Female Education and Maternal Health Care Utilization in Uganda

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Abstract

Extensive literature suggests that female education is a very strong and consistent predictor of maternal health-seeking behaviour. A deeper understanding calls for an investigation of how female education affects this behaviour. It is argued that this relationship is not simply a reflection of a co-occurrence of education with other socioeconomic variables as different education levels have different predictions. Using the Uganda Demographic and Health Survey data, focusing on use of tetanus toxoid inoculations, antenatal care, and birth delivery assistance; under discrete-continuous estimation technique, this paper finds; first, a positive relationship between female schooling and health care seeking behaviour exists. Secondly, however, a number of factors, such as socioeconomic status, overestimate the impact of female education on health care-seeking behaviour; thus, the hypothesis that the relationship between female education and maternal health seeking behaviour might be as a result of other variables cannot be rejected. Thirdly, it is found that female education differentials on maternal health-seeking behaviour exist, with higher level education more pronounced. Thus, more focus should be put on increasing female education beyond secondary level in a bid to improve maternal health-seeking outcomes.

1. Introduction

Maternal health care utilization is an important channel through which mothers can diagnose problems during pregnancy and prevent child delivery complications, thereby increasing chances of maternal-child survival. In particular, accessibility to antenatal care services helps mothers to diagnose diseases, the possibility of multiple births (twins or more), and other delivery complications early enough, making it possible for them to receive appropriate care. It is during an antenatal visit that screening for complications and advice on a range of issues, including place of delivery and referral of mothers with complications, occur (Gage, 2007; Pallikadavath et al., 2004). In addition, since two-thirds of maternal deaths occur in late pregnancy through to 48 hours after delivery (AbouZahr, 1998), the involvement of a skilled attendant at birth is important in averting deaths from pregnancy-related complications through appropriate case management, referral, and effective emergency care (Gage, 2007). Prenatal care also helps mothers gain access to related, but very important, services such as immunization against neonatal tetanus, treatment against malaria (which in many cases leads to miscarriages), and HIV counselling and testing. Furthermore, during antenatal visits, mothers attend 'classes' and receive knowledge about how to live healthy during pregnancy and how to care for children after birth. Indeed, adequate antenatal care during pregnancy and hospital care during delivery have been noted to contribute to a decrease in prenatal mortality, maternal mortality and prevalence of low birth weight (Ahmad et al., 1991; Boerma and Bicego, 1992; Adetunji, 1994; Panis and Lillard, 1995; Raghupathy, 1996; Gage, 2007) and that birth delivery assistance from a trained and well-equipped provider is necessary to reduce maternal mortality (Maine and Rosenfeld, 1999; Gage, 2007).

The importance of maternal health care services cannot be overemphasized in a country like Uganda, which has one of the lowest health indicators in the world. For example, the country's life expectancy is about 50 years, which is very low compared to the world average of about 66 years. In 2005/6, infant mortality was estimated at around 76 for every 1,000 live births, a slight decline from 88 out of every 1,000 live births in 2000/01 (Republic of Uganda, 2007). Maternal mortality rate is estimated at 435 for every 100,000 women giving birth (UDHS, 2006). In addition, Uganda's total fertility rate (TFR)[1] of about seven children per woman is one of the highest in the world[2] (Republic of Uganda, 2007, 1998a, 1998b; Population Reference Bureau, 2001), implying that, on average, a Ugandan female risks the high maternal mortality and infant mortality at least seven times in her lifetime.

It can, therefore, be argued that access to, and use of, quality maternal health care services is crucial for improved maternal-child survival in Uganda. The Uganda

Demographic and Health Survey Report (UDHS, 2006) elaborated factors influencing the use of maternal health services broadly into demographic, cultural and socioeconomic categories, and included education, age of the women, birth order, size of household, ethnicity, place of residence, religious background, marital status, employment, income level and accessibility. According to UDHS Report (2006), antenatal care coverage is strongly associated with a woman's education. Better educated women are more likely to have antenatal care and more likely to be attended to by a doctor than less educated women. About 15% of women who have attained secondary or higher education received antenatal care from a doctor, while the corresponding proportion for women with primary education is only 8%. Furthermore, 8% of women with no education received no antenatal care compared with only 2% who had secondary education and above.

Indeed, beginning with the work of Caldwell (1979), a considerable body of literature suggests that maternal education is the single-most important factor in explaining differentials in maternal health-seeking behaviour and child health outcomes (see Frosta, et al. 2005 for detailed literature). While the linear positive relationship between maternal education and health care utilization is incontestable (Gage, 2007; Bicego and Ahmad, 1996; Cleland and Van Ginneken, 1988), research calls into question the extent of this causal relationship (Desai and Alva, 1998). Here, it is argued that maternal education is mostly a proxy for socioeconomic status, and geographic area of residence and its effect on maternal health care-seeking behaviour diminishes after controlling for these factors. Thus, there is continued debate regarding the influence of maternal education on mothers' health-seeking behaviour. A deeper understanding calls for an investigation of how female education affects maternal health-seeking behaviour. Indeed, while the maternal education effect might exist, literature presents no common stand on the number of years of female schooling that may have a significant impact on maternal health care utilization.

Against this backdrop, this study, using UDHS (2006) data, within a discrete-continous regression analysis, examines the influence between female education and factors known to reduce maternal-child health risk in Uganda, particularly the use of antenatal and delivery-care services. Controlling for socioeconomic and community level factors, the influence of female education on maternal health care utilization in Uganda is analyzed. It is noteworthy that the UDHS Report provides descriptive evidence on the subject area; however, it falls short in providing a rigorous quantitative empirical analysis of, among others, the impact of female education on utilization and accessing maternal health care services. While descriptive evidence can provide insights into policy implications, the importance of a specific quantitative empirical analysis for policy formulation cannot be underscored.

Statement of the problem

Maternal health care is an important ingredient in any set of efforts geared towards the improvement of maternal and child health. Policy makers need adequate knowledge on the factors that influence the utilization of antenatal care and child-delivery services to design policies that are associated with improved reproductive outcomes. The UDHS Report (2006) provides descriptive evidence on the underlying factors;

however, the quantitative evidence has not been explicitly established for Uganda. Furthermore, while literature on the subject area asserts female education as a strong predictor for maternal health-seeking behaviour, there is still considerable debate on the extent and nature of this relationship. Given Uganda's consistently high maternal and infant mortality rates, and limited efforts to improve access to maternal health care, it is important to gain more understanding into the factors that affect household maternal health care utilization. The study sought to provide answers to the following questions: Controlling for other socioeconomic characteristics, does the level of education acquired by a woman affect her decision in terms of seeking maternal health care services? If so, how many years of a woman's schooling have a significant impact in Uganda? This may mean that understanding the impact of a mother's education on maternal health care is not enough; the differential impact of various education levels can provide more meaningful insights. It is worth noting that these relationships had not been explicitly estimated for the case of Uganda.

Objectives

The main objective of this study was to examine the factors that influence the use of maternal health care services in Uganda, particularly the use of antenatal and delivery-care services. Specifically, the study sought to analyze:

i. the net effects of female education on maternal health-seeking behaviour and ascertain the differential impact of education levels on this behaviour; and
ii. if the education effect is consistent across different types of health services.

Hypotheses

i. Female education is the single-most important predictor of maternal health care utilization.
ii. There exists differential impact of female education levels on maternal health-seeking behaviour.
iii. The education effect is not consistent across different types of health services.

2. Literature review

There has been considerable research, particularly in developing countries, exploring the economic and social-cultural factors affecting the maternal health-seeking behaviour of mothers. These factors can be grouped into individual, household, and community level characteristics.

From the individual level perspective, literature asserts that maternal age, birth order, family size, past birth history complications, maternal education, maternal employment, childhood environment, maternal autonomy, religion and media exposure are among the factors that influence maternal health-seeking behaviour. It is argued that younger women are more modern and willing to seek maternal health care services, while older ones have accumulated more knowledge on maternal health care and childbirth, and thus might not seek health assistance (Elo, 1992; Raghupathy, 1996). In terms of birth order, women tend to give greater attention to their first pregnancy, as they are inexperienced and are therefore more likely to seek modern health care and vice versa (Elo, 1992; Bhatia and Cleland, 1995; Raghupathy, 1996; Navaneetham and Dharmalingam, 2002). In addition, working women are more likely to be economically and intellectually empowered and thus are more likely to seek modern health care (Desai and Jain, 1994; Chakraborty et al., 2003; Gage, 2007); however, in some societies, women employment might not signify economic power, since women in well-off families prefer not to work (Chakrabarti and Chaudhuri, 2007). Also, family size is likely to adversely affect maternal health care utilization, since women from large families have many demands on their time, and large families also cause resource constraints (Wong et al., 1987; Chakraborty et al., 2003). However, past birth history complications are most likely to make mothers take more care of a current pregnancy and seek health care services (Navaneetham and Dharmalingam, 2002). It is also argued that childhood environment before marriage is likely to influence the maternal health-seeking behaviour of mothers, particularly depending on the health-seeking behaviour of their parents (Behrman and Wolfe, 1987). However, it is argued that maternal education is one of the strongest determinants of utilization of health services even when controlling for a household's socioeconomic status (Caldwell, 1979; Fosu,1994; Cleland and Van Ginneken, 1988, 1989; Chakrabarti and Chaudhuri, 2007). Educated mothers are more likely to seek maternal health care services; however, maternal education alone might underestimate the effect of female education, especially when the influence of other educated women in the neighbourhood and household is not considered.

