Consilience: The Journal of Sustainable Development
Vol. 6, Iss. 1 (2011), Pp. 20–47

Female Education, Contraceptive Use, and Fertility: Evidence from Uganda

Edward Bbaale
Center for Global Development
Washington, D.C.
ebbaale@cgdev.org

Paul Mpuga
United Nations Children's Fund (UNICEF)
Kigali, Rwanda
paulmpuga@yahoo.co.uk

Abstract

We use the Demographic and Health Survey of 2006 to examine the relationship between female education, contraceptive use, and fertility rates in Uganda. Our findings reveal that female education, especially at the secondary and post-secondary levels, increases the likelihood of using contraceptives and reduces fertility. As a result, measures that aim to educate women beyond secondary level are needed. The government programme to extend free education at the secondary level is an important measure that may help to reduce fertility and should therefore be strengthened.

Author's Note

Edward Bbaale is a Visiting Fellow at the Centre for Global Development in Washington D.C. He obtained a PhD in Economics from the University of Linz-Austria in 2008. His research interests include health care services and outcomes for women and children.

Paul Mpuga holds a PhD in Economic and Social Sciences from Johannes Kepler University, Linz-Austria. He is currently working with UNICEF in Rwanda as Social Policy Manager, where he is in charge of supporting evidence-based policy making and research. His research interests include health, population and rural development. Paul loves peace and tranquility around him.

The Authors wish to thank the African Economic Research Consortium (AERC) for sponsoring a project that contributed to much of this paper. However, the views in this paper are those of the Authors and not of AERC. The Authors also thank the Lord Almighty for the work done in this article.

Keywords: female education, contraceptives, fertility, family planning, Uganda.

1. Introduction

Remarkable socio-economic progress has been achieved in Uganda in the past two decades, with economic growth (percentage change in Gross Domestic Product) averaging about 6% since 1992. The Government of Uganda (GoU) has made great strides in its attempt to meet the targets set out in the previous two rounds of the Poverty Eradication Action Plan (PEAP, 1997-2002 and 2002-2007) and the Millennium Development Goals (MDGs) by 2015, including reducing poverty levels and increasing access to social services. The GoU is now implementing a new National Development Plan (NDP 2010-2015). Through the NDP and the PEAP, the Government underscores the important linkages between better health outcomes, poverty reduction, and economic growth. Progress has been most notable in the achievement of universal primary education enrollment, gender parity in primary education, and the fight against HIV/AIDS (UNDP, 2007; Republic of Uganda, 2004). However, huge challenges remain in ensuring gender parity in secondary education, reducing infant and child mortality, and improving maternal health.

As a consequence, Uganda experiences some of the poorest health indicators in the world. For example, the country's life expectancy at birth of approximately 50 years is low compared to the world average of about 66 years. In 2005/6, infant mortality was estimated at around 76 for every 1,000 children live births, a slight decline from 88 out of every 1,000 births in 2000/01 (Republic of Uganda, 2007). The maternal mortality rate is estimated at 435 for every 100,000 women giving birth. Uganda's total fertility rate (TFR)[1] of about 6.7 children per woman is one of the highest in the world, (Republic of Uganda, 2007, 1998a, 1998b; Population Reference Bureau, 2001). Because of these high fertility rates, Uganda has population growth rates of about 3.2% per annum, the third highest in the world, and a dependency ratio of about 108 dependants for every 100 working persons, the highest in the world.

The Uganda Demographic and Health Survey Report (DHS, 2006) elaborated on some of the factors that contribute to the high fertility rates among the women of Uganda. The factors considered include age, and sexual characteristics of women such as the age at which a woman first enters marriage, age of first sexual relations, and frequency of sexual relations. Others include post-partum amenorrhea[2] and abstinence from sexual relations. The DHS analysis provides descriptive evidence on the underlying factors, dwelling mainly on age group and regional differences, but does not provide a rigorous quantitative analysis, for example, on the

[1] Total Fertility Rate (TFR) is defined as the average number of children a woman would have in her lifetime assuming the current age-specific birth rates, (Population Reference Bureau, 2001).

[2] Total fertility rates for countries of Western Europe and North America are as low as 1.5 and 1.9 children per woman, respectively. On the other hand, the average for developing countries as a group is about 3.6 and about 5.6 children per woman for sub-Saharan Africa.

impact of the level of female education on fertility or level of education on contraceptive use.

A number of studies, using data from both developed and developing countries show that female education is associated with a decrease in fertility (Sackey, 2005; Lam and Duryea, 1999; Ainsworth et al, 1996; Vavrus and Larsen, 2003; Guilkey, 1998; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973; 1974; 1997; 2008). According to Lam and Duryea (1999), Brazil provides an intriguing case of a developing country (probably the best example) that experienced rapid fertility decline (since the 1960s) in the absence of a major family planning effort. The authors estimate that slow but steady improvements in the distribution of schooling, especially at low levels, combined with a strong negative effect of schooling on fertility, can explain around 70 percent of the fertility decline from the 1935-39 birth cohort to the 1951-53 cohort. Additionally, the authors document other important factors influencing fertility such as age at first marriage, and husband's education and earnings. It is noteworthy that the case of Brazil contradicts studies from various countries which document that fertility declines follow periods of active family planning programs[3]. In addition to the importance of women's education, higher levels of education of people in the community have a strong negative impact on fertility. Using Demographic and Health Surveys Data for 22 countries in Sub-Saharan African, the Kravdal (2002) findings indicate that education at the community level had a strong negative impact on fertility rates.

However, the quantitative impact of the level of female education on fertility has not been explicitly estimated for Uganda. This paper aims to examine the relationship between female education, contraceptive use, and fertility. We sought to provide answers to the following questions: Does the level of education acquired by a woman affect her decision in terms of the number of children born, and if so, how many years of a woman's schooling have a significant negative impact on fertility in Uganda? What are the factors that are more likely to influence a woman's decision to use contraceptives? We test the hypothesis that female education leads to higher contraceptive use which in turn leads to a lower fertility rate.

The paper comes at an opportune time, when the debate on the likely implications of high population growth rates and the impact of female education on fertility is hottest in Uganda. The Uganda National Population Policy aimed to reduce fertility rates from 6.9 in 1995 to under 6.5 live births per woman by the year 2000 (Republic of Uganda, 1998a). However, according to the 2005/06 DHS, this reduction was not realized. This paper provides evidence on the relationship between female education, contraceptive use, and fertility in Uganda. Additionally, we document other socioeconomic and demographic factors influencing contraceptive use and fertility in Uganda. Our findings provide a rich body of recommendations that can be used for policy formulation, analysis, and advocacy in an attempt to increase contraceptive use, thus leading to women's economic empowerment and gender equity. By extension, women's economic empowerment is essential for the attainment of sustainable development and Millennium Development Goals 1 (eradication of extreme poverty), 4 (reducing child mortality by two-thirds), and 5

[3] This is considered because it is realised that many women have sexual relations before marriage, which increases their chances of getting pregnant.

(reducing maternal mortality by three-quarters) by 2015. Whereas similar studies have been conducted in other parts of the world, the uniqueness of country-specific conditions dictate that policy options may not be applied universally. Therefore, this paper attempts to close the knowledge gap for the case of Uganda and hence represents a real value added.

2. Review of the Literature

There is wide body of literature concerning the importance of female education in reducing fertility rates and the general improvement in labour force participation and social welfare. Neoclassical theory suggests that as investment in human capital increases and as more women participate in the labour market, the fertility behaviour of households is bound to change in favour of fewer children (Singh, 1994). Empirical evidence from both developed and developing countries unambiguously reveals that female education is associated with a decrease in fertility (Sackey, 2005; Lam and Duryea, 1999; Ainsworth et al., 1996; Vavrus and Larsen, 2003; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973). Increased participation of women in schooling and the labour market raises the economic value of their time, which increases the opportunity cost of raising children (Guilkey, 1998; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973). Schultz (1993) confirms that women's education is associated with smaller desired family sizes across the world. To the best of our knowledge, there is no study in Uganda that has explicitly analyzed the impact of female education on fertility and contraceptive use, thus there is a strong need for empirical inquiry into this issue.

This negative relationship between women's education is explained by a number of factors, which have been explored by both economists and sociologists. First, the longer a woman stays in school, the longer they defer giving birth to their first child. This lowers the chances of giving birth to many children. Moreover with more education and exposure, women acquire more information about their bodies and are more able to process that information to their advantage (Vavrus and Larsen, 2003; Singh, 1994). The positive impact of women's education on their autonomy, leading to later marriages, increased use of contraceptives and lower fertility is discussed by Mason (1986). Indeed, the link between women's education and fertility is much stronger than that of the husband's (Ainsworth et al., 1996).

In general, there are two major determinants of fertility in Uganda. First, underlying or indirect factors include education, the desire for large families, extended family influence, and economic value of children, occupation, property ownership, and residence. Second, immediate or direct determinants include marriage patterns, sexual customs, frequency of sexual activity, access to and use of contraceptives, length of postpartum amenorrhea, sterility, and abortion. In this study, we focus on the negative impact of women's education on fertility, since, according to Schultz (1993), it represents one of the most important nonmarket returns to women's education. In addition, education has other important synergies including its role in influencing participation in labour force, poverty reduction, and improved standards of living.

