fertility trends in Nigeria as a whole by looking at fertility correlates such as cumulative fertility at various attained ages, first births and first marriages at various attained ages. Finally we also investigate family planning policies and the use of contraceptives among women of childbearing ages.

The analysis of the data establishes the fact that female schooling has increased greatly among the youngest cohorts, particularly those living in the south. Women living in Lagos, other areas in the southwest and in the southeast are better educated than those living in the rural and northern areas.

A look at fertility in general does not reveal any decisive decline in fertility. For example, the children ever born declines rapidly from the oldest to the youngest women but this may be because the older women have had a longer exposure to pregnancy and childbearing than the younger women. Cumulative fertility at various attained ages for women actually increases initially, reaches a peak and then eventually falls with the youngest cohorts as we progress from the oldest to the youngest cohorts. Whilst this is true among all the women sampled and also in the southwest and the southeast, among women in the north, even though cumulative fertility at various attained ages eventually falls, sometimes that of the youngest women is actually higher than that of the oldest women (see Figure 5.2). We make similar observations with births and marital patterns.

Contraceptive use which was only one percent among currently married women has since 1989 risen to 6 percent (3.5 modern and 2.5 traditional methods). Among all women about 45.7 percent know about a contraceptive method and for the currently married about 31.9 percent know a contraceptive method. About 29.1 percent of women with no schooling know a contraceptive method, this compares with about 90.8 percent of women who have completed secondary school or higher. About 9.6 percent of all women live under one mile to a facility where family planning services are provided.

The rest of the chapter is organized as follows. Section II examines the trends in female schooling over recent years. Section III discusses the fertility trends in Nigeria without any reference to female schooling. Section IV investigates family planning policies and the knowledge and use of contraceptives among all women and currently married women. Section V concludes the chapter.

5.2. TRENDS IN FEMALE SCHOOLING

In Figures 5.1A through 5.1H, we depict the trend in female schooling in Nigeria between 1943 and 1972 based on the NDHS, 1990 data. According to Figure 5.1A there has been a steady increase in the mean level of completed years of schooling for women in Nigeria from the oldest to the youngest birth cohort. The average mean level of completed schooling for women born in the 1943-47 is 1.47, in comparison, women born in 1968-72 have completed 5.54 mean years of schooling. The highest increases in schooling was witnessed by women in the 1963-57 birth cohort compared to the 1958-62 cohort.

As depicted in Figure 5.1B, in addition to the rise in female educational attainments, the proportion of women who have never received any formal education has dropped drastically from 76.1 percent to 33.6 percent from the oldest to the youngest birth cohorts. The percentage of women who complete primary schooling and beyond has also risen substantially from about 16.3 percent with women born in 1943-47 and more than tripling to 59.1 percent with those born in 1968-72.

In looking at the educational attainment for women in the area of residence, we observe that women residing in Lagos and other urban areas are better educated than women in the rural areas an observation we make for all birth cohorts (see Figure 5.1C). In the regional samples, we observe that women in Lagos and other areas in the Southwest, and Southeast to a lesser extent, on average have higher mean years of completed schooling than women in the North (Figure 5.1D).

A possible reason for the high concentration of better educated women living in Lagos and other Southwest might be the formal labor market opportunities that urban living provides. In addition higher standard of living, more educated parents, and availability of more and better quality schools in the urban settings may account for the higher educational attainment of women residing in the urban areas (Behrman and Deolalikar, 1988).

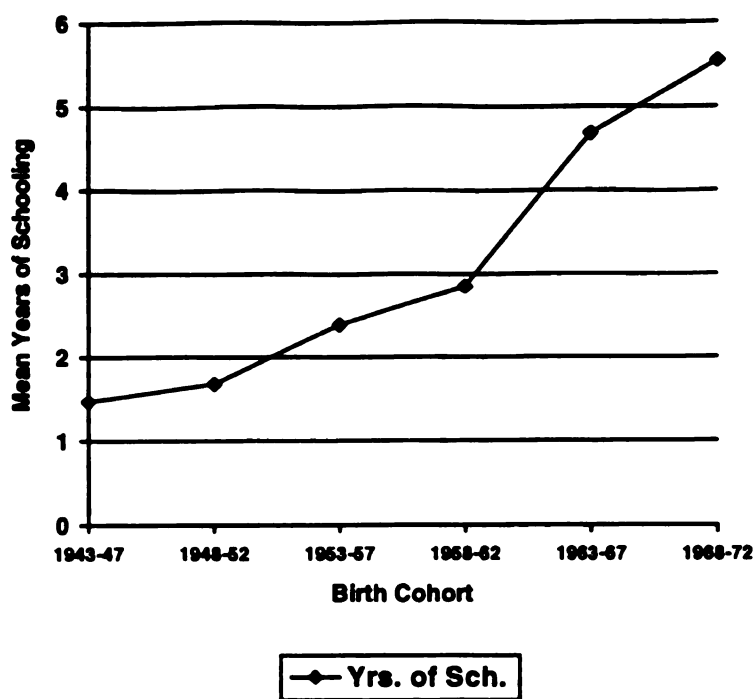


Figure 5.1A - Mean Years of Schooling. Female Cohorts Born 1943-72

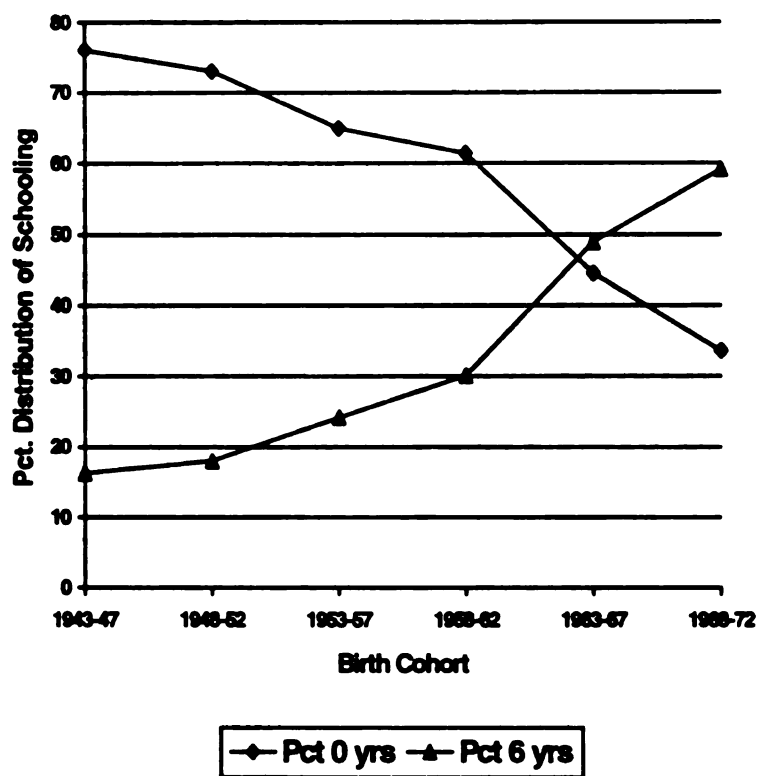


Figure 5.1B- Percentage Distribution of Years of Schooling. Female Cohorts Born 1943-72

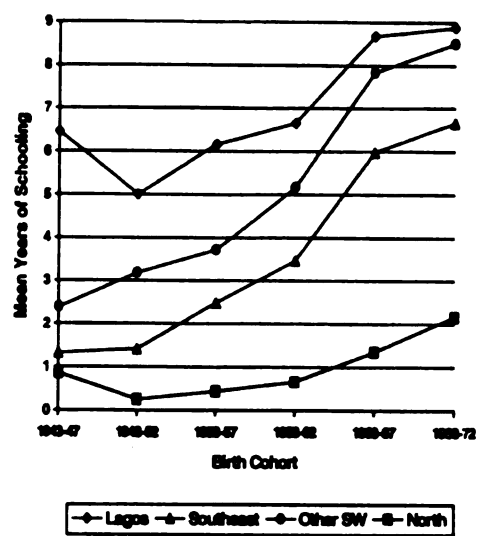
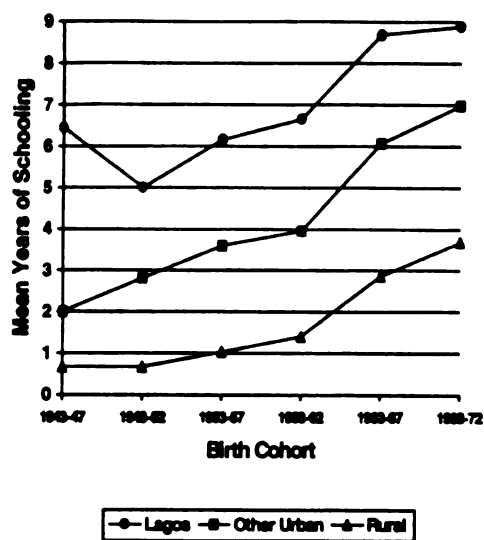


Figure 5.1C & 5.1D- Mean Years of Schooling.
Female Cohorts Born 1943-72

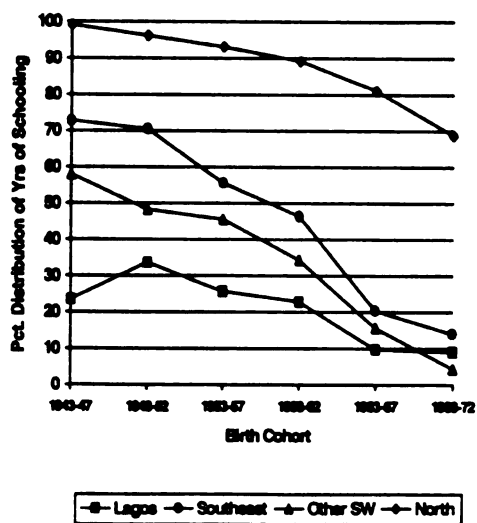
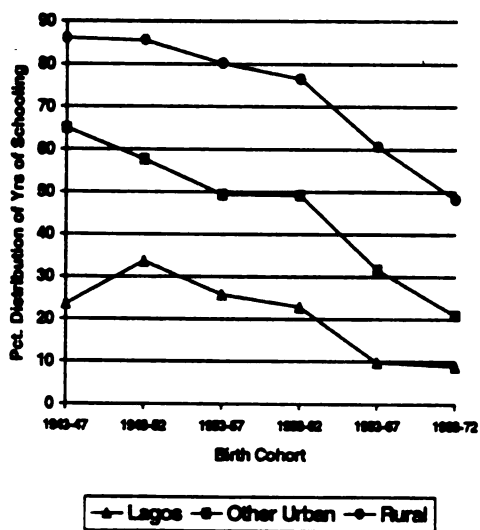


Figure 5.1E & 5.1F- Percentage of Women with Zero Years of Schooling
Female Cohorts Born 1943-72

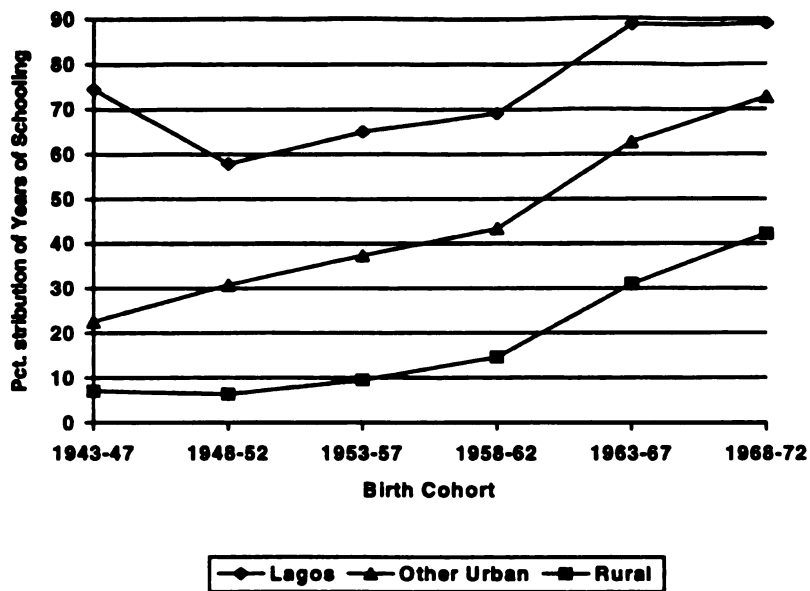


Figure 5.1G- Percentage with 6+ Years of Schooling
Female Cohorts Born 1943-72

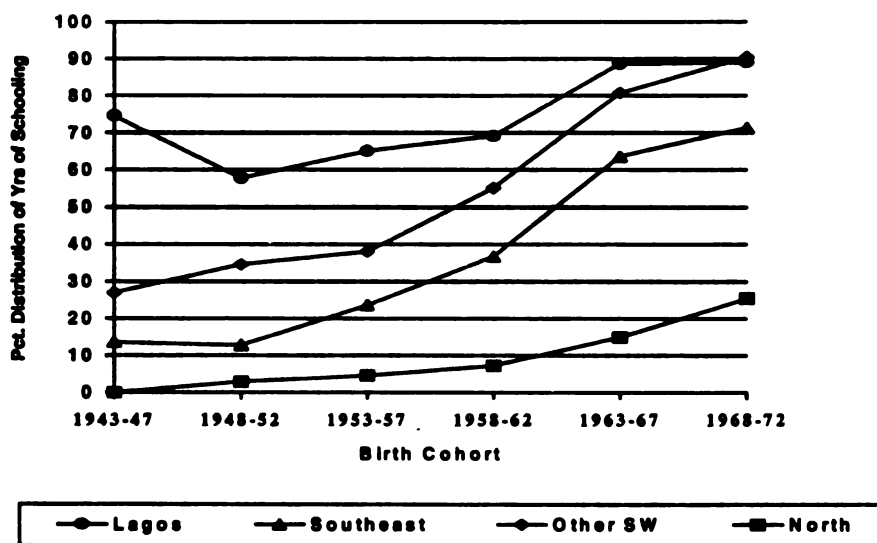


Figure 5.1H- Percentage with 6+ Years of Schooling
Female Cohorts Born 1943-72

5.3. FERTILITY TRENDS IN NIGERIA

Number of Children Ever Born.

In Table 5.1 we document the "number of children ever born" as a measure of cumulative fertility. This includes all live births in a woman's life time, we should, however, take note of the fact that the younger women in the survey have not completed their fertility. Consequently, the mean number of children ever born (CEB) increases rapidly as we move from the youngest to the oldest women. By the end of her reproductive years a woman aged 43-47 would have had on the average 6.70 children.

On average for each age group, women in Lagos have the least number of children, followed by those in the other urban areas. Women ages 43-47 residing in Lagos on average have about 5.27 children at the end of their reproductive cycle. In comparison, women in the same age group in the other areas of Southwest have 7.14, those in the Southeast have 7.18, those in the rural areas have 7.02 and those in the North have 6.45. Younger women ages 18-37 in the North report higher number of mean CEB than younger women residing in either the Southeast or other areas in the Southwest. In contrast, older women ages 38-47 in the North report lower mean CEB than their counterparts living in the Southeast or other areas in the Southwest. In comparing the Southeast and other areas in the Southwest, we observe that younger women ages 18-37 in the other areas of Southwest report fewer mean CEB than women of the same age group in the Southeast, the reverse is true for women in the 38-47 age group. Women in Lagos have smaller family size than women in the other residential areas.

TABLE 5.1
Distribution of All Women by Number of Children Ever Born (CEB) and Mean Number of
Living Children by Five-Year Age Group. Nigeria, 1990

	% with Indicated Number of Children Ever Born					Total	Number of Women	Mean no. of CEB	Mean no. of Living Children
	0	1-3	4-6	7-9	10+				
ALL WOMEN (18-47)									
Age Group									
18-22	50.2	46.3	3.3	0.1	0.0	100.0	1831	0.91	0.76
23-27	17.5	56.2	25.0	1.1	0.1	100.0	1684	2.41	1.99
28-32	6.2	33.5	46.6	13.4	0.4	100.0	1587	4.06	3.45
33-37	3.0	17.5	44.3	30.8	4.4	100.0	955	5.46	4.40
38-42	4.8	16.7	33.6	33.6	11.1	100.0	951	5.93	4.56
43-47	3.8	15.4	24.7	36.5	19.6	100.0	572	6.70	4.97
Total	18.6	36.1	27.8	13.9	3.5	100.0	7580	3.55	2.82
LAGOS									
Age Group									
18-22	75.4	23.7	0.9	0.0	0.0	100.0	333	0.39	0.36
23-27	31.9	58.3	9.8	0.0	0.0	100.0	307	1.55	1.42
28-32	8.9	43.7	42.1	5.3	0.0	100.0	247	3.37	3.02
33-37	0.0	20.0	55.7	23.6	0.7	100.0	140	5.09	4.55
38-42	0.9	24.1	50.9	21.6	2.6	100.0	116	5.06	4.41
43-47	3.9	21.6	45.1	25.5	3.9	100.0	51	5.27	4.76
Total	31.3	36.3	24.9	7.0	0.5	100.0	1194	2.52	2.26
OTHER URBAN									
Age Group									
18-22	58.3	40.2	1.4	0.2	0.0	100.0	503	0.69	0.60
23-27	18.0	56.9	23.8	1.3	0.0	100.0	399	2.34	2.05
28-32	6.4	30.5	50.8	12.3	0.0	100.0	390	4.05	3.52
33-37	3.8	17.3	44.9	30.2	4.0	100.0	225	5.36	4.54
38-42	4.7	12.7	38.0	36.2	8.5	100.0	213	5.98	4.96
43-47	2.5	20.0	28.3	30.0	19.2	100.0	120	6.27	5.04
Total	22.2	34.5	27.9	12.7	2.7	100.0	1850	3.29	2.79
RURAL									
Age Group									
18-22	37.8	57.0	5.1	0.1	0.0	100.0	995	1.19	0.97
23-27	12.8	55.3	30.3	1.4	0.2	100.0	978	2.71	2.14
28-32	5.4	32.0	46.0	15.9	0.7	100.0	950	4.25	3.36
33-37	3.6	16.9	28.9	35.0	13.7	100.0	590	5.59	4.31
38-42	5.6	16.7	28.9	35.0	13.7	100.0	622	6.09	4.45
43-47	4.2	13.2	20.9	39.9	21.7	100.0	401	7.02	4.97

TABLE 5.1 continues

	% with Indicated Number of Children Ever Born						Number of Women	Mean no. of CEB	Mean no. of Living Children
	0	1-3	4-6	7-9	10+	Total			
SOUTHEAST									
Age Group									
18-22	60.8	36.3	2.7	0.2	0.0	100.0	487	0.70	0.62
23-27	21.8	49.6	26.9	1.2	0.5	100.0	427	2.39	2.07
28-32	6.6	30.1	47.7	15.1	0.5	100.0	392	4.20	3.59
33-37	3.3	17.8	37.8	36.7	4.4	100.0	275	5.68	4.81
38-42	1.6	10.4	31.9	44.2	12.0	100.0	169	6.75	5.33
43-47	1.2	9.5	28.4	39.6	21.3	100.0	169	7.18	5.65
Total	21.5	29.9	27.3	17.2	4.1	100.0	2001	3.79	3.10
OTHER SOUTHWEST									
Age Group									
18-22	66.0	33.0	0.7	0.0	0.0	100.0	276	0.48	0.42
23-27	21.7	66.0	12.3	0.0	0.0	100.0	212	1.83	1.58
28-32	3.0	36.9	48.5	11.1	0.5	100.0	198	3.99	3.39
33-37	0.0	10.7	56.7	28.7	4.0	100.0	150	5.73	4.70
38-42	0.6	7.4	44.6	36.6	10.9	100.0	175	6.39	5.05
43-47	0.8	10.9	26.9	42.9	18.5	100.0	119	7.14	5.53
Total	21.0	30.6	28.2	15.9	4.2	100.0	1130	3.66	2.98
NORTH									
Age Group									
18-22	25.9	68.2	5.9	0.1	0.0	100.0	735	1.44	1.16
23-27	7.9	56.4	33.9	1.9	0.0	100.0	738	2.95	2.29
28-32	5.9	30.9	46.9	15.7	0.5	100.0	750	4.24	3.31
33-37	5.1	19.0	40.0	30.0	5.9	100.0	390	5.35	3.93
38-42	9.8	22.5	25.2	29.3	13.2	100.0	409	5.51	3.92
43-47	7.3	20.6	16.3	35.5	22.3	100.0	233	6.45	4.23
Total	11.3	41.9	28.9	13.8	4.1	100.0	3266	3.77	2.81

Source: Calculated from Demographic and Health Survey, Nigeria, 1990

Cumulative fertility: Another Look.

As mentioned earlier in our literature review chapter, the use of the total number of children ever born as a measure of cumulative fertility has censoring problems differentially for different age groups. The younger women in the sample have not completed their fertility. Some studies get around this by using the most recent fertility, usually children born five years before the survey. This still does not avoid the problem of censorship. The youngest women in the survey in particular the 15-19 would be 10-14 five years before the survey and may be too young to have any number of children five years prior to the survey. In addition the two oldest age groups of women (40-44 and 45-49) would be 35-39 and 40-44 respectively five years prior to the survey and at the end of their reproductive years and may not be having considerable number of births within the five years prior to the survey. In this section an alternative measure of cumulative fertility is provided. Using the retrospective birth histories we reconstructed cumulative fertility for each woman at age 18, 23, 28, 33, 38 and 43. The main drawback with this method is that it relies heavily on the accuracy of reporting of mother's own age and that of each child born alive, however, it avoids the problem of differential censoring discussed above. The breakdown of Southwest into Lagos and other Southwest revealed very similar results so we decided to combine Lagos and other Southwest into Southwest. We decided not to discuss cumulative fertility for the rural and urban residents, we will look at this in some detail when we run the regressions in the next chapter.

Figures 5.2A through 5.2D depict cumulative fertility at various attained ages for the all women sample and the regional samples. As Figure 5.2A shows, among all the women, the profile representing cumulative fertility at age 18 is very uniform. Starting with a mean CEB of about 0.48 with women ages 43-47, it rises continuously but faintly such that the next three younger cohorts have actually born more children than the oldest cohort. It peaks at 0.60 with women ages 28-32 before it declines over the next two younger age groups. The profile for cumulative fertility at age 23 on the other hand rises faintly at first from 1.63 and then sharply reaching its peak at 1.98 with the 28-32 age group before it declines. We make similar observations with cumulative fertility at age 28 peaking earlier with the 33-37 age group. We experience a steady increase in cumulative fertility at age 33 from the oldest to the youngest women.

We make similar observations with cumulative fertility in the regions. In the Southeast as Figure 5.2B shows, cumulative fertility at ages 18 and 23 fluctuates among women ages 28-47 but declines over women ages 18-27 for cumulative fertility at age 18 and for women ages 23-27 for that of cumulative fertility at age 23. On the other hand, that of cumulative fertility at ages 28 rises steadily from 3.56 with the oldest women and reaches its highest point at 3.74 with the 33-37 age group before it declines with the next younger age group. Cumulative fertility at age 33 on the other hand rises and then declines from oldest to the younger women.

A look at cumulative fertility at various attained ages for women residing in the Southwest also reveals an eventual fall in cumulative fertility at ages 18, 23 and 28. As evident in Figure 5.2C, cumulative fertility at ages 18, 23 and 28 all rise initially reach a

peak and then decline. Cumulative fertility at age 33 on the other hand rises steadily from the oldest to the youngest women.

Figure 5.2D shows the cumulative fertility at various attained ages for women residing in the North. In the North cumulative fertility at various attained ages rise uniformly from the oldest to the youngest women. That at ages 18 and 23 falls faintly after reaching their highest points with women in the 23-27 and 28-32 age groups respectively but still the cumulative fertility of the youngest cohort is higher than that of the oldest women.

Overall there is little indication of a decline in cumulative fertility among all the women at ages 18 and 23. At higher ages cumulative fertility of the youngest women are even higher than the older women in the survey. This is possible cyclically but not a long-run trend, although the recent claim of a fertility decline could be trend but we do not know yet as these women are too young. It is also possible that the higher cumulative fertility for the younger women by ages 28 or 33 signals changes in the timing of births. This is possible if younger women delay their births but space them closely together so that at the end of their reproductive years they have either the same or more children than the older women. Empirical work on the life-cycle of women suggest that the more educated women take time off and bunch their children together so that they may return to work sooner.

At younger ages women in the Southwest report lower cumulative fertility than their counterparts in the Southeast. At ages 18 and 23 women in the North report the highest cumulative fertility. However, for cumulative fertility at ages 28 and 33 the

oldest women ages 38-47 in the North report fewer number of children than those in the Southwest or the Southeast. This may be a possible sign of underreporting of children by the oldest women in the North. This may also be real in that the North is the poorest region in Nigeria and poor nutrition and health conditions may have contributed to low fertility in this region.

We see some signs of a declining fertility among the youngest women in the Southeast and Southwest for cumulative fertility at ages 18 and 23. For example, cumulative fertility at ages 18 declines by about 46.7 percent over the two youngest age groups and that at ages 23 declines by about 16 percent with the 23-27 age group for women in the Southeast. Similarly, for women in the Southwest cumulative fertility at age 18 declines by 64.7 percent over the two youngest age groups of women and that of cumulative fertility at age 23 declines by 29.4 percent with the 23-27 age group. However, we observe an increase in cumulative fertility in the two regions for cumulative fertility at ages 28 and over, again we have different cohorts and this may be cyclical effects or changes in the timing of births which is hard to distinguish. There is, however, no indication of a fertility decline in the North.

One may conclude that a look at cumulative fertility does not suggest any decisive decline in fertility among all the women and even the drop in either the Southwest or Southeast is not conclusive. At younger ages yes, but one needs to follow and examine the fertility patterns of the younger women for a longer period to see if it will remain at the present level or there would be a change in their present fertility patterns.