From a household and community perspective, literature identifies place of residence, female education, husband's education, husband's occupation, intergenerational

education, and caste, among others, as the factors influencing mothers' maternal health-seeking behaviour. Here, it is argued that women in urban settings are more likely to seek maternal health care services due to the availability and accessibility of modern services, in addition to urban women being more open to use of modern health services (Pebley et al., 1996). Caste and religion determine the conservativeness and autonomy of women as some tribes and religion might restrict their autonomy and health-seeking behaviour (Chakrabarti and Chaudhuri, 2007). In addition, the husband's education has been associated with the openness of a household to maternal health-seeking behaviour, in addition to occupation and income of the household. Thus, the higher the husband's education, the more likely the wife's health-seeking behaviour. However, female education, including maternal education and intergenerational education, is argued to positively influence the health-seeking behaviour of women (Bender and McCann, 2000). Women tend to share information with each other, thus communities with higher proportions of educated women are more likely to have better access to health facilities and share knowledge (Alderman et al., 2003). Furthermore, maternal health-seeking behaviour is influenced by the mother's (grandmother's) education, especially in societies where women seek advice and help from their mothers during pregnancies.

At community, household and individual levels, it is seen that female education influences mothers' health-seeking behaviour. According to Caldwell (1979, 1986) maternal education enhances female autonomy so that women develop greater confidence and capabilities to make decisions regarding their own health as well as that of their children. Three important consequences of maternal education have been outlined. First, a change in the traditional balance of family relationships that shifts power away from the kin group and allows mothers to assume greater responsibility for their own health as well as that of their children. Second, increased self-awareness and acceptance of modern practices; and third, a greater capability in manipulating the real world and securing health services. In this regard, in settings marked by low levels of female literacy, even small increments in educational levels can have substantial impact on maternal survival prospects.

At a community level, communities with higher proportions of more educated women are likely to have better access to health facilities and shared knowledge (Alderman et al., 2003). This can be seen on two fronts; first, in communities with higher proportions of educated women, women groups (powerful) are more likely to influence the accessibility and availability of better health facilities, and secondly, even if maternal education for an individual mother is low, if her peer group and neighbours are educated, their preferences are more likely to affect the mother's preferences. At the household level, the education of other female occupants of the household and relatives will enter into a mother's utility, maximizing health-seeking behaviour. Specifically, intergenerational education plays an important role in influencing maternal health-seeking behaviour; new mothers are affected by their mother's education and experiences. Indeed, women's maternal health care seeking behaviour is strongly influenced by the practices of others in their areas of residence and living in close proximity to people with higher education (Gage, 2007).

However, the health consequences of maternal education are not entirely without dispute. Some scholars (Behrman and Wolfe, 1987) believe that the effects of female schooling may be overstated and female background issues such as area of residence may come into play. They find support from Cleland and Van Ginneken (1988) who find that

half of great educational differentials in health care utilization in developing countries accrue to the economic advantages associated with education. Raghupathy (1996) finds that maternal schooling does not have a uniform impact across all maternal health packages in Thailand. While there is a distinct positive effect of schooling in the use of prenatal care, the educational differentials in the use of delivery assistance start emerging only after secondary schooling. In addition, while women with primary and secondary schooling maintain their advantage in utilizing tetanus toxoid (TT) inoculations during pregnancy, women with higher education showed a lower likelihood of utilizing TT inoculations. This was attributed to the time-intensive nature of antenatal care activities, which may conflict with the work schedules of most educated women who are in most cases employed in formal (public and private) sectors. This may reduce their frequency in seeking antenatal care and may lead to late initiation of their first visits. Overall, secondary education is found to be the most consistent predictor of health care utilization.

This debate regarding the influence of female education on mothers' health-seeking behaviour is not a foregone conclusion. A deeper understanding calls for an investigation into how female education affects maternal health seeking behaviour. This study contributes to this debate as follows: First, instead of looking for the effect of a mother's education on her health-seeking behaviour, a broader look at female (society definition) education is analyzed. Second, the optimal education level question is assessed. Third, the extent to which female education, as a variable, is a proxy of other variables in utility maximizing behaviour of health-seeking mothers is analyzed.

3. Methodology

Analytical framework

The theoretical pillars of the demand for maternal health care can be analyzed within the framework proposed by Rosenzweig and Schultz (1983). This model is very prominent in contemporary literature as a foundation for insights into the analysis of the demand for health care by households (Ajakaiye and Mwabu, 2007; Mwabu, 2009; Bbaale and Buyinza et al., 2011). It is also in line with earlier models (Becker, 1965; Grossman, 1972; Rosenzweig and Schultz, 1982; Mwabu and Wang'ombe, 1997). Intrinsic in the model is the need to maximize household welfare by making a choice between maternal health care and other consumption goods, subject to budget, health production and time constraints. In the model, health care is treated as a special form of good from which satisfaction is derived, with a monetary and time cost of gaining access to it.

The utility of a typical household is a function of the health care services (h), consumption of market goods (g), leisure (l) and taste (t). The household is assumed to maximize a well-behaved twice differentiable utility function, subject to a health care production constraint, time constraint and an income budget constraint. Thus, formally, the utility function is expressed as;

$$U = U\left[h, g, l, t\right] \tag{1}$$

In this model, we present the production function for maternal health care. This relates health inputs to maternal health outcomes (in this case, safe delivery and child survival). Health inputs include market purchased health inputs, n (e.g., antenatal care and child-delivery care), time of the mother (m_t) and father (f_t) in producing maternal health, education of the mother (m_e) and father (f_e) and the innate mother healthiness (ω). Thus;

$$h = h\,(n, m_t, f_t, m_e, f_e, \omega) \tag{2}$$

Basic to the theory of household health production 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. Traditionally, a household member (especially a woman in the African setting) is involved in a lot of household chores, including fetching water, collecting firewood, farm production, cooking food, and childcare. Generally, the total time of the woman can be allocated to leisure, work and producing maternal health. Thus, a woman's time constraint appears as follows:

$$m_c = l_m + y_m + m_h \tag{3}$$

m_c, l_m, y_m, and m_h is total time available to the woman, distributed to leisure, work and producing maternal health, respectively. We finally introduce a budget constraint that relates expenditures to income. Expenditures are allocated to the composite good, market purchased maternal health care inputs, and leisure good. Income sources are earnings of both the mother and the father, and the exogenous non-labour income.

$$P_g g + P_n n + P_l l = y_m w_m + y_f w_f + I \tag{4}$$

$P_g g$, $P_n n$, $P_l l$, $y_m w_m$, $y_f w_f$, and I refer, respectively, to the cost of the composite good, cost of market purchased maternal health inputs, cost of the leisure good, labour income of the mother, labour income of the father, and the exogenous non-labour income.

From this structural model, using optimization, we can solve for the reduced form of the demand for maternal health care inputs in terms of exogenous variables. The exogenous variables include time and money prices for health care inputs, mother and father education and household wealth (income). The mother's and father's expected lifetime wage rate is a crucial variable that may influence maternal health. 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.

$$D_n = D_n (P_n, P_t, P_g, B, m_e, f_e, \eta_{env}, \mu_{env}, \omega) \tag{5}$$

D_n, B, η_{env}, and μ_{env} is, respectively, the demand for maternal health care inputs, household income, household environment, and community or social environment. The rest of the variables remain as defined earlier. The demand for maternal health care inputs can either be discrete (e.g., whether a mother received a tetanus toxoid injection or not) or a continuous variable (e.g., the number of visits a mother made for antenatal care purposes). The household environment can be captured by including the type of dwelling, the source of drinking water and the type of toilet a household uses. On the other hand, the social environment can be captured by the availability of community infrastructure such as health centres or hospitals, road infrastructure and electricity.

Empirical strategy

To test the hypotheses, a number of estimators were used to suit the nature of the dependent variable in question. To estimate the factors associated with the utilization of TT injection, ordered and simple probit models are employed. Simple Ordinary Least Squares (OLS) was employed to estimate the factors influencing the frequency of antenatal care visits. The advantage of using OLS over the other techniques specialized for count data is ease of interpretation of our coefficients directly in terms of the number of visits. A multinomial logistic regression technique was employed to analyze the factors associated with the choice of prenatal and childbirth attendants. A key assumption, which is as well a limitation, of the multinomial logit model is the independence from irrelevant alternatives (IIA). According to Long (1996), this property states that the ratio of the probabilities of any two alternatives is independent of the remaining probabilities. McFadden (1973) suggested that IIA implies that the multinomial logit model should only be used in cases where the outcome categories "can plausibly be assumed to be distinct and weighed independently in the eyes of each decision maker" (Long, 1996). During our estimations, the existence of this limitation/assumption is appropriately examined. Following the conventional approach to applying the categorical models, after the logit/probit estimation, marginal effects or odds ratios are computed for all the right hand side variables.

Additionally, for all our dependent variables, we employed a community fixed effects regression methodology. This technique controls for the systematic differences in the utilization of maternal health care based on individual and household characteristics. We regress any measure of maternal health care utilization on individual, household, and demographic characteristics, and the fixed effects reflect the average health care received, purged of differences in characteristics.

Dependent variables

This study focused on the effects of education on maternal health care-seeking behaviour. It used various dependent variables arising out of prenatal and childbirth specific questions asked of women about their latest pregnancy occurring within the last five years (2001-2006) prior to the survey. The focus on the latest pregnancy hinged on the fact that data for recent births are more accurate than earlier ones. One birth per woman is considered for the analysis.

Antenatal health care utilization: Utilization of antenatal care services helps mothers diagnose diseases, the possibility of multiple births (twins or more), and other delivery complications early enough, making it possible for them to receive appropriate care. Women were asked whether they received antenatal care from; 1=doctor, 2=nurse/midwife, 3=traditional birth attendant (TBA), and 4=none. These categories constituted our dependent variable in our logistic regression.

Delivery assistance utilization: Assistance during delivery is an important component in the reproductive health care services since it reduces the risk of maternal and infant death during delivery. In the UDHS, information is collected about who

assisted the mother during childbirth. There are four main categories of child-delivery attendants or outcomes, coded thus: 1=doctor; 2=nurse/midwife; 3=traditional birth attendant (TBA); and 4=none. These categories also constituted our dependent variable in our logistic regression.