3. Theoretical Framework

Our theoretical foundations are based on a modified version of a household structural model proposed by Rosenzweig and Schultz (1983). In the model, the household is assumed to maximize a utility function subject to the budget, children and health production functions, and time constraints. The utility of a typical household is a function of the number of children (C), child health (H_C), and consumption of market goods (X), leisure (V), and taste (θ). In the model, children are treated as a special form of good from which satisfaction is derived but involving an opportunity cost of time and financial resources required to bring them up. It is to be noted that although this model refers to children in purely economic terms, this is not a complete reflection of how children are viewed in developing countries. The same line of argument has been taken by other authors (see for example, Ajakaiye and Mwabu, 2007; Mwabu, 2009; Bbaale, et al., 2011; and many others). The household is assumed to maximize a utility function conventional in the standard microeconomics specified as follows:

$$U = U[C, H_C, X, V, \theta] \tag{1}$$

In this model, there are two household production functions, one for fertility and the other for child health. The production function for fertility includes a term for the number of children that the couple would have without engaging in any contraception minus a function of contraceptive inputs that reduces the number of children a couple can have.

$$C = \mu - C_1(Z) \tag{2}$$

Where μ and Z refer to the number of children without contraception and contraceptive inputs respectively.

The model further comprises the production function for child health that basically maps health inputs to the health outcome of the child. Some health inputs may be purchased from the market, such as medicine and nutritious foods like milk. These inputs are normally complemented with the time of the mother and father allocated to producing child health, education of the mother and father, and the innate endowment of the child in health terms.

$$H_C = H_C(N, T_{CM}, T_{CF}, E_M, E_F, \alpha) \tag{3}$$

Here $N, T_{CM}, T_{CF}, E_M, E_F,$ and α refer to market purchased child health inputs (such as medicinal items and milk), time of the mother devoted to producing child health, time of the father devoted to producing child health, education of the mother, education of the father, and the innate child endowment respectively.

Since the total time in a day is limited to 24 hours, coupled with the argument that various activities or chores requiring human labour are mutually exclusive, this model introduces the time constraint. Therefore, it is inevitable that a mother and father allocate her/his time amongst such activities as leisure, work, and producing child health.

$$\begin{aligned} T_F &= V_F + L_F + T_{CF} \\ T_M &= V_M + L_M + T_{CM} \end{aligned} \tag{4}$$

Here $T_F, V_F, L_F,$ and T_{CF} are total time available to the father, distributed to leisure, work, and producing child health, respectively. $T_M, V_M, L_M,$ and T_{CM} are total time available to the mother, distributed to leisure, work, and producing child health respectively.

The model introduces a budget constraint to match income flows with various household expenditures. In this model, we assume that the household spends money on consumption goods, child health inputs, and contraceptive inputs. On the other hand, the income streams are the labour income of the mother and father as well as the exogenous non-labour income.

$$P_N N + P_Z Z + P_X X = L_M W_M + L_F W_F + Y \quad (5)$$

Here $P_N N, P_z Z, P_X X, L_M W_M, L_F W_F,$ and Y refer to the cost of market purchased child health inputs, cost of contraceptive inputs, cost of the consumption good, labour income of the mother, labour income of the father, and the exogenous non-labour income, respectively.

Maximizing the utility function in equation (1) subject to the set of constraints in equations (2), (3), (4), and (5) gives rise to the reduced form equations of endogenous variables written in terms of exogenous variables. The endogenous variables include contraceptive use, fertility, labour force participation, and child health. For this paper, our concern is on contraceptive use in equation (6) and fertility in equation (7); hence, our analysis is restricted to only these two outcomes. The exogenous variables include female and male wages, prices of contraceptive inputs and child health inputs, mother and father education, and household wealth (instead of non-labour income).

The reduced form specifications for contraceptive use (Z) and fertility (C) that emerge from the maximization problem above appear as follows:

$$Z = Z(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \theta) \quad (6)$$

$$C = C(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \theta) \quad (7)$$

Where $W_M, W_F, E_M, E_F, W_H, P_Z, P_N, \alpha$ and θ, refer to wage rate of the mother, wage rate of the father, education of the mother, education of the father, household wealth, price of contraceptives, price of child health inputs, price of the consumption good, and taste, respectively. The mother's and father's expected lifetime wage rate is a crucial variable that may affect contraceptive use and fertility. But since the expected lifetime wage rate is not a directly observable variable, it is prudent to use educational attainment to substitute for wages. This proxy has been used by previous researchers, namely Gardner (1973) and Ben-Porath (1973), who found that women's schooling is associated with a fertility decline in the US and Israel, respectively. Consequently, we find this proxy appropriate in our study since the returns to education are greater the higher the level of education in Uganda, everything else held constant.

4. Methodology

4.1 Data and Variable Definitions

The data were obtained from the Uganda Demographic and Health Survey (UDHS) 2006, conducted by MACRO International on behalf of the Uganda Bureau of Statistics (UBOS). The 2006 UDHS is a nationally representative survey of 8,531 women aged 15-49 and 2,503 men aged 15-54. Three questionnaires were used: household questionnaire, women's questionnaire, and men's questionnaire. The UDHS provides information on the demographic characteristics of the country. It contains information on household size, age and sex distribution, region, location, religious affiliation, occupation of household members, the number of children ever born by a woman, child mortality, marital status, and educational attainment of women and men.

For our analysis ,we used three dependent variables: (a) Current use of contraceptives, which was defined as a binary variable equal to 1 if a mother was currently using any contraceptives at the time of the survey and zero otherwise. Methods of contraception are divided into two: modern and traditional methods. The modern method included the use of condoms, pills, injections, implants, and sterilization. Traditional method included the use of rhythm, withdrawal, and folk methods. (b) Total fertility: this was defined as the total number of children ever born by a woman. (c) Cumulative fertility to age 20, 25, and 30: this included the total number of children a woman had before reaching ages 20, 25, and 30 respectively. Cumulative fertility as a dependent variable has been used by previous classic studies (Duryea and Lam (1999) and Ainsworth et al., (1996)). The greatest virtue of using cumulative fertility as a dependent variable, other than total fertility per se is that it helps us to gain insights into the fertility behaviour of younger women, which is extremely important for policy analysis and advocacy.

The central independent variable in our analysis is female education. This was categorized into four outcomes as follows: 0=no education, 1=primary education, 2=secondary education, 3=postsecondary education. In all our regressions, no education is the reference category. It is noteworthy that the educational attainment of men was defined and categorized in the same way. In addition to female and male education, this paper sought to control for other socioeconomic, demographic, and behavioural factors: age of the mother, which was broken into five year age cohorts as 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. Age is used to capture the fact that younger women, compared to older women, may be more dynamic and more willing to utilize modern contraceptives, creating lower future fertility trajectories. In all our regressions, the 15-19 cohort was used as the reference category. In order to capture the effect of location and regional peculiarities such as ease of access to health centres or pharmacies, we defined dummy variables for location and region. Location was defined as equal to one if a mother was in the rural area and zero otherwise. Four region dummies were defined as 1=central, 2=east, 3=north, and 4=west. In all our regressions, the central region was the reference category. To capture the traits or traditional beliefs of mothers, we defined three religious dummies as 1=Catholics, 2=Protestants, 4=Muslims, and 5= "Others." The category "Others" is used to include Evangelicals (born-again Christians), Seventh Day Adventists, Orthodox, and traditionalists/non-believers. In

all our regressions, Catholics were used as the reference category as they are the least likely to use contraceptives because the Catholic Church in Uganda is openly opposed to the practice. The wealth index is provided in the data set in terms of quintiles; 1=poorest quintile, 2=poor, 3=medium, 4=rich, 5=richest. In all our regressions, the poorest quintile was used as the reference category. We also defined a discrete binary variable equal to one if a mother was married and zero otherwise.

4.2 Estimation Strategies

In order to estimate the contraceptive use model, we use maximum likelihood probit techniques in order to generate the probability of contraceptive use. The general form of the probit model takes the following form:

$$Z_i^* = X_i\beta + \mu_i, \quad \forall i = 1,...,n \tag{8}$$

$$Z_i = \begin{cases} 1: \ if \ Z_i^* > 0 \\ 0: \ if \ otherwise \end{cases} \tag{9}$$

Where Z_i is a binary variable equal to 1 if the i^{th} woman used contraceptives in the year of the survey and is equal to zero otherwise. This response is determined by the latent variable Z_i^*. X_i is a vector of explanatory variables, β is a vector of parameters to be estimated and μ_i is the error term. The specific probit model used to estimate the determinants of contraceptive use takes the form:

$$Z = f(E_M, B, W, L, Rn, Rl, E_F) \tag{10}$$

Where Z, E_M, B, W, L, Rn, Rl and E_F is the probability of contraceptive use, mother's level of education, birth cohort dummies, wealth status (measured by the wealth quintiles), location dummy, region dummies, religion, and husband's level of education respectively. Mother's education is hypothesized to have a positive influence on contraception use. The basic argument is that education induces women to prefer fewer children because of the high opportunity cost of the income forgone if they concentrated on child care. Consequently, such women use contraceptives as a way of reducing their fertility rates. Also due to affordability advantages, women living in wealthier households are more likely to use contraceptives compared to their counterparts living in relatively poor households. Considering the location, women living in the urban areas are more likely to use contraceptives and hence experience lower fertility rates compared to their counterparts in the rural areas.