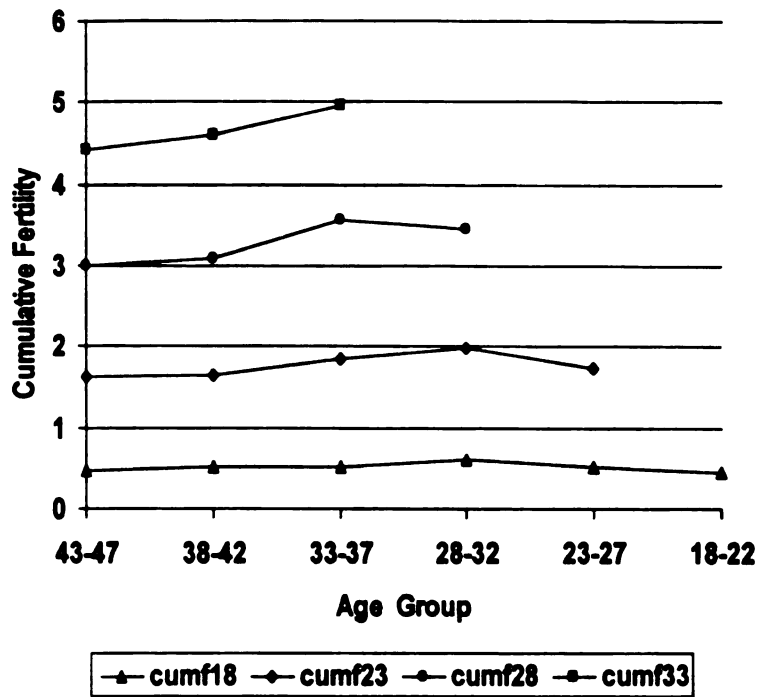


Figure 5.2A- Cumulative Fertility at various Attained Ages. All Women, Nigeria, 1990

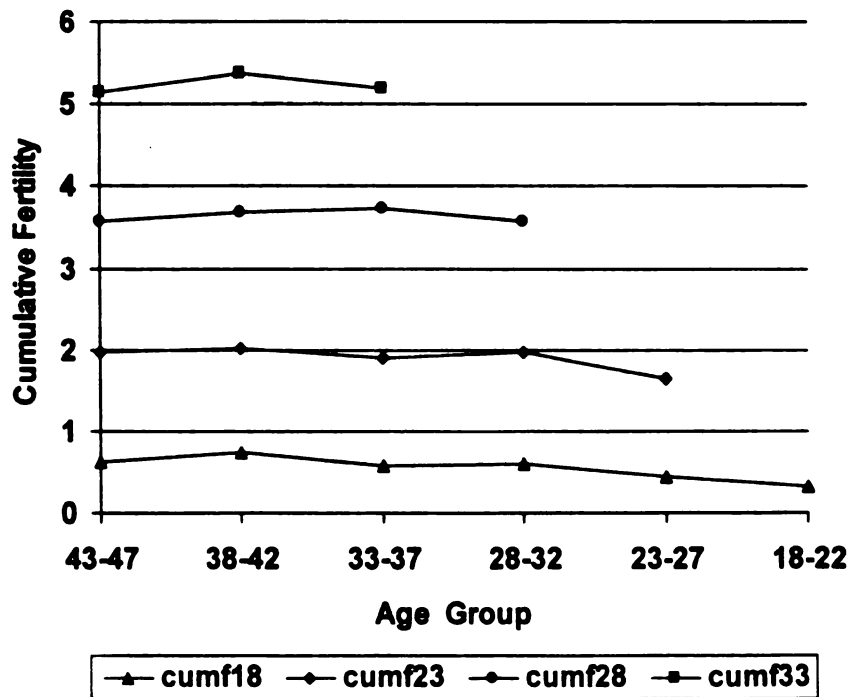


Figure 5.2B- Cumulative Fertility at various Attained Ages. Southeast, Nigeria, 1990.

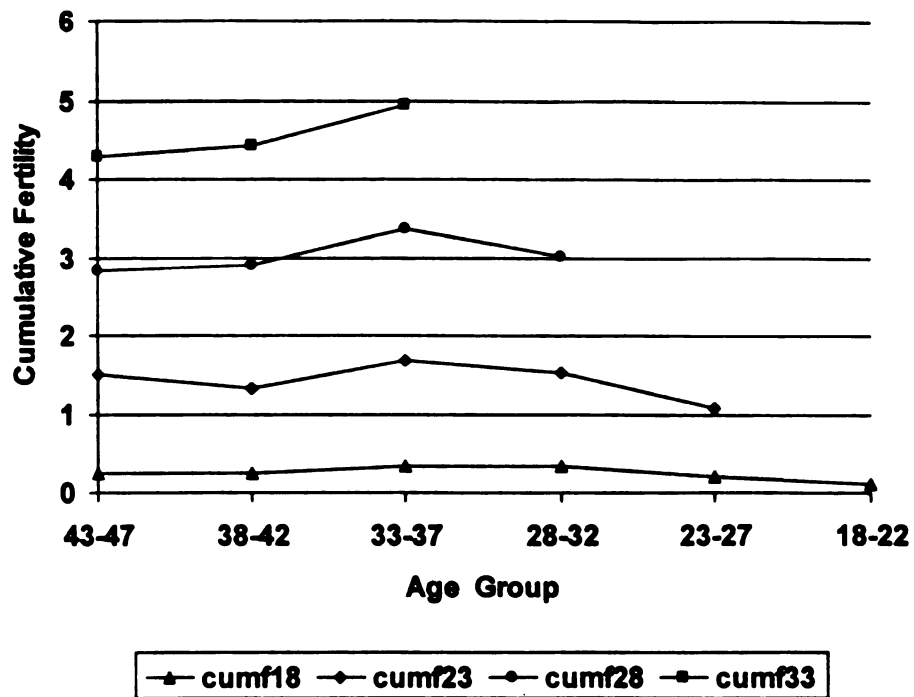


Figure 5.2C- Cumulative Fertility at various Attained Ages. Southwest, Nigeria, 1990.

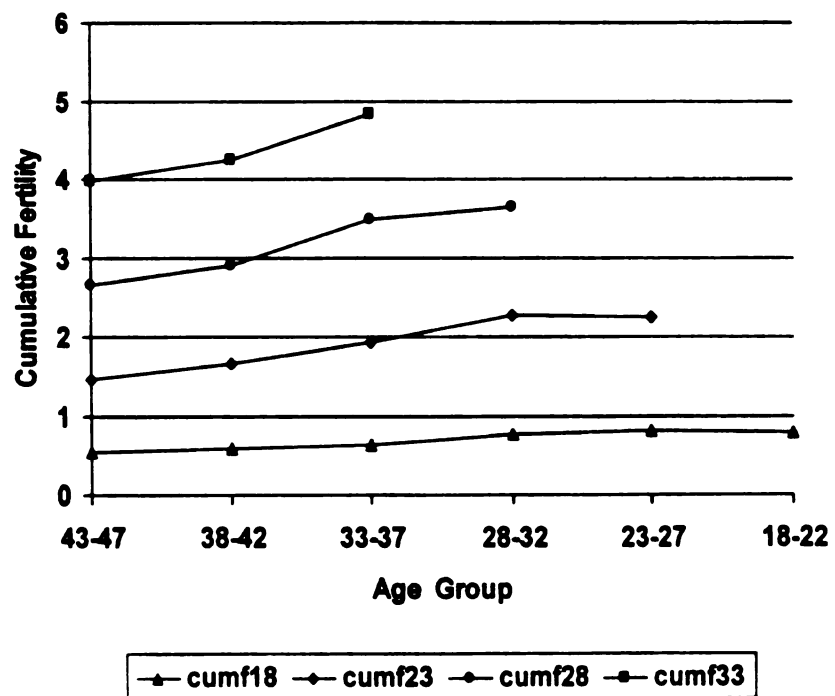


Figure 5.2D- Cumulative Fertility at various Attained Ages. North, Nigeria, 1990.

The use of total fertility rate as a measure of cumulative fertility assumes a constant age specific fertility rates. However, fertility decision is dynamic not static, women may revise their fertility decisions based on both economic, health and biological circumstances realizing their long term fertility goals. The usual practice of measuring total fertility eight and four years before a survey and comparing the two fertility rates may be an inaccurate measure of either an increase or decrease in fertility. We need to follow the younger women into the future to examine how their fertility patterns are changing with time. This calls for a follow up survey to examine fertility at a later date. Thus the recent claim of an overall fall of about 1.3 in total fertility rate among women in Nigeria and a decline of about 10 percent in fertility among women in the Southwest and possibly the Southeast may be an overestimation (Cohen, 1993; Reinis, Rutstein and Ajayi, 1991; Oslen, 1994).

Birth Patterns.

Another measure of fertility behavior is the onset and timing of births. The age at first birth and subsequent birth spacing determines the overall fertility of a woman. Furthermore, for a sustainable fertility decline we should expect a lower proportion of the younger women to have their first births at each of the attained ages. Table 5.2 shows the percentage of women who have had their first births at various attained ages.

As Table 5.2 demonstrates, for the all women sample, the percentage of women with their first births at age 18 rises uniformly from the oldest women to those ages 28-32 before declining over the next two younger women. We make similar observations for

first births at age 23 and 28. However, first births at age 33 rises steadily from the oldest to the youngest women.

The lower panels of Table 5.2 present the distribution of first births for the regional samples. In the Southeast, first births at ages 18 initially rises from women ages 43-47 to women in the 38-42 age group but thereafter declines steadily from oldest to the youngest women. On the other hand, first births at age 23 does not follow any definite pattern, it fluctuates a lot. At higher ages 28 and 33 however, the percentages are fairly stable for women ages 28-42 and 33-42 respectively. We also observe a postponement of birth births at ages 18 but a catch-up at ages 28 and above. However, the five-year age span between 18-23 years may be too long to detect shifts in the median age at first birth.

In the Southwest, the percentage of women with first births at age 18 fluctuates initially between women ages 33-47, but thereafter it declines steadily from the oldest to the youngest women. We make similar observations for first births at age 23. That at age 28 also rises steadily but declines with women ages 28-32. However, first births at age 33, on the other hand rises uniformly from the oldest to the youngest women. We also observe a postponement of first births at age 18 but a catch-up at age 28 and above.

In the North we have a different picture about the percentage distribution of women with first births at various attained ages. The percent of women with first births at all ages rises uniformly from the oldest to the youngest women. In comparing the three regions we observe that at younger ages a higher percentage of women in the North

TABLE 5.2
Percentage of Women with First Births at Various Attained Ages
By Five-Year Age Group. Nigeria, 1990.

	<u>By Age</u>				
	18	23	28	33	N
<u>ALL WOMEN</u>					
Age Group					
18-22	30.4	--	--	--	1831
23-27	33.7	72.6	--	--	1684
28-32	39.1	77.5	91.4	--	1587
33-37	35.2	75.4	92.3	96.4	955
38-42	32.1	67.8	85.5	93.0	951
43-47	29.9	65.9	83.0	92.3	572
<u>SOUTHEAST</u>					
Age Group					
18-22	22.0	--	--	--	487
23-27	27.2	67.9	--	--	427
28-32	37.5	75.3	91.1	--	392
33-37	38.2	73.1	91.3	96.0	275
38-42	41.8	74.1	92.4	96.8	251
43-47	35.5	74.0	87.6	96.4	169
<u>SOUTHWEST</u>					
Age Group					
18-22	10.2	--	--	--	609
23-27	15.4	57.4	--	--	519
28-32	25.6	71.0	89.9	--	445
33-37	25.9	78.6	97.2	100.0	290
38-42	19.9	69.4	91.8	97.6	291
43-47	20.0	72.9	90.0	96.5	170
<u>NORTH</u>					
Age Group					
18-22	52.0	--	--	--	755
23-27	50.4	86.0	--	--	738
28-32	47.9	82.5	92.5	--	750
33-37	40.0	74.6	89.2	94.1	390
38-42	34.7	62.8	76.8	87.3	409
43-47	33.0	54.9	74.7	86.3	233

Source: Calculated from Demographic and Health Survey, Nigeria, 1990

have had their first births. However, at older ages the younger women in the North compared well with those in either the Southeast or the Southwest.

Marital Patterns

Marital status is closely related to fertility, and changes in marital status track the changes in fertility, especially first births. In addition the length of time a women is in union indicates the degree of her exposure to the risk of pregnancy. If fertility has indeed fallen, we should expect that a higher percentage of older women would first marry at each of the attained ages than the younger women. In Table 5.3 we document the percentage of women who have ever been married at various attained ages for all women ages 18-47 and also for the three regions.

In the overall, women ages 18-47, the percentage of women who first marry by age 18 rises steadily from the oldest women and peaks with women ages 28-32 and declines over the next two youngest women. We make similar observations for first marriages at age 23. However, first marriages at ages 28 and 33 remain almost constant among all women since there is almost universal marriage at age 28. Overall we see a catch-up in marriages between ages 18 and 28. Women are postponing marriages at age 18 but by age 28 and above we witness almost a universal marriage among the different age groups.

In the lower panels of Table 5.3 we look at the percentage of women who first marry at various attained ages by region of residence. First we observe that for first marriages at ages 18 and 23 the percentage of women who first marry in the Southeast

and the Southwest fluctuates among the first three age groups of oldest women and thereafter declines steadily from the oldest to the youngest women. First marriages at age 28 in the Southeast follows no definite pattern but that in the Southwest exhibits an inverted U-shaped distribution. First marriages at age 33 in the Southeast declines steadily from the oldest to the youngest women, but in the Southwest remains almost constant around 100 percent. We have fewer women who first marry at age 18 in the Southwest than the Southeast, however, at ages 23 and over women in the Southeast sometimes report fewer marriages than their counterparts in the Southwest. We also observe that the younger women in the Southeast and the Southwest are postponing marriages at age 18 and 23 but there is almost universal marriage at ages 28 and 33.

In contrast, for women residing in the North, we observe a steady increases in the percentage of women who first marry at ages 18 and 23 from the oldest women to the women ages 28-32 and declines slightly over the next relevant younger women. Even though the percentage distribution eventually declines, we still observe that a higher percentage of the younger women first marry at ages 18 and 23 than the oldest women. At ages 28 and 33 we observe a steady increases in the percentage of women who first marry from the oldest to the youngest women. In the North we see women postponing first marriages at only age 18 but we see a catch-up at ages 23 and beyond.

In comparing the three regions, we observe that on average for first marriages that occurred at ages 18 and 23 women residing in the Southwest report the lower percentages than women in the Southeast. Women in the North report the highest percentages of married women at ages 18 and 23. However, for first marriages at ages 28 and 33 the

oldest women ages 43–47 in the North report slightly lower percentages of first marriages than women in the Southwest and the Southeast. There is almost a universal marriage at ages 28 and 33 so the percentages in the three regions are very similar and closer to each other. Notice in particular that in the Southwest and the Southeast the youngest women eventually report lower percentages of marriage than the oldest women, but this is not the case in the North.

Women may postpone their first births for a variety of reasons. They may not be financially ready for the birth of their first child or job opportunities may conflict with the birth of a child. They may also postpone their first birth to complete their schooling. Work in the formal sector may require a new woman employee to work for at least two years before maternity leave with benefits could be paid. A newly employed woman may thus find it advantageous to postpone her first for financial security reasons. Thus a women in a modern competitive society may postpone first birth for the above reason. This may be the underlying factor for younger women in the Southeast and the Southwest postponing their first births. However, because of the relatively underdevelopment in the North, the opportunity cost of child birth may not be higher and thus the incentive to postpone first birth after marriage may not be as great as in the two southern regions.

TABLE 5.3
Percentage of Women Ever-Married at Various Attained Ages
By Five-Year Age Group. Nigeria, 1990.

		<u>By Age</u>				
		18	23	28	33	N
<u>ALL WOMEN</u>						
Age Group						
18-22		51.0	--	--	--	1831
23-27		57.8	83.4	--	--	1684
28-32		67.9	90.5	97.7	--	1587
33-37		64.6	89.8	97.7	98.7	955
38-42		63.5	89.1	97.8	99.5	951
43-47		60.1	88.3	97.2	99.5	572
<u>SOUTHEAST</u>						
Age Group						
18-22		37.4	--	--	--	487
23-27		47.3	74.9	--	--	427
28-32		57.7	85.7	94.4	--	392
33-37		59.3	83.3	93.8	95.6	275
38-42		62.2	86.9	96.4	98.4	251
43-47		59.8	85.8	95.9	99.4	169
<u>SOUTHWEST</u>						
Age Group						
18-22		22.5	--	--	--	609
23-27		26.4	70.3	--	--	517
28-32		40.2	82.5	97.5	--	445
33-37		47.2	87.9	99.0	100.0	290
38-42		37.5	83.2	96.6	99.7	291
43-47		42.4	85.9	98.2	100.0	170
<u>NORTH</u>						
Age Group						
18-22		83.5	--	--	--	735
23-27		85.9	97.4	--	--	738
28-32		87.9	97.9	99.5	--	750
33-37		81.3	95.9	99.5	100.0	390
38-42		82.9	94.6	99.5	100.0	469
43-47		73.4	91.8	97.4	99.1	233

Source: Calculated from Demographic and Health Survey, Nigeria, 1990

Conclusion

In the above discussion we have established the fact that education for women has increased for the younger women. If fertility has indeed fallen we should see that the younger women have fewer mean CEB at each of the attained age, the younger women should first marry and have their first births at much later age than the older women.

However, in looking at cumulative fertility at various attained ages, we do not observe an overall fall in fertility. Fertility eventually declines with the last two youngest cohorts, but even then at ages 28 and over, the cumulative fertility of the youngest cohorts is sometimes higher than that of the oldest cohorts.

In the Southeast we see a decline in cumulative fertility at ages 18 and 23, however, for cumulative fertility at ages 28 and beyond younger women seem to report higher mean CEB than the older women. In sharp contrast in the North, we observe a rising trend in cumulative fertility at various attained ages among women.

An investigation of first births and first marriages at various attained ages also revealed similar results. We do not see a declining proportion of younger women marrying and having their first births. At younger ages 18 and 23 we observe a slight decline in the percentage of young women who marry and have their first births but there is a late catch-up at ages 28 and beyond. Whilst this is true in the overall and the Southeast and Southwest, in the North we see a catch-up at age 23.

5.4. FAMILY PLANNING POLICIES AND CONTRACEPTIVE USE

Family Planning Policies

Family planning policies and the encouragement of women to use contraceptives for either birth spacing or stoppage has been the main direct influence on fertility. Since 1983, organized family planning services have received great governmental support. Family planning policies have now become a part of the state public health system. In addition family planning policies in Nigeria have received tremendous support from its Federal Ministry of Health, USAID, the World Bank and UNFPA (Feyisetan and Ainsworth, 1996).

Organization And Availability of Family Planning Services

Nigeria has a federal system of government with three tiers, Federal, state and local government. Policies and guidelines concerning family planning services are set by the Federal government. On the other hand, policies for the provision of services are determined at the state level and the actual implementation and provision of family planning services are handled by the local government areas (LCAs).

The organization of family planning facilities is structured on a three tier system. At the local level is the primary tier charged with among other things the provision of maternal and child health (MCH) care. At the state level we have the secondary tier which is composed largely of district hospitals charged with the provision of curative services. The federal level is the tertiary tier, which comprises of all the teaching hospitals.

According to the NDHS, 1990 data about 9.8 percent of currently married women in the rural areas live in communities served by a health worker who provides family planning services. Mobile clinics and market outlets together provide 4.5 percent of the family planning outreach services. Health workers provide family planning services to 13.3 percent of the women in the Southeast, and about 8.7 percent of women in the Southwest. In the North we have about 15.3 percent of women in the Northwest and 1.1 percent in the Northeast who receive family planning services from health care providers. (Table 10.1, NDHS, 1992)

About 31.4 percent of all currently married rural women live within 5 miles of a facility that provide family planning services. As many as 41.6 percent of women in the Southeast live in communities where informants were unable to identify a stationary facility which provides family planning services. On the other hand in the Southwest, all women live in communities with a stationary facility providing family planning services (see Table 10.1, NDHS, 1992 page 119). Also according to the NDHS, 1990 data about 37 percent of users of family planning supply methods live within one mile of a facility offering family planning methods compared to 9 percent nonusers (see also Feyisetan and Ainsworth, 1996).

Contraceptive Use

In the NDHS, 1990 data information about the knowledge and use of contraceptive methods was collected by asking the respondent to name ways or methods by which a couple could delay or avoid pregnancy. If respondent failed to mention a

particular method spontaneously, the interviewer described the method and asked if she recognized it. Both modern and traditional methods were described.

About 45.7 percent of all women have some knowledge of a contraceptive method and about 34 percent know a source. Among currently married women about 43.6 percent know a contraceptive method and 31.9 percent know a source (Table 4.1, NDHS, 1992). In the urban areas about 70.4 percent of currently married women know a method, in contrast only 36.3 percent of women in the rural areas know a method. In the Southeast about 56.6 percent of currently married women know a contraceptive method, in comparison about 75.6 percent of currently married women in the Southwest know a contraceptive method. In contrast, in the two northern regions, about 24 percent and 30.3 percent of currently women in the Northeast and Northwest know any method of contraceptive respectively (Table 4.2, NDHS, 1992)

Among currently married women with no schooling, only about 29.1 percent know any method of contraceptives. For currently married women with some primary education about 63.1 percent know a method, and roughly about 67.2 percent of those who have completed primary know a method. In comparison, about 83.8 and 90.8 percent of currently married women with some secondary and completed secondary or higher know a contraceptive method respectively (see Table 4.2, NDHS, 1992)

With regard to the use of contraceptives among women, we observe that, about 15.2 percent of all women have ever used a contraceptive method, about 9.0 percent modern and about 9.3 percent traditional method. On the other hand among currently

married women about 14 percent have ever used a contraceptive method, 8.4 percent modern method and 8.1 percent traditional method. (see Table 4.3 NDHS, 1992)

Among women who are currently using contraceptives about 7.6 percent of all women are use a method of contraceptives, 3.8 percent modern and 3.8 percent traditional. Among the currently married women about 6 percent use a method of contraceptives, 3.5 percent modern and 2.5 percent traditional (see Table 4.4 NDHS, 1992).

In terms of the influence of one's background characteristics and the use of contraceptives, we observe that about 14.8 percent of the urban women currently married use contraceptives, 9.6 percent modern and 5.2 percent traditional methods. Among those in the rural areas only about 3.6 percent are currently using a contraceptive method, 1.9 percent modern and 1.7 percent traditional. In the Southeast about 8.8 percent of currently married women use contraceptive, 3.9 percent modern and 5 percent traditional. In the Southwest this increases to 15 percent, 10.5 percent modern and 4.5 percent traditional methods. On the other hand in the Northeast and Northwest only 2 percent and 1.2 percent of currently married women use a contraceptive method respectively. In the Northeast 1.3 percent use modern methods and only 0.7 percent use traditional methods. In the Northwest 0.7 percent use modern methods and only 0.5 percent use traditional methods.

Among women with no schooling, about 2 percent use any method (1.3 percent modern and 0.7 traditional methods). On the other hand, for women with some primary education 7.8 percent use any method (3.9 percent modern and 3.9 percent traditional).

Those who have completed primary, 10.5 percent use any method (6.4 percent modern and 4.1 percent traditional). Among women with some secondary about 17 percent use any method (9.7 percent modern and 7.3 percent traditional. In comparison, among women who have completed secondary or higher, about 28.4 percent use modern and 11.7 percent traditional) (see Table 4.5, NDHS, 1992).

Relatively higher percentage of the middle-aged women use contraceptives than the older women. For example, among all women ages 20-24 and 25-29 about 9.5 and 8.6 percent currently use contraceptives respectively. In comparison, about 7.9 and 4.2 percent of women ages 40-44 and 45-49 currently use contraceptives respectively. We make similar observations for the currently married women.

There are three main kinds of sources of supply for contraceptive methods in Nigeria, namely from the government, the private sector and other sources. The government supplies about 36.7 percent of the modern contraceptives for current users. The private sector supplies about 47.2 percent of the modern contraceptives for current users and the rest come from other sources including Mission and Friends, relation and unknown sources (Table 4.8, NDHS, 1992).

5.5. SUMMARY AND CONCLUSIONS

This chapter has examined both female educational and fertility trends and family planning and contraceptive policies in Nigeria. Our evidence support the fact that female schooling has increased substantially from the oldest to the youngest cohorts. This is observed among all women in the survey as well as in the regional and urban samples.

We investigated the trends in fertility in general using indicators such as the number of children ever born, marital and birth patterns and cumulative fertility at various attained ages for all the women in the present analysis and also for the three major regions. Using the retrospective birth histories in the NDHS, 1990 data, we reconstructed cumulative fertility at various attained ages. We observed that at younger ages 18, 23 and 28, cumulative fertility declines with the youngest women within the relevant age range, but the decline is not large enough to offset the high fertility of the oldest women.

In the Southwest and the Southeast, we witness an eventual decline in fertility among the youngest women at ages 18 and 23. However, this does not indicate a decline in fertility since at ages 18 and 23 the older women had not completed their childbearing years and the younger women have just begun their reproductive years. On the other hand at ages 33, 38 and 43 we do not have the younger women to compare with. We see no indication of fertility decline in the North. We make similar observations for first marriages and first births for all the women and in the regions.

Family planning policies and programs have expanded since 1983-1989 when officially sponsored family planning programs began. However, family planning programs are still inaccessible to women in the North and in the rural areas. The distance to the nearest family planning facility is still more than one mile reach to 63 percent users and 91 percent of nonusers.

Contraceptive use has also gone up slightly among all women and also among currently married women (from one to six percent in three decades, both modern and

traditional methods). Nearly 46 percent of all women have some knowledge of a contraceptive method, this compares well with 43.6 percent among currently married women. Among women with no schooling only 29.1 percent know a method and nearly 90.8 percent of those who have completed secondary or higher know a method.

In sum one may conclude that the recent claim of a fertility decline in Nigeria of the magnitude of 1.3 in the total fertility rate between eight and four years before the survey may be an overestimation of the actual decline in fertility. There has been some expansion in the family planning policies and programs, however, services must be made more accessible to both users and nonusers. More educated women have better access to the information and use of contraceptives.

For a significant reduction in fertility levels, however, education must be more accessible to women with regard to the knowledge and use of contraceptives. To investigate how much of the decline in fertility if any, is accounted for by the increases in women's education we do a multivariate regression analysis in our next chapter.

CHAPTER 6

THE DYNAMIC RELATIONSHIP BETWEEN FEMALE SCHOOLING AND FERTILITY

6.1. INTRODUCTION.

Fertility transition has been slow and limited in sub-Saharan Africa. This is in part due to lack of development and unique cultural and religious practices that promote the demand for bigger families (Caldwell and Caldwell, 1987, 1990; World Bank 1984, 1986). In spite of these difficulties, some studies have found differentials in recent fertility or total fertility and desired family size among different socio-economic groups in sub-Saharan Africa (Cochrane and Farid, 1990).

Using Nigeria Demographic and Health Survey (NDHS) 1990, this chapter examines the evidence of a fertility decline in Nigeria. At the time of the survey, official family planning had been in force in Nigeria for only one year. In addition only about six percent of currently married women use contraceptive method (3.5 modern and 2.5 traditional). The NDHS, 1990 data also suggests that female schooling has increased dramatically for the younger women in the survey. For example, among women ages 18-47, women who are ages 43-47 have only 1.47 mean years of completed schooling, this compares with 5.54 means years of completed schooling for women ages 18-22 (see chapter 4). In the light of this tremendous increases in female schooling in recent years, one would expect fertility to have started to decline. In chapter 4 we found rather limited evidence of this. Fertility patterns are likely to differ by female schooling, the subject of this chapter. There has not been any systematic quantification of the influence of female

schooling on fertility in Nigeria. As mentioned in our literature review chapter, the use of the number of children ever born as a dependent variable in regressions that seek to examine the relationship between female schooling and fertility has censorship problems, since younger women in the survey have not had the same length of exposure to the risk of pregnancy and childbearing as the older women in the survey. This chapter provides an alternative measure of cumulative fertility. Using the birth histories of women in the survey, the cumulative fertility for each woman at age 18, 23, 28, 33, 38 and 43 was reconstructed. These variables will serve as our dependent variables.