Tetanus toxoid utilization: A tetanus toxoid (TT) inoculation during pregnancy prevents the baby from getting tetanus. Women were asked if they received TT inoculations during pregnancy: 1=yes; 0=no. In addition, they were asked the number of times they received TT injections. We used an ordered probit to estimate: 1=received TT at least twice; 2=received TT once; and 3=no TT injections. The level of utilization of the three services varies in the sample. While 94% of women who had a live pregnancy in the five years preceding the survey received antenatal care from a skilled birth attendant, only 47% of women made four or more antenatal care visits during their entire pregnancy (UDHS, 2006). In addition, half of the women received two or more TT injections during their pregnancy and 42% of the births were delivered with the assistance of a trained health professional, while 23% were delivered by a TBA, and 10% either a relative or no help at all. The study determines the effects of education on this varying maternal health care-seeking behaviour.

Number of antenatal visits made by a mother: It is recommended that a minimum of four antenatal visits is needed to accomplish the essential level of care (World Health Organization, 2005). We establish the factors influencing the frequency of antenatal visits. This is an important variable because the higher the number of times, the higher the likelihood for a mother to maximize the benefits from antenatal care. Missing a visit may imply missing a scheduled type of treatment or checkup, which poses a risk to the mother and baby. According to WHO, at the minimum, a mother should make at least four antenatal care visits.

Independent variables

Female education: The UDHS collects information on education levels attained. Education is categorized into six classes of 0=no education, 1=primary education, 2=O-Level education, 3=A-Level education, 4=tertiary education, and 5=university education. To simplify the analysis, we used only four categorizations as follows; 0=no education, 1=primary education, 2=secondary education (O- and A-Level), 3=post-secondary education. These categories are necessary to allow for nonlinearity in the effects of education on utilization behaviour. The study used a general specification of whether a respondent had any education. In addition, the effect of specific education levels on maternal health care utilization is ascertained.

Other independent variables

The independent variables are divided under three broad categories – respondents' or individual characteristics, household characteristics and community characteristics – as follows:

Individual characteristics: The individual characteristics included the role played by maternal employment, age cohorts, birth order, social status and exposure to the media. Literature also suggests that the mother's birth history (in relation to complications) is significant in influencing maternal health care utilization. Since many of these factors are potentially endogenous, they are not included in our regressions.

Household characteristics: The most direct household characteristic that influences maternal health care utilization is wealth or economic status. The UDHS (2006) constructed a wealth index 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, the asset index is entered as a continuous variable. A woman's maternity choice is strongly influenced by her husband's characteristics, especially the socioeconomic background and opinions. Thus, we control for the husband's level of education in our analysis. The behaviour of household members is, in many of the cases, influenced by cultural and/or religious backgrounds. The study introduced dummies for religious affiliation; Protestant, Catholic, Muslim, Evangelicals and others.

Community characteristics: The community-level characteristics included the control for community infrastructure, such as health facilities, roads and electricity. These variables proxy the overall development of a community, as well as the ease of access to health care facilities. The variable for roads controls for the fact that availability of transport facilities can become an important determinant of accessibility and, therefore, utilization of maternal health care services. A community is counted as having a government facility if it has a government hospital or government dispensary, and a rural public facility if it has a community health centre, primary health centre or subcentre located within a village. On the other hand, the presence of a private hospital or private clinic is taken as a measure of the availability of a private health facility. A measure of residence, whether urban or rural, and regional controls were also included. We generated dummy variables to control for each of these community characteristics.

4. The data

The data used was obtained from the Uganda Demographic and Health Survey (UDHS, 2006) conducted by the Uganda Bureau of Statistics (UBOS). The 2006 UDHS is a nationally representative survey of 8,531 women aged 15-49, and 2,503 men aged 15-54. The sample was designed to allow separate estimates at the national level, and for rural and urban areas of the country. Three questionnaires were used; namely, the household questionnaire, the women's questionnaire, and the men's questionnaire. The sampling was done in two stages; in the first stage, 321 clusters were selected from among a list of clusters sampled in the 2005-2006 Uganda National Household Survey (UNHS) (UBOS, 2006); additional clusters were selected to accommodate special regions of Karamoja and 30 internally displaced people's camps (IDPs). In the second stage, households in each cluster were selected based on a complete listing of households as per UNHS report; in addition to the UNHS sampled households, another 20 households were randomly selected in the sample.

The primary purpose of the UDHS is to furnish policy makers and planners with detailed information on fertility; family planning; infant, adult, and maternal mortality; maternal and child health; nutrition; and knowledge of HIV/AIDS and other sexually transmitted infections. The UDHS provides a relatively 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 a woman bears, reproductive health, marital status, household income and education of women and men. 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).

5. Empirical findings and discussion of results

Factors associated with the utilization of tetanus toxoid (TT) immunization

Descriptive, ordered and simple probit models, and community fixed effects techniques were used to draw insights into the factors associated with the utilization of TT immunization. Women who utilized TT injections were categorized according to the number of injections that they received before childbirth: those who received at least two TT injections, only one injection, and those who received no TT injections at all. This gave rise to an ordered dependent variable that made the ordered probit technique appropriate in the analysis. Additionally, we constructed a binary dependent variable; equal to one if a mother received a TT injection before childbirth, and zero otherwise. Consequently, we also employed a simple probit model during the analysis. Finally, to control for the individual and household characteristics, we employed a community fixed effects regression. We estimated different models for the entire sample of women, and also for the rural and urban subsamples. The findings revealed education of the partner as an important predictor of pregnant women's prenatal utilization of TT immunization (Tables 5, 6, 7, 8, 9 and 10). An increase in the years of a partner's education increases the probability of receiving at least two TT injections by 4-7%, compared to counterparts whose partners had no education at all. However, it reduces the probability of receiving only one TT injection and no TT injections by 1-3% and 3%, respectively (Table 5). It is noteworthy that the effect of partner's education on TT injection utilization is strongest among urban women, compared to their rural counterparts (comparing Tables 6 and 7). These findings are confirmed by other regression techniques. Results from a simple probit model reveal that an increase in the years of a partner's education increases the probability of pregnant women receiving TT injections before childbirth by 3-4% (Tables 8 and 9). Community fixed effects model reveals that an increase in years of partner's education increases the utilization of more TT injections by .06 percentage points (Table 10). These empirical findings are supported by the descriptive findings in Table 1, which shows that 62% of women whose partners had post-secondary education received at least two TT injections, compared to 51% of counterparts whose partners

had no education. Overall, the health care seeking behaviour of women is strongly associated with the education of the partner, making government policy on gender parity in education attainment critical.

Surprisingly, a mother's education is revealed to be weakly associated with the utilization of TT injections (Tables 5, 6, 7, 8, 9 and 10). An increase in the years of a mother's education increases the probability of utilizing TT injections by 2-3%, compared to counterparts with no education at all (Tables 8 and 10). It is observable from the models that estimated the factors associated with TT utilization that the result on maternal education is not robust across the different scenarios explored. Results from the community fixed effects regression indicate that an increase in years of a mother's education increases the utilization of TT injections by .04 percentage points (Table 10). However, more generally, the descriptive findings (Table 1) support the view that highly educated women are more likely to utilize TT injections compared to their counterparts. Table 1 reveals that, on average, 67% of women with post-secondary education received at least two TT injections, compared to only 51% of women with no education at all. It is noteworthy that, irrespective of the level of education, the average percentage of women who utilized at least two TT injections far exceeds those who received only one or no TT injection. These findings are in line with the previous literature (Caldwell, 1979, 1986; Alderman et al., 2003; Frosta et al., 2005; and Gage, 2007).

The wealth index entered as a continuous variable in all our regressions, and we also included its quadratic term. Generally, at lower levels of the wealth index, the utilization of maternal health care services is dampened; yet, at higher levels of the wealth index, the utilization of the same services is heightened. For example, the level of the wealth index reduces the probability of attaining at least two TT injections by 6% and increases the probability of attaining only one TT injection and no TT injections by 2% and 5%, respectively. On the other hand, the square of the wealth index increases the probability of attaining at least two TT injections by 12%, but reduces the probability of attaining only one and no TT injections by 0.3% and 1%, respectively. These results, from the ordered probit model (Table 5), are supported by the findings from the community fixed effects regression in Table 10. The level of the wealth index decreases the utilization of TT injections by 0.1 percentage points. However, the square of the wealth index increases the utilization of TT injections by .02 percentage points (Table 10). We also included the interaction terms between the years of female and partner's education and the wealth index. Table 8 reveals that the interaction between the years of female education and the wealth index increases the probability of attaining TT injections by 2%. Additionally, the interaction between partner's education and wealth index increases the probability of attaining TT injections by .01%. These findings are in line with the findings from the community fixed effects regression in Table 10. It is noteworthy that the effect of the wealth index is not statistically different from zero across the rural and urban subsamples. The descriptive findings in Table 1 are in line with the quantitative findings. Table 1 reveals that 60% of mothers in the richest quintile attained at least two TT injections, compared to 54% of counterparts in the poorest quintile. Therefore, the Government of Uganda should strengthen efforts intended to uplift the majority from abject poverty by pursuing the targets set out in the Millennium Development Goals (MDGs) and the National Development Plan (NDP) that are to be realized by 2015.