On the other hand, we use ordinary least squares (OLS) technique to estimate our reduced form specifications for total fertility and cumulative fertility. The greatest virtue of using ordinary least squares for this particular analysis is that the coefficients can be interpreted directly in terms of the number of children. The specific fertility model we estimated appears as follows:

$$C = f(E_M, B, L, , Rl, Rn, E_F) \tag{11}$$

Where $C, E_M, B, L, RL, Rn,$ and E_F is cumulative or total fertility, woman's level of schooling completed, age cohort dummies, location dummy, religion, region, and husband's educational attainment respectively.

5. Results and Discussion

In this section we discuss the results of the analysis of the relationship between female education, contraceptive use, and fertility outcomes. We begin with a discussion of the descriptive evidence on contraceptive use, fertility, and household characteristics to provide a foundation for the quantitative results.

5.1 Descriptive Evidence

The UDHS 2006 final report makes a detailed presentation on the underlying factors of contraceptive use and fertility in Uganda (UBOS, 2006). In this section, we therefore only highlight the descriptive evidence relevant to the current study, as summarized in tables 1-2. The summaries are generated using the sample weights implying that they are nationally representative and are consistent with those in the UDHS report.

5.1.1 Current Use of Contraceptives

As a precursor to understanding the fertility behaviour of women, we present descriptive evidence on the current use of contraceptives (Table 1). It is interesting to note that the use of contraceptives increases with education level. It is observed that more women with post-secondary education use any method (43.4%) and modern method (38%) respectively, compared to those with no education (12% use any method and 10% use modern method). This underscores the role of education in changing the fertility behaviour of women.

Category	Current use, Any Method	Current use, Modern Method
Female education:		
No education	11.7	9.7
Primary	17.9	16.1
Secondary	28.2	24.7
Post-secondary	43.4	38.0
Wealth status:		
Poorest quintile	8.4	7.5
Poorer quintile	12.6	11.5
Middle quintile	15.9	13.4
Richer quintile	21.9	19.2
Richest quintile	33.9	30.1
Region:		
Central	29.1	25.8
East	17.7	15.9
North	9.7	9.3
West	18.7	15.5
Location:		
Rural	32.5	29.4
Urban	16.9	14.7
Female age cohorts:		
15-19	6.4	5.9
20-24	21.2	19.1
25-29	24.2	22
30-34	27.2	24

35-39	24	20
40-44	23	20
45-49	19	15.3
Female head	18.9	17.4
Non female head	19.8	17.1
Only girl children	24.1	21
Only boy children	24.2	21.1
No. of children:		
0	7.1	6.7
1	20.7	18.6
2	24.3	20.6
3	24.4	21.6
4	26.2	23.5
5+	23.2	20.2
Partner's education:		
No education	11.1	9.5
Primary	19.6	17.1
Secondary	30.7	27.1
Post-secondary	42.1	35.6
Married	19.1	16.9
Not married	20.1	17.8
Married by 20	21.9	19.3
Married by 25	22.5	19.7
Married by 30	22.6	19.7
Religion:		
Catholic	18.2	16.3
Protestant	20.1	17.3
Muslim	24.7	21.6
Other faith	17.3	15.6
Working	20	17.7
Not working	17.2	15.1
Working for pay	23	20.3
Paid in cash	32.3	28.3
Paid in kind	13.1	12.2
Paid in cash + kind	21.8	19.3
Women years of education:		
0	11.3	9.3
1-3	13.2	11.0
4-7	20.1	18.3
8-10	26.8	23.5
10+	38.0	33.3
Total	**19.5**	**17.2**
N	**8,531**	**8,531**

Table 1: Current Use of Contraceptives
Source: Author's own analysis using the Uganda Demographic and Health Survey 2006

In addition to education attainment, we explain differences in contraceptive use by the wealth status of households in order to capture the inequality in access originating from the ability to pay. The average percentage of women using

contraceptives increases steadily the higher the wealth status of the households (Table 1). For example, there are more women in the richest quintile using any method (34%) compared to 8.4% in the poorest quintile. This may imply that for the government to encourage increased use of contraceptives, affordability is a very important factor to consider. The government should subsidize the prices of contraceptives or remove any taxes that may be levied on them. Considering regional differences, the central region is observed to have a higher average percentage of women using contraceptives than any other region with the lowest average being the northern region (Table 1). This can be attributed to the fact that the central region houses the capital city of the country which has a very high concentration of modern health facilities, pharmacies, and health professionals. This implies that contraceptives are more available and can be afforded by the residents given the nature of the cash economy existing in much of the central region. Therefore, purposive regional interventions are needed in order to have a universal utilization of family planning techniques. Unexpectedly, the rural area is doing better than the urban area in using any method of contraceptives (32% compared to 17%).

Age is used in this analysis to reflect differences in contraceptive use owing to differences in traits between old and young women. Young women are thought to be more dynamic and hence more likely to utilize modern contraceptives compared to their old counterparts. Table 1 reveals that the utilization of contraceptives increases steadily with age reaching a peak (27% for any method and 24% for modern method) at the age cohort 30-34 beyond which it falls. This can be attributed to the fact that at a later age cohort women are almost getting over the reproductive period. For women that are heads of households, 92% of contraceptive use is a modern method (17.4/18.9) compared to the non female heads where 86% of contraceptive use is a modern method (17.1/19.8). Thus on average, a higher percentage of women who are female heads use modern methods of contraception. Women with fewer children are observed to use contraceptives less than those with many children. The percentage of women increases steadily (from 7.1-26% and 6.7-24%, for any and modern method, respectively) up to 4 children beyond which it falls. This can be attributed to age such that by 5 children and over the woman is almost getting over the reproductive period and may not use contraceptives so frequently.

The utilization of contraceptives also varies directly with husband's education. The percentage of women increases from 11.1% (for husbands with no education) to 42.1% (for husbands with post-secondary) for any method and from 9.5% (for husbands with no education) to 35.6% (for husbands with post-secondary) for the modern method of contraception. This can be attributed to accessibility to information and affordability amongst the educated. It is also interesting to note that there are more unmarried women using contraceptives compared to the married irrespective of whether it is any method (20.1% compared to 19.1%) or modern method (17.8% compared to 16.9%) of family planning. This can be attributed to the differences in the readiness to have children amongst the married and unmarried women. In fact, there is a lower percentage of women married earlier (21.9% for those married by age 20) using contraceptives than those married later (22.6% for those married by age 25).

Religion is used in this analysis to capture the traits and beliefs of women in different religious affiliations. It is revealed that "Other faith" and Catholics,

compared to Muslims and Protestants, have a lower percentage of women using either any method or a modern method of contraception. This is not surprising because, in Uganda, amongst the Catholics and "Other faith" (especially the evangelicals) there is a serious campaign against the use of condoms. This suggests that the government should establish a sensitization program intended to change the beliefs of religious leaders, who in turn may communicate to their congregations about the importance of contraceptive use.

The employment status and the mode of payment are important in influencing the use of contraceptives. There are more women in the working class using contraceptives. The percentage is highest (32% and 28% for modern and any method, respectively) amongst those paid in cash compared to those paid in kind. This implies that increased participation of women in the labour force, particularly in the formal private and public sectors where they are paid in cash, increases the likelihood of contraceptive use. Government efforts to increase female employability, particularly through education, are therefore necessary.

There are more women (38% and 33% for any and modern methods, respectively) with over ten years of education using contraceptives irrespective of the method used compared to those with zero years of education (11% and 9% for any and modern method, respectively). Therefore, it appears ensuring the effectiveness of family planning campaigns must be preceded by campaigning for higher education amongst girls.

5.1.2 Fertility Characteristics

A long reproductive period and poverty are some of the underlying reasons for the high fertility rates in Uganda. Limited access to family planning services, low education, and residing in rural areas compound the problem. In Table 2 we note that on average 66% and 74% of women aged 15-49 years were married by the age of 20 and 25 respectively. These percentages are quite high and this implies that women have a long reproductive period, hence being vulnerable to producing many children. For those with no education, over 83% were married by age 20 compared to only 23% with post-secondary education. Also for women in the poorest quintile, 74% got married by age 20 compared to only 48% in the richest quintile. There is little wonder then, that women with low education, those in lower welfare groups, those in the North, the East, and in rural areas tend to have more children compared to those with higher education, the relatively rich, and those in the Central, West, and urban areas.

