Female Education, Labour Force Participation and Fertility: Evidence from Uganda

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Abstract

We use the Demographic and Health Survey 2006 to examine the relationship between female education and labour force participation and fertility rates for Uganda. Our results confirm the hypotheses that female education, especially at the secondary and post-secondary school levels, reduces fertility and increases the likelihood of females being engaged in the labour force. We also find that despite the near universal knowledge of family planning methods in Uganda and the importance of contraceptives in fertility reduction, their usage is limited to less than half of the women in Uganda.

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, changing behaviour takes a long time and requires the concerted efforts from various stakeholders, including the central government, health sector, district authorities and communities. The central government needs to provide the overall direction, political commitment and financial support. The health sector should provide technical guidance on all actions needed to reduce fertility, facilities and information on family planning, while District authorities and communities need to provide adequate facilities to ensure access to family planning.

Measures that aim to educate women beyond primary school level are needed. The government programme to extend free education at the secondary level is therefore an important measure that may help reduce fertility. This should be embraced by all stakeholders, with campaigns and other measures to encourage girls to attain education beyond the primary school level. Women should be empowered to decide their reproductive behaviour through awareness campaigns, and increased access to family planning methods. Men also need to be participants in the fertility choices for their families, and should be included in the educational campaigns on family planning. Both government and non-government organizations can play an important role in improving women's access to contraceptives by stocking public and private health centres and pharmacies with the required contraceptives. Policies to eliminate all barriers to access to family planning, including removing taxes on contraceptives to lower their prices, are needed.

1. Introduction

Study concern

Remarkable socio-economic progress has been achieved in Uganda in the past two decades, with economic growth Gross Domestic Product (GDP) 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 year 2015, including reducing poverty levels and increasing access to social services. The government 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 enrolment, 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. Malaria remains the number one cause of morbidity and mortality in Uganda.

As a consequence, Uganda experiences some of the poorest health indicators in the world. For example, the country's life expectancy at birth of about 50 years is very low compared to the world average of about 66 years. In 2005/06, 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). 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[2], (Republic of Uganda, 2007, 1998a, 1998b; Population Reference Bureau, 2001). Because of these high fertility rates, Uganda has a very high population growth rate of about 3.2% per annum, the third highest in the world, and a high dependence ratio of about 108 dependants for every 100 working population. The adverse implications of these trends are large.

From both a theoretical and empirical perspective, it is notable that Uganda's high population growth is constraining its per capita income growth, and service delivery prospects. Klasen (2005) notes that if Uganda began a period of sustained fertility decline, per capita income growth rates could be increased by between 0.5-0.6 percentage points per year in the medium term. Also, considering the favourable age structure dynamics that such a fertility decline would generate, per capita income growth could increase

by between 1.5 and 3.0 percentage points in the longer term. It could also significantly contribute to the acceleration of poverty reduction and inequality, and improving gains in education and health outcomes.

The Uganda Demographic and Health Survey (UDHS, 2006) elaborated on some of the factors that contribute to the high fertility rates among the women of Uganda. The factors include age, and sexual characteristics of women such as the age at which a woman first enters marriage, age of first sexual relation[3] and frequency of sexual relations. Others include post-partum amenorrhea[4] 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 impact of the level of female education on fertility or level of education on labour force participation.

Research problem

For some time now, there has been considerable attention and interest in the relationship between female education and participation in the labour force, and on fertility rates. This has been particularly so following the development of economic models of fertility behaviour. In these models, price and income variables are postulated to affect fertility decisions. Accordingly, childbearing and early nurturing of infants, which are of biological necessity a woman's role (Ellis, 1988), are seen as activities that intensively use a woman's time. But with increased education, urbanization and modernization, the opportunity cost of women staying at home and taking care of children is very high. These activities consume a lot of the woman's time, which can otherwise be used to earn income. Therefore, a woman's expected lifetime wage rate is an important variable that may affect the number of children she gives birth to. But since a woman's expected lifetime wage rate is not a directly observable variable, her educational attainment provides an important proxy for her expected lifetime wage rate.

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 et al., 1998; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973; 1974; 1990; 1993). While studies from various countries show fertility declines to follow periods of active family planning programmes[5], Brazil provides an example of a country where, despite the limited family planning programmes and volatile economic growth, fertility has steadily declined since the 1960s, underscoring the importance of women's education in this trend, even in the absence of other factors (Lam and Duryea, 1999). 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 Sub-Saharan African countries, Kravdal (2002) finds a strong negative impact of the level of education at community level on fertility rates. These findings confirm the neoclassical theory, which 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.

However, the quantitative impact had not been explicitly estimated for Uganda. This study aimed to test this theory using data from the Uganda Demographic and Health Surveys. Given Uganda's consistently high fertility rates and yet limited efforts to implement family planning programmes, it is important to gain more understanding into the factors that affect household fertility decisions. The study seeks 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 participate in the labour force? What is the relationship between mother's education and child outcomes, such as the probability of survival of children?

Study objective

The main objective of the study was to examine the relationship between female education and outcomes, including labour force participation, fertility, and child survival.

Hypothesis

Female education leads to higher labour force participation (and wages), which in turn leads to higher opportunity costs of time, leading to higher contraceptive use and lower fertility rate. Also, female education increases child survival rate.

Significance of the study

The study comes at an opportune time when debate on the likely implications of high population growth rate and the impact of female education on fertility is hottest in Uganda. The Uganda National Population Policy aimed to reduce fertility rate from 6.9 in 1995 to at least 6.5 live births per woman by the year 2000 (Republic of Uganda, 1998a). However, according to the 2005/06 DHS, this had not been realized. This study provides evidence on the impact of female education and labour force participation on fertility, and makes recommendations on how to achieve the optimal fertility targets. The study also adds to the stock of knowledge on female education, fertility and labour force participation.

2. Literature review, data and background

Introduction

There is a wide body of literature on the importance of female education and participation in the labour market in reducing fertility rates and the general improvement in 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 et al., 1998; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973). Studies on female education and fertility conclude that female education leads to a decrease in fertility; that is, with higher levels of education, the number of children born per woman reduces (Guilkey et al., 1998; Ben-Porath, 1973; Gardner, 1973; Schultz, 1993; 1974; 1973). Schultz (1993) confirms that women's education is associated with smaller desired family sizes across the world.

This negative relationship between women's education, and fertility and desired family size is explained by a number of factors that have been explored by both economists and sociologists. First, with higher levels of education, a woman's expectations of future earnings are higher, increasing the opportunity cost of giving birth to, and raising children. Second, the longer a woman stays in school, the lower the chances of giving birth to many children. Related to this is the fact that 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 leads to later marriages, increased use of contraceptives, and lower fertility as discussed by Mason (1986). In fact, the link between women's autonomy on fertility is much stronger than that of husbands.

More importantly, higher levels of women's education are associated with lower child mortality rates, in the order of 5-10% for each additional year of the mother's schooling (Schultz, 1993; Mensch et al., 1985; Cochrane et al., 1980). This is because higher levels of women's education lead to improved child care, nutrition, and basic health and better child outcomes – health and school attainment (Strauss and Thomas, 1995).

In general, there are two major determinants of fertility in Uganda. First, is the underlying or indirect factors known as socio-cultural and economic (intermediate) determinants, including education, the desire for large families, extended family influence, economic value of children, occupation, property ownership, and residence. Second, is the immediate or direct (proximate) determinants, including marriage patterns, sexual customs, and frequency of sexual activity, access to and use of contraceptives, length of post-partum amenorrhea, sterility, and abortion. In this study, we focus on education, a factor that policy makers can influence. It is also a factor that has other important implications, including participation in labour force, poverty reduction and improved standards of living.

Importance of education in fertility reduction

Higher levels of education are a great desire in many developing countries, both for individual and national development (UNESCO, 1994; UN, 1996; Republic of Uganda, 1992). This is even more so for females who, due to a number of factors (most of which are gender-related) have long been disadvantaged in various societal aspects (Taylor, 1985; Wamahiu, 1997; Republic of Uganda, 1995; 1998c). Several traditional societies in Africa consider female education as unimportant, and for many reasons girls will easily drop out of school while boys continue to higher levels. For example, if a family has two children, a boy and girl, and it faces income constraints forcing one of the children to drop out of school, it would be the girl to drop out. Girls are also more involved in household chores, before and/or after school in comparison to their male counterparts. Girls may also drop out of school because of pregnancy, which does not affect boys. Lack of separate sanitary facilities for girls and boys in schools can cause girls to drop out of school especially when they reach adolescent age.

Consequently, girls' education and performance has remained behind that of boys, forcing governments and non-governmental organizations (NGOs) to direct efforts towards the promotion of education, especially for girls. In Uganda, for example, the government has since 1993 asked Makerere University (and other government-aided universities) to give girls who apply for admission 1.5 extra points so as to enable more girls qualify for admission. In the universal primary education (UPE) scheme which, at its initial stage, offered free primary education to four children from every family, it was a requirement that at least two of the children should be girls. Now the programme caters for all children without any restrictions.