The findings also reveal significant regional differences in the utilization of TT immunization (Tables 5, 6, 7, 8 and 9). Compared to counterparts in Central 1, women in Central 2 are 16-17% more likely to attain at least two TT injections. They are also 6% and 10-11% less likely to attain only one TT injection and no TT injections, respectively, compared to counterparts in Central 1 (Tables 5 and 7). Table 1 indicates that 64% of women in Central 2 received at least two TT injections, compared to 48% of those in Central 1. It further shows that 18% of women in Central 2 attained only one TT injection, compared to 26% in Central 1. In Central 2, 19% of women received no TT injection, compared to 26% in Central 1 (Table 1). Women residing in Kampala are 10% more likely to attain at least two TT injections, compared to those in Central 1. They are also 3% and 6% less likely to attain only one TT injection and no TT injection, respectively, compared to counterparts in Central 1 (Table 5). Table 1 shows that 63% of women in Kampala attained at least two TT injections, compared to 48% of women in Central 1. Only 12% of women in Kampala attained no TT injections, compared to 26% in Central 1. Table 5 shows that women in East Central are 6% more likely to attain at least two TT injections, compared to counterparts in Central 1. They are also 2% and 5% less likely to attain only one TT injection and no TT injection, respectively, compared to counterparts in Central 1. This effect is much stronger when we consider the urban subsample in Table 6. Women in East Central are 23% more likely to attain at least two TT injections, compared to counterparts in Central 1. They are also 14% and 9% less likely to attain only one TT injection and no TT injections, respectively, compared to counterparts in Central 1. Surprisingly, women in Northern Uganda are 14% more likely to attain at least two TT injections, compared to those in Central 1. They are also 4% and 10% less likely to attain only one and no TT injection, respectively (Table 5). The Northern region was devastated by a civil war for over two decades from 1986, and is now in the process of economic recovery and restoration of social services. It is thus surprising that it outperforms other regions in the utilization of maternal health care services. However, due to its circumstances the region has a large presence of donor and government interventions, which might explain these findings.

In the same vein, mothers in the West Nile are 6% more likely to attain at least two TT injections, compared to counterparts in Central 1. They are also 2% and 4% less likely to attain only one and no TT injections, respectively, compared to counterparts in Central 1 (Table 5). These empirical findings from the ordered probit regression are fully supported by the empirical findings from the simple probit regression across the rural and urban subsamples (Tables 8 and 9). The descriptive findings in Table 1 fully support the empirical findings. Central 2 outperforms all other regions in the utilization of TT injections, followed by Kampala, North, West Nile, East Central and the Eastern regions. Therefore, government effort is required to eliminate regional disparities in the utilization of health care services by taking them closer to the hard-to-reach women. Whereas the quantitative analyses in Tables 5, 8 and 10 reveal no significant differences by residence (urban/rural), the descriptive analysis in Table 1 shows that 60% of women in urban areas attained at least two TT injections, compared to only 50% of those in rural areas. This can be attributed to the existence of modern health care systems in urban compared to rural settings. These findings are also consistent with those found in earlier literature such as Pebley et al. (1996).

Unlike findings in previous literature (Magadi et al., 2000), this study found that older women are more likely to seek maternal health care services. It is revealed that women in the age cohort 44-49 are 11% more likely to attain at least two TT injections, compared to those in the 15-19 age cohort. On the other hand, they are 4% and 8% less likely to attain only one and no TT injections, respectively (Table 5). These findings from the ordered probit model find support from the findings in the community fixed effects regressions (Table 10). The community fixed effects regression reveals that mothers in the age cohort 44-49 increase the utilization of TT injections by 0.2 percentage points, compared to counterparts in the 15-19 cohort. This can be attributed to the high risk older women may face during childbirth compared to younger women, which makes them seek more maternal health care services. The descriptive findings (Table 1), however, are in line with previous literature showing older women are less likely to seek modern maternal health care services. On average, a lower percentage of older women attained at least two TT injections, compared to counterparts in the 15-19 age cohort. On average, less than 50% of women in the age cohorts 30-44 attained at least two TT injections, compared 56% of those in the 15-19 age cohort. The rural and urban subsamples reveal no significant differences in the effect of age on TT injection utilization.

Our findings also pronounce the importance of household size in influencing maternal health care utilization. An increase in the number of household members by one reduces the probability of attaining at least two injections by 4%. On the other hand, it increases the probability of attaining only one TT injection and no TT injection at all by 1% and 3%, respectively (Table 5). The effect of household size is even more assertive for the rural subsample in Table 7. An increase in the number of household members by one decreases the probability of attaining at least two TT injections by 5%. However, it increases the probability of attaining only one TT injection and no TT injection at all by 1% and 4%, respectively. These findings from the ordered probit analysis find full support from the simple probit model and also from the community fixed effects model (Tables 8, 9 and 10). These findings are supported by previous literature that highlighted the importance of household size (Wong et al., 1987; Chakraborty et al., 2003).

Our model estimations also included the effect of birth order as a factor associated with TT injection utilization. Households with at least the fourth birth order reduce the probability of attaining at least two TT injections by 12%, compared to counterparts with the first birth order. However, it increases the probability of attaining only one TT injection and no TT injection by 3% and 9%, respectively, compared to counterparts with the first birth order. These findings are in line with the ordered probit results of the rural rather than the urban subsample (comparing Tables 6 and 7). A similar picture is also illuminated from our results of the simple probit and community fixed effects estimations (Tables 8, 9 and 10). These findings are supported by previous literature that highlighted the importance of birth order (Elo, 1992; Bhatia and Cleland, 1995; Raghupathy, 1996; Navaneetham and Dharmalingam, 2002).

In summary, these findings suggest that the higher the female and partner education in a society, the higher the likelihood that a pregnant woman in that society will seek optimal TT immunization. In addition, a woman staying in Central 2 will most likely seek at least two TT injections during pregnacy. Furthermore, as women grow older, there is a higher likelihood that they will seek TT immunization. Additionally, household size and birth order matter in influencing maternal health care utilization.

Factors associated with the choice of childbirth attendant

A multinomial logit model was estimated to analyze the factors associated with the choice of childbirth attendant in Uganda. The categories of childbirth attendants identified in the data include doctor, nurse and traditional birth attendant (TBA). Our base category during the regression is women who were not assisted at all during childbirth. The parameter estimates provide only the direction of the effect of the independent variables on the dependent variable and do not represent either the actual magnitude of change nor probabilities. Thus, although we display the coefficients in our results tables, the interpretation is based on the odds ratios. The odds ratio assesses whether the odds of a certain event or outcome are the same for the two groups. The multinomial logit models crucially depend on the independence of irrelevant alternatives (IIA) assumption, which posits that deleting (or adding) an outcome category should not affect the odds among the remaining categories. Appropriate tests were employed to assess the validity of the IIA assumption. The Hausman test validates the IIA assumption (Table 4). Whereas some predictors appear to be unable (in a statistical sense) to distinguish among outcomes, a number of them have sufficient predictive power. The predictors in the latter category, as well as their relationship to the various childbirth attendants, are presented as follows.

As expected, female education is revealed to be important in pregnant women's choice of childbirth attendant in Uganda (Tables 13, 14 and 15). An increase in the years of female education increases the relative chance of pregnant women using a doctor, nurse or TBA, relative to using none during childbirth by 2.4, 1.8, and 1.4, respectively (Table 13). Tables 14 and 15, showing the multinomial estimates for the rural and urban subsamples, reveal a similar picture. However, the effect of female education is more pronounced for the urban compared to the rural subsample. For the urban subsample, an increase in the years of female education increases the relative chance of pregnant women using a doctor and a nurse, relative to using none during childbirth by 2.99 and 2.6, respectively (Table 14). For the rural subsample, an increase in female education increases the relative chance of pregnant women using a doctor, nurse or TBA, relative to using none during childbirth by 2.6, 1.7 and 1.4, respectively (Table 15). Additionally, the descriptive analysis (Table 3) agrees with the direction of the regression findings. Table 3 reveals that 13% of women with post-secondary education were assisted by a doctor during childbirth, compared to 0% of their counterparts with no education. It is further revealed that 74% of women with post-secondary education were assisted by a nurse during childbirth, compared to only 23% of counterparts with no education. It is noteworthy that only 7% and 6% of women with post-secondary education were assisted by a TBA and none, respectively. These findings are in line with previous literature (Caldwell, 1979; Alderman et al., 2003; Frosta et al., 2005; Gage, 2007). Overall, our findings clearly articulate the importance of female education in influencing maternal health care-seeking behaviour, and hence any efforts geared towards promoting female education should be supported by the government and other stakeholders, especially donors.

Our findings also highlight the importance of a partner's education in influencing maternal health care-seeking behaviour. An increase in the years of a partner's education

increases the relative chance of pregnant women being assisted by a doctor, nurse or TBA, relative to using none during childbirth by 1.6, 1.7 and 1.4, respectively (Table 13). Surprisingly, the effect of a partner's education is pronounced in the rural subsample and not in the urban subsample (comparing Tables 14 and 15). An increase in the years of a partner's education increases the relative chance of pregnant women being assisted by a doctor, nurse or TBA, relative to using none during childbirth by 1.5, 1.7, and 1.5, respectively (Table 15). The descriptive findings in Table 3 confirm the regression findings under partner's education. It is noted that 7% of women whose partners had post-secondary education were assisted by a doctor during childbirth, compared to only 1% of their counterparts with no education. Also, 60% of women whose partners had post-secondary education were assisted by a nurse during childbirth, compared to only 20% of their counterparts whose partners had no education. Additionally, only 18% of women whose partners had post-secondary education were not assisted at all during childbirth, compared to 61% of their counterparts whose partners had no education at all (Table 3). Overall, the importance of a partner's education cannot be ignored, hence the need for the government to increase its efforts towards gender parity in education attainment.