Category	Married			Cumulative fertility			
	All Women	By age 20	By age 25	Number of children ever born	By age 20	By age 25	By age 30
Female education:							
Non education	77.7	83.4	93.9	5.5	1.0	2.3	3.6
Primary	78.6	70.3	76.5	3.5	1.2	2.6	4.0
Secondary	72.1	39.4	50.8	1.8	0.7	2.1	3.5
Post-secondary	71.8	22.8	48.0	1.6	0.2	1.0	2.2
Wealth Status:							
Poorest quintile	78.8	73.7	83.8	4.1	1.1	2.3	3.7
Poorer quintile	78.3	75.0	82.1	3.9	1.0	2.5	3.8
Middle quintile	78.0	69.9	76.7	3.9	1.0	2.5	3.8
Richer quintile	79.0	67.2	74.7	3.8	1.1	2.6	4.0
Richest quintile	73.0	48.0	59.1	2.4	0.8	2.2	3.5

Region:							
Central	71.6	57.0	67.1	3.1	1.0	2.4	3.7
East	80.8	71.3	77.9	3.9	1.2	2.7	4.0
North	80.3	69.2	79.5	3.7	0.9	2.1	3.4
West	78.2	66.9	74.6	3.6	1.0	2.4	3.8
Location:							
Rural	67.6	51.1	62.1	3.8	0.8	2.1	3.3
Urban	79.4	68.6	76.8	2.3	1.1	2.5	3.8
Partner's education:							
No education	72.1	81.3	96.9	5.1	.94	2.1	3.4
Primary	70.8	89.2	97.8	4.9	1.2	2.6	3.9
Secondary	71.8	86.4	98.3	3.7	1.1	2.5	3.8
Post-secondary	72.4	68.9	92.3	3.6	.72	2.0	3.3
Religion:							
Catholic	72.1	67.5	76.8	3.6	.97	2.3	3.6
Protestant	71.2	64.5	73.1	3.5	1.0	2.4	3.8
Muslim	71.1	67.2	73.4	3.4	1.2	2.6	3.9
Other	68.3	60.1	69.4	3.4	.96	2.4	3.7
Working	71.6	71.1	80.0	3.9	1.0	2.4	3.7
Not working	69.8	41.9	49.3	1.9	.88	2.3	3.7
Working pay	70.4	72.6	82.8	4.0	1.0	2.4	3.7
Paid in cash	67.3	65.7	79.3	3.5	.9	2.1	3.4
Paid in kind	74.9	71.3	79.1	3.6	1.1	2.4	3.8
Paid in cash + kind	70.2	77.8	86.9	4.5	1.1	2.5	3.8
Female head	68.8	57.1	66.3	3.3	.94	2.2	3.4
Not female head	72.4	69.3	77.8	3.6	1.0	2.5	3.9
Any method	69.7	73.8	85.9	4.3	1.1	2.6	4.1
Modern method	70.1	73.5	85.1	4.1	1.1	2.6	4.1
Age cohorts:							
15-19	71.6			.23			
20-24	71.3	72.4		1.7	.98		
25-29	71.9	78.8	92.8	3.5	1.0	2.5	
30-34	72.2	81.7	93.5	5.1	1.1	2.6	4.0
35-39	68.1	80.1	93.2	6.3	1.0	2.4	3.8
40-44	71.0	79.8	93.7	7.0	.93	2.2	3.5
45-49	71.5	82.0	94.8	7.7	.96	2.2	3.5
Only boys	71.7	84.3	94.8	5.2	1.2	2.6	4.0
Only girls	71.3	84.2	94.9	5.2	1.2	2.6	4.0
Women years of education:							
0	73.3	83.2	93.7	5.5	1.0	2.3	3.6
1-3	73.4	82.6	87.8	4.5	1.2	2.6	3.9
4-7	71.6	64.3	70.9	3.1	1.1	2.6	4.0
8-10	68.3	43.8	52.2	1.9	.87	2.3	3.6
10+	64.7	27.7	49.3	1.6	.33	1.33	2.6
Total	**77.0**	**65.6**	**74.3**	**3.5**	**1.0**	**2.4**	**3.7**
N	**8,531**	**5,494**	**6,296**	**8,531**	**6,583**	**4,921**	**3,511**

Table 2: Fertility Characteristics

Source: Author's own analysis using the Uganda Demographic and Health Survey 2006

Table 2 also reveals that there are fewer women (68.9%) married earlier (by age 20) having partners with post-secondary education compared to 81.3% having partners with no education. A similar observation is amongst those married by age 25. This may mean that highly educated men marry highly educated women, and this occurs at a later age. Women married to men with no education are associated with a fertility rate of 5.1 children compared to 3.6 children for women married to men with post-secondary education. Additionally, lower cumulative fertility is also observed amongst women with more educated spouses. This may imply that education of both boys and girls is critical in reducing the fertility rate in the country.

There is a higher percentage (80%) of working women married by age 25 compared to their counterparts married by age 20 (71%). In fact, for all categories of working women (irrespective of the mode of payment), there is a higher percentage of women married later (by age 25) compared to those married earlier (by age 20). This can be attributed to the fact that most working women stay longer in school and hence get married later. It is rather surprising that working women are associated with a higher average fertility rate of 3.9 children compared to 1.9 children amongst those that do not work. As expected, women that are heads of households are associated with a lower fertility rate (3.3 children) compared to the non-heads; (3.6 children) the same applies to the cumulative fertility. This underscores the role of independence of women in making fertility choices.

Also women using a modern method of contraception are associated with a lower average fertility (4.1 children) compared to their counterparts using any method of contraception (4.3 children). Therefore the government should strive to increase the supply and accessibility to modern methods of contraception. As expected, the number of children increases with age of the woman (7.7 children for the age cohort 45-49 compared to 0.23 children for the age cohort 15-19). Conversely, the number of children that a woman gives birth to varies negatively with her years of education (1.6 children for women with ten years and over compared to 5.5 children for women with zero years of education). This underscores the role of education in fertility reduction just as it is in Table 1 for contraceptive use.

5.2 Quantitative Evidence

5.2.1 Determinants of Current Use of Contraceptives

In table 3, we present evidence on the determinants of the current use of contraceptives as an initial step towards our understanding women's fertility choices.[4] The importance of female education in fertility choices cannot be understated, and the benefits increase with the level of education. Our analysis shows that holding everything else constant, women with a primary level of education are 8-10% more likely to be using a modern or any method of contraception compared to those with no education. We do not seem to notice any discernible differences in the use of contraceptives between unmarried and married women having primary education. Secondary education increases the probability of using contraceptives in the range of 14-17%, and post-secondary education increases the probability to the range 16-20%

[4] This refers to the period between childbirth and the next cycle of menstruation.

apart from married women using any method whose probability is only 12%. While the partner's level of education has a positive impact on the use of contraceptives, its impact is lower than that of the woman's education. Other factors held constant, married women are 6-8% more likely to have used a modern or any method of contraception if their partner has a primary education, 7-11% if the partner has secondary education, and 12-17% if he has post-secondary education.

Specifically, female education increases the probability of using condoms. Women with at least secondary education are 21%-45% more likely to use condoms compared to their counterparts with no education at all. Women whose partners have post-secondary education are 15% more likely to use condoms compared to their counterparts whose partners have no education at all.