In Uganda, women start giving birth at an average age of about 15 years and, in some cases, girls have given birth at ages as low as 12 years. The peak age group for child bearing is 20-29 years (Republic of Uganda, 1998a), such that if between these ages the women are still at school, it would tremendously reduce their chances of having many children.

The measured overall total fertility rate (TFR) in Uganda is very high, in the range of six to seven children as shown in Table 1. However, the level of education is found to tremendously reduce the ideal number of children both women and men would choose to have. The UDHS 2006, 2000/01 and 1995 show that women with some level of secondary education have fewer children (between 4 and 5) compared to those with

no education at all (about 7.8) (Table 1). It is also noteworthy that TFR is significantly lower in urban areas (between 4 and 5 per woman) than in rural areas (over 7 children per woman). One reason for the urban-rural differential is the concentration of women with secondary and higher levels of schooling in urban areas, and also the greater access to contraceptives and other medical facilities in urban areas. In addition, many women in urban areas are engaged in the labour market, thus finding it relatively more expensive to have many children.

Women who have completed primary schooling or those with some secondary schooling have a lower TFR than women without schooling. It is noted, however, that the differential between the fertility of women with primary schooling and those with no schooling is small. Overall, the Table 1 shows that female education has a strong negative impact on fertility. However, the quantitative impact has not been explicitly estimated for Uganda, and it is the intention of this study to provide empirical evidence on this assertion.

Female labour force participation and fertility

Basic to the theory of fertility behaviour is the assumption that the various activities requiring the input of human time are mutually exclusive, implying that not too many activities can be undertaken at the same time. If out of the total available time T, an individual spends Tw working for a wage, then the time available for home production activities, Th is (T – Tw). Where the individual is employed in the organized market sector, this is a reasonable assumption. However, in a developing country such as Uganda, the assumption of mutual exclusiveness of the formal and informal activities requiring the input of a woman's time may be unrealistic, especially for the uneducated and marginally educated women. Home production activities would in this case, and particularly for women, include household chores, cooking, fetching water, firewood, taking care of the children, etc; some of which are carried out the same time.

The relationship between women's labour market participation and fertility may greatly depend on the level of education. Increased schooling substantially enhances women's labour market opportunities through increased market wages and the substitution effects between time-intensive activities (including producing and raising children) and income and leisure that may occur (Birdsall, 1988; Schultz, 1993). Estimates show that the negative effect of women's wages on fertility is much bigger than that found for men (Lam and Duryea, 1999), a suggestion that women's labour market participation and increased education increase the value of their time, making it relatively more expensive to bear more children as opposed to engaging in income-generating activities. In addition, with higher levels of education and earnings (actual and potential), women are more capable to invest in the human capital of their children, thus substituting 'quality' for 'quantity' in terms of the number of desired children (Becker, 1991; Lam and Duryea, 1999).

Female labour force participation in the informal sector versus the formal sector markets generates one other effect that may have a bearing on the response of fertility to educational attainment. A number of factors such as seniority, continuity of employment, and the maintenance of regular working hours that are crucial to women employed in the formal sector have little influence on the expected lifetime wage rates of women

employed in the informal labour market. As a result, disruption of employment is of much less consequence to women in the informal labour market. It is therefore inevitable that most women working in this sector are usually those with very little or no education. But these factors are crucial where the source of employment is the formal sector, and may greatly limit the age at which a woman decides to give birth and the number of children born.

Sources of data

The data used are obtained from the UDHS (2006) conducted by the Uganda Bureau of Statistics (UBOS). The UDHS provides a rich source of data on the demographic characteristics of the country. It contains information on household size, age and sex distribution, religious affiliation, occupation of household members, the number of children ever born by a woman, marital status, household income, educational attainment of women and men, as well as the average child mortality rates for different regions. The wealth index is provided in the data set and is constructed by combining information on household assets, such as ownership of consumer items, type of dwelling, source of water, and availability of electricity into a single asset index. The sample is split into five equal groups (quintiles) from 1 (lowest, poorest) to 5 (highest, richest). In our estimations where the wealth index is used, the poorest quintile is used as the base category.

Trends in Uganda's overall fertility rates

Uganda's fertility rates have for a long time remained at around 7 children per woman (Table 1 and Table 2), something that should worry policy makers because high fertility rates lead to and sustain high population growth rates. The 1988/89 UDHS indicated a drop in fertility rate from 7.6 to 6.9 between 1969 and 1973 and 1984 and 1988, respectively. The 1995 UDHS reported a further decline from 7.4 to 6.8 between 1976 and 1980 and 1991 and 1995, and the 2000/01 UDHS reported decreasing rates from 7.2 to 6.8 between 1981 and 1985 and 1996 and 2000 (Table 2). From Table 2, it is important to note that the fertility rates (or the mortality rates) reported in the DHS actually refer to about 2½ years just before the survey. In the survey, the birth (or the child death) histories for the previous five years prior to the survey are asked for every woman included in the sample, thus the average number of children born (or dead) would refer to the mid-point between the time of the survey and the five years prior. Accordingly, the numbers reported are most likely to be different from the reality at the time the survey report is finalized and may not reflect the impact of current health care or family planning interventions on fertility rates or child mortality. Estimates from census data show similar but relatively more constant fertility rates - 6.8 children per woman in 1959, 7.1 for the period 1968-1991 and 7.0 for the period 1991-2002. Evidence from the 2006 UDHS shows a slight decline in total fertility to 6.7 children per woman.

Uganda's fertility rate is projected to decline rather slowly unless deliberate actions are taken to change this trend. Currently, Uganda's fertility rate is the fifth highest in the world and is projected to become the third highest by 2050 (United Nations Population

Division, 2007). Although it is expected to decrease by 2050, the total fertility rate will still be high, at close to 3 children per woman (Figure 1). This calls for urgent attention to the factors that may help to accelerate a fertility decline if Uganda is to improve the quality of life of its people through poverty reduction, improved education attainment rates, as well as child and maternal health.

The age-specific fertility rates confirm that Ugandan women start giving birth to children at a very early age. In 2006, fertility within the age group 15-19 years was as high as 150 (down from over 200 in 1995) children for every 1,000 women in this age group, peaking at over 300 children per 1,000 in the age group 20-24 years (Figure 2). This descriptive evidence that Ugandan women start giving birth at early ages is important for policy and actions to reduce fertility. It implies that female education and campaigns that are intended to keep the girls in school could play an important role in reducing fertility. Uganda has in place the Universal Primary Education (UPE) and Universal Secondary Education (USE) programmes, which could provide avenues to keep girls in school.

Descriptive analysis

In this sub-section, we present a discussion of the descriptive evidence on fertility and household characteristics to provide a foundation for the quantitative results. The UDHS 2006 final report makes a very detailed presentation of the underlying factors of fertility in Uganda (Republic of Uganda, 2007). In this section, therefore, we only highlight the descriptive evidence relevant to the current study, as summarized in tables 1-9. The summaries are generated using sample weights, implying that they are nationally representative and are consistent with those in the UDHS report.

Fertility characteristics

The 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 being resident in rural areas compound the problem. In Table 3, we note that, on average, 66% and 74% of women aged 15-49 years were married by age of 20 and 25, respectively. These percentages are quite high and this implies that women have a long reproductive period, and are hence 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 in urban areas.

The current use of birth control methods in Uganda is very low, implying that women are at high risk of getting unwanted pregnancies. For example, only about 20% of women in the 15-49 years age group are currently using any method of birth control, and only about 17% are using a modern method (Table 4). On the other hand, only 3% of the

women indicate using a condom. This is in contrast with the fact that knowledge of birth control methods is almost universal among women of child bearing age (UDHS, 2006), which seems to suggest that there are some impediments to access that the government must seek to effectively address.

In Table 5, we summarize the individual characteristics, including age of women, their level of education and that of their partners. The evidence here further shows that Ugandan women are vulnerable to having many children. The average number of years of education attained by women is only 5 years. The male partners' average years of education are slightly higher at 6.2 years (Table 6). About 19% have no education at all and close to 60% have only completed primary school. Only about 1 in 5 women have completed secondary school or higher. This has important implications for lowering fertility, since the level of education is negatively associated with fertility. As can be expected, the situation is even worse among the poorer women compared to those in the top wealth quintiles. For example, almost 40% of the women in the lowest quintile had zero education compared to 4.4% among the richest group (Table 5). This implies limited exposure, skills and control over their reproductive choices. On the other hand, only 13% of the male partners had zero education and almost 30% had attained secondary or higher level of education (Table 6). While the observed relationship between female education and the number of children born to a woman is negative and robust, the relationship is rather weak with respect to the partner's education level (Figure 3).

Labour force participation

The findings of the analysis of the UDHS 2006 show that most women in Uganda participate in the labour force. On average, over 80% of all women were currently working at the time of the survey (Table 7). Poorer women and those in rural areas are more likely to be working compared to the rich and those in urban areas – 93% and 85% of women in the poorest quintile and in rural areas, respectively, were working compared to about 64% and 62% in the richest quintile and urban areas. Over 91% of women with no education were currently working at the time of the survey compared to 77% with post-secondary education. This can be attributed to the availability of low class jobs and participation in small informal businesses, which are overly undertaken by uneducated women. Educated women have a tendency of searching longer for more decent jobs, and hence remaining unemployed for longer spells compared to the uneducated counterparts.