As expected, higher values of the wealth index (quadratic term), compared to the lower values (level of the wealth index) are associated with favourable maternal health care utilization. For example, an improvement in the wealth status (the quadratic term) of a household increases the relative chance of using a nurse, relative to using none during childbirth by 1.06 (Table 13). It is noteworthy that the effect of the wealth status of a household is pronounced in the rural and not in the urban subsample (comparing Tables 14 and 15). In fact, the effect of the wealth status found in the rural subsample is similar to that found in the entire sample, meaning that the rural subsample is the one driving this effect. The descriptive findings (Table 3) confirm the regression findings. Here it is revealed that, on average, 6% of women in the richest quintile were assisted by a doctor during childbirth, compared to only 1% of counterparts in the poorest quintile. And 71% of women in the richest quintile were assisted by a nurse, compared to only 24% of counterparts in the poorest quintile. Furthermore, it is revealed that only 10% of women in the richest quintile were assisted by a TBA during childbirth, compared to 31% in the poorest quintile. Only 13% of women in the richest quintile were not assisted during childbirth, compared to 42% of counterparts in the poorest quintile.

This analysis also reveals significant regional and location differences in the utilization of childbirth assistants. Being in Central 2, compared to Central 1, reduces the relative chance of using a doctor and TBA, relative to using none during childbirth by 0.2 and 0.6, respectively. As expected, being in Kampala, compared to being in Central 1, increases the relative chance of using a doctor relative to using none during childbirth by 3. Being in East Central, compared to being in Central 1, reduces the relative chance of using a TBA by 0.34. Being in Eastern region, compared to being in Central 1, reduces the relative chance of using a doctor, nurse and TBA, relative to using none during childbirth by 0.18, 0.66 and 0.4, respectively. Being in Northern region, compared to being in Central 1, increases the relative chance of using a TBA, relative to using none during childbirth by 2. While being in West Nile, compared to being in Central 1, reduces the relative chance of using a doctor, nurse and TBA, relative to using none during childbirth

by 0.2, 0.5 and 0.5, respectively. However, being in Western region, compared to being in Central 1, reduces the relative chance of using a nurse, relative to using none during childbirth by 0.4. And being in the Southwest, compared to being in Central 1, reduces the relative chance of using a nurse and TBA, relative to using none during childbirth by 0.3 and 0.2, respectively. Regional controls are not significantly different from zero for the urban subsample, but their effect for the rural subsample follows closely the picture observed for the entire sample (comparing Tables 13, 14 and 15). As expected, being in the rural areas, compared to being in urban regions, reduces the relative chance of using a nurse and doctor, and increases the relative chance of using a TBA relative to using none during childbirth by 0.4 and 2.1, respectively. These quantitative findings are confirmed by the descriptive findings in Table 3.

The age of a mother is articulated in the utilization of maternal health care services. Women in the age cohorts 25-44, compared to younger ones in the 15-19 age cohort, have a reduced relative chance of using a TBA, relative to using none during childbirth by 0.5-0.7. On the other hand, women in the age cohort 45-49 have an increased relative chance of using a doctor relative to using none during childbirth by 28. Comparing the rural and urban subsamples, the effect of age cohorts is pronounced in the rural and not in the urban subsample. The effect of age cohorts in the rural subsample is very similar to that observed in the entire sample (comparing Tables 13, 14 and 15). It is noteworthy that the descriptive findings in Table 3 confirm the regression results. These findings are also consistent with those found in earlier literature, such as Pebley et al. (1996).

Being a Protestant, compared to being Catholic, increases the relative chance of being assisted by a nurse and TBA, relative to being assisted by none by 1.14 and 1.29, respectively. On the other hand, being a Muslim, compared to Catholics, increases the relative chance of being assisted by a doctor, nurse, and TBA, relative to being assisted by none by 2.4, 1.7 and 1.3, respectively (Table 13). For the urban subsample, being a Protestant compared to Catholics, increases the relative chance of being assisted by a nurse compared to being assisted by none by 1.9. Additionally, being a Muslim or following another religion, say being an Evangelical, compared to being Catholic, increases the relative chance of being assisted by a nurse compared to being assisted by none by 3 and 4, respectively (Table 14). For the rural subsample, being a Protestant compared to being Catholic increases the relative chance of being assisted by a TBA, relative to none by 1.3. On the other hand, being a Muslim, compared to being Catholic, increases the relative chance of being assisted by a doctor and a nurse relative to none by 4 and 1.6, respectively.

Previous birth history, in terms of birth complications, is closely associated with the choice of childbirth attendant. Women with a previous caesarean birth, compared to counterparts with a normal birth, increase the relative chance of being assisted by a doctor and a nurse relative to none by 170 and 6, respectively (Table 13). This effect is not pronounced in the urban subsample, but its presence is much stronger in the rural subsample (comparing Tables 14 and 15). The effect of household size is also articulated in our findings. An increase in the size of the household by one member, reduces the relative chance of being assisted by a nurse compared to none by 0.9. This effect is not observable in the urban subsample, but a picture similar to that in the entire sample is seen in the rural subsample (comparing Tables 13, 14 and 15). Furthermore, households with higher birth orders, compared to the first birth order, reduce the relative chance of

being assisted by a nurse, relative to none by 0.5-0.7. Households with a fourth birth order, compared to the first birth order, reduce the relative chance of being assisted by a doctor, relative to none by 0.4 (Table 13). Again, this effect is non-existent in the urban subsample but visible in the rural subsample (comparing Tables 14 and 15). These findings are supported by previous literature that highlighted the importance of birth order (Elo, 1992; Bhatia and Cleland, 1995; Raghupathy, 1996; Navaneetham and Dharmalingam, 2002)).

In summary, more than in the case of TT findings, female education influences the choice of childbirth attendant, with more highly educated female societies likely to have a higher doctor childbirth assistance behaviour. In addition, a partner's education helps the quality of choice of delivery attendant with higher education leading to seeking a doctor choice more; also, the wealthier the household, the better the childbirth attendant choice. The size of the household, birth histories and birth order are found to be significant in influencing the choice of childbirth assistant. However, regional differences persist, and older women are more likely to seek a doctor's help during delivery.

Factors influencing the choice of antenatal care attendant

A variable with four categories of antenatal care assistants was generated; doctor, nurse, TBA and none (some women did not seek any professional antenatal care). This variable served as our dependent variable, and since it comprised unordered categories, a multinomial logit technique was employed during the analysis. Our reference category during the analysis is the group of women who were assisted by a nurse during antenatal care. The Hausman test validates the IIA (Table 4b). The interpretation of the findings in Tables 11 and 12 is in terms of odds ratios since the coefficients are not easily interpretable. We did not estimate a model for the urban subsample owing to very few observations for that category of women. Female education is again exposed as an important predictor of maternal choice of antenatal care assistant. An increase in the years of female education increases the relative chance of pregnant women using a doctor, relative to using a nurse during antenatal care by 1.3. However, it reduces the relative chance of being assisted by none during prenatal care, relative to being assisted by a nurse by 0.61 (Table 11). For the rural subsample, the effect of maternal education on the choice of being assisted by a doctor, relative to a nurse is observed to decay. However, for the urban subsample, the reducing effect of maternal education in the choice of being assisted by none, relative to a nurse during prenatal care is observed to persist (Table 12). Additionally, the descriptive findings in Table 2 confirm the regression results. The majority of women in our sample, irrespective of the level of education and other characteristics, are assisted by a nurse during prenatal care. Overall, on average, 91% of women in our sample were assisted by a nurse, compared to 3%, 1% and 5% assisted by a doctor, TBA and none, respectively. It is observed that, 14% of women who attained post-secondary education were assisted by a doctor during prenatal care, compared to only 2% of women with no education at all. Interestingly, 0% of women with post-secondary education were assisted by a TBA during prenatal care, compared to 1.3% of their counterparts with no education at all. Only 2% of women with post-secondary education were not assisted during prenatal care, compared to 8.4% of their

counterparts with no education at all. These findings are in line with previous literature (Caldwell, 1979; Alderman et al., 2003; Frosta et al., 2005; Gage, 2007). Government programmes targeting girl-child education should be strengthened for better maternal health care utilization and survival.

A partner's education is also revealed to be important in influencing the prenatal care-seeking behaviour of women. Table 11 shows that an increase in the years of education of the partner increases the relative chance of a pregnant woman being assisted by a doctor relative to a nurse by 1.5. Conversely, it reduces the relative chance of being assisted by none during prenatal care relative to a nurse by 0.8. For the rural sample, an increase in the years of education of the partner increases the relative chance of a pregnant woman being assisted by a doctor during prenatal care relative to a nurse by 1.6 (Table 12). These findings suggest that pursuing the goal of gender parity in education will result in improved maternal health care-seeking behaviour. The descriptive analysis in Table 2 confirms these regression findings. As mentioned earlier, the majority of women were assisted by a nurse during prenatal care. This may reflect the importance of the accessibility and availability of medical personnel since nurses are more readily available and spatially distributed than doctors.

Regional and location differences are also significant in the analysis (Table 11). Women in Central 2, compared to counterparts in Central 1, have a reduced relative chance of using a doctor and TBA, relative to using a nurse during prenatal care by 0.3 and 0.13, respectively. And, unexpectedly, women in Kampala, compared to counterparts in Central 1, have a reduced relative chance of using a doctor, relative to using a nurse during prenatal care by 0.35. Women in East Central, compared to counterparts in Central 1, have a decreased relative chance of using a doctor, TBA and none, relative to using a nurse during prenatal care by 0.4, 0.21, and 0.6, respectively. Women in the Eastern region, compared to counterparts in Central 1, have a reduced relative chance of using a doctor, TBA, and none relative to using a nurse during prenatal care by 0.1, 0.2, and 0.4, respectively. Women in the northern region, compared to counterparts in Central 1, have a reduced relative chance of using a doctor, TBA and none, relative to using a nurse during prenatal care by 0.2, 0.17 and 0.4, respectively. Women in the West Nile, compared to those in Central 1, have a reduced relative chance of using a doctor, TBA and none, relative to using a nurse during prenatal care by 0.08, 0.16 and 0.07, respectively. Women in the Western region, compared to counterparts in Central 1, have a reduced relative chance of using a TBA and none, relative to using a nurse during prenatal care by 0.3 and 0.5, respectively. Women in the South West, compared to counterparts in Central 1, have a reduced relative chance of using a TBA, relative to using a nurse during prenatal care by 0.3. Women in the rural areas, compared to counterparts in the urban areas, have a reduced relative chance of using a doctor, relative to using nurse during prenatal care by 0.3 (Table 11). The effect of regional controls observed in the entire sample in Table 11 is similar to that of the rural subsample in Table 12. The descriptive findings (Table 2) confirm the regression results. These findings are also consistent with those found in earlier literature, such as Pebley et al. (1996).