We have reason to believe that the increasing trend in female schooling for younger women will alter both the demand and supply of children among the younger women and among the better educated. This is because the negative correlation between female schooling and fertility is well established in the empirical work on fertility (Cochrane, 1979; Ainsworth, Beegle and Nyamete, 1996).

This chapter examines in some detail, using both ordinary least squares and logit regression techniques, about how much of the decline in fertility in Nigeria is accounted for by female schooling alone. Later we introduce dummies for the different cohorts to investigate the cohort effect on fertility. We also introduce dummies for community variables such as urban residence, religious affiliation and type of marriage to investigate the influence of such variables on fertility decision making.

The rest of the chapter is organized as follows: Section II presents the theoretical and empirical model of the present study. Section III also presents the methodology of the study. Section IV discusses the results of both the multivariate least squares

regression of the determinants of fertility and the logit regressions on first births and first marriages at various attained ages. Beginning with the children ever born, this section first looks at the relationship between the number of children ever born and single years of female schooling. We further investigate the relationship between cumulative fertility at various attained ages and female schooling, birth cohort and community variables. The section also looks at the relationship between female schooling and age at first birth and age at first marriage. Finally the section also investigates the relationship between both female and husband's education on fertility for the ever-married women. Section V concludes the chapter.

6.2.1. THE THEORETICAL MODEL

Following the Quality-quantity economic model of household production (Becker, 1981; Becker and Tomes, 1973; Willis, 1973) as applied to contraceptive use and fertility (Rosenzweig, 1990 ; Rosenzweig and Schultz, 1993, 1985; Schultz, 1997), we assume that households choose to allocate resources in order to maximize their lifetime utility which depends on the consumption of both market and non-market goods. Non-market goods comprise of the number of their children C , the quality of their children Q (quality as measured by the average education and health of their children), the average leisure activities of both parents, L_h and L_w , and all market commodities represented by a composite commodity G . The household lifetime utility function has the usual neoclassical properties and is given by:

$$U = U(C, Q, L_h, L_w, G) \quad (1)$$

The household is assumed to be both a consumption and a production unit. It is assumed that each argument of the utility function is produced with both market goods X , and non-market time of both parents. Thus the production for each of the argument is given by;

$$A_i = A_i(X_i, t_h, t_w, \mu) \quad (2)$$

where $i = C, Q, L_h, L_w, G$ and μ is a couple specific traits which influence production possibilities. In the case of the production of children, μ might be exogenous genetic or environmental factors that affect a couple's production of children, which is called "fecundity". (Rosenzweig and Schultz 1983, 1985, 1987).

The household maximizes its lifetime utility function subject to both a time budget constraint and an income budget constraint. We assume for the moment that the time of the husband and that of the wife are mutually exclusive. Also both couple allocate time for both market and non-market activities. The time constraint for each couple is given by:

$$T_j = t_{jm} + \sum_i t_{ji} + \sum_j L_j \quad (3)$$

where $j = h, w$, $i = C, Q, L_h, L_w, G$, and t_m and t_j are market and non-market time. The income budget constraint is also given by::

$$Y = t_{hm}W_h + t_{wm}W_w + V \quad (4)$$

where W_j is the lifetime wage rate received by each member of the family so that lifetime market income is equal to the wage rate times market labor supply. V is non-labor income. of both household members. The full-income budget constraint is thus given by

$$F = T_hW_h + T_wW_w + V \quad (5)$$

If p_c represents the price of each child inputs, and W_h and W_w is the opportunity cost of leisure for the husband and wife respectively, and p_G is the price for the composite market commodity then the full-budget constraint facing the lifetime utility maximizing household is given by :

$$p_c(CQ) + W_hL_h + W_wL_w + p_GG = T_hW_h + T_wW_w + V \quad (6)$$

This gives rise to a nonlinear budget constraint. However, the assumption of a more convex utility function ensures an interior solution to the constrained utility maximization problem.

The reduced form demand equations for the household produced commodities are therefore the solution to the maximization of equation (1) subject to the full-budget

constraint given by equation (6) The reduced form derived demand functions for each of the argument in the utility function is thus given by:

$$Z_i = Z_i(P^*, W_h, W_w, V, \Theta, \xi), \quad (7)$$

where P^* is a vector of average prices of the market good and public services available to the household including that of the price of child inputs Child inputs may include the time of both couple, place or region of residence among other things. W_h , W_w , and V are as defined above and Θ is household specific traits that are a subset of μ , and ξ is an unobservable random disturbance term.

6.2.2 EMPIRICAL SPECIFICATION OF THE MODEL

Children like any other household production good impose both time and income constraints on the household. On the other hand, children may be valued as productive assets for their labor while young and as investments that may yield returns to parents in the future. The desire to lower fertility below its natural level depends on both the direct cost of raising children as well as the imputed value of time cost of both parents. Given the traditional assumption that women allocate more time to childbearing than men do, it is therefore, likely that the desired fertility will be lower among the higher wage and thus the better educated (see chapter 3). Maternal education is also likely to play other roles such as improved information on the efficient use of contraceptives. Given that the demand for children is a joint decision of the household, both husband's and wife's

education, and hence income may influence the desired demand for children. However, the substitution effect of the woman's income will outweigh the income effect of the husband's earning. Measures of both couple's lifetime wage earnings are given by their level of education. Couple specific traits influencing the number of children may include the relative age of the woman, community variables including type of union, area of residence and religious affiliation.

Thus the derived reduced form demand for children may be reformulated as:

$$Z^* = Z^*(E_w, E_h, BCD, U, R, M, \phi, \epsilon),$$

where E_w , E_h is the education of wife and husband respectively, BCD is birth cohort dummies, U is area of residence, R is religious affiliation, M is type of union, ϕ is a couple specific traits which is a subset of Θ and ϵ is an unobservable random disturbance term.

The reduced -form model of fertility determinants we estimate using both OLS and logit is in general of the form:

$$y_{ij} = \alpha_0 + \alpha_1 E_w + \eta_{ij}$$

$$y_{ij} = \beta_0 + \beta_1 E_w + \beta_2 BCD + \zeta_{ij}$$

$$y_{ij} = \lambda_0 + \lambda_1 E_w + \lambda_2 BCD + \lambda_3 Urban + \lambda_4 Religion + \xi_{ij}$$

$$y_{ij} = \delta_0 + \delta_1 E_w + \delta_2 E_h + \delta_3 BCD + \delta_4 Urban + \delta_5 Religion + \delta_6 Polygamy + \epsilon_{ij}$$

where :

y_{ij}	represents the dependent variables, cumulative fertility at various attained ages, first births and first marriages at various attained ages where appropriate, i indexing the dependent variable and j indexing the number of observations.
$\alpha_0, \beta_0, \lambda_0, \text{ and } \delta_0$	are intercepts
E_w	is woman's education in single years dummies up to ten years and eleven or more years of schooling.
E_h	represents husband's education in its various specification
BCD	represents birth cohort dummies of the woman representing some of the household specific traits.
Urban	is whether the woman lives in an urban area also capturing some of the environmental influence on fertility
Religion	is the woman's religion also capturing community influence on fertility
Polygamy	represents polygamous union which is measured by number of other wives.
$\eta_{ij}, \zeta_{ij}, \xi_{ij}, \text{ and } \varepsilon_{ij}$	are error terms capturing unexplained factors affecting fertility and also omitted variables from our regression.

Omitted Variables and Measurement Error Problems.

The nature of the data we have does not permit us to include all the variables that may affect fertility that theory suggests. The two main types of data problems, are that which may originate from omitted variables and that which may be due to measurement errors.

Omitted Variables

In our first sets of regressions we use only women's education as a measure of potential lifetime wage and variables that measure couple specific traits. We have omitted non-labor income because our data does not have observations on non-labor income. Non-labor income may help a couple to probably acquire more education for themselves or more investments in their children. Thus non-labor income may be correlated with the education of the wife. Therefore, the coefficient on women's education may be biased, the extent of the bias depending on the direction of correlation between the omitted non-labor income and education.

To solve this problem, in our second set of regressions however, we controlled for husband's in addition to that of the wife's when looking at the ever-married women. We had to restrict our analysis to the ever-married women for missing values problems. Even though husband's education may not be a perfect proxy for non-labor income, it captures some of the income effects from non-labor income if we had data.

Measurement Errors.

The other major problem is that of measurement errors. Chapter 4 of this study discussed in great details some of the potential measurements errors in the NDHS, 1990. These may be both sampling and non-sampling errors. Whilst sampling errors can be dealt with easily by consistency and reliability tests on the data, that of non-sampling are not easy to detect.

The major measurement errors we encountered were age heaping and underreporting of births by the oldest women in the survey. Since errors in the reporting of births affect cumulative fertility at various attained ages, which is our dependent variable, the errors can be absorbed into a composite error term on the right hand side. There will not be any estimation problems if the composite error term is not correlated with the regressors. However, from chapter 4 we observed that the better educated women report with greater accuracy than the uneducated. In addition the older women had problems with memory lapse, so the error term is likely to be correlated with both age and education. However, since age of respondents and education appear as a right-hand side variables, this may lead to bias and inconsistent coefficient estimates. To avoid this problem we eliminated the oldest women ages 48-49 in all of our regressions and also women ages 43-49 in some of our regressions when appropriate.

6.3. METHODOLOGY

6.3.1 Measurement of Variables

Our primary measures deal with education, fertility, age at first marriage and age at first birth.

Dependent Variables

The measure of fertility we use is cumulative fertility at various attained ages. Using the retrospective birth histories of the respondents, we reconstructed the cumulative fertility at various attained ages: 18, 23, 28, 33, 38 and 43. These will serve as our dependent variables, replacing the traditional use of number of children ever born as a dependent variable. The NDHS, 1990 data included age at first marriage, from this we reconstructed a dummy variable equal to one for women who had married by various attained ages likewise for first births. These are the dependent variables for the examination of schooling on age at first birth and age at first marriage.

Independent Variables

Women's Education

The NDHS, 1990 data included completed female education in single years. To examine in more details the relationship between female schooling and fertility, and to capture the nonlinear relationship between fertility and education, we created dummies for single years of schooling up to ten years and then a dummy for eleven or more years of schooling.

Cohort Effects

The desire of women to have children may vary by cohort. Women in relatively large cohort group may find it advantageous to delay the onset of childbearing and acquire more education to enter the labor market earlier, the reverse is true for women in a relatively small size cohort (Easterlin, 1968). Younger cohorts may benefit more from improved contraceptive technology, increased educational quality and changes in social acceptance of women in the formal labor force, making it easier to have lower fertility in the long- run. Thus by adding the dummies for the cohorts into our regression analysis, we hope to capture the role of cohort-specific factors in fertility decision making.

Area of Residence

To capture the influence of area of residence on fertility we include urban dummy in the regressions. The NDHS, 1990 data, also includes a variable on area of residence, urban and rural. It is generally believed in the literature that because of relatively higher level of living and formal labor market opportunities urban living offers, fertility tends to be lower among women residing in the urban relative to those living in the rural areas (Ainsworth, 1989; Singh and Casterline, 1985).

Religion

It is also believed in the literature that a woman's religious affiliation may alter her demand for children. Studies have found higher fertility rates for Muslims than non-Muslims (Yankey 1961; Rizk, 1963, 1973; Sinha, 1957; Caldwell, 1968). In the West,

studies have shown that Catholics have higher fertility than non-Catholics (Glass, 1968; Chou and Brown, 1968; Ryder and Westoff, 1971). In Nigeria, empirical work have also found Christians to have lower fertility than non-Christians. Muslim and traditional worshipers to be more fertile than Christians (Obadike, 1968; Orubuloye, 1981). The NDHS, 1990 data also includes a variable for religious affiliation of the respondents. We include dummies for women who are Protestants, Catholics and Muslim with those with traditional and no religion as our excluded variables.

Type of Marriage

Monogamy and polygamy exists side by side in many African countries including Nigeria. Islam and African Traditional religion promote polygamous marriage so it a common practice in many African countries. It is believed in the literature that individual women in polygamous union have lower fertility, since they have to share their husbands with other women. and since a large family size can be achieved by fewer children per woman (Namfua, 1981; Orubuloye, 1981). The NDHS, 1990 data contains a variable for type of marriage. Respondents were asked if they were in a polygamous union and if so the number of other wives the respondent's partner currently had. The base was women who were currently married. We created a dummy for respondents who reported to have one through nine other wives into polygamy and use this as an additional regressor. Polygamy at the right hand side poses a potential endogeneity problem. This is because in most agricultural societies where polygamy is practiced,

polygamy has been found to be positively related to the productivity of wives on the farm (Jacoby, 1995).

Husband's Education

The NDHS, 1990 data, has no measure of household income or consumption or household expenditure. However, it includes current husband's education in completed years, so we decided to use husband's education as a proxy for household income. If women bear the greater part in childbearing and childraising, then the impact of maternal education is likely to be larger than that of the husbands education. On the other hand if even the husband spends no time raising children, as long as both husband's and wife's leisure are complements within the household, the husband's education will also have a negative impact on fertility. To examine the impact of husband's education on fertility we have dummies representing husbands education for 1-5 years, six years, 7-10 years and eleven or more years of schooling. As a result of the fact that some of the women in the survey are not married, and some women could not recall their husbands education with accuracy we have missing variable problems with regard to husband education. Consequently, husband's education is used only in regressions for the ever-married women. The coefficient on husband's education may be biased downward because of random misreporting or displacement of husband's education by respondents or because current husband may not be a relevant factor for earlier fertility.

6.3.2 Methodology

Methods used in this present analysis are multivariate least squares and logit regression. Even though our dependent variable, cumulative fertility at various attained ages, takes on only positive values, and more efficient estimation procedures like Tobit or Poisson Count regression could be used, we decided to use the easy to interpret ordinary least squares regression analysis (see Ainsworth, 1989). However, because the first births and first marriages at various attained ages are binary, we decided to use logit regressions.

6.4. EMPIRICAL RESULTS.

We present both Ordinary Least Squares (OLS) and Logit regressions for various specifications of fertility equations. As dependent variables we use cumulative fertility at ages 18, 23, 28, 33 and 38 and binary variables indicating whether first births and first marriages have taken place by age 18 or 23. As a result of almost universal first births and first marriages at ages 28 and over, the Logit regressions are presented for first births and first marriages at ages 18 and 23. At the right hand side our explanatory variables include female schooling in single years, dummies for a woman's relative cohort, urban residence and religious affiliation, women in polygamous marriage, with our omitted variables being women with no schooling, rural residence, women in the 43-47 age cohort, traditional and no religion and women in monogamous marriage. We begin first by looking at the relationship between children ever born and single years of female schooling. The regressions for this chapter is restricted to women in the south, since from

our previous chapter it became apparent that fertility has fallen among the younger women in the Southeast and the Southwest but not in the North.

6.4.1. Education and Fertility: Mean CEB and Completed Years of Schooling.

We begin by looking at the relationship between female schooling and single years of female schooling. Figure 6.1 is a graphical representation of mean CEB and single years of schooling for all women ages 18-47 and also for women in the 18-27, 28-37 and 38-47 age groups.

Consistent with other empirical work in the literature, we find that the relationship between the mean CEB is highly nonlinear. Among all women ages 18-47, the mean CEB initially fluctuates and above that for women with no schooling with 1-3 years of female schooling. However, with four or more years of schooling we see a continuous fall in mean CEB with additional years of female schooling. So that from 4.35 mean CEB with no schooling, the mean CEB falls to 4.11 with four years of schooling, and still declines further to 1.28 with eleven or more years of schooling.

The profile representing mean CEB for completed years of schooling for the youngest women 18-27 is gentle indicating that the youngest women are the most educated and have little exposure to the risk of childbearing. We also observe that even among the youngest women, mean CEB for the first few years of schooling also is associated with higher fertility. It is only after four years of schooling that we observe a negative relationship between female schooling. From 2.36 mean CEB for women with

no schooling this declines even though not uniformly to 0.57 with eleven or more years of schooling.

For women in the 28-37 age group, mean CEB starts to decline below that of women with no schooling only with six or more years of female schooling. Mean CEB declines from 4.77 for women with no schooling to 2.95 for women with eleven or more years of schooling. As we get to the oldest women ages 38-47, the impact of female schooling on mean CEB diminishes. In fact it is only with nine or more years of schooling that we observe a powerful negative influence of schooling on mean CEB. Mean CEB declines from 6.22 for women with no schooling to 4.86 for women with eleven or more years of schooling.

We make several observations between female schooling and mean CEB. First the first few years of female schooling is associated with rising fertility. It is after a certain threshold has been reached that female schooling depresses fertility. Among the youngest cohort this is four years, among the middle cohort this is six years and among the oldest cohort the threshold is nine years of schooling. The influence of schooling is greatest among women in the 28-37 age group and mildest among women in the 38-47 age group.

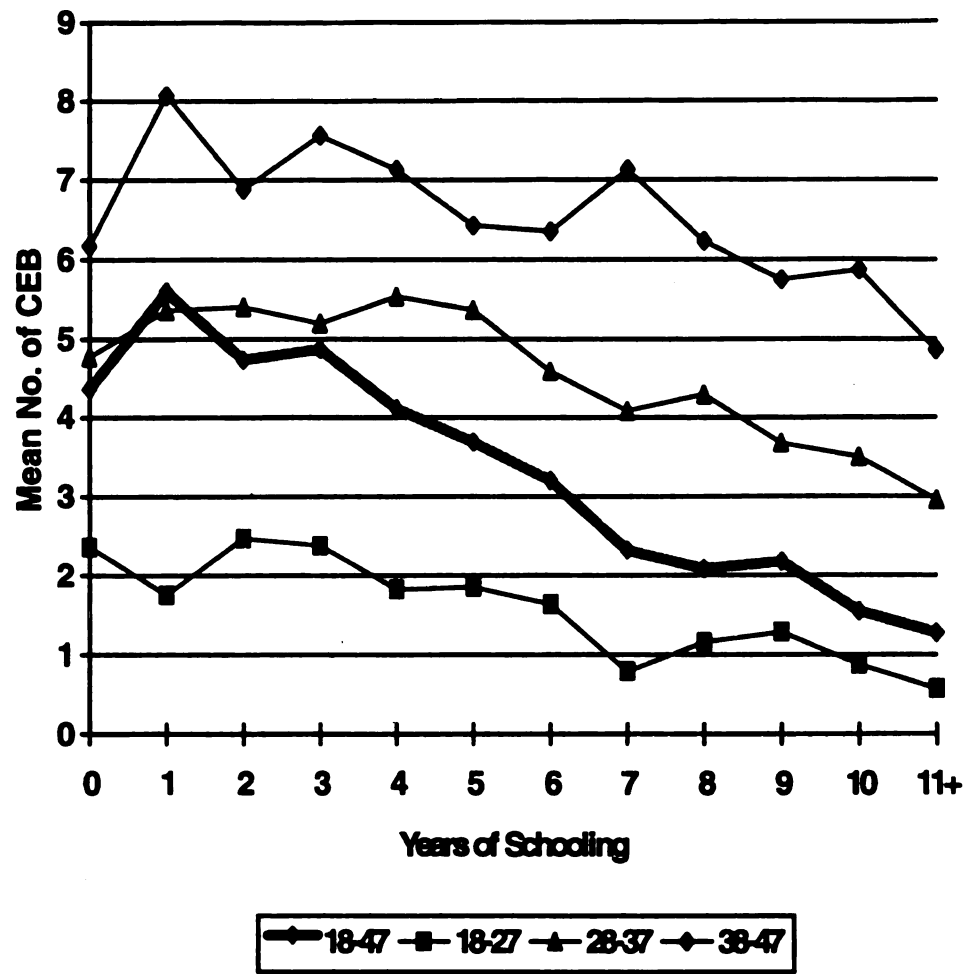


Figure 6.1- Mean CEB by Completed years of Schooling

6.4.2 REGRESSION ANALYSIS

Impact of Education on Fertility: Female Schooling Only

In order to study the relationship between fertility and female schooling, cumulative fertility at various attained ages is initially analyzed as a function of women's schooling in single years. The results are presented in Table 6.1. At age 18, 1-3 years of female schooling has an unpredictable influence on cumulative fertility, with that of women with one year of schooling being significantly higher. However, with four or more years of female schooling, we witness a powerful negative correlation between maternal education and cumulative fertility. For instance, women with six years of schooling have 0.24 fewer children and the gap widens to 0.53 fewer children with eleven or more years of schooling, as compared with women with no schooling.

At age 23, we observe a significant negative relationship between female schooling and cumulative fertility with six or more years of schooling. On the other hand at age 28 we observe a powerful negative relationship only with nine or more years of schooling. At higher attained ages 33 and 38, it is only women with eleven or more years of schooling who have significantly fewer children than their counterparts with no schooling.

In comparing the influence of schooling across cohorts we observe that with six years of schooling, at age 18, women have 0.24 fewer children, but at 23 they have 0.22 fewer children. At higher attained ages however, six years of schooling has no significant impact on cumulative fertility. On the other hand women with eleven or more years of schooling, at age 18 have 0.53 fewer children, 1.23 fewer children at age 23, and 1.39,

1.27 and 1.50 fewer children at ages 28, 33 and 38 respectively. Whilst the influence of six years of schooling diminishes at higher attained ages that of eleven or more years of schooling persists and even stronger at higher attained ages. It is possible that with time the influence of lower levels of schooling on fertility decisions fades out because of lack of job opportunities. On the other hand that of higher levels of schooling persists because it enhances a woman's competitiveness in the formal labor market.

Our results parallels other empirical studies on other African countries (Ainsworth et al, 1996; Thomas et al, 1995; Shapiro et al, 1997). Many reasons are given in the literature for the initial rise in fertility with the first few years of schooling. Among which are better hygienic way of living, good nutritional habits formation, and changing patterns of traditional fertility behaviors such as breastfeeding. Evidence that link good nutrition to fertility is however, either limited or not conclusive (Bongaarts, 1980; Menken et al, 1981). One plausible reason given is the fact that in most of the African setting, the quality of the education system is poor and with the high school drop out rates among girls literacy is not gained with one or two years of schooling. That girls who drop out after a few years of schooling are those whose parents wanted them to drop out or just could not keep up. Schooling just like any commodity may well be a choice variable and that self-selection may be a problem, those girls who drop out after a few years of schooling are not any different from those who never went to school to begin with (Ainsworth et al, 1996; Thomas 1995). We should also take note of the fact that some of the excluded variables like age, household income from our regressions may in

part explain the sometime non relation between the first few years of schooling and cumulative fertility.

Impact of Education on Fertility: Female Schooling and Age Cohorts

Table 6.2 presents our second set of equations which include female schooling and age cohorts of the respondents as our regressors. The inclusion of the cohort dummies does not change the significance of female schooling and has very minimal influence on the magnitude of the coefficients.

In all the regressions we continue to observe an inverted U-shaped distribution of the number of children born at various attained ages from the oldest to the youngest women as we observed in our descriptives in chapter 5. For instance, at age 18, we observe that relative to the oldest women ages 43-47, cumulative fertility increases steadily reaches its peak at a significant positive value of 0.13 for women ages 28-32, and declines over the next two younger age cohorts. Similar observations are made for cumulative fertility at ages 23 and 28, whilst that at age 33 rises steadily. There is thus no indication of a fertility decline among the younger women relative to the oldest women in the survey. We had anticipated however, that with the tremendous increases in women's education among the younger birth cohorts, this would be accompanied by declining fertility also among the younger women, but the evidence points to the contrary.

TABLE 6.1 - Impact of Education on Fertility - Female Schooling only

Dependent Variable	Cumulative Fertility at Age 18	Cumulative Fertility at Age 23	Cumulative Fertility at Age 28	Cumulative Fertility at Age 33	Cumulative Fertility at Age 38
	18-47	23-47	28-47	33-47	38-47
<u>Independent Variables:</u>					
1 year of Schooling	0.356** (0.14)	0.615** (0.29)	0.964** (0.40)	1.495** (0.54)	1.634** (0.76)
2 years of Schooling	- 0.106 (0.08)	0.240 (0.17)	0.437*** (0.25)	0.362 (0.34)	0.438 (0.51)
3 years of Schooling	- 0.085 (0.06)	0.041 (0.13)	0.169 (0.19)	0.769** (0.28)	0.973** (0.41)
4 years of Schooling	- 0.109*** (0.06)	0.083 (0.14)	0.273 (0.22)	0.529*** (0.30)	0.515 (0.47)
5 years of Schooling	- 0.272* (0.07)	- 0.139 (0.16)	- 0.014 (0.26)	0.222 (0.37)	- 0.160 (0.56)
6 years of Schooling	- 0.243* (0.03)	- 0.217* (0.07)	- 0.077 (0.11)	0.094 (0.16)	- 0.027 (0.23)
7 years of Schooling	- 0.235** (0.10)	- 0.177 (0.29)	0.118 (0.44)	0.901 (0.67)	0.998 (0.88)
8 years of Schooling	- 0.473* (0.07)	- 0.515* (0.17)	- 0.325 (0.32)	- 0.549 (0.51)	- 0.446 (0.83)
9 years of Schooling	- 0.358* (0.05)	- 0.456* (0.13)	- 0.470** (0.24)	- 0.445 (0.37)	- 0.634 (0.58)
10 years of Schooling	- 0.533* (0.06)	- 0.700* (0.18)	- 0.814** (0.35)	- 0.741 (0.54)	- 0.431 (0.94)
11 or more years of Schooling	- 0.527* (0.03)	- 1.229* (0.07)	- 1.388* (0.13)	- 1.271* (0.22)	- 1.502* (0.36)
Intercept	0.606* (0.02)	1.927* (0.04)	3.514* (0.06)	4.918* (0.08)	6.002* (0.11)
R-squared	0.08	0.10	0.08	0.04	0.04
F(all Covariates)	35.59	33.53	13.48	6.00	3.20
N	4317	3223	2279	1445	880

Note: Standard errors in parenthesis. * -- p-value < 0.01, ** -- p-value < 0.05, ***-- p-value < 0.10.

TABLE 6.2 - Impact of Education on Fertility - Female Schooling and Cohort Effects.