	(1)	(2)	(3)	(4)	(5)	(6)
	Modern method		**Condoms**		**Any method**	
	All women	**Married women**	**All women**	**Married women**	**All women**	**Married women**
Education: primary	0.079	0.101	0.088	0.048	0.078	0.086
	(7.02)***	(4.49)***	(1.60)	(1.21)	(6.69)***	(3.64)***
Secondary	0.142	0.166	0.210	0.056	0.153	0.162
	(7.99)***	(4.71)***	(3.10)***	(1.10)	(8.33)***	(4.47)***
Post-secondary	0.176	0.155	0.453	0.117	0.194	0.118
	(6.74)***	(2.94)***	(5.21)***	(1.65)*	(7.10)***	(2.21)**
Age cohort: 20-24 years	0.199	0.135	-0.163	-0.073	0.225	0.156
	(12.08)***	(2.91)***	(5.05)***	(2.33)**	(13.00)***	(3.16)***
25-29 years	0.251	0.164	-0.246	-0.093	0.281	0.190
	(14.03)***	(3.53)***	(8.57)***	(3.06)***	(15.01)***	(3.83)***
30-34 years	0.295	0.179	-0.227	-0.097	0.335	0.224
	(15.42)***	(3.72)***	(7.80)***	(3.23)***	(16.84)***	(4.34)***
35-39 years	0.286	0.188	-0.206	-0.093	0.331	0.229
	(13.71)***	(3.72)***	(7.24)***	(3.34)***	(15.20)***	(4.25)***
40-44 years	0.302	0.243	-0.193	-0.065	0.352	0.278
	(13.08)***	(4.41)***	(6.51)***	(2.04)**	(14.66)***	(4.80)***
44-49 years	0.244	0.155	-0.179	-0.072	0.298	0.216
	(9.72)***	(2.72)***	(5.48)***	(2.26)**	(11.38)***	(3.54)***
Rural resident	-0.024	-0.030	-0.014	-0.006	-0.021	-0.029
	(2.04)**	(1.31)	(0.50)	(0.26)	(1.64)	(1.16)
Religious affiliation: Protestant	-0.010	-0.006	0.025	0.003	-0.006	-0.011
	(1.09)	(0.32)	(0.92)	(0.14)	(0.68)	(0.59)
Muslim	-0.003	0.015	-0.026	-0.006	-0.001	0.003
	(0.29)	(0.63)	(0.77)	(0.25)	(0.05)	(0.10)
Other faith	-0.034	-0.010	-0.026	0.001	-0.041	-0.020
	(2.82)***	(0.41)	(0.66)	(0.03)	(3.20)***	(0.75)
Region: East	-0.022	-0.017	-0.029	-0.019	-0.031	-0.030
	(2.00)**	(0.79)	(0.90)	(0.74)	(2.74)***	(1.34)
North	-0.057	-0.072	0.053	0.041	-0.079	-0.111
	(4.78)***	(2.93)***	(1.18)	(1.13)	(6.24)***	(4.29)***
West	-0.022	-0.034	-0.017	-0.021	-0.017	-0.016
	(2.04)**	(1.58)	(0.53)	(0.79)	(1.43)	(0.69)
Wealth quintile: poorer	0.045	0.098	0.012	0.049	0.042	0.097
	(2.93)***	(2.98)***	(0.19)	(0.87)	(2.62)***	(2.83)***
Middle	0.053	0.097	0.023	0.060	0.063	0.103
	(3.27)***	(2.81)***	(0.36)	(1.01)	(3.69)***	(2.89)***
Richer	0.095	0.127	0.024	0.033	0.105	0.131
	(5.55)***	(3.59)***	(0.40)	(0.61)	(5.86)***	(3.58)***
Richest	0.161	0.271	0.068	0.067	0.180	0.291
	(8.32)***	(6.63)***	(1.15)	(1.29)	(8.87)***	(6.89)***
Partner's		0.056		0.035		0.080

education: primary						
		(2.12)**		(0.67)		(2.84)***
Secondary		0.074		0.099		0.108
		(2.33)**		(1.61)		(3.15)***
Post-secondary		0.115		0.146		0.171
		(2.69)***		(1.90)*		(3.64)***
Observations	8,525	2,763	1,267	911	8,525	2,763

Table 3: Determinants of Current Use of Contraceptives

Absolute value of z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

As observed under the descriptive evidence, age is another important determinant of using contraceptives, with the young more likely to use contraceptives than the old. The results show that all women in the age cohorts 20-40 years are 20-30% more likely to use a modern method of family planning compared to those in the age group 15-19 years (the excluded category). Yet, all women in the age cohort 44-49 years are only 24% (significant at 1%) more likely to be using a modern contraceptive method of family planning. Married women in the age cohorts 20-40 years are 14-24% more likely to be using a modern method of family planning. However, married women in the age cohort 44-49 are only 16% more likely to be using a modern method of family planning. The scenario is not any different once we look at the age cohorts in relation to the probability of using any method of family planning for all women and married women, respectively. It is noted that for all age cohorts, the probability of using either a modern method or any method of family planning is smaller for married women than for all women. This may be partly attributed to the need to first seek the opinion of the partner before using any contraceptives, which reduces their application among the married women.

The wealth of the household is an important factor in women's use of family planning. We examine the impact of wealth on family planning by using wealth quintiles with the poorest quintile (bottom 20%) as the base category. The results show that all women in the second poorest quintile are about 4-5%, and married women in the same quintile are about 10% more likely to be using a modern or any method compared to the poorest. All women in the middle quintile are about 5-6%, and married women in the same quintile are 10% more likely to be using a modern or any method compared to the poorest. Women in the top two quintiles are even more likely to be using a modern or any method of family planning – all women in the second richest quintile are 10%, and married women in the same quintile are 13%, more likely to be using a modern or any method of family planning. All women in the richest quintile are 16-18% and married women in the same quintile are about 30% more likely to be using a modern or any method of family planning. It is worth noting that at all levels of welfare (wealth quintiles) married women possess a higher likelihood of using either a modern or any method of family planning than when all women are considered.

Access to modern contraceptive methods is also underscored by the residence of women. Other factors held constant, all women in rural areas are 2%[5]

[5] Jain (1999) in the introductory chapter to the book "*Do Population Policies Matter*?" notes that the existence of charismatic leaders and diversity of family planning

less likely to be using a modern method compared to their urban counterparts. Again compared to the Central region, all women in the North, East, and West of the country are less likely (in decreasing order of magnitude) to be using a modern or any method of family planning. Thus, increased access to family planning services in these areas is critical to helping women (and their partners) meet their fertility needs.

5.2.2 Determinant of Total and Cumulative Fertility

Evidence on the determinants of fertility, using the number of children born to a woman in her lifetime as the dependent variable, is presented in Table 4. We also present evidence on the determinants of cumulative fertility by age 20, 25 and 30 in Table 5 in order to understand the fertility behaviour of younger women. In both tables 4 and 5, we present results for all women and married women. The analysis shows that other factors held constant, education, particularly at the secondary level and above plays a very powerful role in reducing fertility. This suggests that efforts to improve access to education beyond the primary level need to be strengthened. For all women, the coefficient on primary education is -0.15, implying that every 100 women with primary education will, on average, have 15 fewer children than those with no education at all. For women married by age 20 and 25, the coefficient on primary education is -0.37 and -0.53, implying that every 100 women married by 20 and 25 years of age will, on average, have 37 and 53 fewer children than those with no education at all. The coefficients on secondary and post-secondary education for all women, married women, married by age 20 and married by age 25, range from -0.5 to -2.1 respectively, implying that every 10 women with at least secondary education will, on the average, have 5 to 21 children less than those with no education at all (ref. Table 4). For all women, by age 20, 25, and 30 (cumulative fertility), every 10 women with at least secondary education will, on average, have 2 to 14 children less than those with no education at all (ref Table 5). The scenario is not very different from married women.

Male partners' primary education increases fertility by about 0.3 compared to those with no education at all. This suggests that men with at least a primary level of education may have higher earnings and this can lead to higher fertility (ref. Table 4). On the other hand, male partners' primary and secondary education increase cumulative fertility by about 0.13-0.2 compared to those with no education at all. Yet, partners' secondary and post-secondary education has limited impact on fertility.

Other important factors in altering fertility behaviour include age cohorts and residence in rural areas. As would be expected, the number of children ever born to a woman increases with her age and this is consistent with both married and unmarried women. We note that fertility among all women in the age cohort 20-24 years is, on average, about 1.5 children higher than those in the age cohort 15-19 years while fertility in the age cohort 44-49 years is over 7 children. We notice that the same trend is portrayed for married women (ref. Table 4).

methods are critical in the successful implementation of population policies to achieve declines in fertility.

Dependent variable is number of children ever born to a woman				
	(1)	**(2)**	**(3)**	**(4)**
	All women	**Married women**	**Married by age 20**	**Married by age 25**
Woman's education: Primary	-0.149	0.003	-0.369	-0.525
	(2.76)***	(0.04)	(4.48)***	(5.82)***
Secondary	-0.853	-0.746	-0.476	-0.560
	(11.53)***	(6.91)***	(5.01)***	(5.71)***
Post-secondary	-2.093	-2.024	-1.139	-0.878
	(18.35)***	(11.20)***	(9.90)***	(7.63)***
Partner's education: Primary		0.303		
		(3.72)***		
Secondary		0.037		
		(0.37)		
Post-secondary		-0.047		
		(0.35)		
Age cohort: 20-24 years	1.490	1.347		
	(24.28)***	(11.84)***		
25-29 years	3.222	3.036	1.843	
	(49.81)***	(26.72)***	(23.53)***	
30-34 years	4.753	4.595	3.419	2.414
	(70.44)***	(39.76)***	(38.67)***	(23.09)***
35-39 years	5.856	5.792	4.582	3.341
	(79.52)***	(47.71)***	(49.69)***	(28.82)***
40-44 years	6.556	6.476	5.625	4.378
	(80.47)***	(49.91)***	(54.10)***	(32.72)***
44-49 years	7.305	7.253	6.124	4.948
	(82.81)***	(52.94)***	(52.32)***	(32.36)***
Rural resident	0.612	0.563	0.341	0.127
	(10.06)***	(6.22)***	(5.11)***	(2.25)**
Religious affiliation: Protestant	0.056	0.045	0.025	0.049
	(1.21)	(0.72)	(0.44)	(1.00)
Muslim	0.227	0.266	0.044	-0.003
	(3.35)***	(2.97)***	(0.52)	(0.04)
Other faith	0.020	0.001	-0.193	-0.058
	(0.29)	(0.01)	(2.43)**	(0.86)
Region: East	0.148	0.150	0.031	-0.105
	(2.44)**	(1.86)*	(0.41)	(1.63)
North	-0.270	-0.311	-0.132	-0.065
	(4.55)***	(3.90)***	(1.80)*	(1.00)
West	-0.185	-0.112	-0.167	-0.239
	(3.04)***	(1.34)	(2.30)**	(3.84)***
Constant	0.284	0.340	0.564	0.699
	(2.99)***	(2.11)**	(5.09)***	(6.45)***
Observations	8,525	5,347	3,429	2,301
R-squared	0.68	0.59	0.72	0.62