Previous birth history is also pronounced in our findings. Women with a previous caesarean birth, compared to counterparts with a normal birth, increase the relative chance of being assisted by a doctor, relative to a nurse, during prenatal care by 2.7

(Table 11). This effect is even more assertive for the rural subsample. Women with a previous caesarean birth, compared to counterparts with a normal birth, increase the relative chance of being assisted by a doctor, relative to a nurse, during prenatal care by 3.4 (Table 12). Birth order is also revealed to be important in our analysis. Women with at least the fourth birth order, compared to counterparts with the first, increase the relative chance of being assisted by a TBA relative to a nurse by 11 (Table 11). A similar effect is also observable for the rural subsample (Table 12). These findings are supported by previous literature that highlighted the importance of birth order (Elo, 1992; Bhatia and Cleland, 1995; Raghupathy, 1996; Navaneetham and Dharmalingam, 2002).

In summary, while female and partner's education are important in influencing the choice of antenatal care attendant, of great importance also is the availability and accessibility of medical personnel. Regional differences still persist, and birth histories and birth order matter.

Factors associated with the frequency of antenatal care visits

A continuous variable of the number of antenatal visits that a mother made during the most recent pregnancy prior to the survey date was generated. Community fixed effects and simple OLS were used to estimate the factors associated with antenatal care visits (Tables 16, 17 and 18). The greatest virtue of using OLS is that the interpretation of results directly in terms of the number of visits that a mother can make, given particular background characteristics, is possible. Prior to the OLS regression, a descriptive analysis revealed that the average number of antenatal visits in Uganda is 3.7, which is slightly below the minimum of four visits recommended by WHO. It is noteworthy that the community fixed effects results in Table 16 are similar to the OLS results in Table 17, hence we interpret Table 16. The results indicate that female education and that of the partner are significant in influencing the frequency of antenatal visits. An increase in the years of female education increases the number of antenatal visits by approximately .03 times (Table 16). These findings are in line with previous literature (Caldwell, 1979, 1986; Alderman et al., 2003; Frosta et al., 2005; Gage, 2007). Additionally, partner's education appears to have a stronger effect, compared to female education. An increase in the years of partner's education increases the number of antenatal visits by .07 to .08 times (Table 16). Comparing the rural and urban subsamples, in Table 18, it is revealed that female education is more important in urban than in rural areas, and partner's education is more important in rural than in urban areas. Consequently, government efforts geared towards gender parity in education should be strengthened for the attainment of better maternal health care-seeking behaviour and survival.

As expected, lower values of the wealth index are associated with fewer visits, while higher values of the wealth index are associated with more visits. For example, the level of the wealth index increases the number of antenatal visits by .015 times before the quadratic term is included in the model. Once the quadratic term is included in the model, a U-shaped relationship is exhibited. The level of the wealth index reduces the number of antenatal visits by 0.1 times, yet the square of the wealth index increases the number of antenatal visits by .02 times. This implies that, at an upper end of the wealth index,

more antenatal care visits are anticipated. These findings remain the same irrespective of whether we employ simple OLS (Table 17) or community fixed effects (Table 16). This can probably be attributed to the fact that antenatal sessions involve financial costs for medical care and diagnosis, as well as the transport cost to get to and from the health facility. The interaction between partner education and wealth index increases the number of antenatal visits by .07 times for the urban subsample (Table 18). This may imply that mothers with highly educated spouses, that are also wealthier, give rise to favourable maternal health care-seeking behaviour. The interaction between female education and wealth index, however, is not statistically different from zero.

Regional differentials are also pronounced in our regressions. Mothers living in Central 2, compared to those in Central 1, reduce the number of antenatal visits by approximately 0.13 times. Living in Kampala, compared to Central 1, reduces the number of antenatal visits by 0.14-0.17 times. The case of Kampala may not be surprising since a significant percentage of women living there are working outside their homes either in formal public or private enterprises, or operating their own businesses. This may imply that they have limited time available to devote to antenatal care. The case of lower antenatal visits is more pronounced in East Central and Eastern regions. Living in East Central and Eastern regions, compared to Central 1, reduces the number of antenatal visits by 0.2 times. Women in the Northern region reduce the number of antenatal visits by 0.1 times, while women living in the Western region and Southwest reduce the number of antenatal visits by approximately 0.2 times. This may be attributed to limited access to health care facilities and information, since much of these regions are rural in nature. The descriptive findings (Table 2) confirm these regression results. These findings are also consistent with those found in earlier literature, such as Pebley et al. (1996).

Contrary to the blend of literature (Magadi et al., 2000) where older women are less likely to seek modern maternal health care, these findings reveal that older women are more likely to visit more times than their younger counterparts. Compared to the 15-19 age cohort, mothers in the 20-49 cohorts increase the number of antenatal visits by .06-0.2 times (Tables 16 and 17). It is noteworthy that the effect is strongest at the upper limit of the age cohorts. This effect of age cohorts persists for both the rural and urban subsamples in Table 18. This should not be surprising since it is medically proved that older mothers have more birth-related risks and are also more enlightened than their younger counterparts. Birth history also matters as regards the number of prenatal care visits. Women with a previous caesarean birth, compared to those who had a normal birth, increase the number of antenatal visits by approximately 0.16 times. Additionally, mothers with at least the third birth order reduce the number of antenatal care visits by .08 to 0.1 times (Table 16). This effect persists for the rural but not for the urban subsample (Table 18).

In summary, these findings point to the importance of education; however, differentials persist with higher female education more pronounced. Also, regional differentials persist probably due to facility accessibility and lack of time for women in Kampala. In addition, age matters, with older women likely to seek more antenatal services. Birth histories and birth order also matter.

6. Conclusions and policy recommendation

The study set out to test the importance of female education in influencing maternal health care seeking behaviour. It is found that female education is indeed important across all prenatal and childbirth health care services tested in this study. Female education is found to be positively statistically significant in influencing the utilization of at least two TT inoculations, quality of choice of antenatal attendants and child-delivery attendants, and the number of antenatal visits. However, there exists differential impact of female education levels on maternal health care-seeking behaviour, with higher levels of education consistently more pronounced across all health services tested in this study.

However, a number of factors overestimate the impact of female education on health care seeking behaviour. It is found, in addition to female education, that understanding regional differentials in increasing prenatal and neonatal outcomes is important across all health services employed in this study. Quite unusually, a partner's education is also found consistently important (in some cases, like prenatal care visits, it is more than a woman's education) in maternal health care-seeking behaviour across all benchmarks tested in this study. We also note the muted effect of wealth status on prenatal care utilization, an issue pointing to near-universal accessibility of prenatal care services.

In regard to these findings, the government's Universal Secondary Education Programme is quite pertinent and should be supported and propelled to higher levels. However, since a partner's education is also found to be important in influencing maternal health care utilization, an optimal education strategy should involve promoting higher education with gender parity at the forefront. Regional disadvantages should be eliminated by the government undertaking village outreach programmes, where community level clinics with qualified staff can be stationed to bring on board women in remote areas.

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 rates (Population Reference Bureau, 2001).

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

3. This is the estimated cut point on the latent variable used to differentiate low TT utilization from middle and high TT utilization when values of the predictor variables are evaluated at zero. Subjects that had a value of 0.0744 or less on the underlying latent variable that gave rise to our TT utilization variable would be classified as low TT utilization.

4. This is the estimated cut point on the latent variable used to differentiate low and middle TT utilization from high TT utilization when values of the predictor variables are evaluated at zero. Subjects that had a value of 0.812 or greater on the underlying latent variable that gave rise to our TT utilization variable would be classified as high TT utilization. Subjects that had a value between 0.0744 and 0.812 on the underlying latent variable would be classified as middle TT utilization.

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Tables

Table 1: Average percentage of women who received tetanus toxoid injections before childbirth by background characteristics

Characteristics	Observations	At least two TT injections	One TT injection	No TT injection
Female Education: No education	1154	51	23	26
Primary	3054	49	28	24
Secondary	640	62	22	16
Post-secondary	141	67	26	7
Partner Education: No education	515	51	24	25
Primary	2759	48	27	25
Secondary	1035	57	26	17
Post-secondary	311	62	23	15
Wealth Quintiles: Poorest	1220	54	26	20
Poor	1050	45	29	25
Middle	910	49	25	26
Rich	887	49	24	27
Richest	922	60	25	15
Region: Central 1	448	48	26	26
Central 2	416	64	18	19
Kampala	340	63	26	12
East Central	565	50	27	23
Eastern	604	40	38	22
North	1087	57	26	16
West Nile	441	51	29	20
Western	553	48	22	30
Southwest	535	45	19	36
Location: Urban	639	60	27	14
Rural	4250	50	26	24
Religion: Catholic	2283	54	26	21
Protestant	1628	49	26	25
Muslim	568	53	26	21
Other	335	45	28	27
Age Cohort:15-19	366	56	27	17
20-24	1255	54	27	19
25-29	1226	54	26	20
30-34	1007	48	27	25
35-39	658	48	22	30
40-44	350	47	25	27
45-49	127	54	20	26

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Table 1 Continued

Characteristics	Observations	At least two TT injections	One TT injection	No TT injection
Caesarean: Yes	178	60	25	15
No	4773	51	26	23
Exposure to Media: Not at all	4081	50	26	25
<once a week	421	54	26	20
At least once a week	347	63	28	9
Every day	124	60	31	9
Mother Occupation: White collar	138	66	27	7
Services/sales	564	54	27	19
Agriculture	3585	50	26	24
Blue collar	278	55	24	21
Partner Occupation: White collar	370	59	25	16
Services/sales	653	50	27	23
Agriculture	2801	50	26	24
Blue collar	901	52	28	20
Total	**4989**	**51**	**26**	**23**

Source: Authors' own computations from UDHS 2006.