Dependent Variable	Cumulative Fertility at Age 18	Cumulative fertility at Age 23	Cumulative Fertility at Age 28	Cumulative Fertility at Age 33	Cumulative Fertility at Age 38
	18-47	23-47	28-47	33-47	38-47
Independent Variables:					
1 year of Schooling	0.358** (0.14)	0.618** (0.29)	0.960** (0.40)	1.485** (0.54)	1.637** (0.76)
2 years of Schooling	- 0.106 (0.08)	0.227 (0.17)	0.414*** (0.25)	0.345 (0.34)	0.430 (0.51)
3 years of Schooling	- 0.092 (0.06)	0.028 (0.13)	0.136 (0.19)	0.732** (0.28)	0.985** (0.41)
4 years of Schooling	- 0.110*** (0.06)	0.070 (0.14)	0.222 (0.22)	0.471 (0.30)	0.524 (0.47)
5 years of Schooling	- 0.276* (0.07)	- 0.163 (0.16)	- 0.062 (0.26)	0.179 (0.37)	- 0.161 (0.58)
6 years of Schooling	- 0.248* (0.03)	- 0.238* (0.07)	- 0.114 (0.11)	0.067 (0.16)	-0.027 (0.23)
7 years of Schooling	- 0.222*** (0.10)	- 0.187 (0.29)	0.114 (0.44)	0.906 (0.66)	1.009 (0.88)
8 years of Schooling	- 0.469* (0.07)	- 0.544* (0.18)	- 0.390 (0.38)	- 0.608 (0.51)	- 0.449 (0.83)
9 years of Schooling	- 0.359* (0.05)	- 0.477* (0.13)	- 0.525** (0.24)	- 0.497 (0.37)	- 0.627 (0.58)
10 years of Schooling	- 0.526* (0.07)	- 0.721* (0.18)	- 0.897** (0.35)	- 0.831 (0.54)	- 0.422 (0.94)
11 or more years of Schooling	- 0.529* (0.03)	- 1.257* (0.08)	- 1.460* (0.13)	- 1.343* (0.22)	- 1.497* (0.36)
Cohort Effects					
18-22	0.034 (0.05)				
23-27	0.097** (0.05)	0.068 (0.09)			
28-32	0.128** (0.05)	0.212** (0.09)	0.318** (0.12)		
33-37	0.079 (0.05)	0.146 (0.09)	0.508* (0.13)	0.420** (0.15)	
38-42	0.048 (0.05)	- 0.073 (0.10)	0.090 (0.13)	0.150 (0.15)	- 0.069 (0.17)
Intercept	0.536* (0.04)	1.853* (0.08)	3.275* (0.11)	4.716* (0.13)	6.043* (0.15)
R-squared	0.09	0.11	0.07	0.05	0.04
F(all Covariates)	25.37	25.74	12.16	5.76	2.94
F(cohort)	2.72	3.96	6.91	4.76	0.16
N	4317	3223	2279	1445	880

Note: Standard Errors in parenthesis. *-- p-value < 0.01, ***-- p-value < 0.05, **--p-value < 0.10

Impact of Education on Fertility: Female Schooling , Cohort and Community Variables

Table 6.3 presents our third set of equations, which in addition to dummies for single years of female schooling and age cohorts, includes dummies representing community variables. The community variables include urban residence and religious affiliation. As Table 6.3 demonstrates, the inclusion of the community variables do not change the significance of either the educational or age cohort dummies and has very little on the magnitude of the coefficients.

In all the regressions, women living in the urban areas have significantly fewer number of children born at various attained ages. Protestant background has an insignificant influence on cumulative fertility at various attained ages. Catholic influence is only significantly higher for cumulative fertility at age 23, otherwise it is not significant. In comparison, women with Islamic religious background have fewer children for cumulative fertility at all attained ages. This is, however, contrary to what we had anticipated. One would have expected that women with Islamic background enter into marriage early and thus this would provide the incentive for more children given the longer exposure to the risk of pregnancy and childbearing. On the other hand since Islam promotes polygamy, it is believed in the literature that women in polygamous marriage have fewer children. This is because they have to share their husbands with other women and larger families could still be achieved with each wife having fewer number of children. Furthermore, since our regression analysis is restricted to women in the South, women with Islamic background may well be migrants from the North. Since women

TABLE 6.3
Impact of Education on Fertility - Female Schooling, Cohort Effects and Community Variables

Dependent Variable	Cumulative fertility at Age 18	Cumulative fertility at Age 23	Cumulative fertility at Age 28	Cumulative fertility at Age 33	Cumulative fertility at Age 38
	18 - 47	23-47	28-47	33-47	38-47
Independent Variables:					
1 year of Schooling	0.343** (0.14)	0.567** (0.29)	0.887** (0.39)	1.395** (0.53)	1.721** (0.74)
2 years of Schooling	- 0.124 (0.08)	0.175 (0.17)	0.315 (0.25)	0.178 (0.34)	0.163 (0.50)
3 years of Schooling	- 0.095 (0.06)	0.004 (0.13)	0.109 (0.20)	0.727** (0.28)	0.998** (0.40)
4 years of Schooling	- 0.108*** (0.06)	0.046 (0.14)	0.215 (0.22)	0.546*** (0.27)	0.764 (0.47)
5 years of Schooling	- 0.291* (0.07)	- 0.212 (0.16)	- 0.109 (0.25)	0.187 (0.37)	- 0.035 (0.57)
6 years of Schooling	- 0.224* (0.03)	- 0.216*** (0.07)	- 0.063 (0.11)	0.253 (0.17)	0.372 (0.24)
7 years of Schooling	- 0.183*** (0.10)	- 0.149 (0.30)	0.192 (0.44)	1.140*** (0.66)	1.541*** (0.87)
8 years of Schooling	- 0.426* (0.07)	- 0.499** (0.18)	- 0.292 (0.32)	- 0.265 (0.51)	0.171 (0.82)
9 years of Schooling	- 0.313* (0.05)	- 0.412** (0.13)	- 0.391 (0.24)	- 0.224 (0.37)	- 0.115 (0.57)
10 years of Schooling	- 0.489* (0.08)	- 0.683** (0.18)	- 0.774** (0.35)	- 0.522 (0.54)	0.109 (0.92)
11 or more years of Schooling	- 0.483* (0.07)	- 1.214* (0.08)	- 1.364* (0.14)	- 1.064* (0.24)	- 0.909** (0.38)
Cohort Effects					
18-22	0.032 (0.05)				
23-27	0.095** (0.05)	0.067 (0.09)			
28-32	0.139* (0.05)	0.232** (0.09)	0.353* (0.12)		
33-37	0.086*** (0.05)	0.156 (0.10)	0.526* (0.13)	0.449* (0.15)	
38-42	0.058 (0.049)	- 0.054 (0.10)	0.122 (0.13)	0.204 (0.15)	0.010 (0.17)
Community Variables					
Urban Residence	- 0.088* (0.02)	- 0.140** (0.06)	- 0.265** (0.09)	- 0.517* (0.13)	- 0.996* (0.09)
Protestant	- 0.038 (0.05)	0.081 (0.10)	0.163 (0.15)	0.007 (0.21)	- 0.153 (0.29)
Catholic	- 0.004 (0.05)	0.196*** (0.11)	0.259 (0.16)	- 0.140 (0.23)	- 0.234 (0.32)
Islam	- 0.126** (0.05)	- 0.99 (0.11)	- 0.167 (0.17)	- 0.485** (0.25)	- 0.782 (0.33)
Intercept	0.606* (0.06)	1.838* (0.11)	3.258* (0.16)	4.515* (0.21)	6.575* (0.28)
R-squared	0.09	0.11	0.08	0.07	0.09
F(all Covariates)	22.36	21.87	11.15	6.68	5.23
F(Cohort and Community)	5.77	5.34	7.08	7.63	9.38
F(Community)	9.55	6.68	7.16	9.27	11.76
N	4317	3223	2279	1445	880

who migrate into the cities are the better educated, self-selection may also be a plausible reason for the lower fertility among the Islamic women.

6.4.3. PREDICTIONS: The Decline In Fertility Accounted for by Female Schooling

Following Oaxaca's decomposition (Oaxaca, 1973), we decided to decompose the decline in cumulative fertility from the oldest to the youngest women into that which is accounted for by the increases in female schooling and that which is unexplained by female schooling.

In Table A6.1. we predict how much of the decline in fertility from women ages 38-47 to those ages 18-22 that is accounted for by female schooling, controlling for relative cohort of the women. First using the regression coefficients on schooling for women ages 18-47 and second using coefficient on the regression for women ages 18-22. We observe that using the coefficients on women ages 18-47, about 25 percent of the decline in cumulative fertility at age 18 is accounted for by female schooling. When we use the coefficients on women ages 18-22, we observe that now at age 18, female schooling accounts for about 23 percent of the decline in fertility from the oldest to the youngest cohorts.

We make similar predictions for cumulative fertility at age 23. As Table A6.2 demonstrates, first using the regression coefficient on women ages 23-47, we observe that female schooling accounts for about 46 percent of the decline in fertility from the women ages 38-47 to women ages 23-27 at age 23. On the other hand when using the

regression coefficient on women ages 23-27, female schooling now makes a much bigger impact on the fertility decline, accounting for nearly 61 percent of the decline in fertility.

At higher attained ages however, we have fewer cohorts to compare and the decline in fertility among the older cohorts is small. In this regard, we do not report the prediction for cumulative fertility at ages 28 and beyond.

6.4.4 Age At First Marriage and Age At First Birth.

Age at First Marriage

Table 6.4 presents the regressions for women who had first been married by ages 18 and 23. At age 18, four or more years of maternal schooling is associated with delays in first marriages relative to women with no schooling. In our second set of regressions, the addition of the cohort dummies does not change the significance of the coefficients on schooling and has very little effect on the magnitude. Relative to the oldest women ages 43-47, women in the 28-32 and 33-37 age groups marry early. When community variables are added, we observe that urban residence delays first marriages at age 18, whilst none of the religious variables has significant impact on the timing of first marriages at age 18.

At age 23, the influence of female schooling on first marriages diminishes. Some primary education has no influence on the timing of first marriages at age 23. However, it is only with nine or more years of schooling that we observe female schooling delaying first marriages at age 23. We make similar observations with female schooling and the timing of first marriages with our second and third set of equations. In the second set

women ages 28-32 enter into marriages significantly earlier than the oldest women ages 43-47. On the other hand in our third set of regressions neither the cohort dummies nor community variables has predictive power on the timing of marriage.

The relationship between female schooling and age at first marriage at 18 and 23 is very similar to that of cumulative fertility at ages 18 and 23. This is not surprising since first marriages and cumulative fertility are closely related.

Age At First Birth

In Table 6.5 we also look at the relationship between first births at ages 18 and 23 and female schooling, relative cohort and community variables. We make similar observations between female schooling and first births at age 18 as we did with first marriages at age 18. Among the cohort dummies however, now women ages 23-27, 28-32 and 38-37 all have their first births significantly earlier than the oldest women ages 43-47, an observation we made in both regressions two and three. Urban residence is the only community variable which delays the onset of first births at age 18.

At age 23, the influence of female schooling on the timing of first births again greatly diminishes. In all three regressions it is only women with eleven or more years of schooling who consistently delay the onset of first births. In our second equations, among the cohorts, women ages 28-32 and 33-37 have their first births early, whereas in our third equation only women ages 28-32 have their first births early. Among the community variables only women with Protestant background have their first births early.

We make several observations in this section. First, the first few years of schooling has no predictive power on either cumulative fertility at various attained ages, first marriages or first births. It is only after a certain threshold of schooling has been reached that we observe a powerful negative relation between female schooling and cumulative fertility and other proximate determinants of fertility.

At younger ages 18 and 23, schooling makes an early impact on fertility decisions including the timing of age at first marriage and age at first birth. At age 18, it takes four years of schooling, and at age 23 it takes six years of schooling to make an impact on cumulative fertility, first marriages and first births. It should also be mentioned that at age 18, most women have not attained higher levels of schooling, with the quality of schooling in most African countries and late entrance into schooling. It is only at age 23 and above that women are either still going to school or nearing the completion of their education and thus a greater impact of schooling on fertility. At higher attained ages 33 and 38 the influence of schooling on fertility diminishes greatly. An evidence which is also consistent with the literature, a possible indication of a late catch-up effect.

**TABLE 6.4 - Impact of Education on First Marriages at Various Attained ages - Female
Schooling, Cohort Effects and Community Variables (Logit).**

Dependent Variable	First Marriage at Age 18			First Marriage at age 23		
	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
Independent Variables:						
1 year of Schooling	1.035** (0.50)	1.043** (0.50)	0.988*** (0.50)	4.033 (4.541)	4.025 (4.53)	4.041 (4.53)
2 years of Schooling	0.150 (0.24)	0.141 (0.24)	0.066 (0.24)	- 0.342 (0.35)	- 0.353 (0.35)	- 0.314 (0.36)
3 years of Schooling	- 0.007 (0.18)	- 0.014 (0.18)	- 0.037 (0.19)	0.508 (0.38)	0.493 (0.38)	0.508 (0.38)
4 years of Schooling	- 0.386** (0.18)	- 0.381** (0.18)	- 0.386** (0.18)	- 0.273 (0.30)	- 0.273 (0.30)	- 0.260 (0.31)
5 years of Schooling	- 0.113 (0.21)	- 0.114 (0.21)	- 0.179 (0.21)	- 0.101 (0.37)	- 0.110 (0.37)	- 0.091 (0.37)
6 years of Schooling	- 0.593* (0.09)	- 0.591* (0.09)	- 0.533* (0.09)	- 0.278** (0.15)	- 0.277*** (0.15)	- 0.304** (0.15)
7 years of Schooling	- 0.699* (0.28)	- 0.623** (0.28)	- 0.505*** (0.28)	- 0.221 (0.62)	- 0.227 (0.63)	- 0.262 (0.63)
8 years of Schooling	- 1.50* (0.21)	- 1.463* (0.22)	- 1.348* (0.32)	- 0.521 (0.34)	- 0.514 (0.35)	- 0.559 (0.35)
9 years of Schooling	- 1.128* (0.16)	- 1.107* (0.16)	- 0.985* (0.16)	- 0.771* (0.23)	- 0.750* (0.24)	- 0.817* (0.24)
10 years of Schooling	- 1.805* (0.22)	- 1.757* (0.23)	- 1.668* (0.23)	- 0.943* (0.31)	- 0.916* (0.31)	- 0.955* (0.32)
11 or more years of Schooling	- 2.261* (0.11)	- 2.242* (0.12)	- 2.124* (0.12)	- 2.081* (0.12)	- 2.067* (0.14)	- 2.121* (0.16)
Cohort Effects						
18-22		- 0.046 (0.14)	- 0.055 (0.14)			
23-27		0.168 (0.14)	0.166 (0.14)		- 0.013 (0.19)	- 0.012 (0.19)
28-32		0.263** (0.14)	0.301** (0.14)		0.315*** (0.19)	0.295 (0.19)
33-37		0.273** (0.14)	0.296** (0.14)		0.205 (0.21)	0.189 (0.21)
38-42		- 0.045 (0.14)	- 0.012 (0.14)		- 0.028 (0.20)	- 0.044 (0.20)
Community Variables						
Urban Residence			- 0.292* (0.08)			- 0.141 (0.12)
Protestant			- 0.006 (0.14)			- 0.051 (0.22)
Catholic			0.166 (0.15)			0.021 (0.23)
Islam			- 0.239 (0.15)			0.166 (0.25)
Intercept	0.400* (0.06)	0.284* (0.12)	0.392** (0.16)	2.167* (0.09)	2.061* (0.170)	2.009* (0.25)
- 2 log likelihood	5176.98	5150.11	5119.83	2730.47	2721.67	2716.72
Goodness of Fit	4316.38	4309.80	4323.27	3199.05	3208.68	3225.90
N	4317	4317	4317	3223	3223	3223
% married by age 18	41.6	41.6	41.6	81.2	81.2	81.2

Note : Standard Errors in parenthesis. *—p-value < 0.01, **— p-value < 0.05, ***- p-value < 0.10

**TABLE 6.5 - Impact of Education on First Births at Various Attained ages - Female
Schooling, Cohort Effects and Community Variables (Logit)**

Dependent Variable	First Births at Age 18			First Births at Age 23		
	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
Independent Variables:						
1 year of Schooling	0.476 (0.40)	0.484 (0.40)	0.433 (0.40)	0.384 (0.55)	0.382 (0.55)	0.348 (0.55)
2 years of Schooling	- 0.074 (0.24)	- 0.078 (0.23)	- 0.149 (0.24)	0.384 (0.32)	0.368 (0.32)	0.323 (0.33)
3 years of Schooling	- 0.034 (0.18)	- 0.058 (0.18)	- 0.088 (0.18)	0.251 (0.24)	0.239 (0.24)	0.194 (0.24)
4 years of Schooling	- 0.347*** (0.19)	- 0.351*** (0.19)	- 0.372*** (0.20)	0.070 (0.25)	0.057 (0.25)	0.016 (0.24)
5 years of Schooling	- 0.687* (0.24)	- 0.700* (0.24)	- 0.763* (0.24)	- 0.256 (0.26)	- 0.278 (0.26)	- 0.333 (0.26)
6 years of Schooling	- 0.531* (0.09)	- 0.542* (0.10)	- 0.510* (0.10)	- 0.057 (0.11)	- 0.069 (0.12)	- 0.115 (0.12)
7 years of Schooling	- 0.672** (0.32)	- 0.618*** (0.33)	- 0.537 (0.33)	0.110 (0.51)	0.107 (0.51)	0.064 (0.51)
8 years of Schooling	1.704* (0.30)	- 1.684* (0.30)	- 1.608* (0.31)	- 0.204 (0.28)	- 0.218 (0.29)	- 0.268 (0.29)
9 years of Schooling	- 1.017* (0.18)	- 1.013* (0.19)	- 0.927* (0.19)	- 0.278 (0.20)	- 0.280 (0.21)	- 0.327 (0.21)
10 years of Schooling	2.178* (0.14)	- 2.147* (0.35)	- 2.082* (0.36)	- 0.320 (0.28)	- 0.322 (0.28)	- 0.367 (0.28)
11 or more years of Schooling	- 2.145* (0.14)	- 2.146* (0.14)	- 2.054* (0.15)	- 1.579* (0.11)	- 1.589* (0.12)	- 1.644* (0.13)
Cohort Effects						
18-22		0.121 (0.16)	0.126 (0.15)			
23-27		0.325** (0.15)	0.337** (0.16)		0.043 (0.15)	0.050 (0.15)
28-32		0.483* (0.15)	0.524* (0.15)		0.265*** (0.15)	0.273*** (0.15)
33-37		0.355** (0.16)	0.379** (0.16)		0.263*** (0.16)	0.267*** (0.15)
38-42		0.152 (0.16)	0.181 (0.16)		- 0.065 (0.16)	- 0.062 (0.16)
Community Variables						
Urban Residence			- 0.268* (0.08)			- 0.013 (0.09)
Protestant			0.125 (0.14)			0.318*** (0.16)
Catholic			0.152 (0.15)			- 0.334*** (0.17)
Islam			- 0.134 (0.16)			- 0.259 (0.18)
Intercept	- 0.476* (0.06)	- 0.741* (0.13)	- 0.726* (0.17)	1.226* (0.07)	1.120* (0.13)	0.868* (0.18)
-2 log likelihood	4400.28	4382.29	4355.28	3645.35	3634.66	3630.56
Goodness of Fit	4316.76	4299.21	4276.64	3222.98	3226.58	3224.35
N	4317	4317	4317	3223	3223	3223
% with 1st births at Age 18	24.7	24.7	24.7	70.1	70.1	70.1

Note: Standard Errors in parenthesis. *— p-value < 0.01, **—p-value < 0.05, ***— p-value < 0.10.

6.4.5 Impact of Education on Fertility: Female and Husband's Education with Cohort, Community Variables (Ever-Married Women).

In this section we begin to look at the influence of both spouses education on fertility decisions. For each dependent variable we select women who have ever been married at the relevant age. We have also four specifications, the first equation is the maternal education only, the second being maternal education and that of their age cohort position, third we include community variables which include urban residence, religious affiliation and polygamous union. Finally the fourth set of equations include that of their husbands' education in addition to those in the third equation.

Table 6.6 looks at this for cumulative fertility at age 18. Female schooling makes a significant impact for the ever-married women at age 18 even with two or more years of schooling. We make similar observations in column two when we control for relative cohort. Relative to the oldest women, women ages 28-32 and 38-42 have more children at age 18. We continue to observe an inverted U-shaped distribution of births among the cohorts. The inclusion of the community variables do not change the magnitude and level of significance of the female education and cohort variables. Among the community variables it is only Islam background which has a negative impact on cumulative fertility.

Women in polygamous union have more children even though the coefficient is not significant. The inclusion of the husband's education changes the significance of the lower levels of maternal education, however, women with five or more years of schooling still have fewer children. Among the husband's education it is only women whose husbands have six years of schooling who have fewer children. This is however,

consistent with theory, since women who marry at age 18 are the least educated and thus may find the opportunity cost of childbearing relatively low. Also it is possible that these women may marry relatively well-to-do husbands and may have little contribution to fertility decisions in the household.

In comparing this with the all sample, we observe that the ever-married women have fewer children than all the women sample at lower levels of schooling but with eleven or more women in the all sample have fewer children. Among the cohorts too we observe that the ever-married women have born more children as compared with the all women sample.

In Table 6.7 we also look at the same set of regressions for cumulative fertility at age 23. At age 23 we witness that six or more years of female schooling (except seven years) depresses fertility. We make similar observations when we control for the relative cohort position of women. None of the cohort variables is significant. Women ages 28-32 have significantly more children at age 23 than the oldest women. Urban residence has a significant negative impact on cumulative fertility at age 23 but Catholic influence rather raises fertility at age 23. Polygamous union has an insignificant negative impact on fertility. Inclusion of husband's education affects only the significance of women with six years of schooling, however women with eight and ten or more years of schooling still have fewer children at age 23. Among the relative cohort and community variables we make similar observations as we did without controlling for husband's education. It is only women whose husbands have eleven or more years of schooling that have significantly fewer children at age 23. We again observe that higher levels of

schooling has a more negative impact on fertility among all the women than the ever-married women.

At age 28, as Table 6.8 indicates, the influence of schooling diminishes very much for the ever-married as we observed for the all women sample. It is only ever-married women with ten or more years of schooling who have fewer children. At age 28 however, the gap between the influence of maternal education on fertility for the all women and the ever-married narrows. This is not surprising since at age 28 and above we witness almost a universal marriage. Women in polygamous marriage have fewer children but again the result is not significant. None of the husband's education dummies has significant influence on fertility.

At ages 33 and 38 as Tables 6.9 and 6.10 indicate, the influence of female schooling diminishes even further as we noticed in the all women sample too. It is only women with eleven or more years of schooling who have fewer children. Urban residence and Islam background continue to make a negative impact on fertility. Women in polygamous marriage have fewer number of children even though the coefficient is not significant. Husband's education has no significant impact on fertility. Among the cohorts we continue to observe that the ever-married women have more children as compared with the all women sample.

We had anticipated that women in polygamous union will have fewer children. However, at age 18 we observe its influence to be positive even though it is insignificant. At ages 23 and above its influence is negative but again it is not significant. It is possible that Islam and polygamy are measuring the same effect in our regressions.