Age distribution, residence and religious affiliation

In tables 8 and 9, we summarize evidence on residence of the women (rural/urban), age cohort and religious affiliation, factors with important implications for their fertility. The statistics reveal that Uganda's women are predominantly young and resident in rural areas, corroborating the earlier household surveys and the 2002 population census. On average, over 83% of the women live in rural areas. The situation is even more pronounced among the poor – over 98% of women in the poorest quintile live in rural areas (Table 8). The age distribution of Uganda's women also has implications for fertility.

The age cohorts 15-19, 20-24 and 25-29 make up about 60% of the women included in the UDHS, i.e. the age group 15-49 years (Figure 4). The situation is even worse in the central region, among the richest quintile, and in urban areas where over 63%, 67% and 68%, respectively, of the women are in the age cohorts 15-19, 20-24 and 25-29 years. Considering the early age at which women start bearing children, and the limited access to contraceptives, this implies a large potential for higher fertility, unless interventions are made to alter the situation. In terms of religious affiliation, most women belong to the Christian faiths – Catholics (42%), Protestant Church of Uganda (34.5%), (Table 9). Muslims make up about 11% of the sample and "others" (including evangelicals, traditionalists, etc) account for the remaining 12%.

3. Theoretical framework and methodology

Theoretical framework

In the recent years, economists have began to look more closely at the microeconomic determinants of household fertility in an attempt to provide a better theoretical and empirical explanation of the falling birth rates observed in the more developed countries (Schultz, 1993). The analysis and models used draw on both traditional and neo-classical theories of household and consumer behaviour and the principle of optimization to explain family-size decisions. Intrinsic in the model is the need to maximize household welfare by making a choice between more children and other consumption goods. In the model, children are treated as a special form of good, from which satisfaction is derived, and the cost of which is the time required to bring them up.

Model of fertility choices

The utility of a typical household is a function of the number of children , consumption of market goods , leisure , and taste (Sackey, 2005). As noted in Grossman's model (1972), households demand a certain level of health in order to maximize utility subject to a given set of constraints. Therefore, we include child health to the utility function. The same line of argument has been taken by other authors; Mwabu (2009) used a simplified version of Rosenzweig and Schultz (1983) model to study the production of child health in Kenya. The household is assumed to maximize a well behaved twice differentiable utility function subject to a given set of constraints.

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

In this model, there are two household production functions, one for fertility and the other for child health, in this case child survival rate. 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, which reduces the number of children a couple has because of contraception.

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

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

The production function for child health relates health inputs to survival. Health inputs include market purchased health inputs (e.g. medical care), time of the mother and father in producing child health, education of the mother and father, and the term for the innate child health.

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

Where $N, T_{CM}, T_{CF}, E_M, E_F,$ and α refer to market purchased child health inputs (such as medical care), 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 health, respectively.

There are two time constraints, one for the mother and the other for the father. Basic to the theory of fertility behaviour is the assumption that the various activities requiring the input of human time are mutually exclusive, implying that not too many activities can be undertaken at the same time. Total time of either the mother or father can be allocated to leisure, work and child health.

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

Where T_F, V_F, L_F, and T_{CF} is total time available to the father, distributed to leisure, work, and producing child health, respectively. T_M, V_M, L_M, and T_{CM} is total time available to the mother, distributed to leisure, work, and producing child health, respectively. We finally introduce a budget constraint that relates expenditures to income. Expenditures are spent on the composite good, market purchased child health inputs, and contraceptive inputs. Income sources are earnings of both the mother and the father, and the exogenous non-labour income.

$$P_N N + P_Z Z + P_X X = L_M W_M + L_F W_F + Y \tag{5}$$

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

From this structural model, we can solve for the reduced forms of the endogenous variables in terms of exogenous variables. The endogenous variables include contraceptive use, fertility, labour force participation, and child health (child survival rate). The exogenous variables include female and male wages, prices of contraceptive goods and child health inputs, mother and father education, and household wealth (instead of non-labour income). The mother's and father's expected lifetime wage rate is a crucial variable that may affect fertility, child health and labour force participation. But since the expected lifetime wage rate is not a directly observable variable, it is prudent to use educational attainment and age cohort dummies to substitute for wages - we do this later in the model estimations.

The reduced form specifications for contraceptive use (Z), fertility (C), child survival (H_C), and female labour force participation (L_F) can be specified as:

$$Z = Z(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \alpha, \theta) \tag{6}$$

$$C = C(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \alpha, \theta) \tag{7}$$

$$H_C = H_C(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \alpha, \theta) \tag{8}$$

$$L_F = L_F(W_M, W_F, E_M, E_F, W_H, P_z, P_N, P_X, \alpha, \theta) \tag{9}$$

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, innate child health, and taste, respectively.

Methodology

In order to achieve the objectives of this study, we follow the works of Sackey (2005) and Duryea and Lam (1999) and estimate the reduced form specifications for fertility, current use contraceptives, female labour force participation, and child survival.

Methods employed, and estimated models

In order to estimate the fertility choice model, we follow Duryea and Lam (1999) and Ainsworth et al. (1996) and define fertility as a cumulative outcome. We use the birth histories in the DHS and create variables, number of children born by age 20, 25 and

30, respectively. We take a count of all live births before the woman reached age 20, 25 and 30, respectively. The cumulative fertility by age 20, 25, and 30 variables are used as dependent variables as in Lam and Duryea (1999). Independent variables in this regression include the woman's education, man's education and dummies for the birth year cohort. We then use the ordinary least squares technique to estimate our reduced form equation. The fertility model specification appears as follows:

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

Where C, E_M, B, L, RL, Rn, and E_F are cumulative fertility, woman's level of schooling completed, birth cohort dummies, locality, ethnicity, religion, region of birth dummy variables, and husband's education level, respectively. We use information in the DHS on the place of birth of the woman and construct dummy variables on region. Including the regional dummy variables in the analysis enables us to examine, for example, the impact of the war in northern Uganda on fertility, and how it compares with other regions. The impact of the war in the north on fertility, child health, and labour force participation is certainly an issue of great curiosity to the government and other stakeholders - this study sheds some light on this issue.

We address the second objective by estimating the model for female labour force participation and, in so doing, we translate the theoretical model into an empirical probit model. Labour supply or labour force participation in our case, measured at the time of the survey, is entered as a dependent variable in our model. The main objective of estimating this model is to establish the factors that are more likely to influence a woman's decision to participate in the labour market. Given the relative time intensity of children, couples face a trade-off in the allocation of time between the labour market and care for children. The mother's schooling may have important effects on this trade-off, as emphasized in many economic theories of fertility. Increased schooling will increase the probability that a woman works in the labour market if and only if the schooling causes a larger increase in her market wage than the reservation wage (Lam and Duryea, 1999). This technically means that low levels of schooling may not raise female labour force participation; since the reservation wages may rise as fast as the market wages, the reverse is true for higher levels of education. Following the conventional approach to applying the binary choice models, after the probit estimation, we compute the marginal effects for all the right hand side variables in order to obtain the probability of participation. The probit model estimated takes the following form:

$$Y_i^* = X_i\beta + \mu_i, \ \ \forall i = 1,...,n \tag{11}$$

$$Y_i = \begin{cases} 1 : if\ Y_i^* > 0 \\ 0 : if\ otherwise \end{cases} \tag{12}$$

Where Y_i is a binary variable equal to 1 if the i^{th} woman participated in the labour force in the year of survey, and is equal to zero otherwise. This response is determined by the latent variable Y_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 probit model used to estimate the determinants of female labour force participation takes the form:

$$L_M = f(E_M, B, W, L, Rn, Rl, E_F) \tag{13}$$

Where L_M, E_M, B,W, L,Rn,Rl and E_F are the probability of female labour force participation, mother's level of education, birth cohort dummies, wealth status (measured by the wealth quintiles), locality, region dummies, religion, and husband's level of education, respectively. Mother's education is expected to positively influence her labour force participation decisions. This is based on the premise that with a higher level of education and skills, staying out of work (because of having to take care of children) increases the opportunity cost of foregone income. On the other hand, a woman living in a wealthier household is more likely to be reluctant to participate in the labour force when compared to one living in a relatively poor household. Whereas the effect of a woman's social environment on fertility and participation choice may be uncertain, a woman living in urban locality is more likely to be associated with factors that negatively affect fertility, and yet positively influence labour force participation. A woman living in the urban area may have greater access to contraceptives and also better education, issues that may reduce fertility and increase labour force participation.

To address the third objective, we estimate a model of child health outcome; the child survival rate to age 5 is used as a dependent variable, with the right hand side covariates that include the same ones as for cumulative fertility. This regression model helps us to test the third hypothesis; mother's education, more than father's education, improves child survival rate. Female education has been found in many empirical studies to be the most important factor for declining child mortality in both rural and urban areas. Agricultural employment is related with higher child mortality, perhaps because of the interaction of animal and human diseases and the greater time cost of obtaining modern medical care on the farm (Schultz, 1981). It may also partly be explained by low levels of income and education among the agricultural rural communities.