Table 2: Average percentage of women who received prenatal care from a particular assistant by background characteristics

	Observations	Doctor	Nurse	TBA	None
Female Education: No education	1054	2.3	88	1.3	8.4
Primary	2747	2.8	91.7	1.6	3.9
Secondary	572	4	92	1.1	2.6
Post-secondary	113	14	84	0	2
Partner Education: No education	469	2	89	1	8
Primary	2501	2	91	2	5
Secondary	919	4.7	90.6	1.1	3.6
Post-secondary	268	8	91	1	0
Wealth Quintiles: Poorest	1141	1.6	91	1.2	6.2
Poor	945	3	90	2	5
Middle	801	4	90	2	4
Rich	789	3	91	1	5
Richest	810	6	91	0.6	2.4
Region: Central 1	364	4	85	5	6
Central 2	390	2.3	92.1	0.5	5.1
Kampala	300	6	91	0	3
East Central	532	2	93	1	4
Eastern	546	0	94	2	4
North	1023	2	91	1	6
West Nile	408	0.7	98	0.7	0.7
Western	488	7	86	2	5
Southwest	435	7	85	1	7
Location: Urban	569	6.5	91	0.3	2.2
Rural	3917	2.5	91	1.5	5
Relgion: Catholic	2006	3	90	2	5
Protestant	1460	3	91	1	5
Muslim	515	3	94	0	3
Other	294	4	81	1	4

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Table 2 Continued

	Observations	Doctor	Nurse	TBA	None
Age Cohort: 15-19	331	3	92	1	4
20-24	1144	3	91	2	4
25-29	1086	3	90	2	5
30-34	911	3	91	1	5
35-39	599	3	90	1	6
40-44	305	3	90	1	6
45-49	110	4	89	1	6
Caesarean: Yes	141	11	87	1	1
No	4309	3	91	1	5
Exposure to Media: Not at all	3703	3	90	2	5
<once a week	373	2	95	0	3
At least once a week	297	7	90	1	2
Every day	100	12	86	0	2
Mother Occupation: White collar	115	10	89	1	0
Services/sales	501	5	90	1	4
Agriculture	3237	2	91	2	5
Blue collar	252	3	91	3	3
Partner Occupation: White collar	324	7	89	1	3
Services/sales	581	4	92	0	4
Agriculture	2517	3	90	2	5
Blue collar	827	3	91	1	5
Total Average	**4486**	**3**	**91**	**1**	**5**

Source: Authors' own computations from DHS 2006.

Table 3: Average percentage of women who were assisted during childbirth by background characteristics

	Observations	Doctor	Nurse	TBA	None
Female Education: No education	1914	0	23	25	52
Primary	4793	1	39	25	35
Secondary	855	4	69	12	15
Post-secondary	165	13	74	7	6
Partner Education: No education	834	1	20	18	61
Primary	4515	1	34	26	39
Secondary	1515	2	54	20	24
Post-secondary	432	7	60	15	18
Wealth Quintiles: Poorest	2001	1	24	31	44
Poor	1708	1	31	26	42
Middle	1426	1	34	22	43
Rich	1380	2	48	18	32
Richest	1212	6	71	10	13
Region: Central 1	672	2	49	26	23
Central 2	662	1	51	18	30
Kampala	421	11	79	3	7
East Central	958	1	59	11	29
Eastern	980	0	39	18	43
North	1746	0	26	40	34
West Nile	650	1	32	20	47
Western	824	3	24	30	43
Southwest	814	27	26	12	60

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Table 3 Continued

	Observations	Doctor	Nurse	TBA	None
Location: Urban	806	7	75	6	12
Rural	6921	1	35	25	39
Religion: Catholic	3566	1	34	25	39
Protestant	2556	2	41	22	35
Muslim	856	3	58	14	25
Other	495	3	42	23	32
Age Cohort: 15-19	384	1	54	23	22
20-24	1941	1	44	25	30
25-29	2065	2	41	21	36
30-34	1646	1	37	23	39
35-39	1037	1	32	22	45
40-44	490	2	27	21	50
45-49	164	2	24	24	50
Caesarean: Yes	139	43	47	4	6
No	7525	1	39	23	37
Exposure to Media: Not at all	6506	1	34	25	40
<once a week	614	2	58	16	24
At least once a week	448	4	71	11	14
Every day	143	13	70	5	12
Mother Occupation: White collar	168	7	73	10	10
Services/sales	780	5	62	13	20
Agriculture	5794	1	32	26	41
Blue collar	410	2	42	20	36
Partner Occupation: White collar	513	4	56	14	26
Services/sales	972	3	51	17	29
Agriculture	4609	1	28	26	45
Blue collar	1350	2	56	20	22
Total Average	**7727**	**2**	**38**	**23**	**37**

Source: Authors' own computations from DHS 2006; none also includes those that were assisted by a friend or relative.

Table 4a: Hausman Test of IIA assumption for the choice of the prenatal assistant model

Omitted		df	P>chi2	Evidence
Doctor	-1.70E+03	30	1	for Ho
Nurse	-43.408	30	1	for Ho
TBA	-1.80E+03	30	1	for Ho
None	-1.70E+03	60	1	for Ho

Ho: Odds (Outcome-J vs Outcome-K) are independent of other alternatives.

Table 4b: Hausman Test of IIA assumption for the choice of the childbirth assistant model

Omitted		df	P>chi2	Evidence
Doctor	122.393	33	0.984	for Ho
Nurse	43.847	66	1	for Ho
TBA	543.846	33	0.975	for Ho
None	9023.508	66	0.999	for Ho

Ho: Odds (Outcome-J vs Outcome-K) are independent of other alternatives.

Table 5: Factors influencing the utilization of tetanus toxoid injection (coefficients and marginal effects after and ordered probit regression) for the entire sample

		At least 2 TT injections	One TT injection	No TT injection
	Coefficients after an ordered probit	Marginal effects	Marginal effects	Marginal effects
Years of mother's education	-0.0511 (0.126)	.0203756 (.1262363)	-.0053183 (.1274303)	-.0150573 (.1262607)
Years of father's education	-0.0917*** (0.00143)	.0365452*** (.0014267)	-.0095387*** (.0016535)	-.0270065*** (.0014311)
Wealth index	0.158** (0.0259)	-.0627931** (.0258602)	.0163897** (.0268815)	.0464034** (.0258738)
Wealth index squared	-0.0291** (0.0147)	.0115986** (.0147448)	-.0030274** (.0155689)	-.0085713** (.0147557)
Log household size	0.101** (0.0246)	-.040072** .0246057	.0104593** (.0255736)	.0296128** (.0246317)
Region: Central 2	-0.411*** (4.18e-06)	.1591673*** (1.28e-06)	-.055072*** (.0000981)	-.1040954*** (4.01e-08)
Kampala	-0.230* (0.0581)	.0907148* (.0535915)	-.0284139* (.0968359)	-.0623008** (.0374541)
East Central	-0.163** (0.0422)	.0644473** (.0404367)	-.018935* (.0652854)	-.0455123** (.0319692)
Eastern	-0.0287 (0.727)	.0114312 (.7268383)	-.0030515 (.7325322)	-.0083796 (.7247216)
North	-0.360*** (1.00e-05)	.1415201*** (6.10e-06)	-.0438146*** (.0000983)	-.0977055*** (1.38e-06)
West Nile	-0.158* (0.0718)	.062454* (.0693539)	-.0184036* (.1028898)	-.0440504* (.056981)
Western	-0.0575 (0.487)	.0229054 (.4865383)	-.0062572 (.5053228)	-.0166483 (.4792497)
Southwest	0.0956 (0.247)	-.0381243 (.2463175)	.0091542 (.2041804)	.0289701 (.2595507)
Location: Rural	0.0318 (0.700)	-.012673 (.699452)	.0033915 (.7063456)	.0092815 (.6968752)
Religion: Protestant	0.0716* (0.0827)	-.0285348* (.0826387)	.0072603* (.0759533)	.0212744* (.0854248)
Muslim	0.0554 (0.369)	-.0220983 (.368799)	.0055079 (.345866)	.0165905 (.376338)
Other	0.266*** (0.000221)	-.1053522*** (.000178)	.0205105*** (3.91e-08)	.0848417*** (.0005716)