TABLE 6.6 - Impact of Education on Fertility - Female Schooling, Cohort Effects, Community Variables and Husband's Education (Ever-married at Age 18)

Dependent Variable:	Cumulative fertility At Age 18			
	Reg 1	Reg 2	Reg 3	Reg 4
Independent Variables:				
1 year of Schooling	0.204 (0.20)	0.203 (0.20)	0.200 (0.20)	0.221 (0.20)
2 years of Schooling	- 0.236*** (0.13)	- 0.224*** (0.13)	- 0.237*** (0.13)	0.219*** (0.13)
3 years of Schooling	- 0.184*** (0.10)	- 0.197*** (0.11)	- 0.203*** (0.11)	- 0.171 (0.11)
4 years of Schooling	- 0.197* (0.11)	- 0.195*** (0.11)	- 0.193*** (0.12)	- 0.160 (0.12)
5 years of Schooling	- 0.403* (0.12)	- 0.401* (0.12)	- 0.405* (0.14)	- 0.368* (0.13)
6 years of Schooling	- 0.217* (0.06)	- 0.218* (0.06)	- 0.190* (0.06)	- 0.155** (0.07)
7 years of Schooling	- 0.117 (0.19)	- 0.098 (0.20)	-0.064 (0.20)	- 0.028 (0.20)
8 years of Schooling	- 0.549* (0.17)	- 0.540* (0.17)	- 0.506* (0.17)	- 0.471* (0.17)
9 years of Schooling	- 0.282** (0.11)	- 0.280* (0.12)	- 0.230** (0.12)	- 0.194 (0.12)
10 years of Schooling	- 0.653* (0.18)	- 0.646* (0.18)	- 0.603* (0.18)	- 0.568* (0.19)
11 or more years of Schooling	- 0.490* (0.09)	- 0.488* (0.09)	- 0.444* (0.08)	- 0.416* (0.10)
Cohort Effects				
18-22		0.067 (0.09)	0.066 (0.09)	0.072 (0.09)
23-27		0.139 (0.09)	0.144 (0.09)	0.159*** (0.09)
28-32		0.180** (0.08)	0.195** (0.08)	0.199** (0.09)
33-37		0.091 (0.09)	0.099 (0.09)	0.099 (0.09)
38-42		0.147*** (0.09)	0.153** (0.09)	0.148 (0.09)
Community Variables				
Urban Residence			- 0.071 (0.05)	- 0.063 (0.05)
Protestant			- 0.077 (0.08)	- 0.065 (0.08)
Catholic			- 0.071 (0.09)	- 0.054 (0.09)
Islam			- 0.191** (0.09)	- 0.180** (0.09)
Polygamy			0.012 (0.05)	0.012 (0.05)
Husband's Education				
1-5 years of Schooling				- 0.109 (0.08)
6 years of Schooling				- 0.103*** (0.06)
7-10 years of Schooling				- 0.106 (0.10)
11+ years of schooling				- 0.082 (0.08)
Intercept	0.906* (0.03)	0.871* (0.07)	0.965* (0.10)	0.988* (0.10)
R-squared	0.04	0.04	0.04	0.05
F(all Covariates)	5.99	4.51	3.93	3.45
N	1798	1798	1798	1798

TABLE 6.7- Impact of Education on Fertility - Female Schooling, Cohort Effects, Community Variables and Husband's Education (Ever-married at Age 23)

Dependent Variable:	Cumulative fertility At Age 23			
	Reg 1	Reg 2	Reg 3	Reg 4
Independent Variables:				
1 year of Schooling	0.418 (0.29)	0.423 (0.29)	0.367 (0.29)	0.383 (0.29)
2 years of Schooling	0.328*** (0.18)	0.317*** (0.18)	0.244 (0.18)	0.232 (0.18)
3 years of Schooling	- 0.029 (0.14)	- 0.038 (0.14)	- 0.070 (0.14)	- 0.078 (0.14)
4 years of Schooling	0.048 (0.15)	0.039 (0.15)	0.018 (0.15)	0.015 (0.15)
5 years of Schooling	- 0.124 (0.18)	- 0.144 (0.17)	- 0.200 (0.17)	- 0.212 (0.17)
6 years of Schooling	- 0.171** (0.07)	- 0.186** (0.07)	- 0.154** (0.08)	- 0.128 (0.08)
7 years of Schooling	- 0.124 (0.31)	- 0.134 (0.31)	- 0.072 (0.31)	- 0.020 (0.31)
8 years of Schooling	- 0.475** (0.19)	- 0.497** (0.19)	- 0.419** (0.19)	- 0.389** (0.20)
9 years of Schooling	- 0.298** (0.14)	- 0.314** (0.14)	- 0.212 (0.14)	- 0.155 (0.15)
10 years of Schooling	- 0.575* (0.20)	- 0.587* (0.20)	- 0.524* (0.20)	- 0.422** (0.21)
11 or more years of Schooling	- 0.864* (0.09)	- 0.890* (0.09)	- 0.820* (0.10)	- 0.676* (0.12)
Cohort Effects				
18-22				
23-27		0.037 (0.10)	0.039 (0.10)	0.035 (0.10)
28-32		0.160 (0.10)	0.199** (0.10)	0.181*** (0.10)
33-37		0.105 (0.10)	0.121 (0.10)	0.144 (0.14)
38-42		- 0.089 (0.10)	- 0.065 (0.10)	- 0.071 (0.10)
Community Variables				
Urban Residence			- 0.205* (0.06)	- 0.198* (0.06)
Protestant			0.093 (0.11)	0.093 (0.11)
Catholic			0.236** (0.11)	0.232** (0.11)
Islam			- 0.130 (0.12)	- 0.127 (0.12)
Polygamy			- 0.055 (0.06)	- 0.064 (0.06)
Husband's Education				
1-5 years of Schooling				0.086 (0.10)
6 years of Schooling				0.049 (0.08)
7-10 years of Schooling				0.101 (0.13)
11+ years of schooling				- 0.199** (0.10)
Intercept	2.124* (0.04)	2.077* (0.08)	2.093* (0.12)	2.088* (0.12)
R-squared	0.04	0.05	0.05	0.07
F(all Covariates)	10.04	8.64	8.71	7.76
N	2619	2619	2619	2619

TABLE 6.8 - Impact of Education on Fertility - Female Schooling, Cohort Effects, Community Variables and Husband's Education (Ever-married at Age 28)

Dependent Variable:	Cumulative fertility At Age 28			
	Reg 1	Reg 2	Reg 3	Reg 4
Independent Variables:				
1 year of Schooling	0.891** (0.39)	0.888** (0.39)	0.821** (0.39)	0.835** (0.39)
2 years of Schooling	0.482*** (0.25)	0.462*** (0.25)	0.320 (0.25)	0.313 (0.25)
3 years of Schooling	0.149 (0.19)	0.111 (0.19)	0.066 (0.19)	0.056 (0.20)
4 years of Schooling	0.280 (0.22)	0.231 (0.22)	0.215 (0.22)	0.211 (0.23)
5 years of Schooling	- 0.025 (0.25)	- 0.073 (0.25)	- 0.131 (0.25)	- 0.144 (0.26)
6 years of Schooling	- 0.058 (0.10)	- 0.095 (0.10)	- 0.053 (0.11)	- 0.030 (0.12)
7 years of Schooling	0.045 (0.43)	0.040 (0.43)	0.099 (0.43)	0.172 (0.43)
8 years of Schooling	- 0.309 (0.31)	- 0.383 (0.31)	- 0.280 (0.32)	- 0.233 (0.32)
9 years of Schooling	- 0.352 (0.24)	- 0.403*** (0.24)	- 0.243 (0.24)	- 0.172 (0.25)
10 years of Schooling	- 0.694*** (0.36)	- 0.777** (0.35)	- 0.636*** (0.35)	- 0.499 (0.36)
11 or more years of Schooling	- 1.264* (0.13)	- 1.337* (0.13)	- 1.250* (0.15)	- 1.076* (0.17)
Cohort Effects				
18-22				
23-27				
28-32		0.321** (0.12)	0.362* (0.12)	0.354* (0.12)
33-37		0.502* (0.13)	0.525* (0.13)	0.513* (0.12)
38-42		0.087 (0.13)	0.126 (0.13)	0.122 (0.13)
Community Variables				
Urban Residence			- 0.302* (0.08)	- 0.296* (0.09)
Protestant			0.164 (0.15)	0.154 (0.15)
Catholic			0.255 (0.16)	0.239 (0.16)
Islam			- 0.228 (0.17)	- 0.231 (0.17)
Polygamy			- 0.129 (0.09)	- 0.135 (0.09)
Husband's Education				
1-5 years of Schooling				0.138 (0.15)
6 years of Schooling				0.042 (0.11)
7-10 years of Schooling				0.184 (0.18)
11+ years of schooling				- 0.216*** (0.13)
Intercept	3.586* (0.06)	3.349* (0.11)	3.410* (0.17)	4.405* (0.17)
R-squared	0.05	0.06	0.08	0.08
F(all Covariates)	10.98	10.16	9.93	8.52
N	2197	2197	2197	2197

**TABLE 6.9 - Impact of Education on Fertility - Female Schooling, Cohort Effects,
Community Variables and Husbands Education (Ever-married at Age 33)**

Dependent Variable:	Cumulative fertility At Age 33			
	Reg 1	Reg 2	Reg 3	Reg 4
Independent Variables:				
1 year of Schooling	1.457** (0.53)	1.446** (0.53)	1.374* (0.53)	1.362* (0.53)
2 years of Schooling	0.307 (0.34)	0.291 (0.34)	0.071 (0.34)	0.051 (0.34)
3 years of Schooling	0.742** (0.28)	0.697** (0.28)	0.661** (0.28)	0.623** (0.28)
4 years of Schooling	0.536* (0.31)	0.474 (0.31)	0.535*** (0.31)	0.512*** (0.31)
5 years of Schooling	0.184 (0.37)	0.133 (0.36)	0.129 (0.37)	0.117 (0.37)
6 years of Schooling	0.102 (0.15)	0.071 (0.15)	0.234 (0.17)	0.246 (0.18)
7 years of Schooling	0.863 (0.65)	0.869 (0.66)	1.059 (0.67)	1.113*** (0.65)
8 years of Schooling	- 0.586 (0.50)	- 656 (0.50)	- 0.345 (0.51)	- 0.277 (0.52)
9 years of Schooling	- 0.355 (0.38)	- 0.409 (0.37)	- 0.130 (0.53)	- 0.075 (0.39)
10 years of Schooling	- 0.778 (0.53)	- 0.883 (0.53)	- 0.578 (0.53)	- 0.474 (0.54)
11 or more years of Schooling	- 1.321* (0.22)	- 1.403* (0.22)	- 1.160* (0.24)	- 1.048* (0.27)
Cohort Effects				
18-22				
23-27				
28-32				
33-37		0.475* (0.15)	0.507* (0.15)	0.496* (0.15)
38-42		0.158 (0.15)	0.215 (0.15)	0.222 (0.15)
Community Variables				
Urban Residence			- 0.521* (0.13)	- 0.514* (0.14)
Protestant			0.011 (0.21)	- 0.025 (0.22)
Catholic			0.130 (0.23)	0.023 (0.23)
Islam			- 0.482** (0.24)	- 0.498** (0.24)
Polygamy			- 0.181 (0.12)	- 0.190 (0.12)
Husband's Education				
1-5 years of Schooling				0.309 (0.20)
6 years of Schooling				0.066 (0.16)
7-10 years of Schooling				0.083 (0.26)
11+ years of schooling				- 0.093 (0.21)
Intercept	1.955* (0.08)	4.733* (0.13)	5.011* (0.22)	4.992* (0.22)
R-squared	0.05	0.05	0.08	0.08
F(all Covariates)	6.10	6.13	6.90	5.79
N	1427	1427	1427	1427

TABLE 6.10 - Impact of Education on Fertility - Female Schooling, Cohort Effects, Community Variables and Husbands Education (Ever-married at Age 38)

Dependent Variable:	Cumulative fertility At Age 38			
	Reg 1	Reg 2	Reg 3	Reg 4
Independent Variables:				
1 year of Schooling	1.629** (0.76)	1.631** (0.76)	1.780** (0.74)	1.693** (0.74)
2 years of Schooling	0.472 (0.51)	0.424 (0.51)	0.131 (0.50)	0.003 (0.50)
3 years of Schooling	1.018** (0.41)	1.030** (0.41)	1.027* (0.41)	0.918** (0.41)
4 years of Schooling	0.599 (0.40)	0.608 (0.40)	0.848*** (0.48)	0.850*** (0.48)
5 years of Schooling	- 0.166 (0.58)	- 0.167 (0.50)	- 0.043 (0.57)	- 0.117 (0.58)
6 years of Schooling	- 0.027 (0.23)	- 0.027 (0.23)	0.353 (0.24)	0.357 (0.26)
7 years of Schooling	0.992 (0.88)	1.003 (0.69)	1.503*** (0.87)	1.580*** (0.88)
8 years of Schooling	- 0.452 (0.83)	- 0.455 (0.83)	0.121 (0.82)	0.201 (0.85)
9 years of Schooling	- 0.640 (0.58)	- 0.633 (0.58)	- 0.103 (0.57)	- 0.062 (0.59)
10 years of Schooling	- 0.437 (0.94)	- 0.428 (0.94)	0.112 (0.93)	0.218 (0.96)
11 or more years of Schooling	- 1.508* (0.36)	- 1.503* (0.36)	- 0.951* (0.38)	- 0.840** (0.42)
Cohort Effects				
18-22				
23-27				
28-32				
33-37				
38-42		0.070 (0.17)	0.010 (0.17)	0.036 (0.17)
Community Variables				
Urban Residence			- 0.992* (0.19)	- 1.015* (0.19)
Protestant			- 0.148 (0.30)	- 0.208 (0.30)
Catholic			- 0.280 (0.33)	- 0.347 (0.33)
Islam			- 0.733** (0.33)	0.737** (0.34)
Polygamy			- 0.226 (0.18)	- 0.240 (0.17)
Husband's Education				
1-5 years of Schooling				0.850* (0.30)
6 years of Schooling				0.134 (0.23)
7-10 years of Schooling				0.096 (0.40)
11+ years of schooling				0.016 (0.30)
Intercept	6.01* (0.11)	6.049* (0.15)	6.669* (0.29)	6.597* (0.29)
R-squared	0.04	0.04	0.09	0.10
F(all Covariates)	3.27	3.01	5.03	4.479
N	875	875	875	875

6.4.6 URBAN AND RURAL SAMPLES

In Tables A6.3 and Table A6.4 we have the regression result for women living in the urban and rural areas in the South for our third set of equations. As evident in the tables, fertility declines with higher levels of female schooling in both the rural and urban areas. At age 18 in particular, cumulative fertility declines with two or more years of schooling for women in the rural areas but only with six or more years of schooling for women in the urban areas. This is consistent with empirical work in the literature which suggests that women with lower levels of schooling may have slightly higher fertility in the urban areas than the rural areas due to greater relaxation of traditional fertility restraints in urban areas than rural areas (Singh and Casterline, 1985). In both the urban and rural areas we observe an inverted U-shaped distribution of births among the age cohort dummies from the oldest to the youngest cohort. However, within each age group women residing in the rural areas have born more children than those in the urban areas. Among the community variables, however, has predictive power in the urban areas but Islam has a significant negative influence on fertility in the rural areas..

We make similar observations for cumulative fertility at age 23. In the rural areas we have scattered influence of female schooling on cumulative fertility at age 23, on the other hand women with eight or more years of schooling in the urban areas have fewer children. Community variables do not make any impact in both the urban and rural areas.

At age 28, however, the influence of schooling diminishes in both the urban and rural areas. In the urban areas it is only women with eleven or more years of schooling

who have fewer children, but in the rural areas women with nine and eleven or more years of schooling have fewer number of children born at age 28.

At higher attained ages, influence of female schooling diminishes still further in both the rural and urban areas. In both areas it is only women with eleven or more years of schooling who have fewer children at age 33 and 38. The influence of eleven or more years of schooling however, has a greater impact on fertility for women in the rural areas than the urban areas. None of the community variables has influence on cumulative fertility at ages 33 and 38 in the rural areas but Islam has a significant negative impact on cumulative fertility at ages 33 and 38 in the urban areas. At age 33 and 38, however women ages 33-37 and 38-42 in the urban areas have more children than those in the rural areas.

We tested if the rural and urban regressions were significantly different and found them to be jointly significant.. The early years of schooling is sometimes associated with higher fertility in the urban areas at all attained ages though its influence is not significant. On the other hand in the rural areas women with one year of schooling have significantly more children born at all attained ages.

6.5. SUMMARY

In this chapter, we have analyzed the relationship between female schooling, relative cohort position and community variables on such key correlates of fertility such as cumulative fertility, age at first marriage and age at first birth in southern Nigeria where it is believed that fertility had fallen in recent years.

Our results indicate that lower levels of female schooling does not influence fertility decision making. It is only after a certain threshold has been reached that increases in female schooling begin to have a negative impact on fertility. Schooling has a differential impact on fertility depending on a woman's age. Among the youngest women 18-27, the threshold is about four or more years of schooling, among women ages 28-37 the threshold is about six or more years of schooling, and with the oldest women 38-47 it is eight or more years of schooling. We make similar observations for the relationship between female schooling and age at first marriage and age at first births. We observe that about 25 percent to 61 percent of the decline in fertility is accounted for by female schooling, controlling for the relative cohort position of the woman.

Urban residence has a significant negative influence on fertility and age at first marriage and age at first birth. On the other hand, Protestant or Catholic background often has unpredictable effect, whilst that of Islam background makes a significant negative impact on cumulative fertility and the other proximate determinants of fertility. The inclusion of women in polygamous unions did not change our results, in addition it was not significant in all of our regressions. .

Among the ever-married women, we observed that within each cohort the ever-married have born more children than women in the all sample. Husband's education actually raises fertility for younger women, whilst its impact is negligible for the older women. It is only women whose husbands have either six or eleven or more years of schooling that have sometimes fewer children at age 18 and higher attained ages respectively.

In looking at the urban and rural women we observe that higher levels of female schooling makes a significant negative impact on fertility in both the rural and urban areas, with its greatest impact in the rural areas. Islamic background makes a significant impact on fertility in rural areas at younger ages and in the urban areas at higher attained ages. Protestant and Catholic backgrounds, however, make some impact in both the rural and urban areas.

We had anticipated that Islamic background would have a positive impact on fertility and other proximate determinants of fertility but our results point to the contrary. This may be in part because of the restriction of our regression analysis to women in the south since Islam is practiced on a wider scale in the North. It is also possible that women who are in the Islamic faith in the south are better educated migrants from the North. We have similar reasons for the insignificant impact of polygamous union on cumulative fertility for the ever-married women.

CHAPTER 7

INCREASES IN WOMEN'S EDUCATION AND FERTILITY DECLINE

7.1. INTRODUCTION

From our analysis in chapter 5, there was little or no evidence to suggest an overall fertility decline in Nigeria in spite of the tremendous increases in schooling for women. There was some evidence however, of a decline in fertility in the Southwest and the Southeast among the youngest two birth cohorts. In chapter 6 we also examined in some detail the relationship between female schooling and cumulative fertility at various attained ages and other proximate determinants of fertility. Our analysis suggests that women who have completed primary school and beyond consistently have fewer children ever born by ages 18, 23 and 28. At higher attained ages 33 and 38, however, the influence of schooling on fertility diminishes, but that of eleven or more years of schooling persists. Similar observations were made for first marriages and first births at various attained ages.

A sustainable fertility transition must be accompanied by younger women having fewer children, marrying later and having their first births later than the older women at each of the various attained ages. However, even from the regressions in chapter 6, we still observe an inverted U-shaped distribution of children ever born from the oldest to the youngest women. In addition we found evidence to support that younger women do first marry and have their first births earlier than the older women. Evidence from chapter 6

suggests that women with higher levels of schooling have fewer children but still we may not know from the analysis that fertility has fallen.

In this chapter, we investigate further to see if fertility has indeed fallen and if so among which socio-economic groups, using female schooling as our measure of social stratification. We run a series of regressions in this chapter over different levels of female schooling. Our object is to see if women of the same age group behave differently depending on their educational status with regard to fertility decision making. We report the results for cumulative fertility at ages 18, 23 and 28 since at higher attained ages we have fewer age groups to compare and the regressions coefficient were not jointly significant. For similar reasons and for the fact that at higher attained ages we have almost universal first marriages and first births we report that for first marriages and first births at ages 18 and 23.

The rest of the chapter is organized as follows: Section II first looks at the trend in cumulative fertility over different schooling levels and second at the multivariate least squares analysis of fertility over different schooling levels. Section III also discusses the logit regressions of age at first marriage and age at first births over different levels of female schooling. Section IV concludes the chapter.

7.2. Increases In Women's Schooling and Fertility Decline

7.2.1 Cumulative Fertility at Various Attained Ages by Years of Schooling

In Figure 7.1 A through Figure 7.2D we look at the trend in cumulative fertility among age groups of women in the survey over different levels of female schooling. As

Figure 7.1A shows at age 18, the cumulative fertility profiles for women with either no schooling or 1-5 years of schooling rise steadily from the oldest women reaching their peaks with women ages 23-27 and then declines with the youngest women.. On the other hand , for women with six years of schooling the profile remains fairly constant for women ages 33-47 but thereafter rises steadily from the oldest to the youngest women. In sharp contrast, that of women with seven or more years of schooling rises initially but then declines steadily from the oldest to the youngest women.

In Figure 7.1B we make similar observations for cumulative fertility at age 23. Cumulative fertility rises steadily from the oldest to the youngest women with no schooling or 1-5 years of schooling. That of women with six years of schooling declines with the two youngest age cohorts. On the other hand, cumulative fertility of women with seven or more years of schooling declines steadily from the oldest to the youngest age cohort.

At age 28 as Figure 7.1C shows, we observe a more pronounced inverted U-shaped distribution for women with no schooling or 1-5 years of schooling but that of women with six years of schooling rises steadily from the oldest to the youngest women. On the other hand, the profile for women with seven or more years of schooling declines steadily from the oldest women to the youngest women. At age 33 on the other hand , cumulative fertility for women with no schooling, 1-5 years and six years of schooling all rise uniformly from the oldest to the youngest women. In sharp contrast, however, the cumulative fertility for women with seven or more years of schooling declines steadily from the oldest to the youngest women as evident in Figure 7.1D.

Several implications can be drawn from the analysis presented in Figures 7.1A through 7.1D. First, since cumulative fertility at age 18 for all levels of schooling and for all the ages groups is less than 1.00, this means Nigerian women have started motherhood at age 18 but have not started parenting yet. Women with no schooling report the highest cumulative fertility, followed by those with 1-5 years of schooling, followed by women with six years of schooling, women with seven or more years of schooling reporting the lowest cumulative births at age 18. There is therefore, a clear inverse relationship between schooling and cumulative fertility at age 18.

At age 23, however, the cumulative fertility for women with no schooling, 1-5 years and six years are almost indistinguishable and all women have started parenthood. On the other hand, women with seven or more years of schooling report the lowest cumulative fertility and the last two youngest women have not started parenthood at age 23.. However, even at age 23 the inverse relation between education and fertility remains for the two youngest women. At ages 28 and 33 however, the perfect inverse relationship between cumulative fertility and fertility disappears since women with 1-5 years and six years of schooling have more children at ages 28 and 33 than women with no schooling. It is women with seven years of schooling who have the lowest fertility even at ages 28 and 33. We can conclude that women 1-5 years and six years of schooling are the most likely to postpone births at ages 18 and 23 but then catch-up by age 28 and above.

Figures 7.2A through 7.2D are another look at the same data but this time for cumulative fertility at various attained ages for different levels of schooling. As evident in Figure 7.2A for women with no schooling cumulative fertility at various attained ages rises steadily from the oldest to the youngest women. We begin to observe an inverted U-shaped distribution for women with 1-5 years and six years of schooling for cumulative fertility at ages 23, 28 and 33. In sharp contrast, for women with seven or more years of schooling, cumulative fertility at all attained ages decline from the oldest to the youngest women.

The evidence above suggests that cumulative fertility may have fallen only for women with seven or more years of schooling, the better educated women. However, it may also be better reporting of births by the more educated women relative to the least educated. In the next section we run a series of regressions to investigate whether fertility has indeed fallen and for women in which schooling category.

7.2.2 Education and Fertility: Results by Levels of Female Schooling

Table 7.1 presents our regression analysis for cumulative fertility at age 18 for women with no schooling, 1-6 years of schooling and seven or more years of schooling. We combined women with 1-5 years and six years of schooling because the slopes of the profiles were very similar.

We begin by running our first set of regressions with only cohort dummies and then add education and later community variables. For women with no schooling we have only two specifications. A look at cumulative fertility at age 18 for women with no

schooling reveals that relative to the oldest women ages 43-47, all the younger women have more children except those ages 18-22. Children ever born at age 18 rises steadily with the 38-42 age group to significant high of 0.17 and 0.18 with women ages 28-32 and 23-27 respectively, a pattern very similar to the inverted U-shaped distribution discussed above. We make similar observation in our second equations for women with no schooling. Urban residence and Islam have a negative influence on fertility for women with no schooling.

Among women with 1-6 years of schooling we continue to observe that relative to the oldest women, all the younger women have borne more children at age 18. The result is significantly higher for women ages 33-37 in our first specification and for women ages 23-27, 28-32 and 33-37 in our second specification. Relative to women with one year of schooling women with 2-6 years of schooling all have fewer children, an observation we made in both our second and third specifications.

The picture is significantly different for women with seven or more years of schooling. Relative to the oldest women ages 43-47, the last three youngest age cohorts all have fewer children even though the result is not significant, an observation we also made in all specifications. None of the community variables has any predictive influence on cumulative fertility at age 18. Relative to the women with seven years of schooling those with eight or more years of schooling have fewer children.

As Table 7.2 shows, at age 23 for women with no schooling women ages 23-27 and 28-32 have significantly more children. Cumulative fertility at age 23 increases steadily from the oldest to the youngest women. This is an observation we make when

we also control for community variables. Urban residence depresses fertility, so does Islamic influence. For women in with 1-6 years of schooling, in all three specifications all younger women have more children born at age 23 than the oldest women with the women of ages 33-37 being significantly higher. Relative to women with one year of schooling, those with three or more years of schooling have fewer children in our second set of equations. We make similar observations when we control for community variables. Women with Protestant or Catholic backgrounds have more children.

As we get to women with seven or more years of schooling we make remarkably different observations. In all of our three sets of equations, the younger women have fewer children than the oldest women, with that of the youngest women ages 18-22 being significantly lower in two of the specifications. At age 23 however, it is only women with ten or more years of schooling who have fewer number of children in both specification. In our third specification none of the community variables has predictive power.

At age 28 and among women with no schooling we again observe that women ages 28-32 and 33-37 have significantly more children as evident in Table 7.3. Urban residence makes a significant negative impact on cumulative fertility at age 28 and so is Islamic affiliation. We make similar observations with women who have 1-6 years of schooling. Relative to women with one year of schooling women with 2-6 years of schooling have fewer children in both specifications that female education is controlled for. On the other hand, among women with seven or more years of schooling, we observe that younger women have fewer children with that of the 28-32 being significantly lower. We observe that relative to those with exactly seven years of

schooling, it is only women with ten or more years of schooling who have significantly fewer children.

In sum, in looking at the regressions for women in different schooling categories, we observe that for women with no schooling or 1-6 years of schooling the younger women have more children than the oldest women, an observation we make for cumulative fertility at ages 18, 23, and 28 respectively.

7.3.3 Age at First Marriage and Age at First Birth: By Levels of Female Schooling

In this section we also run logit regressions for age at first marriage and at first birth over levels of female schooling to see if women in the same age group behave differently depending on their educational status with regard to marital and birth decision making. We report the results for only first marriages and first births at ages 18 and 23 since there is almost a universal marriage and first births at ages 28 and over.

Age at First Marriage

Table 7.4 reports first marriages at age 18 for women with no schooling, 1-6 years of schooling and seven or more years of schooling. For women with no schooling in our first regression we observe that women ages 23-27 and 28-32 significantly marry early relative to the oldest women. When we control for community variables the magnitude and significance of the cohort dummies do not change very much. In addition urban residence delays first marriages but Catholic background ushers women into first marriages at age 18 early.

For women with 1-6 years of schooling, we observe that relative to the oldest women, the younger women (except those ages 33-37) marry early even though the coefficients are not significant. In addition relative to women with one year of schooling those with 2-6 years of schooling do marry late at age 18. Urban residence delays first marriages at age 18 whilst women with 2-6 years of schooling all marry late relative to those with one year of schooling.

As we move to women with seven or more years of schooling we observe that the younger women postpone marriages at age 18 as compared to the oldest women. Women ages 18-22 and 23-27 significantly postpone their marriages at age 18 than the oldest women. We make similar observations when we control for years of schooling. Women in all the schooling categories marry late relative to those with exactly seven years of schooling, with that of women with eight and ten years of schooling being significant. In the third set of regressions when we control for community variables as well, we observe that women in the urban areas as well as women in all the religious groups marry late at age 18.

We make a similar observation for first marriages at age 23. Urban residence delays first marriages at age 23, but religious influence ushers women into early first marriages at age 23. For women with 1-6 years of schooling we observe that relative to the oldest women all the younger women first marry early. None of the community variables make any significant impact on the timing of first marriages at age 23.

We make different observations for women with seven or more years of schooling. In all the three specifications the younger women marry late relative to the

oldest women even though the coefficients are not significant. It is only urban residence and eleven or more years of schooling that have a delay impact on first marriages at age 23.

Age at First Birth

In Table 7.6 we document first births at age 18 over levels of female schooling. In both specifications for women with no schooling, we observe that younger women have their first births early at age 18 than the oldest women with that of women ages 23-27 and 28-32 being significant. Urban residence and Islamic influence delays the onset of first births at age 18. For women with 1-6 years of schooling we again observe that relative to the oldest women younger women have their first births early, the results being significant for women ages 28-32 and 33-37. In addition relative to women with one year of schooling, women with four and six year of schooling delay their first births at age 18. In the third specification none of the community variables has a significant impact on the timing of first births at age 18.

For women with seven or more years of schooling, we make slightly different observations. In all the equations the three youngest women delay the onset of their first births even though the coefficients are not significant. Relative to women with seven years of schooling, women with eight, ten and eleven or more years of schooling delay their onset of first births. All the community variables delay the onset of first births with that of urban residence being significant.