4. Results, presentation and discussion

Introduction

In this section, we discuss the results of the analysis of the relationship between female education and outcomes, including labour force participation, fertility, and child survival. We estimate various models, including determinants of labour force participation, total fertility, cumulative fertility, child survival rate, and contraceptive use.

Female labour force participation

From the analysis, we note that women's education, particularly at the secondary school level and above, plays an important role in their labour force participation, which from the literature has important implications for fertility. Women with a primary school level of education and those with a secondary level are about 3% and 5%, respectively, more likely to be working (significant at 5% level) compared to those with no education at all (Table 10). Among the married, women with a post-secondary school education are about 9% more likely to be working compared to the uneducated. Education enhances the skills of women, and thus the chances of their being able to be employed. Being employed also implies that educated women are likely to have fewer children as they trade-off their time for child care for work and earnings.

The partner's education (at all levels) also plays an important role in the women's ability to work - women whose partners have primary, secondary and post-secondary school education are about 5% more likely to be working compared to those whose partners have no education. This may suggest that educated men are more supportive of their partners to find employment, perhaps through their contacts or by establishing businesses for them. Further analysis of the data is needed to establish the kind of jobs and sectors in which the women work in order to better understand why partners' education is important for their being able to work.

The impact of age cohort on women's participation in the labour force is generally the same, ranging between 15-16% (except for the age cohort 20-24 years, which is 11% - some of whom are expected to be still in school) compared to the age cohort 15-19 years. Women residing in rural areas are 7% more likely to be currently working compared to those in urban areas. For married women, the probability is even bigger (14%) than that of the unmarried women. This can be attributed to the fact that in rural areas of Uganda, many women work on family farms and sometimes on neighbours' farms or operate small household businesses, which is a little difficult in urban areas. In terms of regions,

women in the East, North and West are more likely to be currently working compared to those in the Central region (the base category). Women in poor households are more likely to be working compared to those in the relatively rich households – women in the 2nd to the 5th wealth quintiles are 6-18% less likely to be working compared to those in the poorest quintile. Apart from those in the poorer quintile, the scenario is almost the same when we compare the married with the unmarried women. This should not be surprising, as the poorer women struggle to supplement family income.

Determinants of total and cumulative fertility

Evidence on the determinants of fertility, using the number of children ever born as the dependent variable, is presented in Table 11. We also present evidence on the determinants of cumulative fertility by age 20, 25 and 30 in Table 13 in order to understand the fertility behaviour of younger women. In both tables 11 and 12, we present results for all women and married women. The analysis shows that, other factors held constant, education, particularly at the secondary school level and above plays a very powerful role in reducing fertility. This suggests that efforts to improve access to education beyond the primary school level need to be strengthened. For all women, the coefficient on primary education is -0.15, implying that every 10 women with primary education will, on average, have 1.5 children less than those with no education at all. For women married by age 20 and 25, the coefficient on primary school education is -0.37 and -0.53, implying that every 10 women married by 20 and 25 years will, on average, have 3.7 and 5.3 children less than those with no education at all. The coefficients on secondary and post-secondary school education for all women, married women, married by age 20 and by age 25, range from -0.5 to -2.1, respectively, implying that every 10 women with at least secondary school education will, on average, have 5 to 21 children less than those with no education at all (Table 11). 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 (Table 13). 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 primary school level of education may have higher earnings, and this can lead to higher fertility (Table 11). On the other hand, male partner 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 school education has limited impact on fertility. This should be worrying because over 50% of male partners have only primary school level of education (Table 6).

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 45-49 is over seven children. We notice that the same trend is portrayed for married women (Table 11).

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 rural areas. Other factors held constant, for all women, married women, those married by age 20 and 25, every 10 women in rural areas have between 1.3-6.0 children more than those in urban areas (Table 11). For all women in rural areas, cumulative fertility by age 20, 25, and 30 for every 10 women is 1, 2, and 4 children, respectively; more than those in urban areas. The picture is not any different from that of married women (Table 13). This suggests that fertility behavioural change campaigns in Uganda need to focus on women in these areas if they are to have effect. 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 from that of married women. On the other hand, for all women in the Northern region, every 10 women, on average, have three children less than those in the Central region. Almost the same picture is observed for married women. All women and those married by age 20 and 25 in the Western region, on average, have 1.7-2.4 children less compared to those in the Central region (Table 11).

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 age 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 12). This may be explained by the war in the Northern region, which pushed many people out of their homes and hence mothers and fathers had no or little opportunity to concentrate on child bearing. Also, many economic activities and property were destroyed during the war and hence parents doubted their ability to bring up many children in such circumstances. For cumulative fertility by age 20 and 25, for the entire sample of women, for every 10 women in the Western region, on average, have two children less than those in the Central region (Table 12).

Decision to get married

In Table 13, we present evidence on the determinants of the decision to get married in order to deepen our understanding of the woman's fertility choices. The role of female education in influencing the decision to get married cannot be underscored. Our analysis shows that holding everything else constant, education of the woman reduces the probability of getting married. Women with primary education are 5% less likely to get married, and the probability increases to 16% and 22% for women with secondary and post-secondary education, respectively. Primary and secondary education of the woman reduces the probability of getting married by age 20 and 25. The probability is 7-10% and 2-3% lower for those married by age 20 and 25, respectively, if they attained primary to secondary education. Since education of the woman plays an important role in reducing early marriages, it is an important factor that reduces fertility just as our analysis in tables 11 and 13 revealed. On the other hand, the impact of education is insignificant for a woman married by age 30, meaning that by this age, normally an individual has completed schooling, and education may not be a factor delaying her decision to marry.

Other important factors influencing the decision to be married include age cohorts and residence in rural areas. As would be expected, the probability of getting married increases with a woman's age. The probability increases from 39% for the age cohort 20-24 to 44% for the age cohort 25-29 compared to their counterparts in the age cohort 15-19 years for the regression of all women. On the other hand, for the age cohorts 30-34 to 45-49, the probability is positive but declines from 43% to 33%. This may imply that whereas the probability of getting married increases with age, it is smaller at the upper age cohort. This picture is not very different for women married by age 20, 25, and 30.

Religious affiliation is another factor influencing the decision to marry. Protestants are 3% less likely to marry compared to Catholics (base category). Yet, Muslims are 6% more likely to marry compared to Catholics. On the other hand, being in the North increases the probability of getting married (6%) compared to women living in the Central region. Women in the richest quintile are 6%-10% less likely to get married compared to their counterparts in the poorest quintile.

Child survival rate

In Table 14, we show that women's education is important in influencing the survival rate of children. Women who have attained secondary and post-secondary education are associated with a high survival rate of children once compared to their counterparts with no education at all. Every 10 women that have attained at least secondary education are associated with about 6 to 10 children surviving every 10 years when compared to those with no education at all. It is observed that the scenario is not very different once we compare married and unmarried women. This suggests that the government's programme that promotes free secondary education is, therefore, an important tool in an effort to increase the child survival rate in the country. There is strong need for campaigns to advocate for female education beyond secondary school level if the survival rate of children is to increase.

As expected, rural residents are associated with a lower child survival rate compared to the urban counterparts. This may be explained by the limited access to modern health care and use of contraceptives. As seen from the descriptive evidence, rural women are the least educated, hence further undermining child survival. Rural women tend to produce very many children in the face of biting poverty; the resources are too scarce for them to provide the necessary medical care and feeding to the children. Many of these children end up dying before the age of five years. Government effort needs, therefore, to target rural women with a whole set or package of policies, including education. Women in the age cohort 20-49 years are associated with lower child survival rate compared to those between 15 and 19 years (the base group). The lowest survival rate is observed in the age cohort 40-49 years once compared to 15-19 years. It is observed that regional differences also have an impact on child survival rate; residents of the Northern region are associated with a lower survival rate compared to residents of the Central region (the base category). The picture is not different when we compare married and unmarried women. Therefore, government's efforts and campaigns need to target these regions if the country is to realize better child health outcomes. It is noted that religious differences have limited impact on child survival rate.