Table 4: Determinants of Fertility

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Women residing in rural areas are more likely to have more children than those in urban areas, which is consistent with the usually lower education level in the rural areas. Other factors held constant, every 10 rural women married by age 20 to 25 have between 1.3 and 6 children more than those in urban areas (ref. Table 4). For all women in the rural areas, cumulative fertility by ages 20, 25, and 30 for every 10 women is 1, 2, and 4 children, respectively, which is higher than in urban areas. The picture is no different to that of married women (ref. Table 5). This suggests that fertility behavioural change campaigns in Uganda need to focus on women in these areas if they are to have greater influence. The impact of regional differences on fertility is pronounced in our regression. For all women in the Eastern region, every 10 women, on average, have 1.5 children more than those in the central region. The picture is not different for married women. On the other hand, for all women in the Northern region, every 10 women, on average, have 3 children less than those in the central region. Almost the same picture is observed for married women. On average, for all women and those married by ages 20 and 25 in the Western region, women have 1.7-2.4 children less compared to those in the central region (ref. Table 4).

Considering cumulative fertility by ages 20, 25 and 30 for the entire sample, every 10 women in the northern region will have on average 4, 5, and 6 children, respectively, less than those in the central region. Yet, by ages 20, 25 and 30 for married women, every 10 women in the northern region will have on average 4, 6, and 6.2 children, respectively, less than those in the central region (Table 5). This may be explained by the war in the northern region, which pushed many people out of their homes, leaving mothers and fathers with little or no opportunity to concentrate on child bearing. Also, with much economic activity and property devastated during the war, parents may have doubted their ability to bring up many children in the given circumstances. For cumulative fertility by ages 20 and 25 for the entire sample of women, every 10 women in the Western region, on average, have 2 children less than those in the central region (Table 5).

Dependent variable is cumulative fertility	(1)	(2)	(3)	(4)	(5)	(6)
		All women			**Married women**	
	By age 20	**By age 25**	**By age 30**	**By age 20**	**By age 25**	**By age 30**
Education: primary	0.064	0.202	0.268	0.065	0.204	0.235
	(2.27)**	(4.56)***	(4.01)***	(1.40)	(2.88)***	(2.20)**
Secondary	-0.406	-0.325	-0.227	-0.305	-0.348	-0.211
	(9.82)***	(4.53)***	(1.96)*	(4.34)***	(3.07)***	(1.15)
Post-secondary	-0.937	-1.402	-1.332	-0.913	-1.343	-1.388
	(15.71)***	(13.54)***	(7.43)***	(8.19)***	(7.87)***	(5.06)***
Age cohort 25-29	0.036			-0.135		
	(1.10)			(2.51)**		
Age cohort 30-34	0.068	0.010		-0.073	0.007	
	(1.99)**	(0.20)		(1.30)	(0.09)	
Age cohort 35-39	-0.053	-0.167	-0.199	-0.206	-0.168	-0.213
	(1.41)	(3.04)***	(2.68)***	(3.44)***	(2.08)**	(1.96)*
Age cohort 40-44	-0.153	-0.380	-0.414	-0.282	-0.431	-0.428
	(3.71)***	(6.28)***	(5.10)***	(4.24)***	(4.74)***	(3.52)***
Age cohort 45-49	-0.124	-0.368	-0.445	-0.325	-0.486	-0.566
	(2.79)***	(5.66)***	(5.10)***	(4.46)***	(4.88)***	(4.24)***
Rural resident	0.095	0.221	0.389	0.124	0.239	0.393
	(2.71)***	(3.70)***	(4.02)***	(2.27)**	(2.69)***	(2.73)***
Religious affiliation: Protestant	0.067	0.091	0.091	0.098	0.151	0.156
	(2.53)**	(2.06)**	(1.32)	(2.28)**	(2.25)**	(1.48)
Muslim	0.164	0.165	0.107	0.223	0.257	0.180
	(4.25)***	(2.51)**	(1.04)	(3.85)***	(2.78)***	(1.25)
Other faith	-0.004	0.006	0.011	0.056	0.124	0.185
	(0.10)	(0.10)	(0.11)	(0.89)	(1.27)	(1.22)
Region: East	0.007	0.055	0.095	-0.004	0.046	0.220
	(0.22)	(0.97)	(1.07)	(0.07)	(0.55)	(1.68)*
North	-0.365	-0.554	-0.583	-0.403	-0.607	-0.623
	(10.94)***	(10.05)***	(6.75)***	(7.55)***	(7.24)***	(4.71)***
West	-0.221	-0.222	-0.133	-0.229	-0.263	-0.103
	(6.45)***	(3.89)***	(1.48)	(4.24)***	(3.08)***	(0.77)
Partner's education: primary				0.154	0.207	0.221
				(2.86)***	(2.55)**	(1.82)*
Secondary				0.134	0.316	0.244
				(2.08)**	(3.13)***	(1.56)
Post-secondary				0.143	0.218	0.341
				(1.61)	(1.59)	(1.60)
Constant	1.114	2.490	3.739	1.082	2.295	3.555
	(22.31)***	(30.39)***	(29.30)***	(12.36)***	(17.26)***	(17.17)***
Observations	6578	4920	3510	2617	2077	1473
R-squared	0.10	0.12	0.09	0.11	0.15	0.11

Table 5: Determinants of Fertility by Age 20, 25, and 30.

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

6 Conclusions and Recommendations

6.1 Conclusions

Using the Demographic and Health Survey 2006, we examine the relationship between female education, contraceptive use, and fertility in Uganda. The results of the analyses confirm the hypothesis of this study. We show that education, particularly of women, is an important factor in reducing fertility in Uganda. While the partner's education is also negatively related to the number of children born, the magnitude is much smaller. There is near universal knowledge of methods of family planning, but very few women have used these methods and even fewer the modern methods. Our findings further show that access to or use of contraceptives is positively associated with the education of both the woman and her partner.

These findings are important for improving the quality of life of Ugandan women (and also children) through a number of policy actions. Policies to reduce fertility can play both direct and indirect roles in enhancing maternal and child mortality reductions. When women give birth to fewer children, it reduces their exposure to the risks of child birth, particularly in rural areas where health and maternal care services are poor or non-existent. Having fewer children also implies that family income is shared among fewer heads. With fewer children born, parents (both women and men) are more likely to provide more and adequate care thus ensuring their survival and attention to their early childhood development requirements.

6.2 Recommendations

Reducing total fertility is expected to play an important role in achieving both the national development goals contained in the National Development Plan and the Millennium Development Goals. However, reducing fertility needs concerted efforts from various stakeholders including the central government, the health sector, district authorities, and communities. The central government needs to provide the overall direction, political commitment and financial support for family planning. In addition, the health sector needs to provide the technical guidance on all actions needed to reduce fertility and facilities for family planning. District authorities and communities need to provide adequate facilities to ensure access to family planning. Lastly, parents require sustained information over a long period of time on the importance of planning their families in order to change their aspirations and behaviour.

The findings of the study suggest that efforts to reduce fertility need to target measures that aim to educate women beyond the secondary level. The government programme to extend free education at the secondary level is therefore an important measure that may help to reduce fertility. This needs to be embraced by all stakeholders, including donors, parents, community leaders, and local government authorities as well as women's organisations with special interests in female education. The Ministry of Education on behalf of the central government in collaboration with community leaders and local government authorities and school administrators should actively sensitize parents about the importance of female education beyond secondary level. Government legislation can be put in place to

penalise parents who discourage their children from taking advantage of the Universal Secondary Education Program established by the government. Measures need to be put in place to remove, or at least minimise factors that may lead girls to drop out of school early, including improving the quality of schools and teaching, government legislation against early marriages, and ensuring that all schools have separate sanitary facilities for girls and boys.

Measures to expand access to family planning facilities and the capacity to use them are needed. The evidence shows that while almost all women in Uganda know of at least one method of family planning only half have used any. Both government and non-government organizations can play an important role in improving women's access to contraceptives through stocking public and private health centers and pharmacies with the required contraceptives. Policies to eliminate all barriers of access to family planning services are needed, for example by removing any taxes and ensuring accessibility in the rural areas. Consistent information and public awareness of the importance of appropriate family size is needed. For the recommendations emerging from our study to be realized, political and financial commitment on the part of the government is necessary. This should be complemented with donor financial support as well as sensitization campaigns by non-governmental organizations concerning the utilization and importance of contraceptives and family planning. Village level sensitization seminars are highly recommended to catch women who may not be reached via the mass media; this is a powerful instrument for ensuring more understanding of gender justice and equity. The strong linkage between female education and contraceptive use and fertility found in this study portrays the quantity-quality trade-off and the opportunity cost of time that highly educated women face, which induces them to have fewer children. Prioritizing female education is a prime future strategy for important demographic change not only in Uganda but also in other developing countries.