At age 23 as Table 7.7 shows, for women with no schooling, the youngest two cohorts have their first births at age 23 early relative to the oldest women. Urban residence delays the onset of first births at age 23, but Protestant and Catholic background quicken the onset of first births at age 23.. For women with 1-6 years of schooling, we also observe that relative to the oldest women all the younger women have their first births early with that of women ages 33-37 being significant. This is an observation we make in all the three specifications. None of the community variables make any significant impact on first births. Apart from women with three years of schooling who delay their first births, the rest are not significant. In sharp contrast for women with seven or more years of schooling, we observe that relative to the oldest women. the younger women have their first births late with that of women ages 23-27 being significant in the first equation. None of the community variables has predictive influence of first births at age 23. Relative to women with seven years of schooling only women with eleven or more delay their first births at age 23.

The effect of female schooling on cumulative fertility, age at first marriage and age at first births are very similar. At lower levels of schooling, the younger women have more children, marry early and have their first births early relative to the oldest women. However for women with seven or more years of schooling, we observe that the younger women have fewer children, first marry late and delay the onset of first births. This suggests then that fertility may have fallen among the better educated women.

7.4. SUMMARY

The main objective of this chapter was to investigate if women behave differently with regards to fertility decision making depending on the educational level. Our second object was also to find out if fertility has fallen and if so among which socio-economic group. The result indicates that fertility may have fallen among the better educated women in the south. Among women with no schooling and 1-6 years of schooling we observe that the younger women rather have more children relative to the oldest women. However, among women with seven or more years of schooling, we observe that younger women have fewer children. An observation we made for cumulative fertility at ages 18, 23, and 28 and in all our three specifications.

We make similar observations for other proximate determinants of fertility such as age at first marriage and age at first birth. Among women with no schooling and 1-6 years of schooling the younger women are marrying early and having their first births earlier than the oldest women. On the contrary among women with seven or more years of schooling, we observe that the younger women delay their first marriages and the onset of their first births.

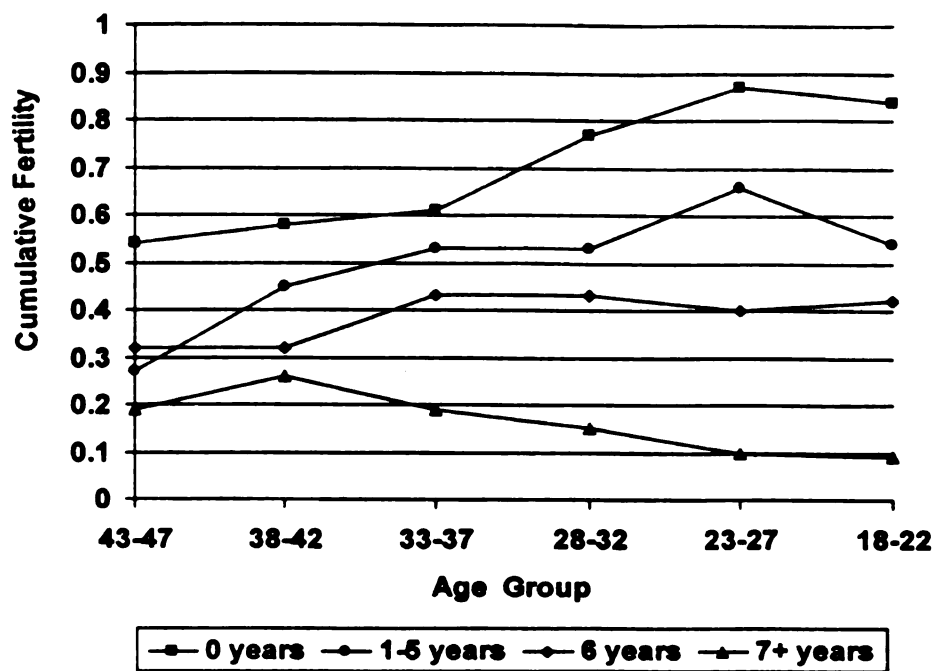


Figure 7.1A- Cumulative Fertility at Age 18
by Years of Schooling.

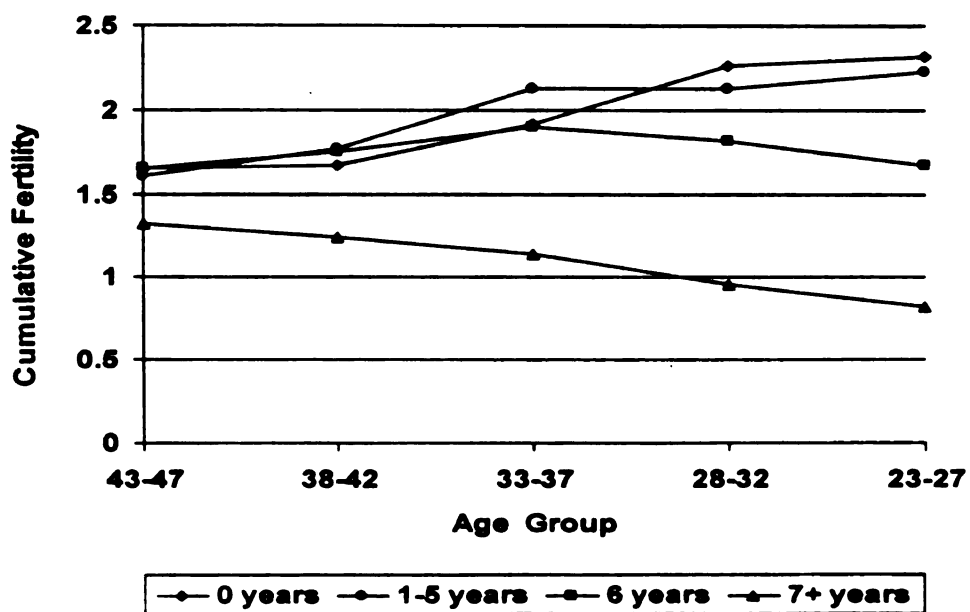


Figure 7.1B- Cumulative Fertility at Age 23
by Years of Schooling

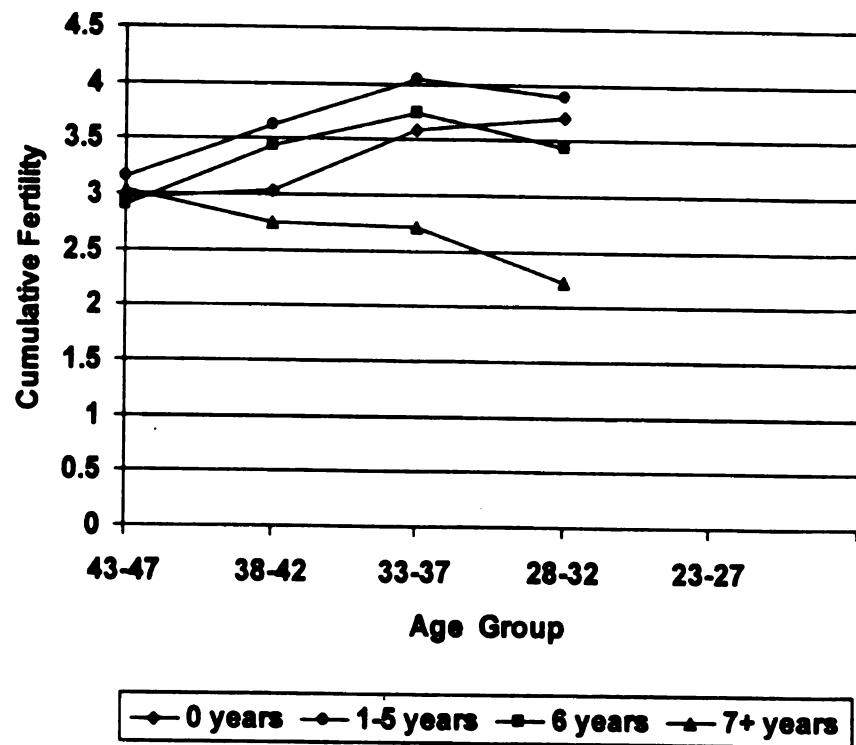


**Figure 7.1C- Cumulative Fertility at Age 28
by Years of Schooling**

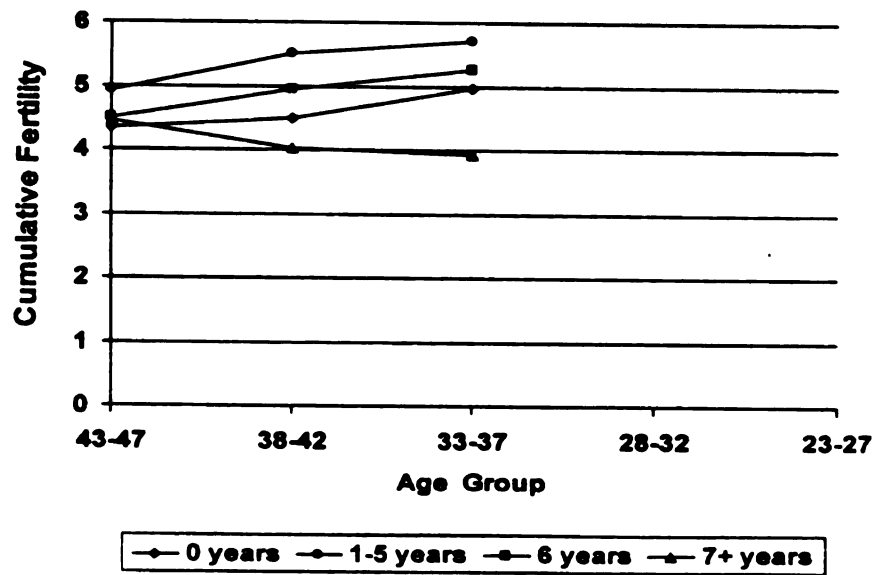


**Figure 7.1D- Cumulative Fertility at Age 33
by Years of Schooling**

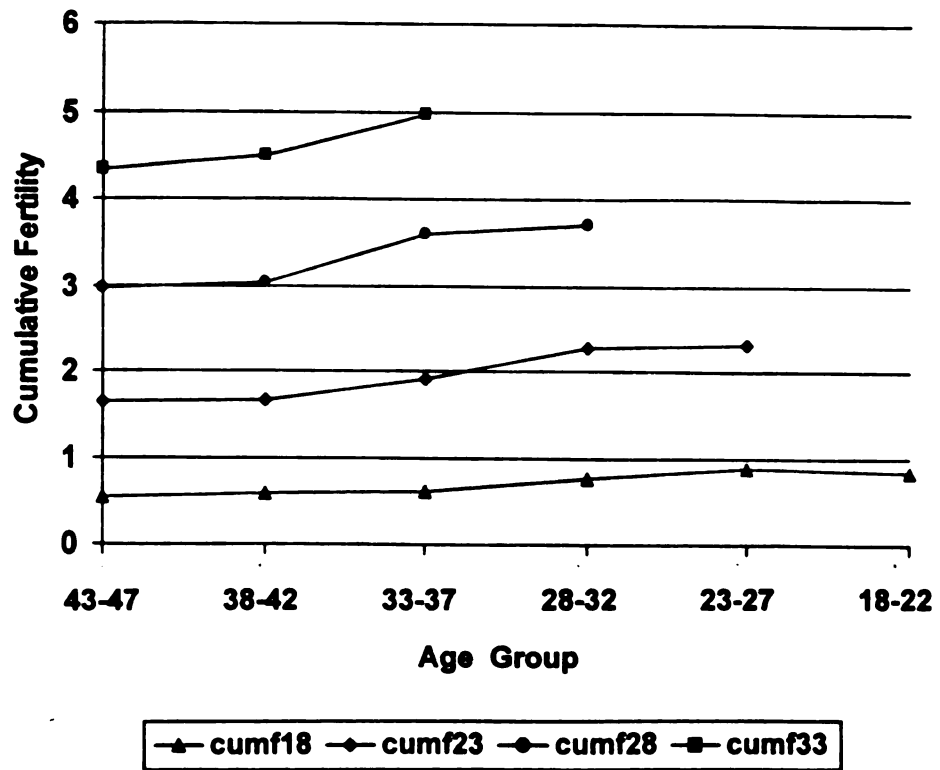


Figure 7.2A-Cumulative Fertility at various Attained Ages by Years of Schooling (0 years)

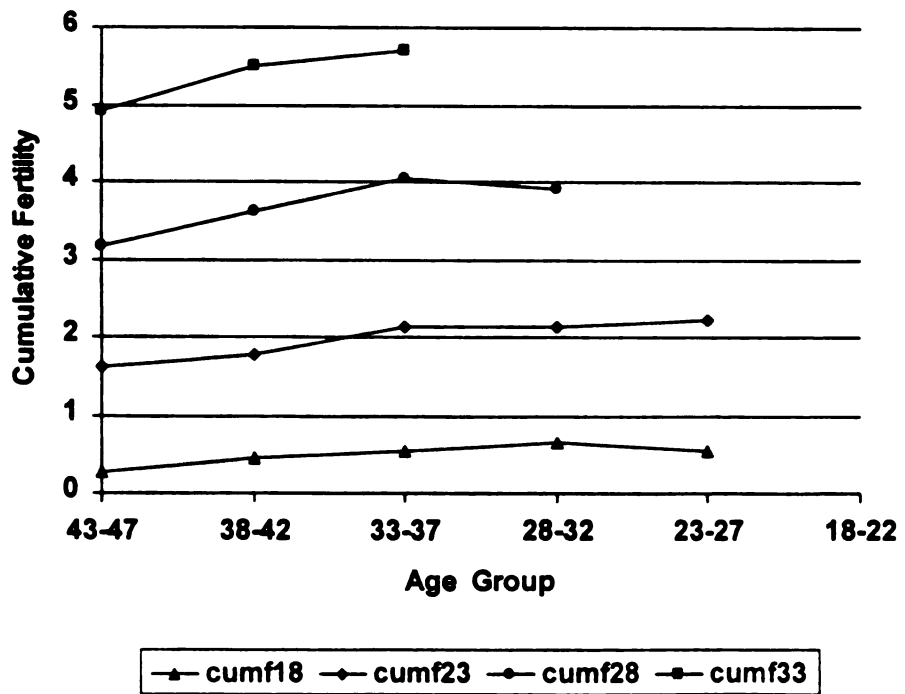


Figure 7.2B- Cumulative Fertility at various Attained Ages by Years of Schooling (1-5 years)

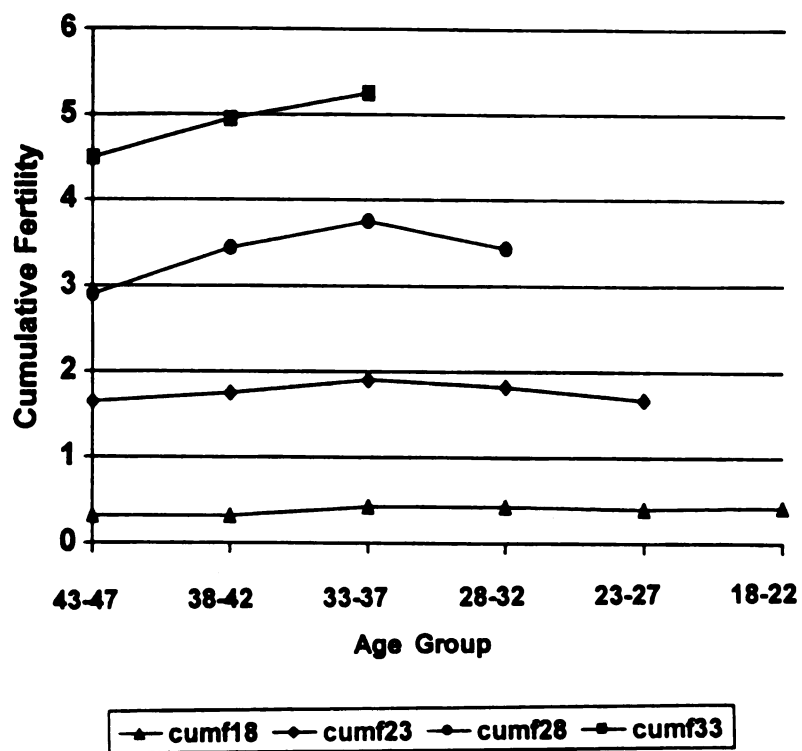


Figure 7.2C- Cumulative Fertility at various Attained Ages by Years of Schooling (6 years)

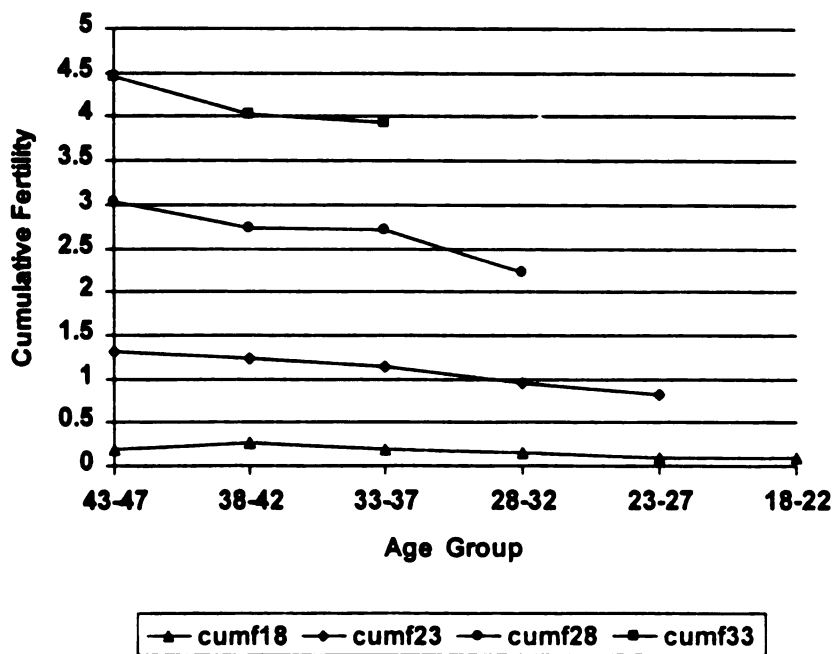


Figure 7.2D- Cumulative Fertility at various Attained Ages by Years of Schooling (7+ years)

**TABLE 7.1 - Impact of Education on Fertility - Female Schooling, Cohort Effects
and Community Variables by level of Female Schooling**

Dependent Variable: Cumulative fertility At Age 18 Woman Ages 18-47								
	0 Years of Schooling		1-6 Years of Schooling			7+ Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22	- 0.003 (0.11)	0.027 (0.11)	0.045 (0.08)	0.079 (0.08)	0.075 (0.09)	- 0.107 (0.07)	- 0.088 (0.07)	- 0.097 (0.07)
23-27	0.181*** (0.10)	0.217** (0.10)	0.115 (0.09)	0.151*** (0.08)	0.151*** (0.09)	- 0.093 (0.07)	- 0.066 (0.07)	- 0.077 (0.07)
28-32	0.172** (0.08)	0.204* (0.08)	0.126 (0.09)	0.141*** (0.09)	0.141*** (0.09)	- 0.039 (0.07)	- 0.020 (0.08)	- 0.020 (0.08)
33-37	0.010 (0.09)	- 0.001 (0.09)	0.204** (0.09)	0.202** (0.09)	0.199** (0.09)	0.005 (0.08)	0.010 (0.08)	0.016 (0.08)
38-42	0.037 (0.08)	0.062 (0.09)	0.071 (0.09)	0.058 (0.09)	0.058 (0.09)	0.056 (0.09)	0.049 (0.08)	0.056 (0.09)
<u>Community Variables</u>								
Urban Residence		- 0.153* (0.06)			- 0.028 (0.04)			- 0.103* (0.02)
Protestant		- 0.076 (0.07)			0.158 (0.11)			0.018 (0.11)
Catholic		0.022 (0.08)			0.194*** (0.11)			- 0.003 (0.11)
Islam		- 0.278* (0.09)			0.140 (0.12)			0.003 (0.11)
<u>Education</u>								
2 years of Schooling				0.470* (0.16)	- 0.473** (0.17)			
3 years of schooling				- 0.452* (0.16)	- 0.448** (0.16)			
4 years of schooling				- 0.478* (0.16)	- 0.472* (0.16)			
5 years of schooling				- 0.640* (0.16)	- 0.645* (0.17)			
6 years of schooling				- 0.610* (0.15)	- 0.603* (0.15)			
8 years of schooling							- 0.232* (0.06)	- 0.226* (0.06)
9 years of schooling							0.122** (0.06)	- 0.118*** (0.06)
10 years of schooling							- 0.207* (0.06)	- 0.281* (0.06)
11 or more years of schooling							- 0.285* (0.06)	- 0.268* (0.06)
Intercept	0.539* (0.06)	0.661* (0.09)	0.308* (0.07)	0.855* (0.16)	0.707* (0.19)	0.194** (0.07)	- 0.422* (0.09)	0.485* (0.13)
R-squared	0.01	0.04	0.01	0.02	0.03	0.01	0.04	0.06
F(all Covariates)	2.00	5.37	1.66	3.33	2.65	3.55	8.02	7.07
F(Community)	--	9.52	--	--	0.97	--	--	4.78
F(Schooling)	--	--	--	4.97	--	--	13.34	--
N	1326	1326	1436	1436	1436	1555	1555	1555

Note: Standard errors in parenthesis> *--p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10..

**TABLE 7.2 - Impact of Education on Fertility - Female Schooling, Cohort effects,
and Community Variables by level of Female Schooling**

Dependent Variable: Cumulative fertility At Age 23								
Woman Ages 23-47								
	0 Years of Schooling		1 - 6 years of Schooling			7 + Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22								
23-27	0.339** (0.18)	0.409** (0.14)	0.069 (0.19)	0.143 (0.17)	0.141 (0.170)	- 0.515** (0.21)	0.387** (0.21)	- 0.391** (0.21)
28-32	0.336** (0.14)	0.397* (0.14)	0.210 (0.17)	0.246 (0.17)	0.247 (0.17)	- 0.349 (0.22)	- 0.244 (0.21)	- 0.235 (0.21)
33-37	- 0.039 (0.14)	- 0.017 (0.14)	0.419** (0.18)	0.417** (0.18)	0.411** (0.18)	- 0.154 (0.24)	- 0.099 (0.23)	- 0.082 (0.23)
38-42	- 0.158 (0.14)	- 0.113 (0.13)	0.075 (0.18)	0.067 (0.18)	0.066 (0.18)	- 0.119 (0.35)	- 0.127 (0.24)	- 0.099 (0.24)
<u>Community Variables</u>								
Urban Residence		- 0.274** (0.10)			- 0.074 (0.09)			- 0.122 (0.10)
Protestant		0.089 (0.12)			0.446*** (0.24)			- 0.287 (0.37)
Catholic		0.238*** (0.14)			0.529** (0.25)			0.120 (0.38)
Islam		- 0.308** (0.15)			0.431 (0.26)			- 0.244 (0.30)
<u>Education</u>								
2 years of Schooling				- 0.382 (0.34)	- 0.389 (0.34)			
3 years of schooling				- 0.587*** (0.32)	- 0.581*** (0.33)			
4 years of schooling				0.551*** (0.33)	- 0.537 (0.33)			
5 years of schooling				- 0.768* (0.34)	- 0.779** (0.34)			
6 years of schooling				- 0.833* (0.30)	- 0.818** (0.31)			
8 years of schooling						- 0.279 (0.26)		- 0.272 (0.26)
9 years of schooling						- 0.210 (0.25)		- 0.208 (0.25)
10 years of schooling						- 0.445*** (0.27)		- 0.454*** (0.27)
11 or more years of schooling						- 0.963* (0.23)		- 0.947* (0.23)
Intercept	1.848* (0.11)	1.888* (0.12)	1.654* (0.15)	2.35* (0.32)	1.933* (0.39)	1.323* (0.21)	1.956* (0.29)	2.297* (0.47)
R-squared	0.02	0.05	0.01	0.02	0.03	0.02	0.10	0.10
F(all Covariates)	5.54	7.51	2.48	2.89	2.39	4.30	12.52	8.61
F(Community)	—	9.32	—	—	1.25	—	—	0.81
F(Schooling)	—	—	—	3.20	—	—	20.29	—
N	1216	1216	1107	1107	1107	900	900	900

Note: Standard errors in parenthesis. *--p-value <0.01, **-- p-value < 0.05 ***-- p-value < 0.10

**TABLE 7.3 - Impact of Education on Fertility - Female Schooling, Cohort Effects ,
and Community Variables by level of Female Schooling**

Dependent Variable: Cumulative fertility At Age 28								
Woman Ages 28-47								
	0 Years of Schooling		1 - 6 years of Schooling			7+ Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22								
23-27								
28-32	0.472* (0.18)	0.563* (0.18)	0.543** (0.21)	0.590* (0.21)	0.589** (0.21)	- 0.803** (0.33)	- 0.661** (0.32)	- 0.633** (0.32)
33-37	0.319*** (0.19)	0.359** (0.18)	0.976* (0.22)	0.901* (0.22)	0.984* (0.22)	- 0.300 (0.35)	0.214 (0.34)	- 0.194 (0.34)
38-42	- 0.059 (0.18)	0.002 (0.17)	0.476 (0.23)	0.474** (0.23)	0.483** (0.23)	- 0.360 (0.37)	- 0.366 (0.36)	- 0.349 (0.37)
<u>Community Variables</u>								
Urban Residence		- 0.408* (0.14)			- 0.244*** (0.15)			0.115 (0.24)
Protestant		0.239 (0.18)			0.346 (0.41)			0.373 (0.98)
Catholic		0.256 (0.20)			0.401 (0.42)			0.636 (0.99)
Islam		- 0.341*** (0.21)			0.304 (0.44)			0.298 (0.99)
<u>Education</u>								
2 years of Schooling				- 0.530 (0.45)	- 0.586 (0.46)			
3 years of schooling				- 0.947** (0.43)	- 0.797** (0.43)			
4 years of schooling				- 0.769*** (0.44)	- 0.696 (0.44)			
5 years of schooling				- 1.025** (0.46)	- 0.982** (0.46)			
6 years of schooling				- 1.069** (0.40)	- 0.969** (0.40)			
8 years of schooling						- 0.441 (0.47)	- 0.454 (0.47)	
9 years of schooling						- 0.581 (0.43)	- 0.579 (0.44)	
10 years of schooling						- 0.941** (0.49)	- 0.947** (0.49)	
11 or more years of schooling						- 1.454* (0.40)	- 1.486* (0.40)	
Intercept	3.319* (0.14)	3.329* (0.20)	3.009* (0.18)	3.924* (0.12)	3.639* (0.57)	3.032* (0.31)	4.059* (0.47)	3.554* (1.05)
R-squared	0.01	0.04	0.02	0.03	0.04	0.03	0.10	0.10
F(all Covariates)	4.56	6.71	6.68	4.03	3.02	3.70	6.38	4.25
F(Community)	--	8.23	--	--	1.00	--	--	0.56
F(Schooling)	--	--	--	2.41	--	--	8.29	--
N	1066	1066	790	790	790	423	423	423

Note: Standard errors in parenthesis. *--p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10.