Determinants of current use of contraceptives

Table 10: Female labour force participation

Dependent variable is currently working women	(1) All women	(2) Married women
Woman's education:		
Primary	0.030	0.033
	(2.32)**	(1.75)*
Secondary	0.049	0.008
	(2.88)***	(0.33)
Post-secondary	0.032	0.087
	(1.46)	(2.91)***
Partner's education:		
Primary		0.053
		(2.59)***
Secondary		0.056
		(2.62)***
Post-secondary		0.052
		(1.90)*
Age cohort:		
20-24 years	0.111	0.062
	(11.20)***	(2.50)**
25-29 years	0.157	0.102
	(16.09)***	(4.44)***
30-34 years	0.151	0.106
	(14.83)***	(4.66)***
35-39 years	0.154	0.119
	(14.28)***	(5.35)***
40-44 years	0.152	0.111
	(12.91)***	(4.88)***
45-49 years	0.147	0.119
	(11.53)***	(5.23)***
Rural resident	0.067	0.143
	(4.91)***	(6.12)***
Religious affiliation:		
Protestant	-0.016	0.002
	(1.65)*	(0.13)
Muslim	-0.059	-0.070
	(4.13)***	(3.20)***
Other faith	0.014	-0.006
	(1.02)	(0.28)

continued next page

Table 10 Continued

Dependent variable is currently working women	(1) All women	(2) Married women
Region:		
East	0.097	0.073
	(8.68)***	(4.12)***
North	0.044	0.022
	(3.36)***	(1.04)
West	0.084	0.081
	(7.43)***	(4.56)***
Wealth quintile:		
poorer	-0.062	-0.031
	(3.71)***	(1.15)
Middle	-0.106	-0.074
	(5.67)***	(2.45)**
Richer	-0.143	-0.111
	(7.43)***	(3.51)***
Richest	-0.184	-0.161
	(8.69)***	(4.44)***
Observations	8,525	2,763
Pseudo R-squared	0.17	0.16

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

Table 11: Determinants of fertility

Dependent variable is number of children ever born to a woman				
	(1) All women	(2) Married women	(3) Married by age 20	(4) 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)		

continued next page

Table 11 Continued

Dependent variable is number of children ever born to a woman	(1) All women	(2) Married women	(3) Married by age 20	(4) Married by age 25
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)***
45-49 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

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

Table 12: Determinants of cumulative fertility by age 20, 25 and 30

Dependent variable is number of children born	(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:	0.067	0.091	0.091	0.098	0.151	0.156
Protestant	(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)

continued next page

Table 12 Continued

Dependent variable is number of children born	(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
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

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

Table 13: Female education and the decision to marry

	(1) All currently married women	(2) Married by age 20	(3) Married by age 25	(4) Married by age 30
Woman's education:				
Primary	-0.049	-0.103	-0.032	-0.004
	(2.96)***	(3.58)***	(3.18)***	(1.20)
Secondary	-0.162	-0.074	-0.023	-0.005
	(6.90)***	(2.18)**	(2.22)**	(1.56)
Post secondary	-0.216	-0.013	-0.002	-0.003
	(6.29)***	(0.32)	(0.14)	(1.21)
Age cohort:				
20-24 years	0.386			
	(28.56)***			
25-29 years	0.441	0.637		
	(34.05)***	(22.90)***		
30-34 years	0.426	0.691	0.530	
	(32.24)***	(22.47)***	(14.12)***	
35-39 years	0.387	0.658	0.572	0.382
	(27.31)***	(20.53)***	(13.38)***	(8.62)***
40-44 years	0.356	0.644	0.480	0.466
	(22.86)***	(18.01)***	(10.65)***	(8.98)***
45-49 years	0.338	0.637	0.758	0.556
	(19.92)***	(15.85)***	(11.78)***	(7.17)***
Rural resident	0.104	0.018	-0.003	0.002
	(5.32)***	(0.65)	(0.34)	(0.70)
Religious affiliation:				
Protestant	-0.031	-0.035	-0.005	-0.002
	(2.23)**	(1.70)*	(0.63)	(0.79)
Muslim	0.056	0.022	-0.010	0.005
	(2.87)***	(0.69)	(1.04)	(1.21)

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Table 13 Continued

	(1) All currently married women	(2) Married by age 20	(3) Married by age 25	(4) Married by age 30
Other faith	0.008	-0.040	0.000	-0.001
	(0.41)	(1.40)	(0.03)	(0.32)
Region:				
East	0.115	0.028	-0.012	0.002
	(6.50)***	(0.95)	(1.40)	(0.62)
North	0.062	-0.015	-0.005	0.004
	(3.23)***	(0.49)	(0.48)	(0.97)
West	0.008	-0.027	-0.028	-0.001
	(0.45)	(1.00)	(3.74)***	(0.48)
Wealth quintile:				
poorer	0.014	0.003	-0.011	-0.002
	(0.72)	(0.10)	(1.05)	(0.53)
Middle	-0.029	-0.079	-0.014	-0.000
	(1.35)	(2.30)**	(1.24)	(0.04)
Richer	-0.019	-0.058	-0.004	-0.002
	(0.88)	(1.66)*	(0.34)	(0.38)
Richest	-0.059	-0.099	-0.015	0.003
	(2.33)**	(2.55)**	(1.14)	(0.67)
Observations	8,525	3,429	2,301	2,112

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

Table 14: Child survival rate

Dependent variable is child survival rate+	(1) All women	(2) Married women
Education:		
primary	0.023	0.022
	(3.70)***	(2.27)**
Secondary	0.065	0.048
	(6.99)***	(3.27)***
Post-secondary	0.101	0.101
	(6.54)***	(4.17)***
Age cohort:		
20-24 years	-0.039	-0.027
	(3.34)***	(1.33)
25-29 years	-0.061	-0.039
	(5.25)***	(1.93)*
30-34 years	-0.069	-0.066
	(5.90)***	(3.23)***

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Table 14 Continued

Dependent variable is child survival rate+	(1) All women	(2) Married women
35-39 years	-0.092	-0.088
	(7.54)***	(4.19)***
40-44 years	-0.113	-0.082
	(8.86)***	(3.76)***
45-49 years	-0.142	-0.121
	(10.65)***	(5.29)***
Rural resident	-0.032	-0.019
	(4.12)***	(1.69)*
Religious affiliation:		
Protestant	-0.001	0.002
	(0.15)	(0.23)
Muslim	-0.004	-0.009
	(0.47)	(0.77)
Other faith	-0.009	-0.007
	(1.00)	(0.58)
Region:		
East	0.011	0.010
	(1.52)	(0.91)
North	-0.022	-0.032
	(2.96)***	(2.84)***
West	-0.010	-0.014
	(1.29)	(1.22)
Partner's education:		
primary		-0.011
		(0.98)
Secondary		0.005
		(0.39)
Post-secondary		0.026
		(1.36)
Constant	0.944	0.929
	(64.80)***	(37.76)***
Observations	6,413	2,654
R-squared	0.07	0.07

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
+The child survival rate is measured as the ratio of surviving children over the total number of children born to a woman;

Table 15, we present evidence on the determinants of the current use of contraceptives to deepen our understanding on women's fertility choices.[6] The importance of female education in fertility choices cannot be underscored, and the benefits increase with the level of education. Our analysis shows that, holding everything else constant, women with a primary school 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 difference in the use of contraceptives between unmarried and married women having primary school education. Secondary school education increases the probability of using contraceptives to the range of 14-17%, and post-secondary education increases the probability to the range of 16-20%, 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 contraceptives if their partner has primary school education, 7-11% if the partner has secondary school education, and 12-17% if the partner has post-secondary school education.

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

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 45-49 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 45-49 are only 16% more likely to be using a modern method of family planning. The scenario is not any different when 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 much 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.

Religion too has some impact on the use of contraceptives. All women in 'other' faith (including evangelical, etc) are about 3-4% less likely to be using a modern or any method of family planning compared to Catholic women. However, Anglican and Muslim are found to have no impact on the use of contraceptives. Also, religion does not seem to have any impact on the use of contraceptives for married women.

Access to modern contraceptive methods is also underscored by the residence of women. Other factors held constant, all women in rural areas are 2%[7] 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 is critical to helping women (and their partners) to meet their fertility needs.

5. Conclusions and recommendations

Conclusions

Using the UDHS 2006, we examine the relationship between female education and female labour force participation and fertility in Uganda. The results of the analyses confirm the hypothesis of this study. We show that education, particularly of the woman, 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. While there is almost universal knowledge of methods of family planning, very few women have used these methods, and more so the modern methods. Education also reduces the likelihood of women being married, with further implications for fertility. Our findings further show that access to or use of contraceptives is positively associated with the education of both the woman and her partner. Women's education, at the secondary school level, and the partners' education (at all levels above primary school) plays an important role in female labour force participation, which from the literature has important implications for fertility. We also find that mother's education (at all levels) and not father's education plays a cardinal role in improving child survival rate.

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 a few heads. With fewer children born, parents (both women and men) are more likely to provide adequate care, thus ensuring child survival and attention to early childhood development requirements.

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, health sector, district authorities and communities. The central government needs to provide the overall direction, political commitment and financial support for family planning. 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. 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 primary school level. The government's programme to extend free education at the secondary school level is therefore an important measure that may help to reduce fertility. This, therefore, needs to be embraced by all stakeholders and actively campaigned for to encourage girls to remain in school beyond the primary school level. Measures need to be put in place to remove, or at least to minimize, factors that may lead girls to dropping out of school early, including improving the quality of schools and teaching and ensuring that all schools have separate sanitary facilities for girls and boys.

Accessibility to information and higher education are important factors in efforts to change fertility behaviour in Uganda. Women with higher levels of education (especially beyond primary school level), and those with higher levels of income are more likely to use contraceptives and to have fewer children.

Measures to expand access to family planning facilities and 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 by stocking public and private health centres and pharmacies with the required contraceptives. Policies to eliminate all barriers to 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 on the importance of appropriate family size is needed.