Appendix

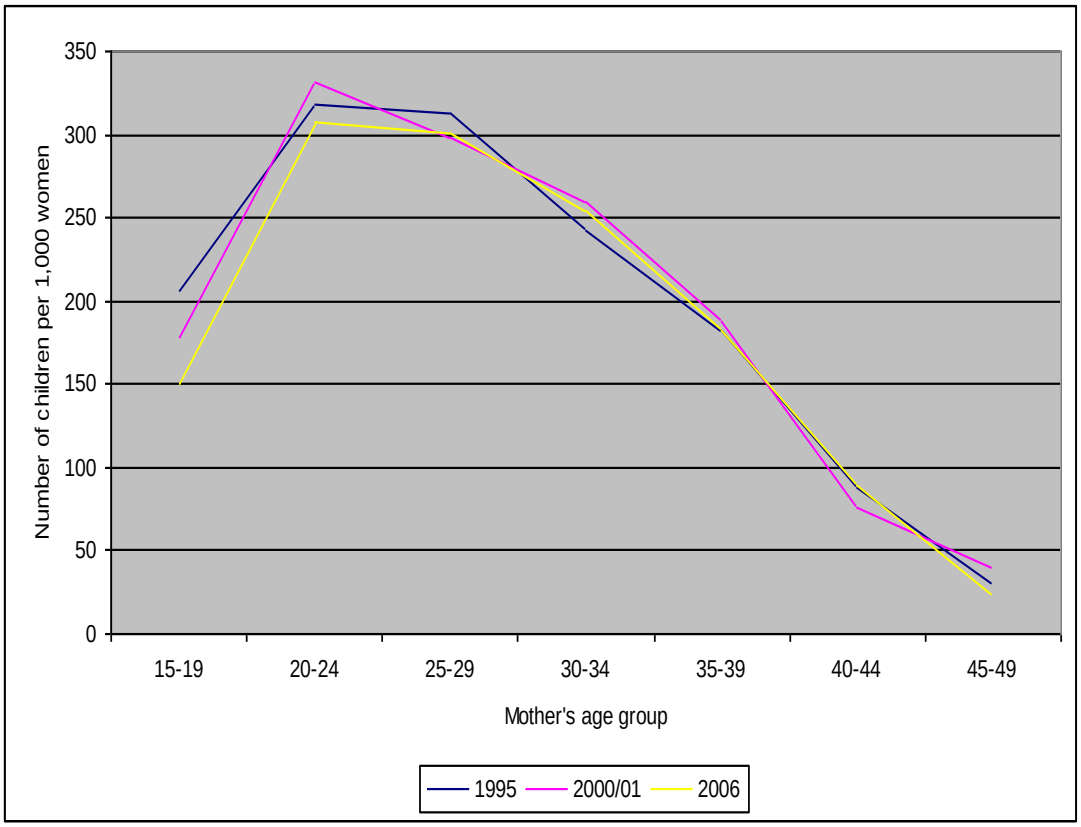


Figure 1: Age-specific fertility rates for Uganda.
Source: Republic of Uganda, 2006.

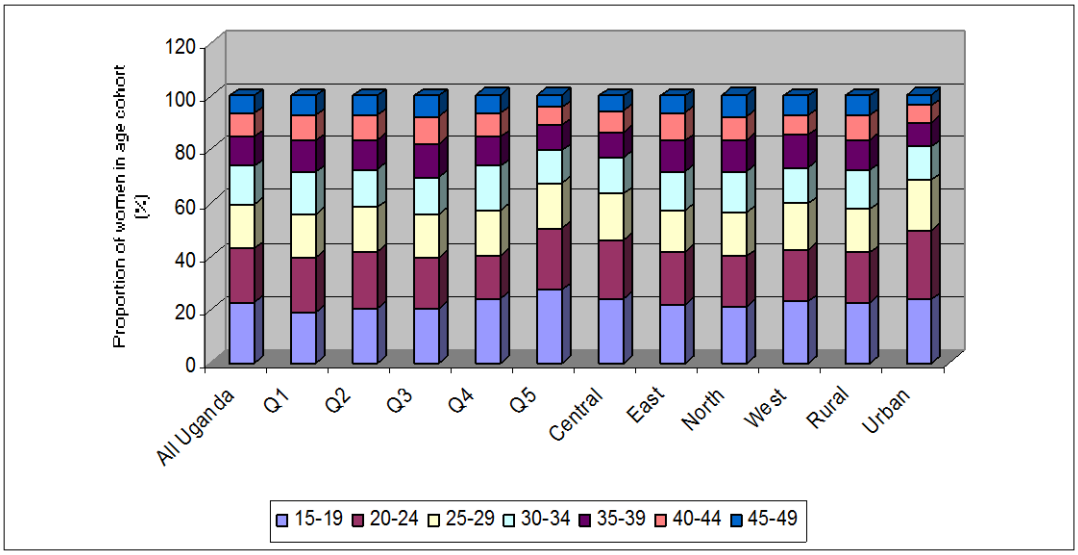
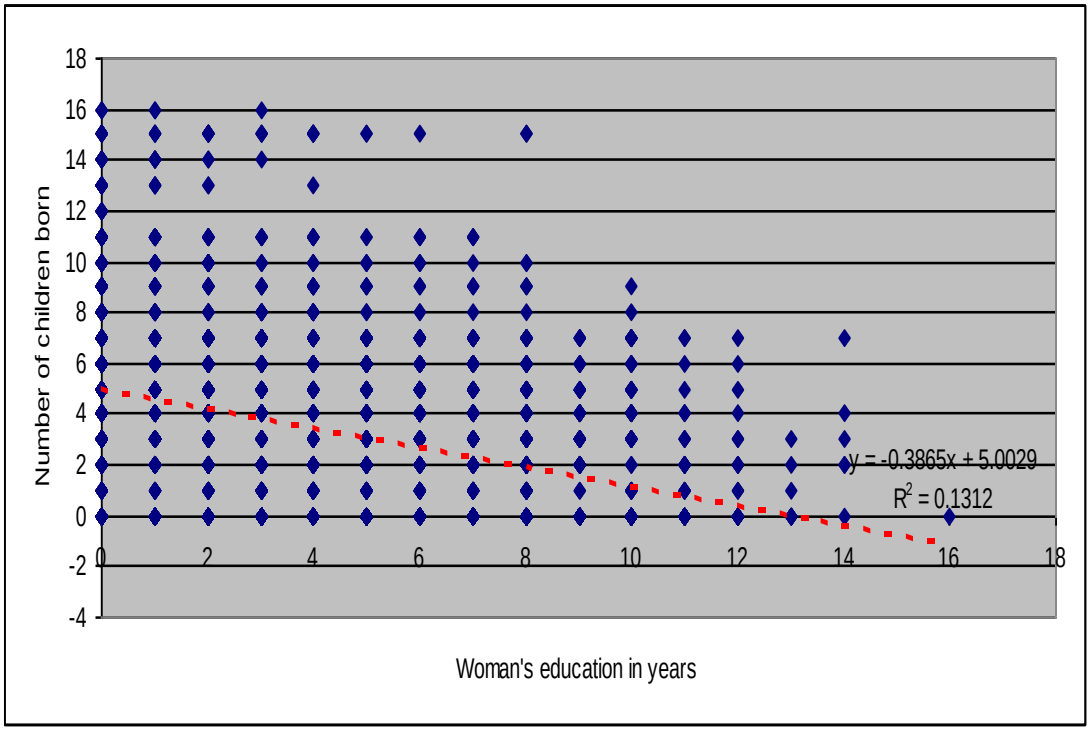
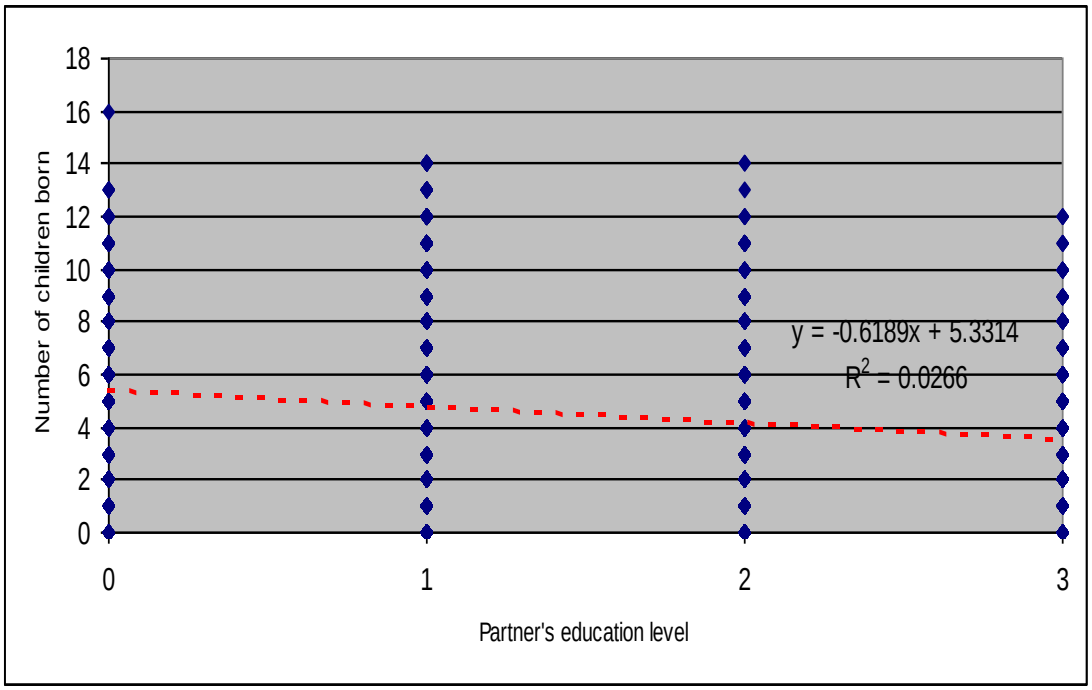