TABLE 7.4 - Impact of Education on Age at First Marriage - Female Schooling, Cohort Effects, and Community Variables by level of Female Schooling (Logit)

Dependent Variable: First Marriage at Age 18								
Woman Ages 18-47								
	0 Years of Schooling		1 - 6 years of Schooling			7+ Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22	- 0.097 (0.24)	- 0.034 (0.24)	0.128 (0.23)	0.266 (0.23)	0.198 (0.23)	- 0.796*** (0.41)	- 0.711*** (0.42)	- 0.768*** (0.42)
23-27	0.499** (0.23)	0.593* (0.23)	0.188 (0.23)	0.333 (0.23)	0.279 (0.23)	- 0.724*** (0.41)	- 0.548 (0.43)	- 0.632 (0.43)
28-32	0.343*** (0.19)	0.420* (0.19)	0.285 (0.23)	0.353 (0.23)	0.349 (0.23)	- 0.449 (0.43)	- 0.314 (0.44)	- 0.346 (0.44)
33-37	0.006 (0.19)	0.020 (0.19)	0.514** (0.24)	0.534** (0.25)	0.547** (0.25)	0.171 (0.45)	0.280 (0.46)	0.267 (0.47)
38-42	- 0.169 (0.18)	- 0.123 (0.19)	0.130 (0.25)	0.123 (0.25)	0.145 (0.26)	0.105 (0.48)	0.083 (0.50)	0.081 (0.50)
<u>Community Variables</u>								
Urban Residence		- 0.377* (0.13)			- 0.285** (0.12)			- 0.289*** (0.16)
Protestant		0.152 (0.17)			- 0.291 (0.29)			- 1.349** (0.57)
Catholic		0.535** (0.10)			- 0.086 (0.30)			- 1.488** (0.58)
Islam		- 0.148 (0.19)			- 0.415 (0.32)			- 1.578* (0.59)
<u>Education</u>								
2 years of Schooling				- 0.910*** (0.55)	- 0.911*** (0.55)			
3 years of schooling				- 1.079** (0.53)	- 1.011** (0.53)			
4 years of schooling				- 1.469** (0.53)	- 1.392** (0.53)			
5 years of schooling				- 1.192** (0.54)	- 1.169** (0.54)			
6 years of schooling				- 1.669* (0.51)	- 1.525* (0.51)			
8 years of schooling						- 0.800** (0.35)	- 0.736** (0.35)	
9 years of schooling						- 0.448 (0.32)	- 0.347 (0.32)	
10 years of schooling						- 1.075* (0.35)	- 1.011* (0.360)	
11 or more years of schooling						- 1.556* (0.30)	- 1.449* (0.30)	
Intercept	0.316** (0.14)	0.271* (0.19)	- 0.231* (0.20)	1.175** (0.53)	1.482* (0.60)	- 0.894** (0.40)	0.164 (0.49)	1.746** (0.74)
- 2 Log Likelihood	1769.28	1736.62	1983.55	1951.19	1936.89	1470.85	1411.08	1399.06
Goodness of Fit	1325.97	1326.97	1436.00	1436.84	1436.86	1554.82	1547.68	1548.84
N	1326	1326	1436	1436	1436	1555	1555	1555

Note: Standard errors in parenthesis. *--p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10.

TABLE 7.5 - Impact of Education on Age at First Marriage - Female Schooling, Cohort Effects, and Community Variables by level of Female Schooling (Logit)

Dependent Variable: First Marriage at Age 23								
Woman Ages 23-47								
	0 Years of Schooling		1 - 6 years of Schooling			7+ Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22								
23-27	0.796*** (0.45)	0.846*** (0.45)	0.354 (0.30)	0.414 (0.31)	0.423 (0.31)	- 0.662 (0.41)	- 0.489 (0.43)	- 0.466 (0.43)
28-32	0.113 (0.31)	0.151 (0.31)	0.670** (0.32)	0.676** (0.32)	0.667** (0.32)	- 0.187 (0.42)	- 0.013 (0.44)	- 0.030 (0.44)
33-37	- 0.118 (0.31)	- 0.116 (0.31)	0.581*** (0.34)	0.571*** (0.34)	0.570*** (0.34)	- 0.032 (0.45)	0.054 (0.47)	0.009 (0.48)
38-42	- 0.431 (0.29)	- 0.419 (0.29)	0.744** (0.36)	0.697*** (0.36)	0.676*** (0.36)	- 0.177 (0.48)	- 0.195 (0.50)	- 0.216 (0.50)
<u>Community Variables</u>								
Urban Residence		- 0.414*** (0.21)			0.243 (0.20)			0.406** (0.19)
Protestant		0.434*** (0.26)			- 1.008 (0.74)			- 5.806 (7.03)
Catholic		0.685** (0.32)			- 1.026 (0.76)			- 5.782 (7.04)
Islam		0.545*** (0.31)			- 0.951 (0.78)			- 5.393 (7.04)
<u>Education</u>								
2 years of Schooling				- 5.338 (7.45)	- 5.292 (7.44)			
3 years of schooling				- 4.570 (7.45)	- 4.560 (7.44)			
4 years of schooling				- 5.324 (7.45)	- 5.340 (7.44)			
5 years of schooling				- 5.129 (7.45)	- 5.119 (7.44)			
6 years of schooling				- 5.305 (7.45)	- 5.346 (7.43)			
8 years of schooling						- 0.210 (0.70)	- 0.205 (0.71)	
9 years of schooling						- 0.435 (0.66)	- 0.451 (0.66)	
10 years of schooling						- 0.592 (0.69)	- 0.584 (0.69)	
11 or more years of schooling						- 1.739* (0.63)	- 1.772* (0.63)	
Intercept	2.219* (0.24)	1.921* (0.30)	1.498* (0.25)	6.694 (7.45)	7.576 (7.46)	0.894** (0.40)	2.107* (0.73)	7.525 (7.07)
- 2 Log Likelihood	793.46	785.48	806.81	796.11	792.31	1184.97	1112.64	1093.35
Goodness of Fit	1215.69	1219.93	1106.99	1078.76	1074.40	900.00	904.95	891.36
N	1216	1216	1107	1107	1107	900	900	900

Note: Standard errors in parenthesis. *--p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10.

TABLE 7.6 - Impact of Education on Age at First Birth - Female Schooling, Cohort Effects and Community Variables by level of Female Schooling (Logit)

Dependent Variable: First Births at Age 18								
<i>Woman Ages 18-47</i>								
	0 Years of Schooling		1-6 Years of Schooling			7+ Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22	0.076 (0.25)	0.145 (0.25)	0.252 (0.27)	0.352 (0.27)	0.331 (0.27)	- 0.605 (0.56)	- 0.485 (0.57)	- 0.583 (0.57)
23-27	0.555** (0.22)	0.641* (0.22)	0.349 (0.27)	0.453*** (0.27)	0.441 (0.27)	- 0.596 (0.56)	- 0.415 (0.57)	- 0.519 (0.58)
28-32	0.524* (0.19)	0.601* (0.19)	0.480*** (0.27)	0.523*** (0.27)	0.522*** (0.27)	- 0.093 (0.57)	0.046 (0.59)	0.026 (0.59)
33-37	0.114 (0.20)	0.139 (0.20)	0.652** (0.28)	0.661** (0.28)	0.661** (0.28)	0.240 (0.60)	0.357 (0.61)	0.391 (0.62)
38-42	0.096 (0.19)	0.146 (0.19)	0.212 (0.29)	0.187* (0.30)	0.188 (0.30)	0.443 (0.62)	0.420 (0.64)	0.457 (0.64)
<u>Community Variables</u>								
Urban Residence		- 0.310** (0.14)			- 0.126 (0.13)			- 0.674* (0.20)
Protestant		0.107 (0.17)			0.293 (0.33)			- 0.216 (0.81)
Catholic		0.244 (0.19)			0.362 (0.34)			- 0.574 (0.83)
Islam		- 0.350*** (0.20)			0.294 (0.60)			- 0.365 (0.84)
<u>Education</u>								
2 years of Schooling				- 0.580 (0.45)	- 0.584 (0.46)			
3 years of schooling				- 0.558 (0.43)	- 0.534 (0.43)			
4 years of schooling				-0.877** (0.44)	- 0.848*** (0.44)			
5 years of schooling				1.218* (0.46)	- 1.212* (0.46)			
6 years of schooling				- 1.055* (0.41)	- 1.013** (0.41)			
8 years of schooling							- 0.998** (0.44)	- 0.956** (0.44)
9 years of schooling							- 0.328 (0.37)	- 0.288 (0.38)
10 years of schooling							- 1.436* (0.47)	- 1.306* (0.48)
11 or more years of schooling							- 1.425* (0.35)	- 1.297* (0.36)
Intercept	-0.715* (0.15)	- 0.679* (0.20)	- 1.251* (0.24)	- 0.368 (0.45)	- 0.632 (0.54)	- 1.910* (0.54)	- 0.944 (0.62)	- 0.169*** (0.89)
-2 log Likelihood	1749.68	1723.76	1719.76	1703.78	1701.56	943.11	909.17	895.68
Goodness of Fit	1325.98	1326.61	1435.99	1435.63	1435.44	1554.89	1529.62	1533.61
N	1326	1326	1436	1436	1436	1555	1555	1555

Note: Standard errors in parenthesis> *-- p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10.

TABLE 7.7 - Impact of Education on Age at First Births - Female Schooling, Cohort Effects and Community Variables by level of Female Schooling(Logit)

Dependent Variable: First Births at Age 23								
Woman Ages 23-47								
	0 Years of Schooling		1 - 6 years of Schooling			7 + Years of Schooling		
	Reg 1	Reg 2	Reg 1	Reg 2	Reg 3	Reg 1	Reg 2	Reg 3
<u>Independent Variables:</u>								
<u>Cohort Effects</u>								
18-22								
23-27	0.865*	0.960*	0.153	0.206	0.215	- 0.787**	- 0.634	- 0.627
	(0.30)	(0.30)	(0.25)	(0.26)	(0.26)	(0.39)	(0.40)	(0.41)
28-32	0.389***	0.465**	0.267	0.291	0.281	- 0.378	- 0.221	- 0.227
	(0.22)	(0.22)	(0.26)	(0.26)	(0.26)	(0.34)	(0.42)	(0.42)
33-37	- 0.021	0.009	0.575**	0.582**	0.580**	0.036	0.121	0.108
	(0.22)	(0.22)	(0.28)	(0.29)	(0.29)	(0.43)	(0.45)	(0.45)
38-42	- 0.262	- 0.223	0.415	0.410	0.397	- 0.347	- 0.390	- 0.396
	(0.21)	(0.21)	(0.29)	(0.29)	(0.29)	(0.45)	(0.48)	(0.48)
<u>Community Variables</u>								
Urban Residence		- 0.311**			0.058			0.136
		(0.16)			(0.16)			(0.18)
Protestant		0.565**			0.136			- 0.611
		(0.20)			(0.39)			(0.76)
Catholic		0.622**			0.087			- 0.599
		(.23)			(0.40)			(0.77)
Islam		0.203			0.389			- 0.519
		(0.22)			(0.43)			(0.77)
<u>Education</u>								
2 years of Schooling				0.029	0.032			
				(0.64)	(0.63)			
3 years of schooling				- 0.137**	- 0.149			
				(0.60)	(0.59)			
4 years of schooling				- 0.316	- 0.321			
				(0.60)	(0.60)			
5 years of schooling				- 0.616	- 0.612			
				(0.61)	(0.61)			
6 years of schooling				- 0.399	- 0.446			
				(0.56)	(0.56)			
8 years of schooling							- 0.240	- 0.231
							(0.57)	(0.58)
9 years of schooling							- 0.203	- 0.275
							(0.54)	(0.55)
10 years of schooling							- 0.315	- 0.305
							(0.58)	(0.58)
11 or more years of schooling							- 1.578*	- 1.576*
							(0.52)	(0.52)
Intercept	1.125*	0.805*	0.950*	1.275**	1.121***	0.598	1.640*	2.113**
	(0.16)	(0.22)	(0.22)	(0.58)	(0.68)	(0.38)	(0.63)	(0.98)
- 2 log Likelihood	1278.44	1261.36	1176.84	1172.66	1170.26	1227.33	1150.36	1148.80
Goodness of Fit	1215.79	1219.07	1106.99	1107.87	1109.60	899.99	901.75	902.89
N	1216	1216	1107	1107	1107	900	900	900

Note: Standard errors in parenthesis. *- p-value < 0.01, **-- p-value < 0.05, , ***-- p-value < 0.10.

CHAPTER 8

SUMMARY, CONCLUSIONS AND IMPLICATIONS

8.1 Introduction

This chapter is divided into three parts. The first part is a summary of the previous chapters of data analysis. The second part is a discussion of our findings in relation to other findings of research in the area. The third part is conclusions, implications and suggestions for further research.

8.2 Summary

In this study we have investigated the evidence for a fertility decline in Nigeria and also the relationship between female schooling and fertility using the NDHS, 1990 data. We started by first looking at the validity and reliability of the data. Our evidence suggests that respondents tend to heap their ages on either "0" or "5". The Whipple's Index for age concentration is 224.6 which is very high by the United Nations standards. However, the Whipple's Index for age at first marriage and age at first birth were 121.73 and 112.78 respectively, which was approximate by United Nations standards. There was also evidence to support the fact that the oldest women in the survey have memory problems with recalling of their own ages, that of their children and also the number of dead live-births they have had.

Second by looking at the trends in female schooling, the study provided evidence to support a substantial increases in female schooling among the younger women. Our

cohort analysis of fertility in general without reference to schooling, using such indicators like cumulative fertility at various attained ages, age at first birth and age at first marriage did not reveal any decisive decline in fertility.

Reconstructing both births and marital histories from the NDHS, 1990 data, our evidence suggest that cumulative fertility may have declined over the younger women at ages 18 and 23, but the overall decline in fertility is not large enough to offset the high fertility of the oldest cohort. It is also possible that the young women may catch-up later which we can not tell from data. We witness young women postponing first marriages and first births at ages 18 and 23 but most women are married and have their first births at age 28. In our regional analysis we found some evidence of fertility decline in the Southwest and the Southeast but not in the North and also the magnitude that is suggested in the recent empirical literature.

A look at the relationship between the mean CEB and single years of female schooling revealed an eventual negative relation but one that is far from linear. We observe that female schooling has a differential impact on fertility depending on the woman's age. Female schooling has a greater negative impact on fertility for women ages 28-37 and the mildest impact for women ages 38-47.

Our multivariate regression analysis provided evidence on differentials in fertility and other correlates of fertility by levels of female schooling. There is a powerful negative relation between female schooling beyond primary and fertility. Women who have completed primary and beyond have significantly fewer number of children. They also marry late and have their first births later than women who have no schooling. This

is an observation we made both without controlling for and also controlling for age cohort and community variables. The first four or five years of schooling has either a positive or no relation on cumulative fertility at ages 18 and 23. At higher attained ages 28, 33 and 38, it requires a higher threshold of female schooling to make a negative impact on fertility. At ages 28, there is a powerful negative relationship between female schooling and fertility only with nine or more years of schooling, however at ages 33 and 38 it is only women with eleven or more years of schooling who have fewer children. Thus indicating that the influence of female schooling on fertility diminishes at higher attained ages.

In looking at the community variables, we witness that urban residence has a significant negative impact on cumulative fertility in almost all of our regressions and at all attained ages. Protestant and Catholic background has either no relation or positive influence on fertility. However, Islamic background has significant negative influence on fertility in almost all of our regressions.. Our results indicate that female schooling alone, controlling for relative cohort position, can account for about 23 percent to 61 percent of the decline in fertility.

Similar observations are made for the relationship between female schooling and age at first birth and age at first marriage. For instance at age 18, 1-3 years of female schooling either ushers women into their first marriages early or has no predictive power. At age 23, 1-5 years of female schooling has no predictive influence on first marriages.

With regards to first births our study also provided evidence to support the fact that 1-3 years of schooling has no influence on first births at age 18. In contrast, 1-10 years of schooling has no influence on first births at age 23.

We also observed that among the community variables urban residence made a difference in the first marriages and first births at age 18 for women ages 18-47 and those ages 38-47. Islam also made a difference on the timing of first births and first marriages but none of the other religious backgrounds made a significant impact on the timing of first births and first marriages at age 18 and 23.

The inclusion of husband's education in the regressions for the ever-married showed that for ever-married women at age 18, only women whose husbands had primary schooling have fewer children. At ages 23 and 28, it is only women whose husbands have eleven or more years of schooling that have fewer children. However at ages 33 and 38 husband's schooling does not make any negative impact on fertility. In fact at age 38, women whose husbands have 1-5 years of schooling have more children. Polygamous union has no predictive influence on fertility for the ever-married women.

We also investigated if women behaved differently in fertility decision making depending on their educational level and also wanted to investigate if fertility had fallen among the better educated women. A look at cumulative fertility at various attained ages for levels of female schooling revealed that at ages 18 and 23, there is a perfect negative relationship between female schooling and fertility. However, at ages 28 and 33, the negative relationship between female schooling and fertility diminishes except when the woman has seven or more years of schooling.

We found from our multivariate analysis that relative to women ages 43-47, younger women with either no schooling or 1-6 years of schooling have more children born at ages 18, 23 and 28. However, consistently we observed that among women with seven or more years of schooling, the younger women have fewer children relative to the oldest women. We also observed that among women in each education category, the higher educated women had fewer children. There is therefore evidence to suggest that fertility may have fallen at ages 18, 23 and 28 for women with seven or more years of schooling.

Community variables including urban residence and religious affiliation seem to have a greater impact on fertility decisions for women with no schooling or 1-6 years of schooling. Urban residence is important in all schooling groups but religious influence had no predictive impact on fertility decisions for women with seven or more years of schooling. The net cost of children may be relatively lower in the rural areas because education may bring fewer employment opportunities in rural areas as a result education may have a greater negative impact on fertility in the urban compared to the rural areas.

Similarly an investigation into the marital patterns of women with no schooling or 1-6 years of schooling revealed that younger women do first marry earlier relative to the oldest women. On the other hand, for women seven or more years of schooling, the younger women first marry later than the oldest women. An observation we also made for first births.

We also found strong evidence in support of the negative correlation between female schooling and cumulative fertility in both the rural and urban areas. The influence

of schooling on fertility is even greater in the rural areas than the urban areas. We found out that women with two or more years of schooling in the rural areas have fewer children at age 18, but 1- 5 years of schooling has no predictive influence on fertility for women in the urban areas. At age 23, women with ten or more years of schooling in the rural areas have fewer children than women in the urban areas. An observation we continue to make at ages 28 and 33. None of the religious influence seems to matter except Islam in few of the regressions for women in both the rural and urban areas.

8.3 Findings and Conclusions

Consistent with other research in the area our result indicate that the first few years of female schooling may not be related to fertility it may sometimes raise fertility. It is only women with more than primary education who have fewer number of children (Caldwell et al, 1992). We found the strongest influence of female schooling for cumulative fertility at ages 18, 23 and 28. For example, at age 18 we found that women with eleven or more years schooling have 0.53 fewer children, at age 23 they have 1.23 and at 28 they have 1.39 fewer children. Whilst the influence of lower levels of schooling diminish with age, we found women with eleven or more years of schooling in almost all of our regressions having fewer children. At ages 33 and 38 the influence of female schooling diminishes greatly, a finding which is also consistent with other empirical work in the literature. The influence of women with exactly seven years of schooling is sometimes unpredictable in some of our regressions. Women who continue one year after primary and then drop out of school may not be any different from those

who left at the end of the primary education. Self-selection may be a problem, they may quit school to go and get married and have children since the labor marketability at the end of primary may be limited (Thomas, 1996).

We also found that urban residence reduces fertility in almost all of our regressions. Protestant and Catholic influence on fertility is minimal but Islam has a strong negative impact on fertility an observation that was contrary to our expectations. Polygamous marriage does not make any difference in fertility decision making among the ever-married women at various attained ages. Inclusion of husband's education does not make any difference except for women whose husbands have eleven or more years of schooling. who have fewer children.

We made similar observations with age at first marriage and age at first birth. The first few years of female schooling did not influence marital and birth decision. It is women with more than primary education who delay both first marriages and first births. A look at whether younger women have fewer children at each attained age also revealed that for women with either no schooling or 1-6 years of schooling the younger women have more children than the oldest women. On the other among women with seven or more years of schooling we observed that fertility has declined with the younger women.

7.4 Implications and Suggestions for Further Research

There are several implications from our present research findings for public policy. If Nigeria seeks to lower fertility, investment in programs that will enhance opportunities for young women to be in school at least to secondary school level (high

school) is important. To the extent that there is a boy/girl discrimination when it comes to parents paying for their children's education, economic hardships may further hinder school going opportunities for girls in Nigeria and in Africa in general.

Economic hardship or decline that may affect different socio-economic groups differentially will affect school going differentially for girls. The greatest financial impact of an economic decline on schooling may be felt at the secondary school level. According to the educational figures, about 62 percent of school going girls attended primary but only 17 percent of them attended secondary (1991 figures). This may be in part because of higher cost associated with secondary education relative to that of primary. The boarding and lodging cost associated with secondary education may be an added incentive in the face of an economic decline for parents to withdraw their girls from schooling. This in the long-run may have an adverse effect on fertility. If girls quit school to marry, this may lead to an increase in fertility. On the other hand, economic hardship in addition to high bride price may lead to postponement of marriage by men. This may in the short-run lead to a decline in fertility, however, in the long-run its effect on fertility may be negligible.

However, if a sustainable fertility transition is a policy objective, then programs should be in place to subsidize female schooling at least at the secondary school level where the drop out rate is highest to ease the direct economic burden on parents. Subsidies will be necessary in the face of credit constraints. Students loans may not be readily available in the African setting for parents to borrow to pay for their children's education. If even they could borrow most parents may not be willing to do that for the

education of their girls. This is because education is seen everywhere as an investment in children, which in the African situation, it is expected to yield direct returns to parents when old in the form of remittances. However, studies have shown that girls may not be reliable to pay back in the future, marriage and childbearing may reduce their sovereignty and earning ability. The private benefits and social benefits from girls education may thus be different. There should also be in addition to subsidizing of girls education, better job opportunities for women when they graduate from college and expansion of credit facilities for parents to borrow money to pay for their children's education

It is also worth investigating further the decline in fertility especially for the younger women in the survey. Our results indicate a decline in fertility among the younger women. There is the need for a follow up research to examine if the fertility patterns now for the younger women will remain the same or will change with time. The next NDHS, which is yet to be fielded will be a good source of information for a follow-up research. In addition Nigeria has undergone many economic and political changes since independence in 1960 that may have had both short and long-run impacts on fertility. For example, macro-economic shocks from the oil bump and subsequent oil slump, the Nigerian Civil War and many political instabilities. It is important to research further the links between these macroeconomic shocks and fertility in Nigeria.

To also investigate the possibility of female schooling as a major determinant of a fertility transition in sub-Saharan, it will be worth applying the same research procedure to other African countries before a generalization could be made. It is worth researching

further into programs and incentives that will make girls stay in school beyond the primary level. To investigate among which programs such as free textbooks, free school clothes, or subsidized school has the greatest impact towards the enrollment and retention of girls in school.

A sustainable fertility decline in Nigeria and sub-Saharan Africa in general will need a balance between better family planning programs and also female education. International agencies such as the International Planned Parenthood Federation, in their fight against high population growth rate in Africa should also aim at channeling some of the resources into programs that will enhance both the use of family planning methods and school enrollment and retention for girls. This may take the form of both direct investment in family planning programs and indirect investments in the form of subsidies for girls education to ease the economic burden that female education may impose on parents.

APPENDIX

TABLE A 5.1
Distribution of Women by Years of Schooling. Female Cohorts Born 1943-72.
Nigeria, 1990.

	Birth Cohort	Sample Size	mean yrs. of Sch.	Std. Dev.	% 0yrs	% < 3yrs	% > 6yrs
ALL WOMEN (18-47)							
Age Group							
43-47	1943-47	572	1.47	3.04	76.1	80.9	16.3
38-42	1948-52	950	1.68	3.16	73.0	78.5	18.0
33-37	1953-57	955	2.39	3.84	64.9	70.8	24.2
28-32	1958-62	1584	2.85	4.16	61.4	66.2	30.1
23-27	1963-67	1682	4.68	4.77	44.5	47.4	48.9
18-22	1968-72	1826	5.54	4.54	33.6	36.4	59.1
Total	1943-72	7572	3.59	4.44	53.9	58.1	38.0
LAGOS							
Age Group							
43-47	1943-47	51	6.45	4.47	23.5	25.5	74.5
38-42	1948-52	116	5.00	4.25	33.6	37.9	57.8
33-37	1953-57	140	6.16	4.70	25.7	28.6	65.0
28-32	1958-62	246	6.66	4.58	22.8	26.8	69.1
23-27	1963-67	306	8.68	3.83	9.8	10.8	88.6
18-22	1968-72	333	8.88	3.43	9.0	9.3	88.9
Total	1943-72	1192	7.57	4.30	19.0	19.0	78.3
OTHER URBAN							
Age Group							
43-47	1943-47	120	2.00	3.27	65.0	70.8	22.5
38-42	1948-52	212	2.81	3.79	57.6	62.7	30.7
33-37	1953-57	225	3.60	4.25	49.3	56.0	37.3
28-32	1958-62	390	3.96	4.57	49.2	53.3	43.3
23-27	1963-67	399	6.06	4.81	31.6	34.8	62.7
18-22	1968-72	502	6.98	4.31	20.9	22.9	72.7
Total	1943-72	1848	4.93	4.67	39.7	43.6	52.0
RURAL							
Age Group							
43-47	1943-47	401	0.67	1.91	86.0	91.0	7.0
38-42	1948-52	622	0.67	1.87	85.5	91.5	6.3
33-37	1953-57	590	1.03	2.46	80.2	86.4	9.5
28-32	1958-62	948	1.40	2.91	76.5	81.8	14.6
23-27	1963-67	977	2.86	4.00	60.6	64.0	30.9
18-22	1968-72	994	3.69	4.05	48.3	52.2	42.2
Total	1943-72	4532	2.00	3.43	69.4	74.2	21.7

Table A 5.1. continues.