Expanding education for women (and men) is also important for their engaging in the labour force. We note from the findings that educating women beyond secondary school increases the likelihood of being engaged in the labour force. This has important implications for fertility behaviour as women who work will have less time for many children. Provision of facilities and support to encourage women's participation in the labour force is also needed, as this could further help to reduce fertility. Thus, review of the maternity leave policy and provision of child care services at community level needs to be explored.

Notes

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 rate (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, while that for Sub-Saharan Africa is about 5.6 children per woman.

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

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

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

6. We use the dprobit estimation to fit the maximum-likelihood probit model. Thus, the reported coefficients are the marginal effects, i.e., the change in the probability for an infinitesimal change in each independent, continuous variable. For dummy variables, the coefficients refer to the discrete change in the probability.

7. This number appears to be small; this may mean that modern family planning methods have started penetrating the rural areas.

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Table 1: Trends in total fertility rates in Uganda between 2000/01 and 2006

Background characteristic		Total Fertility Rate (TFR) 1995	2000/01	2006
Education	No education	7.0	7.8	7.7
	Primary	7.1	7.3	7.2
	Secondary +	5.2	3.9	4.4
Residence	Urban	5.0	4.0	4.4
	Rural	7.2	7.4	7.1
Wealth index	Lowest quintile	n.a.	8.5	8.0
	Lower middle	n.a.	8.2	7.9
	Middle	n.a.	7.5	7.0
	Upper middle	n.a.	6.3	6.8
	Highest	n.a.	4.1	4.3
Total	6.9	6.9	6.7	

Source: Uganda DHS, 2006, 2000/01 and 1995; n.a.: information not available

Table 2: Total fertility rate various UDHS series and censuses, 1958-2002

UDHS 1988/89		UDHS 1995		UDHS 2000/01		UDHS 20061		Censuses 1958-2002	
Reference period	TFR	Reference period	TFR	Reference period	TFR	Reference period	TFR	Reference period	TFR
1969-73	7.6	1976-80	7.4	1981-85	7.2	-	-	1958-59	6.8
1974-78	7.3	1981-85	7.2	1986-90	7.1	1993-1995	6.9	1968-69	7.1
1979-83	7.1	1986-90	6.9	1991-95	7.0	1998/99-2000/01	6.9	1990-91	7.1
1984-88	6.9	1991-95	6.8	1996-2000	6.8	2003/2006	6.7	1991-2002	7.0

Source: Blacker et al. 2005, Table 2, page 358; Republic of Uganda, 2006. UDHS 2006
1 The UDHS 2006 numbers are adjusted for districts that were not included in the 2000/01 survey

Table 3: Fertility characteristics

Category	Married			Number of children ever born	Cumulative fertility		
	All women	By age 20	By age 25		By age 20	By age 25	By age 30
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
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
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

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Table 3 Continued

Category	Married			Number of children ever born	Cumulative fertility		
	All women	By age 20	By age 25		By age 20	By age 25	By age 30
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
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

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

Table 4: Current use of contraceptives

Category	Current use, Any Method	Current use, Modern Method	Useofcondoms – current
No education	11.7	9.7	0.4
Primary	17.9	16.1	2.0
Secondary	28.2	24.7	7.4
Post secondary	43.4	38.0	16.7
Poorest quintile	8.4	7.5	0.9
Poorer quintile	12.6	11.5	1.5
Middle quintile	15.9	13.4	1.6
Richer quintile	21.9	19.2	2.3
Richest quintile	33.9	30.1	8.2
Central	29.1	25.8	6.1
East	17.7	15.9	2.3
North	9.7	9.3	1.5
West	18.7	15.5	2.3
Rural	32.5	29.4	2.2
Urban	16.9	14.7	8.3
Total	19.5	17.2	3.2
N	8,531	8,531	271.0

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

Table 5: Woman's age, household head and education

	Age	Female head	Years of education	Level of education (%)			
				None	Primary	Secondary	Post-secondary
Poorest quintile	28.8	32.6	2.5	39.6	56.9	3.0	0.5
Poorer quintile	28.4	27.7	3.6	24.4	68.0	6.7	0.8
Middle quintile	28.9	29.6	4.0	21.0	68.5	9.8	0.6
Richer quintile	28.3	26.9	5.3	12.7	67.6	17.2	2.4
Richest quintile	26.5	35.5	8.2	4.4	41.1	42.2	12.3
Central	27.4	37.8	6.8	8.9	51.8	31.2	8.0
East	28.4	24.4	5.0	15.8	64.0	17.4	2.8
North	28.6	33.3	3.3	32.1	59.1	7.1	1.6
West	28.1	26.9	4.3	23.1	63.2	11.3	2.3
Rural	28.4	28.8	4.4	21.7	63.1	12.9	2.3
Urban	26.5	40.1	7.9	7.5	40.9	39.9	11.7
Total	28.1	30.7	5.0	19.3	59.3	17.4	3.9
N	8,531	8,531	8,530	1,768	4,922	1,496	345

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

Table 6: Partner's age and education

	Age	Years of education	Level of education (%)			
			None	Primary	Secondary	Post-secondary
Poorest quintile	36.0	4.5	22.7	63.4	11.8	2.1
Poorer quintile	35.6	5.3	13.4	68.2	15.3	3.1
Middle quintile	37.3	5.7	12.6	63.9	19.2	4.4
Richer quintile	37.8	6.7	8.5	58.0	26.1	7.4
Richest quintile	37.1	8.8	8.0	33.4	39.0	19.6
Central	36.7	6.9	12.4	48.2	30.4	9.0
East	37.2	6.1	9.1	61.0	23.7	6.2
North	36.5	5.9	17.1	57.6	18.0	7.4
West	36.5	5.8	14.0	62.6	16.8	6.6
Rural	36.9	5.8	13.7	61.6	19.1	5.5
Urban	35.6	8.6	9.4	32.2	40.5	18.0
Total	36.7	6.2	13.1	57.4	22.2	7.3
N	5,325	6,447	966	3,611	1,423	457

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

Table 7: Female labour force participation

	Working
No education	91.2
Primary	84.4
Secondary	60.1
Post-secondary	77.0
Poorest	92.9
Poorer quintile	89.2
Middle quintile	85.5
Richer quintile	80.6
Richest quintile	63.6
Central	66.2
East	87.2
North	87.5
West	86.4
Urban	62.2
Rural	85.0
Total	81.2
N	8,531

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

Table 8: Location and age cohort

	Rural (%)	Age cohort (Birth history) (% of women in each group)						
		15-19	20-24	25-29	30-34	35-39	40-44	45-49
No education	93.4	4.1	12.0	16.8	16.3	18.5	15.8	16.6
Primary	88.4	25.5	20.0	16.4	15.0	10.3	7.6	5.1
Secondary	61.4	37.0	26.7	14.3	9.9	5.5	4.5	2.1
Post secondary	49.0	7.9	31.1	28.6	12.7	9.2	6.1	4.5
Poorest quintile	98.1	19.2	20.2	16.2	15.7	11.7	9.5	7.5
Poorer quintile	96.6	20.7	21.0	16.5	14.2	11.2	8.9	7.5
Middle quintile	96.5	20.7	18.7	16.3	13.8	12.6	10.0	7.9
Richer quintile	89.3	24.1	16.2	17.0	16.2	10.9	8.8	7.0
Richest quintile	46.8	27.3	23.2	16.8	12.2	9.3	6.6	4.7
Central	63.8	24.3	21.7	17.2	13.7	9.3	8.1	5.7
East	91.9	21.9	19.8	15.3	14.8	11.3	10.4	6.5
North	88.5	21.2	18.8	16.5	15.0	11.9	8.7	8.0
West	91.3	22.9	19.6	17.0	13.8	11.9	7.5	7.2
Rural	100.0	22.5	18.8	16.2	14.6	11.4	9.1	7.4
Urban	-	23.7	26.1	18.6	12.5	8.9	6.4	3.9
Total	83.1	22.7	20.0	16.6	14.3	11.0	8.6	6.8
N	8,531	1,948	1,662	1,410	1,228	959	722	602

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

Table 9: Religious affiliation

	Catholic	Protestant	Muslim	Other
No education	54.5	28.7	7.3	9.6
Primary	41.8	35.2	11.1	11.9
Secondary	32.6	37.8	15.8	13.8
Post secondary	35.3	38.9	11.3	14.5
Poorest quintile	62.4	25.8	3.2	8.6
Poorer quintile	42.1	37.5	7.8	12.6
Middle quintile	40.3	37.4	8.6	13.6
Richer quintile	38.6	35.9	15.8	9.7
Richest quintile	32.5	35.4	18.0	14.0
Central	36.0	31.0	18.4	14.7
East	31.9	38.8	15.3	14.1
North	61.5	25.9	6.1	6.5
West	43.2	41.1	4.3	11.3
Rural	44.4	34.9	9.5	11.2
Urban	32.3	32.8	19.8	15.1
Total	42.4	34.5	11.2	11.9
N	3,785	2,823	970	947