Figure 2: Distribution of women in the age group 15-49 years.
Source: Derived from author's own analysis of the UDHS 2006.

A. Number of children born plotted against years of education of the woman



B. Number of children born plotted against level of education of the woman (0 = none, 1 = primary, 2= secondary and 3 = post-secondary)



C. Cumulative fertility at age 30 plotted against woman's education in years

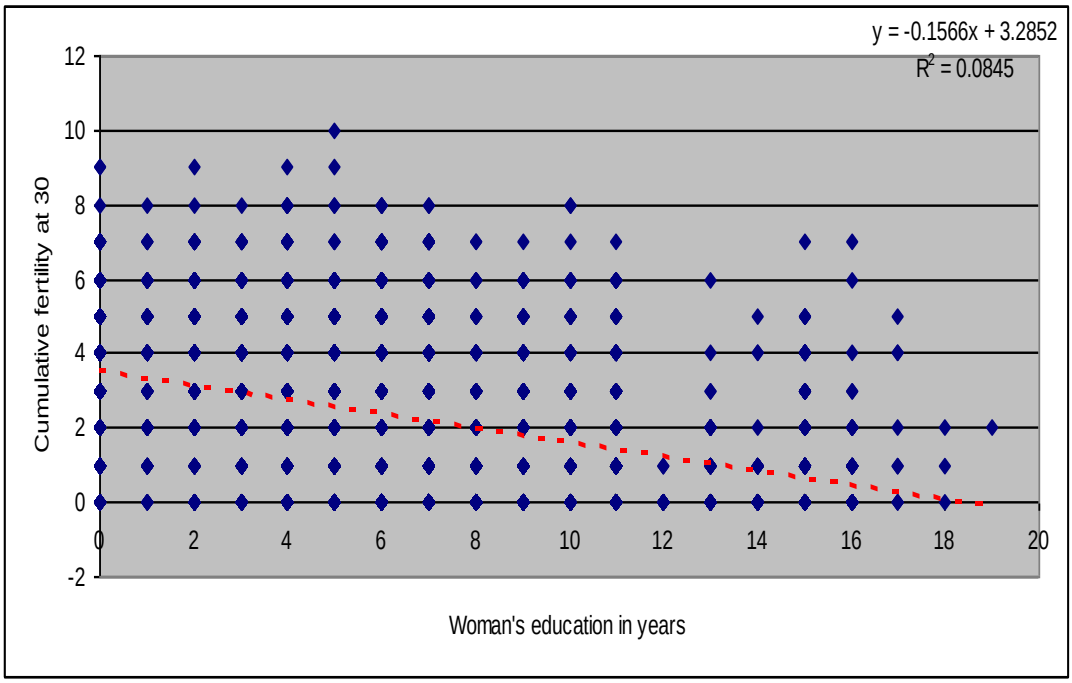


Figure 3: Fertility vs. women's education.
Source: Derived from author's own analysis of the UDHS 2006.

Bibliography

Ajakaiye, O., and G. Mwabu (2007). The demand for reproductive health services: frameworks of analysis. AERC, Nairobi, mimeo.

Ainsworth, M., Beegle, K., and A. Nyamete (1996). The impact of women's schooling on fertility and contraceptive use: a study of fourteen Sub-Saharan African countries. *The World Bank Economic Review, Vol. 10(1),* pp. 85-122.

Bbaale, E., and Buyinza, F. (2011). Micro-analysis of mother's education and child mortality: evidence from Uganda. *Journal of International Development*, DOI: 10.1002/jid.1762.

Becker, G.S. (1992). Fertility and the economy. *Journal of Population Economic, Vol. 5,* pp. 185-201.

Becker, G.S. (1991). A treatise on the family. Cambridge: Harvard University Press.

Ben-Porath, Y. (1973). Economic analysis of fertility in Israel: point and counterpoint. *Journal of Political Economy*, *No. 81*, pp. 202 – 233.

Birdsall N. and Griffin C. (1988). Fertility and poverty in developing countries. *Journal of Policy Modeling*, *Vol. 10(1),* pp. 29-55.

Gardner, B. (1973). Economics of size of North Carolina families. *Journal of Political Economy. No. 81*, pp. 99-122.

Guilkey, D., G. Angeles and T. Mroz. (1998). The measurement of indirect program impact through the effect of female education on fertility and mortality. Carolina Population Centre, University of North Carolina, Chapel Hill.

Grossman, M. (1972). On the concept of health capital and demand for health. *Journal of Political Economy, Vol. 80(2),* pp.223-235

Jain, A. (1999). Population policies that matter. In Jain, A. (1999) Eds. *Do population policies matter? Fertility and politics in Egypt, India, Kenya and Mexico.* The Population Council, New York, USA.

Kravdal, O. (2002). Education and fertility in sub-Saharan Africa: individual and community effects. *Demography. Vol. 39(2),* pp. 233-250.

Lam, D. and S. Duryea. (1999). Effects of schooling on fertility, labour supply and investments in children, with evidence from Brazil. *Journal of Human Resources, Vol. 34(1),* pp. 160-192.

Mason, K.O. (1986). The status of women: conceptual and methodological issues in demographic studies. *Sociological Forum*, *Vol.1*, pp. 284-300.

Mwabu G. (2009). The production of child health in Kenya: a structural model of birth weight. *Journal of African Economies, Vol.18 (2),* pp. 212–260. DOI: 10.1993/jae/ejn013

Population Reference Bureau (2005). World population data sheet. Washington, DC: Population Reference Bureau.

Population Reference Bureau (2001). World population data sheet. www.prb.org.

Republic of Uganda (2007). Demographic and Health Survey 2006, Final Report. Uganda Bureau of Statistics, Kampala.

Republic of Uganda (2004). Poverty Eradication Action Plan (PEAP) 2004/5 – 2007/8. Kampala: Ministry of Finance, Planning and Economic Development.

Republic of Uganda (1998a). Demographic and Health Survey 1995. Ministry of Finance and Economic Planning, Entebbe.

Republic of Uganda (1998b). Statistical abstract. Ministry of Finance and Economic Planning, Entebbe.

Republic of Uganda (1998c). Women and men in Uganda: facts and figures. Kampala: Ministry of Gender and Community Development, Entebbe: Ministry of Planning and Economic Development.

Rosenzweig, Mark R., and Schultz, T. Paul (1983). Estimating a household production function: heterogeneity, the demand for health inputs, and their effects on birth weight. *Journal of Political Economy, Vol. 91(5),* pp. 723-746.

Sackey H.A. (2005). Female labour force participation in Ghana: the effects of education. African Economic Research Consortium Research Paper 150, Nairobi.

Schultz, T.P. (1993). Mortality decline in the low-income world: causes and consequences. *American Economic Review, Vol.83,* pp. 337-42.

Schultz, T.P. (1990). Women's Changing Participation in the Labour Force: A World Perspective. *Economic Development and Cultural Change, Vol. 38,* pp. 457-88.

Schultz, T.P. (1974). Fertility determinants: theory, evidence, and application to policy evaluation. Santa Monica, California: Rand Corp.

Schultz, T.P. (1973). Explanation of birth rate changes of space and time. *Journal of Political Economy. No. 81,* pp. 238 – 274.

Singh, R.D. (1994). Fertility-mortality variation across LDCs: women's education, labour force participation and contraceptive use. *KYLOS, Vol.47(2),* pp. 209-229.

UNDP (2007). Millennium Development Goals: Uganda's Progress Report 2007. Kampala, United Nations Development Programme.

Vavrus, F. and U. Larsen (2003). Girls' education and fertility transition: an analysis of recent trends in Tanzania and Uganda. *Economic Development and Cultural Change, Vol. 51(4),* pp. 945-76.