Birth	Sample	mean yrs. Cohort	Std. Size	% of Sch.	% Dev.	% 0yrs	% < 3yrs	% > 6yrs
SOUTHEAST								
Age Group								
43-47		1943-47	169	1.33	2.64	72.8	82.8	13.6
38-42		1948-52	251	1.41	2.61	70.5	82.9	12.8
33-42		1953-57	275	2.48	3.46	55.6	68.0	23.6
28-32		1958-62	390	3.47	3.95	46.4	55.6	36.7
23-27		1963-67	426	5.98	4.03	20.4	25.8	63.6
18-22		1968-72	485	6.66	3.75	14.0	19.4	71.3
Total		1943-72	1996	4.20	4.17	39.5	47.9	44.1
OTHER SOUTHWEST								
Age Group								
43-47		1943-47	119	2.38	3.25	58.0	64.7	26.9
38-42		1948-52	174	3.18	3.66	48.3	56.3	34.5
33-37		1953-57	150	3.71	4.18	45.5	54.0	38.0
28-32		1958-62	198	5.16	4.73	34.3	41.9	55.1
23-27		1963-67	212	7.84	4.24	15.6	18.4	80.7
18-22		1968-72	276	8.51	3.12	4.4	6.2	90.4
Total		1943-72	1129	5.69	4.54	29.6	35.0	60.2
NORTH								
Age Group								
43-47		1943-47	233	0.86	0.09	99.1	100.0	0.0
38-42		1948-52	409	0.26	1.44	96.1	96.8	2.9
33-37		1953-57	390	0.45	1.91	93.1	94.4	4.6
28-32		1958-62	750	0.66	2.12	89.1	91.1	7.3
23-27		1963-67	738	1.35	3.10	81.0	83.3	14.9
18-22		1968-72	735	2.16	3.52	68.7	71.2	25.4
Total		1943-72	3255	1.03	2.69	84.7	86.6	11.7

Source : Calculated from Demographic and Health Survey, Nigeria, 1990.

TABLE A 5.2

Percentage of All Women with Second and Third or more Births at Various Attained Ages

	SECOND BIRTHS				THIRD OR MORE BIRTHS				
	BY AGE				BY AGE				
	18	23	28	33	18	23	28	33	N
<u>ALL SAMPLE</u>									
Age group									
18-22	10.5	--	--	--	2.3	--	--	--	1831
23-27	14.0	52.1	--	--	4.0	29.0	--	--	1684
28-32	15.8	57.9	81.3	--	4.3	36.4	67.0	--	1587
33-37	14.0	54.0	82.2	92.5	2.9	33.1	70.5	85.2	955
38-42	14.0	47.7	73.9	87.6	4.2	28.9	59.7	78.2	951
43-47	12.2	47.2	71.3	83.6	3.8	26.9	55.9	74.5	572
<u>SOUTHEAST</u>									
Age Group									
18-22	7.6	--	--	--	1.6	--	--	--	487
23-27	10.5	49.4	--	--	3.0	28.1	--	--	427
28-32	14.8	57.9	82.9	--	5.4	39.0	68.4	--	392
33-37	14.5	55.3	83.6	92.0	4.4	36.7	72.0	84.7	275
38-42	21.1	57.4	83.3	93.6	7.6	37.8	72.1	90.8	251
43-47	16.0	53.8	80.5	91.1	6.5	34.9	65.7	85.2	169
<u>SOUTHWEST</u>									
Age Group									
18-22	1.1	--	--	--	0.2	--	--	--	609
23-27	4.8	32.9	--	--	0.4	12.1	--	--	519
28-32	7.0	46.3	77.8	--	1.1	22.5	61.3	--	445
33-37	7.6	51.0	85.2	96.6	0.7	25.9	72.4	91.0	290
38-42	4.1	39.9	78.0	93.8	0.7	17.2	58.1	81.8	291
43-47	4.7	49.4	77.6	91.2	0.6	20.6	57.6	80.0	170
<u>NORTH</u>									
Age Group									
18-22	20.1	--	--	--	4.6	--	--	--	735
23-27	22.4	67.2	--	--	7.2	41.3	--	--	738
28-32	21.5	64.8	82.7	--	5.6	43.3	69.7	--	750
33-37	18.5	55.4	79.0	89.7	3.6	35.9	67.9	81.3	390
38-42	16.6	47.4	65.3	79.5	4.6	31.8	53.3	68.0	409
43-47	15.0	40.8	60.1	72.5	4.3	25.8	47.6	62.7	233

TABLE A6.1
Predictions of the Decline in Fertility Attributable to Female Schooling:
Cumulative Fertility at Age 18

Female Schooling In Single Years	Regression Coefficients Women Ages 18-47	Means of Female Schooling Women ages 18-22	Estimated Means Col 2*col 3	Means of Female Schooling Women Ages 38-47	Estimated Means Col 2* Col 5	Change In Fertility Col 4 - Col 6
1 year of Schooling	0.358	0.002	0.0007	0.012	0.0043	-0.0036
2 years of Schooling	-0.106	0.009	-0.0010	0.028	-0.0030	0.0020
3 years of Schooling	-0.092	0.018	-0.0017	0.045	-0.0041	0.0025
4 years of Schooling	-0.11	0.031	-0.0034	0.033	-0.0036	0.0002
5 years of Schooling	-0.276	0.023	-0.0064	0.022	-0.0061	-0.0003
6 years of Schooling	-0.248	0.217	-0.0538	0.178	-0.0441	-0.0097
7 years of Schooling	-0.222	0.027	-0.0060	0.009	-0.0020	-0.0040
8 years of Schooling	-0.469	0.055	-0.0258	0.010	-0.0047	-0.0211
9 years of Schooling	-0.359	0.075	-0.0269	0.022	-0.0079	-0.0190
10 years of Schooling	-0.526	0.065	-0.0342	0.008	-0.0042	-0.0300
11+ years of Schooling	-0.529	0.377	-0.1994	0.059	-0.0312	-0.1682

Sum			-0.3578		-0.1067	-0.2511
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Female Schooling In Single Years	Regression Coefficients Women Ages 18-22	Means of Female Schooling Women ages 18-22	Estimated Means Col 2*col 3	Means of Female Schooling Women Ages 38-47	Estimated Means Col 2* Col 5	Change In Fertility Col 4 - Col 6
1 year of Schooling	0.464	0.002	0.0009	0.012	0.0056	-0.0046
2 years of Schooling	-0.236	0.009	-0.0021	0.028	-0.0066	0.0045
3 years of Schooling	0.064	0.018	0.0012	0.045	0.0029	-0.0017
4 years of Schooling	-0.183	0.031	-0.0057	0.033	-0.0060	0.0004
5 years of Schooling	-0.138	0.023	-0.0032	0.022	-0.0030	-0.0001
6 years of Schooling	-0.213	0.217	-0.0462	0.178	-0.0379	-0.0083
7 years of Schooling	-0.236	0.027	-0.0064	0.009	-0.0021	-0.0043
8 years of Schooling	-0.403	0.055	-0.0222	0.01	-0.0040	-0.0181
9 years of Schooling	-0.317	0.075	-0.0238	0.022	-0.0070	-0.0168
10 years of Schooling	-0.466	0.065	-0.0303	0.008	-0.0037	-0.0266
11+ years of Schooling	-0.495	0.377	-0.1866	0.059	-0.0292	-0.1574

Sum			-0.3243		-0.0912	-0.2331
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TABLE A6.2
Predictions of the Decline in Fertility Attributable to Female Fertility:
Cumulative Fertility at Age 23

Female Schooling In Single Years	Regression Coefficients Women Ages 23-47	Means of Female Schooling Women Ages 23-27	Estimated Means Col 2* Col 3	Means of Female Schooling Women Ages 38-47	Estimated Means Col 2 * Col 5	Changes In Fertility Col 4 - Col 6
1 year of Schooling	0.618	0.001	0.0006	0.012	0.0074	-0.0068
2 years of Schooling	0.227	0.012	0.0027	0.028	0.0064	-0.0036
3 years of Schooling	0.028	0.021	0.0006	0.045	0.0013	-0.0007
4 years of Schooling	0.069	0.029	0.0020	0.033	0.0023	-0.0003
5 years of Schooling	-0.163	0.023	-0.0038	0.022	-0.0036	-0.0002
6 years of Schooling	-0.238	0.249	-0.0593	0.178	-0.0424	-0.0169
7 years of Schooling	-0.187	0.005	-0.0009	0.009	-0.0017	0.0007
8 years of Schooling	-0.544	0.033	-0.0180	0.01	-0.0054	-0.0125
9 years of Schooling	-0.477	0.072	-0.0343	0.022	-0.0105	-0.0239
10 years of Schooling	-0.721	0.038	-0.0274	0.008	-0.0058	-0.0216
11+ years of Schooling	-1.257	0.357	-0.4488	0.059	-0.0742	-0.3746
Sum			-0.5865		-0.1262	-0.4603

Female Schooling In Single Years	Regression Coefficients Women Ages 23-27	Means of Female Schooling Women Ages 23-27	Estimated Means Col 2* Col 3	Means of Female Schooling Women Ages 38-47	Estimated Means Col 2 * Col 5	Changes In Fertility Col 4 - Col 6
1 year of Schooling	-0.218	0.001	-0.0002	0.012	-0.0026	0.0024
2 years of Schooling	0.450	0.012	0.0054	0.028	0.0126	-0.0072
3 years of Schooling	0.063	0.021	0.0013	0.045	0.0028	-0.0015
4 years of Schooling	0.036	0.029	0.0010	0.033	0.0012	-0.0001
5 years of Schooling	-0.368	0.023	-0.0085	0.022	-0.0081	-0.0004
6 years of Schooling	-0.610	0.249	-0.1519	0.178	-0.1086	-0.0433
7 years of Schooling	-1.187	0.005	-0.0059	0.009	-0.0107	0.0047
8 years of Schooling	-0.703	0.033	-0.0232	0.010	-0.0070	-0.0162
9 years of Schooling	-0.790	0.072	-0.0569	0.022	-0.0174	-0.0395
10 years of Schooling	-0.853	0.038	-0.0324	0.008	-0.0068	-0.0256
11+ years of Schooling	-1.620	0.357	-0.5783	0.059	-0.0956	-0.4828
Sum			-0.8496		-0.2402	-0.6094

TABLE A6.3
Impact of Education on Fertility - Female Schooling, cohort effects and
community variables. (RURAL RESIDENCE)

Dependent Variable	Cumulative Fertility At Age 18	Cumulative Fertility at Age 23	Cumulative Fertility at Age 28	Cumulative Fertility at Age 33	Cumulative Fertility at Age 38
	18 - 47	23-47	28-47	33-47	38-47
<u>Independent Variables:</u>					
Dummies for:					
1 year of Schooling	0.357*** (0.19)	0.639*** (0.36)	1.025** (0.49)	1.865** (0.66)	2.157** (0.95)
2 years of Schooling	- 0.210*** (0.11)	0.029 (0.21)	0.132 (0.30)	0.001 (0.38)	0.266 (0.54)
3 years of Schooling	- 0.164*** (0.09)	- 0.002 (0.19)	0.075 (0.27)	0.970** (0.38)	1.449** (0.52)
4 years of Schooling	- 0.166*** (0.10)	- 0.131 (0.20)	- 0.020 (0.33)	0.025 (0.46)	- 0.561 (0.73)
5 years of Schooling	- 0.415* (0.11)	- 0.417*** (0.23)	- 0.306 (0.38)	0.387 (0.54)	0.306 (0.80)
6 years of Schooling	- 0.331* (0.06)	- 0.451* (0.11)	- 0.190 (0.18)	0.385 (0.27)	0.608 (0.39)
7 years of Schooling	0.002 (0.20)	0.955 (0.68)	1.823 (1.16)	6.882* (2.26)	5.804** (2.49)
8 years of Schooling	- 0.409** (0.15)	- 0.591 (0.39)	- 0.494 (0.90)	- 4.196*** (2.26)	- 4.532*** (2.49)
9 years of Schooling	- 0.362* (0.11)	- 0.214 (0.26)	- 1.156** (0.54)	- 0.267 (0.75)	1.325 (1.12)
10 years of Schooling	- 0.592* (0.14)	- 0.897** (0.34)	- 0.824 (0.90)	0.802 (2.00)	- 1.019 (2.49)
11 or more years of Schooling	- 0.605* (0.08)	- 1.682* (0.17)	- 2.014* (0.36)	- 1.968** (0.72)	- 1.610* (1.25)
<u>Cohort Effects</u>					
18-22	0.078 (0.08)				
23-27	0.139*** (0.08)	0.145 (0.14)			
28-32	0.194** (0.07)	0.340** (0.13)	0.325*** (0.18)		
33-37	0.041 (0.08)	- 0.025 (0.14)	0.264 (0.18)	0.082 (0.21)	
38-42	0.120 (0.07)	- 0.034 (0.14)	0.035 (0.18)	- 0.001 (0.20)	- 0.176 (0.23)
<u>Community Variables</u>					
Protestant	- 0.025 (0.06)	0.163 (0.12)	0.268 (0.18)	0.139 (0.25)	- 0.109 (0.34)
Catholic	0.016 (0.07)	0.200 (0.13)	0.212 (0.20)	0.061 (0.26)	- 0.446 (0.38)
Islam	- 0.221** (0.08)	- 0.224 (0.16)	- 0.151* (0.24)	- 0.316 (0.31)	- 0.528 (0.42)
Intercept	0.619* (0.08)	1.888* (0.14)	2.377* (0.20)	5.057* (0.25)	6.640* (0.32)
R-squared	0.07	0.08	0.04	0.05	0.06
F(all Covariates)	7.44	7.71	3.01	2.60	1.98
N	1966	1530	1140	773	492

Note : Standard errors in parenthesis. *—p-value < 0.01, **— p-value < 0.05, ***— p-value < 0.10.

TABLE A6.4
Impact of Education on Fertility - Female Schooling, cohort effects and
community variables. (URBAN RESIDENCE)

Dependent Variable	Cumulative Fertility At Age 18	Cumulative Fertility At Age 23	Cumulative Fertility At Age 28	Cumulative Fertility At Age 33	Cumulative Fertility At Age 38
	18 - 47	23-47	28-47	33-47	38-47
Independent Variables:					
1 year of Schooling	0.218 (0.24)	0.332 (0.52)	0.621 (0.72)	0.678 (0.92)	1.230 (1.18)
2 years of Schooling	0.099 (0.14)	0.519 (0.33)	0.757 (0.50)	0.997 (0.84)	- 0.313 (1.65)
3 years of Schooling	0.002 (0.09)	- 0.018 (0.19)	0.129 (0.29)	0.311 (0.40)	0.216 (0.63)
4 years of Schooling	- 0.026 (0.08)	0.295 (0.20)	0.535 (0.30)	1.047 (0.40)	1.734** (0.60)
5 years of Schooling	- 0.093 (0.10)	0.057 (0.24)	0.131 (0.35)	- 0.012 (0.50)	- 0.458 (0.80)
6 years of Schooling	- 0.109* (0.04)	- 0.004 (0.09)	0.081 (0.14)	0.171 (0.50)	0.175 (0.30)
7 years of Schooling	- 0.217** (0.10)	- 0.322 (0.30)	- 0.006 (0.45)	0.520 (0.66)	0.795 (0.90)
8 years of Schooling	- 0.378* (0.07)	- 0.372** (0.19)	- 0.164 (0.33)	- 0.093 (0.50)	0.613 (0.84)
9 years of Schooling	- 0.243* (0.06)	- 0.389** (.15)	- 0.096 (0.26)	- 0.236 (0.41)	- 0.711 (0.65)
10 years of Schooling	- 0.397* (0.07)	- 0.523** (0.20)	- 0.683 (0.37)	- 0.740 (0.54)	0.242 (0.96)
11 or more years of Schooling	- 0.389* (0.04)	- 0.984* (0.09)	- 1.168* (0.16)	- 1.036* (0.25)	- 0.978** (0.39)
Cohort Effects					
18-22	- 0.009 (0.06)				
23-27	0.056 (0.06)	0.061 (0.13)			
28-32	0.076 (0.06)	0.162 (0.13)	0.475** (0.18)		
33-37	0.111*** (0.06)	0.348 (0.13)	0.864* (0.19)	0.955 (0.21)	
38-42	- 0.021 (0.06)	- 0.060 (0.14)	0.283 (0.19)	0.528 (0.22)	0.311 (0.25)
Community Variables					
Protestant	0.073 (0.09)	0.098 (0.23)	0.065 (0.37)	- 0.519 (0.50)	- 0.428 (0.73)
Catholic	0.089 (0.10)	0.300 (0.23)	0.381 (0.38)	- 0.026 (0.52)	0.037 (0.77)
Islam	0.029 (0.10)	0.049 (0.23)	- 0.180 (0.37)	- 1.027** (0.50)	- 1.193** (0.74)
Intercept	0.360* (0.10)	1.477* (0.24)	2.739* (0.38)	4.548** (0.50)	5.695* (0.71)
R-squared	0.09	0.12	0.10	0.10	0.09
F(all Covariates)	11.46	11.29	7.48	4.67	2.42
N	2351	554	1139	672	388

Note: Standard errors in parenthesis. *—p -value < 0.01, **— p-value < 0.05, ***— p-value < 0.10..

TABLE A 6.5
Impact of Education on Fertility: Female Schooling Result by Age Cohort

Dependent Variable	Cumulative Fertility at Age 18			Cumulative Fertility at Age 23		Cumulative Fertility at Age 28
	18-22	23-27	28-32	23-27	28-32	28-32
Independent Variables:						
1 year of Schooling	0.464 (0.37)	- 0.720 (0.66)	- 0.378 (0.32)	- 2.187*** (1.25)	- 0.517 (0.58)	- 0.457 (0.75)
2 years of Schooling	- 0.236 (0.17)	- 0.098 (0.20)	- 0.045 (0.19)	0.450 (0.39)	0.261 (0.34)	0.654 (0.44)
3 years of Schooling	0.064 (0.13)	- 0.120 (0.16)	- 0.225 (0.14)***	0.063 (0.30)	- 0.319 (0.24)	- 0.385 (0.32)
4 years of Schooling	- 0.183*** (0.10)	0.132 (0.14)	- 0.211 (0.17)	0.036 (0.26)	- 0.017 (0.29)	0.335 (0.39)
5 years of Schooling	- 0.136 (0.11)	- 0.356** (0.15)	- 0.348** (0.17)	- 0.368 (0.28)	- 0.047 (0.31)	0.164 (0.40)
6 years of Schooling	- 0.213* (0.06)	- 0.373* (0.07)	- 0.306* (0.07)	- 0.610* (0.13)	- 0.435* (0.13)	- 0.400** (0.17)
7 years of Schooling	- 0.236** (0.11)	- 0.720** (0.30)	- 0.087 (0.28)	- 1.187** (0.57)	- 0.559 (0.50)	- 0.915 (0.65)
8 years of Schooling	- 0.403* (0.08)	- 0.494* (0.13)	- 0.600* (0.19)	- 0.703* (0.25)	- 0.628*** (0.34)	- 0.512 (0.44)
9 years of Schooling	- 0.317* (0.08)	- 0.470* (0.10)	- 0.493* (0.15)	- 0.790* (0.18)	- 0.621** (0.26)	- 0.853** (0.34)
10 years of Schooling	- 0.466* (0.08)	- 0.634* (0.12)	- 0.635* (0.22)	- 0.853* (0.23)	- 1.107** (0.40)	- 1.405** (0.52)
11 or more years of Schooling	- 0.495* (0.06)	- 0.658* (0.06)	- 0.583* (0.08)	- 1.620* (0.12)	- 1.440* (0.14)	- 1.873* (0.18)
Intercept	0.536* (0.05)	0.720* (0.05)	0.711* (0.045)	2.187* (0.10)	2.184* (0.08)	3.790* (0.10)
R-squared	0.10	0.13	0.08	0.21	0.13	0.14
F(all Covariates)	11.21	13.07	6.65	22.69	11.05	12.08
N	1094	944	834	944	834	834

Note: Standard Errors in parenthesis. *-- p-value < 0.01, ** -- p-value < 0.05, *** -- p-value < 0.10..

TABLE A6.6
Impact of Education on Fertility - Female Schooling
and Cohort Effect : Results by Age Cohort

Dependent Variable	Cumulative Fertility At Age 18			Cumulative Fertility At Age 23		
	18-27	28-37	38-47	23-27	28-37	38-47
<u>Independent Variables:</u>						
1 year of Schooling	0.039 (0.34)	0.124 (0.23)	0.709** (0.26)	- 2.187*** (1.25)	- 0.010 (0.42)	1.613* (0.45)
2 years of Schooling	- 0.068 (0.13)	- 0.015 (0.13)	- 0.277 (0.17)	0.450 (0.39)	0.324 (0.246)	- 0.044 (0.31)
3 years of Schooling	- 0.038 (0.10)	- 0.130 (0.10)	- 0.094 (0.14)	0.063 (0.30)	0.001 (0.19)	0.011 (0.25)
4 years of Schooling	- 0.061 (0.08)	- 0.056 (0.11)	- 0.360** (0.16)	0.036 (0.26)	0.267 (0.21)	- 0.400 (0.29)
5 years of Schooling	- 0.253** (0.09)	- 0.244** (0.13)	- 0.455** (0.20)	- 0.368 (0.28)	0.037 (0.24)	- 0.545 (0.35)
6 years of Schooling	- 0.302* (0.05)	- 0.209* (0.06)	- 0.237* (0.08)	- 0.610* (0.13)	- 0.198*** (0.10)	- 0.059 (0.51)
7 years of Schooling	- 0.359* (0.11)	- 0.182 (0.24)	0.182 (0.30)	- 1.187** (0.57)	- 0.297 (0.44)	0.509 (0.53)
8 years of Schooling	- 0.463* (0.07)	- 0.560* (0.15)	- 0.560** (0.28)	- 0.703* (0.25)	- 0.555** (0.28)	- 0.757 (0.50)
9 years of Schooling	- 0.402* (0.06)	- 0.449* (0.12)	- 0.039 (0.20)	- 0.790* (0.18)	- 0.530** (0.213)	- 0.062 (0.35)
10 years of Schooling	- 0.553* (0.07)	- 542* (0.17)	- 0.567*** (0.32)	- 0.853* (0.23)	- 0.840** (0.304)	- 0.887 (0.57)
11 or more years of Schooling	- 0.584* (0.04)	- 0.470* (0.06)	- 0.449* (0.12)	- 1.620* (0.12)	- 1.199* (0.12)	- 0.728* (0.22)
<u>Cohort Effects</u>						
18-22	- 0.060** (0.05)					
23-27						
28-32		0.045 (0.04)			0.064 (0.08)	
33-37						
38-42			0.043 (0.06)			- 0.085 (0.10)
Intercept	0.668* (0.04)	0.649* (0.04)	0.536* (0.05)	2.187* (0.10)	1.978* (0.07)	1.805* (0.09)
R-squared	0.12	0.06	0.05	0.21	0.09	0.04
F(all Covariates)	22.32	6.78	3.69	22.69	11.23	2.89
N	2037	1399	880	944	1399	880

Note: Standard Errors in parenthesis. *— Coefficient is significant at 0.01, **— Coefficient is significant at 0.05, ***— Coefficient is significant at 0.10.

TABLE A6.7
Impact of Education on Fertility - Female Schooling, Cohort Effects
and Community Variables: Results by Age Cohort

	Cumulative Fertility At Age 18		Cumulative Fertility At Age 23		Cumulative Fertility At Age 28	
	28 - 37	38-47	28-37	38-47	28-37	38-47
Independent Variables:						
1 year of Schooling	0.098 (0.23)	0.676** (0.25)	- 0.065 (0.42)	1.551* (0.45)	0.191 (0.53)	1.701* (0.60)
2 years of Schooling	- 0.032 (0.13)	- 0.356** (0.17)	0.273 (0.25)	- 0.203 (0.31)	0.520 (0.32)	- 0.058 (0.36)
3 years of Schooling	- 0.128 (0.11)	- 0.117 (0.14)	- 0.017 (0.18)	- 0.031 (0.24)	- 0.023 (0.24)	0.287 (0.32)
4 years of Schooling	- 0.059 (0.11)	- 0.323** (0.16)	0.243 (0.21)	- 0.324 (0.28)	0.430 (0.27)	- 0.122 (0.37)
5 years of Schooling	- 0.255 (0.13)	- 0.457** (0.19)	- 0.006 (0.24)	- 0.543 (0.34)	0.033 (0.30)	- 0.454 (0.45)
6 years of Schooling	- 0.189* (0.06)	- 0.175** (0.08)	- 0.198*** (0.11)	0.066 (0.14)	- 0.195 (0.13)	0.153 (0.19)
7 years of Schooling	- 0.151 (0.24)	0.251 (0.29)	- 0.271 (0.44)	0.655 (0.53)	- 0.602 (0.56)	1.343*** (0.70)
8 years of Schooling	- 0.523* (0.15)	- 0.463*** (0.31)	- 0.535*** (0.28)	- 0.561 (0.50)	- 0.408 (0.36)	- 0.168 (0.66)
9 years of Schooling	- 0.400* (0.12)	0.055 (0.19)	- 0.483** (0.22)	0.119 (0.35)	- 0.748** (0.28)	0.335 (0.46)
10 years of Schooling	- 0.495* (0.17)	- 0.502 (0.31)	- 0.788** (0.31)	- 0.748 (0.57)	- 1.080* (0.39)	- 0.036 (0.74)
11 or more years of Schooling	- 0.432* (0.07)	- 0.362** (0.13)	- 1.171* (0.13)	- 0.546** (0.23)	- 1.628* (0.16)	- 0.654** (0.30)
Cohort Effects						
18-22						
23-27						
28-32	0.050 (0.04)		0.072 (0.08)		- 0.153 (0.10)	
33-37						
38-42		0.064 (0.06)		- 0.046		0.124 (0.13)
Community Variables						
Urban Residence	- 0.087*** (0.05)	- 0.172** (0.07)	- 0.144 (0.09)	- 0.364* (0.12)	- 0.142 (0.12)	- 0.521* (0.15)
Protestant	0.011 (0.08)	0.006 (0.10)	0.226 (0.15)	0.081 (0.18)	0.453** (0.20)	- 0.202 (0.24)
Catholic	0.042 (0.09)	0.137 (0.11)	0.227 (0.17)	0.301 (0.20)	0.465** (0.21)	0.007 (0.26)
Islam	- 0.075 (0.12)	- 0.181 (0.11)	- 0.063 (0.17)	- 0.243 (0.20)	0.220 (0.22)	- 0.706** (0.26)
Intercept	0.636* (0.08)	0.586* (0.10)	1.873* (0.15)	1.851* (0.17)	3.529* (0.19)	3.608* (0.22)
R-squared	0.06	0.07	0.09	0.07	0.11	0.07
F(all Covariates)	5.70	4.34	8.96	3.90	11.07	3.80
F(Cohort and Community)	2.11	4.95	1.78	5.48	2.59	6.70
F(Community)	2.36	6.06	2.06	6.68	2.57	8.31
N	1399	880	1399	880	1399	880

Note: Standard Errors in parenthesis. *-- p-value < 0.01, **-- p-value < 0.05, ***-- p-value < 0.10.

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