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

Table 10: Female labour force participation

Dependent variable is currently working women	(1) All women	(2) Married women
Woman's education:		
Primary	0.030	0.033
	(2.32)**	(1.75)*
Secondary	0.049	0.008
	(2.88)***	(0.33)
Post-secondary	0.032	0.087
	(1.46)	(2.91)***
Partner's education:		
Primary		0.053
		(2.59)***
Secondary		0.056
		(2.62)***
Post-secondary		0.052
		(1.90)*
Age cohort:		
20-24 years	0.111	0.062
	(11.20)***	(2.50)**
25-29 years	0.157	0.102
	(16.09)***	(4.44)***
30-34 years	0.151	0.106
	(14.83)***	(4.66)***
35-39 years	0.154	0.119
	(14.28)***	(5.35)***
40-44 years	0.152	0.111
	(12.91)***	(4.88)***
45-49 years	0.147	0.119
	(11.53)***	(5.23)***
Rural resident	0.067	0.143
	(4.91)***	(6.12)***
Religious affiliation:		
Protestant	-0.016	0.002
	(1.65)*	(0.13)
Muslim	-0.059	-0.070
	(4.13)***	(3.20)***
Other faith	0.014	-0.006
	(1.02)	(0.28)
Region:		
East	0.097	0.073
	(8.68)***	(4.12)***
North	0.044	0.022
	(3.36)***	(1.04)

continued next page

Table 10 Continued

Dependent variable is currently working women	(1) All women	(2) Married women
West	0.084	0.081
	(7.43)***	(4.56)***
Wealth quintile:		
poorer	-0.062	-0.031
	(3.71)***	(1.15)
Middle	-0.106	-0.074
	(5.67)***	(2.45)**
Richer	-0.143	-0.111
	(7.43)***	(3.51)***
Richest	-0.184	-0.161
	(8.69)***	(4.44)***
Observations	8,525	2,763
Pseudo R-squared	0.17	0.16

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

Table 11: Determinants of fertility

Dependent variable is number of children ever born to a woman				
	(1) All women	(2) Married women	(3) Married by age 20	(4) 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)***	

continued next page

Table 11 Continued

Dependent variable is number of children ever born to a woman	(1) All women	(2) Married women	(3) Married by age 20	(4) Married by age 25
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)***
45-49 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

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

Table 12: Determinants of cumulative fertility by age 20, 25 and 30

Dependent variable is number of children born	(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)

continued next page

Table 12 Continued

Dependent variable is number of children born	(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
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

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

Table 13: Female education and the decision to marry

	(1) All currently married women	(2) Married by age 20	(3) Married by age 25	(4) Married by age 30
Woman's education:				
Primary	-0.049	-0.103	-0.032	-0.004
	(2.96)***	(3.58)***	(3.18)***	(1.20)
Secondary	-0.162	-0.074	-0.023	-0.005
	(6.90)***	(2.18)**	(2.22)**	(1.56)
Post secondary	-0.216	-0.013	-0.002	-0.003
	(6.29)***	(0.32)	(0.14)	(1.21)
Age cohort:				
20-24 years	0.386			
	(28.56)***			
25-29 years	0.441	0.637		
	(34.05)***	(22.90)***		
30-34 years	0.426	0.691	0.530	
	(32.24)***	(22.47)***	(14.12)***	
35-39 years	0.387	0.658	0.572	0.382
	(27.31)***	(20.53)***	(13.38)***	(8.62)***
40-44 years	0.356	0.644	0.480	0.466
	(22.86)***	(18.01)***	(10.65)***	(8.98)***
45-49 years	0.338	0.637	0.758	0.556
	(19.92)***	(15.85)***	(11.78)***	(7.17)***
Rural resident	0.104	0.018	-0.003	0.002
	(5.32)***	(0.65)	(0.34)	(0.70)
Religious affiliation:				
Protestant	-0.031	-0.035	-0.005	-0.002
	(2.23)**	(1.70)*	(0.63)	(0.79)
Muslim	0.056	0.022	-0.010	0.005
	(2.87)***	(0.69)	(1.04)	(1.21)

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Table 13 Continued

	(1) All currently married women	(2) Married by age 20	(3) Married by age 25	(4) Married by age 30
Other faith	0.008	-0.040	0.000	-0.001
	(0.41)	(1.40)	(0.03)	(0.32)
Region:				
East	0.115	0.028	-0.012	0.002
	(6.50)***	(0.95)	(1.40)	(0.62)
North	0.062	-0.015	-0.005	0.004
	(3.23)***	(0.49)	(0.48)	(0.97)
West	0.008	-0.027	-0.028	-0.001
	(0.45)	(1.00)	(3.74)***	(0.48)
Wealth quintile:				
poorer	0.014	0.003	-0.011	-0.002
	(0.72)	(0.10)	(1.05)	(0.53)
Middle	-0.029	-0.079	-0.014	-0.000
	(1.35)	(2.30)**	(1.24)	(0.04)
Richer	-0.019	-0.058	-0.004	-0.002
	(0.88)	(1.66)*	(0.34)	(0.38)
Richest	-0.059	-0.099	-0.015	0.003
	(2.33)**	(2.55)**	(1.14)	(0.67)
Observations	8,525	3,429	2,301	2,112

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

Table 14: Child survival rate

Dependent variable is child survival rate+	(1) All women	(2) Married women
Education:		
primary	0.023	0.022
	(3.70)***	(2.27)**
Secondary	0.065	0.048
	(6.99)***	(3.27)***
Post-secondary	0.101	0.101
	(6.54)***	(4.17)***
Age cohort:		
20-24 years	-0.039	-0.027
	(3.34)***	(1.33)
25-29 years	-0.061	-0.039
	(5.25)***	(1.93)*
30-34 years	-0.069	-0.066
	(5.90)***	(3.23)***
35-39 years	-0.092	-0.088
	(7.54)***	(4.19)***

continued next page

Table 14 Continued

Dependent variable is child survival rate+	(1) All women	(2) Married women
40-44 years	-0.113	-0.082
	(8.86)***	(3.76)***
45-49 years	-0.142	-0.121
	(10.65)***	(5.29)***
Rural resident	-0.032	-0.019
	(4.12)***	(1.69)*
Religious affiliation:		
Protestant	-0.001	0.002
	(0.15)	(0.23)
Muslim	-0.004	-0.009
	(0.47)	(0.77)
Other faith	-0.009	-0.007
	(1.00)	(0.58)
Region:		
East	0.011	0.010
	(1.52)	(0.91)
North	-0.022	-0.032
	(2.96)***	(2.84)***
West	-0.010	-0.014
	(1.29)	(1.22)
Partner's education:		
primary		-0.011
		(0.98)
Secondary		0.005
		(0.39)
Post-secondary		0.026
		(1.36)
Constant	0.944	0.929
	(64.80)***	(37.76)***
Observations	6,413	2,654
R-squared	0.07	0.07

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
+The child survival rate is measured as the ratio of surviving children over the total number of children born to a woman;

Table 15: Determinants of current use of contraceptives

	(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)***
45-49 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)***

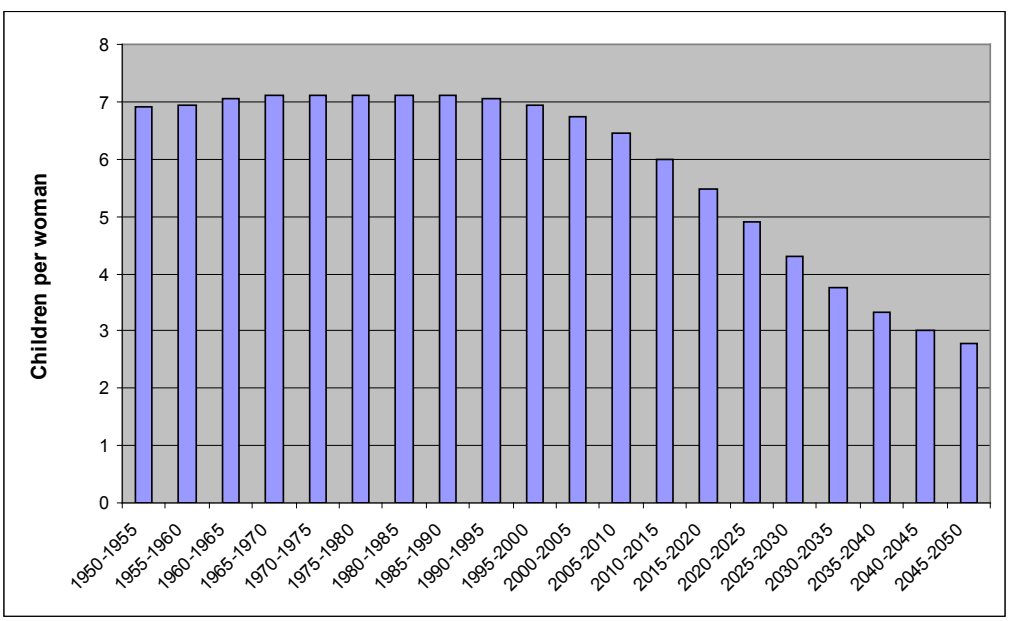
continued next page

Table 15 Continued

	(1)	(2)	(3)	(4)	(5)	(6)
	Modern method		Condoms		Any method	
	All women	Married women	All women	Married women	All women	Married women
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 education:						
primary		0.056		0.035		0.080
		(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

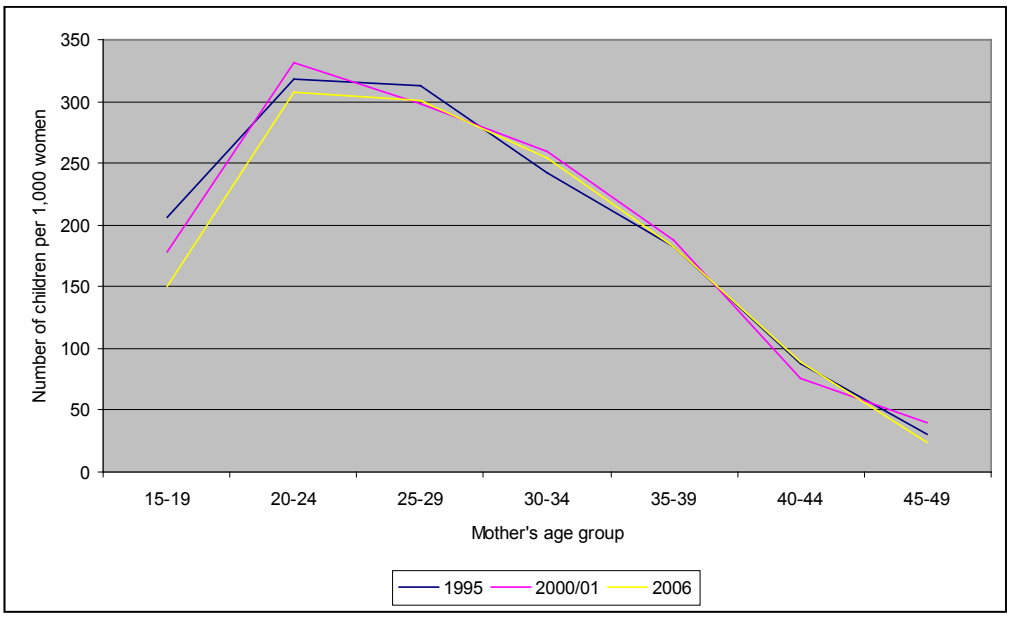
Absolute value of z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1: Uganda's fertility trends, 1950-2050 (medium variant)



Source: United Nations Population Division. 2007. World Population Prospects: The 2006 Revision and World Urbanization Prospects. http://esa.org.unpp. November 5, 2007.

Figure 2: Age-specific fertility rates for Uganda



Source: Republic of Uganda (2006)

Figure 3: Fertility vs. women's and partner's education

The woman's level of education reduces the likelihood of her giving birth to many children. While the partner's education is also negatively related to the number of children born, the magnitude is much smaller.

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

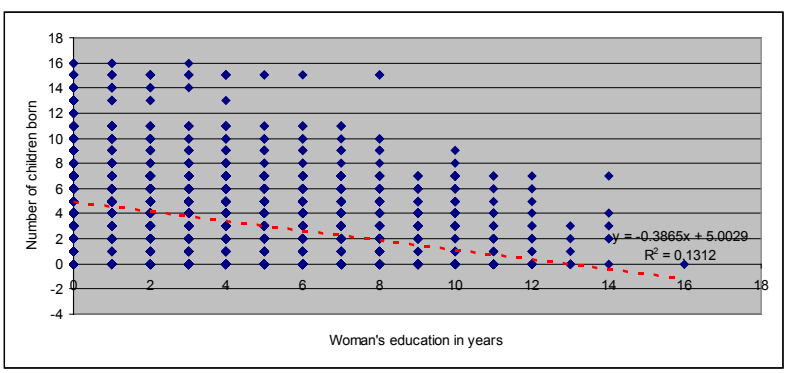
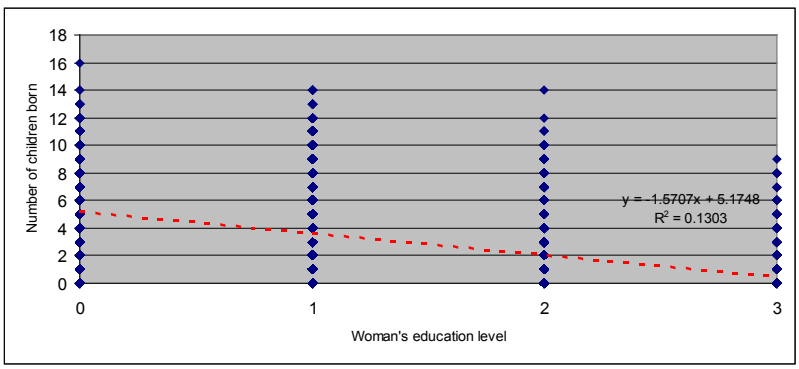


Figure 3 continued next page

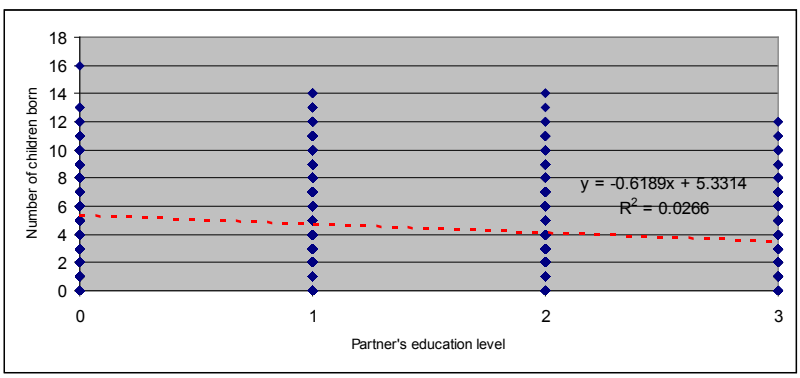
Figure 3 Continued

B. Number of children born plotted against level of education of the woman

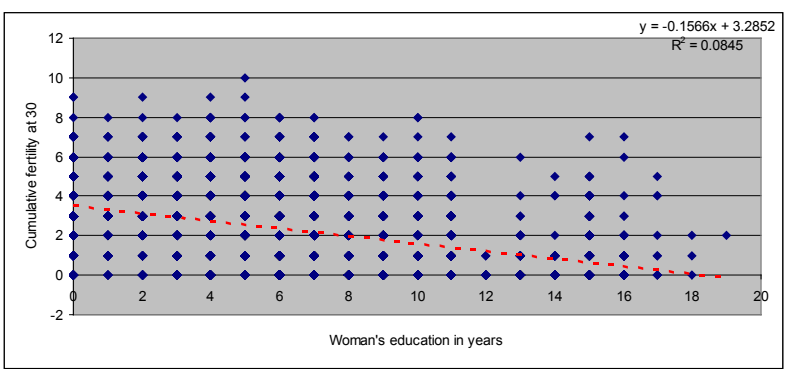
(0 = none, 1 = primary, 2= secondary and 3 = post-secondary)



C. Number of children born plotted against partner's level of education



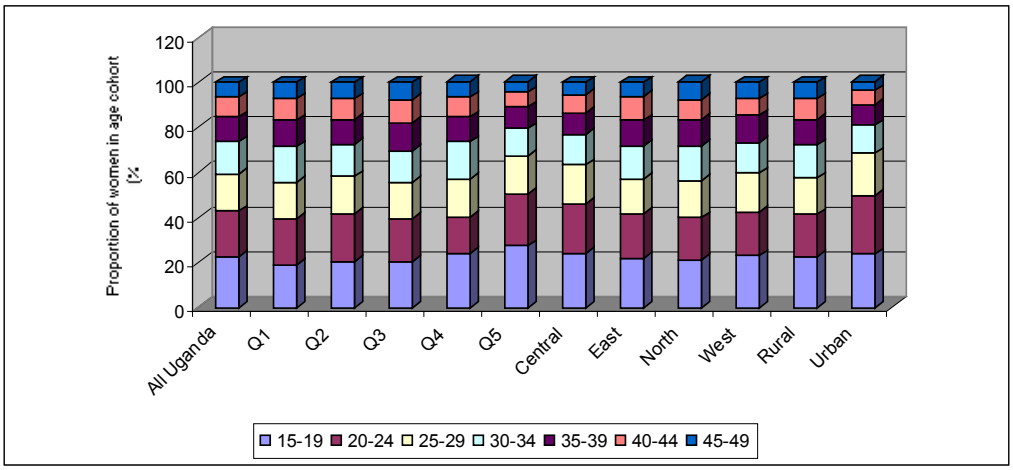
D. Cumulative fertility at age 30 plotted against woman's education in years



Source: Derived from author's own analysis of the UDHS 2006

Figure 4: Distribution of women in the age group 15-49 years

Over 60% of the women in this age group are below 30 years, suggesting a big potential for high fertility and population growth because of this built-in momentum.



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