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Table 5 Continued

		At least 2 TT injections	One TT injection	No TT injection
	Coefficients after an ordered probit	**Marginal effects**	**Marginal effects**	**Marginal effects**
Age Cohort: 20-24	-0.0248 (0.777)	.0098799 (.7766093)	-.002613 (.7794353)	-.0072668 (.7755843)
25-29	-0.139 (0.160)	.0551878 (.1583309)	-.0154061 (.1854507)	-.0397816 (.1481949)
30-34	-0.0901 (0.394)	.0358473 (.3926149)	-.0098602 (.4160013)	-.0259871 (.3835078)
35-39	-0.0503 (0.651)	.02002 (.6505738)	-.0054239 (.6621099)	-.0145961 (.6461252)
40-44	-0.118 (0.324)	.0469488 (.3216084)	-.0135195 (.3642509)	-.0334293 (.3034063)
45-49	-0.297** (0.0457)	.11623** (.0389471)	-.0386027* (.0868215)	-.0776273** (.0217229)
Birth Order: 2	0.0317 (0.668)	-.0126543 (.6685684)	.0032236 (.6607763)	.0094307 (.6711824)
3	0.129* (0.106)	-.0516075* (.1052835)	.0121172* (.068902)	.0394904 (.1177017)
4+	0.293*** (0.000365)	-.1162174*** (.0003233)	.0317383*** (.0006407)	.0844791*** (.0002659)
Caesarean Section	-0.138 (0.182)	.0546393 (.1787046)	-.0161222 (.2273109)	-.0385171 (.1583041)
_cut1[3]	0.230 (0.175)			
_cut2[4]	0.971*** (1.21e-08)			
Log likelihood	-443.1763			
LR Chi2 (27)	224.42			
Prob>chi2	0.000			
Observations	4,424	4,424	4,424	4,424

pval in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6: Factors influencing the utilization of tetanus toxoid injection (coefficients and marginal effects after and ordered probit regression) for the urban sample

		At least 2 TT injections	One TT injection	No TT injection
	Coefficients after an ordered probit	Marginal effects	Marginal effects	Marginal effects
Years of mother's education	-0.0299 (0.741)	.0115491 (.7413639)	-.0056635 (.7415379)	-.0058855 (.7413802)
Years of father's education	-0.175** (0.0386)	.0675783** (.0385469)	-.0331397** (.0430874)	-.0344386** (.0398672)
Wealth index	0.0941 (0.812)	-.0363521 (.8116319)	.0178267 (.8117056)	.0185254 (.8116315)
Wealth index squared	-0.0456 (0.413)	.0176251 (.4126209)	-.0086431 (.4143776)	-.0089819 (.4130411)
Log household size	-0.0302 (0.803)	.0116476 (.802973)	-.0057118 (.803055)	-.0059357 (.8029754)
Region: Central 2	-0.469 (0.160)	.1672747 (.1164381)	-.0955689 (.1675113)	-.0717058 (.0605385)
Kampala	-0.412 (0.119)	.1583682 (.1147655)	-.0765359 (.110717)	-.0818322 (.1245678)
East Central	-0.686* (0.0818)	.2292721** (.0294168)	-.1391673* (.0660447)	-.0901048*** (.0040427)
Eastern	-0.701* (0.0602)	.2339278** (.0184194)	-.1419728** (.0468546)	-.091955*** (.0020112)
North	-0.400 (0.238)	.1455404 (.2007931)	-.0810583 (.2514279)	-.0644821 (.1402213)
West Nile	-0.578* (0.0819)	.2021059** (.0441007)	-.1176739* (.0806425)	-.0844319** (.0141783)
Western	-0.260 (0.455)	.0965251 (.432902)	-.0522515 (.4725842)	-.0442736 (.3815141)
Southwest	-0.704** (0.0457)	.2363922** (.0132174)	-.1424106** (.0357154)	-.0939815*** (.0015195)
Religion: Protestant	0.232* (0.0982)	-.0904705* (.0998116)	.0422449* (.0876224)	.0482255 (.1169621)
Muslim	0.386*** (0.00980)	-.151163*** (.0099948)	.0663117*** (.0050276)	.0848514** (.0199883)
Other	0.376** (0.0482)	-.1484285** (.0490881)	.0610565** (.0169132)	.087372* (.0869962)

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Table 6 Continued

		At least 2 TT injections	One TT injection	No TT injection
	Coefficients after an ordered probit	**Marginal effects**	**Marginal effects**	**Marginal effects**
Age Cohort: 20-24	0.0338	-.0130767	.0063692	.0067075
	(0.885)	(.8856025)	(.8848267)	(.8863452)
25-29	-0.308	.1162479	-.0601158	-.0561321
	(0.263)	(.2497053)	(.273902)	(.2273337)
30-34	-0.112	.042836	-.021695	-.021141
	(0.707)	(.7038726)	(.7125339)	(.6947381)
35-39	-0.386	.1409299	-.0779895	-.0629404
	(0.232)	(.1981726)	(.2466472)	(.1415457)
40-44	-0.0972	.0370514	-.0189339	-.0181175
	(0.805)	(.8021454)	(.8095924)	(.7938131)
45-49	0.896	-.3401245	.073139	.2669856
	(0.291)	(.2180802)	(.1375025)	(.4087325)
Birth Order: 2	-0.0250	.0096172	-.0047508	-.0048664
	(0.892)	(.8914894)	(.8922728)	(.8907274)
3	0.148	-.0579189	.0269092	.0310097
	(0.497)	(.5010148)	(.4766593)	(.5217442)
4+	0.332	-.1285944	.0607598	.0678346
	(0.128)	(.1273224)	(.1157922)	(.1436245)
Caesarean Section	-0.172	.0650853	-.033965	-.0311203
	(0.381)	(.3688173)	(.3973042)	(.3381874)
cut1	-0.943			
	(0.220)			
cut2	-0.00966			
	(0.990)			
Log likelihood	-3952.1835			
LR Chi2 (27)	183.83			
Prob>chi2	0.0000			
Observations	520	520	520	520

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 7: Factors influencing the utilization of tetanus toxoid injection (coefficients and marginal effects after and ordered probit regression) for the rural sample

		At least 2 TT injections	One TT injection	No TT injection
	Coefficients after an ordered probit	Marginal effects	Marginal effects	Marginal effects
Years of mother's education	-0.0443 (0.225)	.0176575 (.2245374)	-.0041903 (.2256954)	-.0134672 (.224563)
Years of father's education	-0.0850*** (0.00573)	.0339258*** (.0057264)	-.0080509*** (.0063896)	-.0258749*** (.0057354)
Wealth index	0.0979 (0.189)	-.0390396 (.1890796)	.0092645 (.190456)	.0297751 (.1890799)
Wealth index squared	-0.0170 (0.180)	.0067994 (.1799629)	-.0016136 (.1813824)	-.0051859 (.1799612)
Log household size	0.115** (0.0180)	-.0458755** (.0180373)	.0108867** (.0191606)	.0349888** (.0180553)
Central 2	-0.432*** (3.61e-06)	.1678448*** (1.25e-06)	-.0549217*** (.0001279)	-.1129231*** (2.97e-08)
East Central	-0.138* (0.0931)	.0548541* (.0917598)	-.0145293 (.126572)	-.0403248* (.0800055)
Eastern	0.00182 (0.983)	-.0007257 (.9829173)	.000172 (.9828905)	.0005538 (.9829256)
North	-0.372*** (1.04e-05)	.1468197*** (7.16e-06)	-.0418132*** (.0001254)	-.1050065*** (1.69e-06)
West Nile	-0.140 (0.127)	.0556766 (.1254471)	-.0149025 (.1682772)	-.0407741 (.1102483)
Western	-0.0459 (0.593)	.0182897 (.5930139)	-.0045166 (.606962)	-.0137732 (.5882391)
Southwest	0.142* (0.0973)	-.0563709* (.0960866)	.0116268** (.050423)	.0447442* (.1096232)
Religion: Protestant	0.0552 (0.204)	-.0220153 (.203421)	.0051149 (.1948875)	.0169004 (.2064148)
Muslim	-0.0163 (0.813)	.0065189 (.8130732)	-.0015706 (.8157925)	-.0049483 (.8121971)
Other	0.277*** (0.000412)	-.1095314*** (.0003155)	.0182415*** (4.51e-09)	.0912898*** (.0009626)
Age Cohort: 20-24	-0.0286 (0.763)	.0114215 (.7627865)	-.002758 (.7666814)	-.0086635 (.76151)
25-29	-0.109 (0.310)	.0433613 (.3092582)	-.0109328 (.3367115)	-.0324285 (.2995494)

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Table 7 Continued

		At least 2 TT Injections	One TT Injection	No TT Injection
	Coefficients After an ordered probit	Marginal effects	Marginal effects	Marginal effects
30-34	-0.0702 (0.539)	.0279927 (.5383323)	-.0069515 (.555607)	-.0210412 (.532282)
35-39	0.00444 (0.970)	-.0017704 (.9704563)	.0004186 (.9703452)	.0013518 (.9704908)
40-44	-0.0908 (0.479)	.0361702 (.4784994)	-.009339 (.5115214)	-.0268313 (.4658953)
45-49	-0.285* (0.0670)	.1122845* (.0600372)	-.0343997 (.1221933)	-.0778847** (.0379356)
Birth Order: 2	0.0447 (0.585)	-.0178491 (.5846409)	.0040727 (.5692046)	.0137764 (.5890962)
3	0.123 (0.161)	-.0489427 (.1596824)	.0103816 (.1114138)	.0385611 (.1735036)
4+	0.270*** (0.00264)	-.1074*** (.002481)	.0270981*** (.0045263)	.0803019*** (.0020403)
Caesarean Section	-0.111 (0.368)	.0441551 (.36601)	-.0117336 (.4134902)	-.0324215 (.3475216)
cut1	0.199 (0.209)			
cut2	0.924*** (5.44e-09)			
Log likelihood	-455.51313			
LR Chi2 (27)	60.79			
Prob>chi2	0.0001			
Observations	3,904	3,904	3,904	3,904

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8: Factors influencing the utilization of tetanus toxoid injection (marginal effects after a simple probit regression) for the entire sample

	Model (1)	Model (2)	Model (3)
	Marginal effects	Marginal effects	Marginal effects
Years of mother's education	.0214061* (.0738526)	-.033546 (.1989326)	.0194059* (.1068752)
Years of father's education	.0273865*** (.0079528)	.0262606** (.0109084)	-.0084089 (.6999888)
Wealth index	-.0256263 (.3079774)	-.0216475 (.3893396)	-.0274508 (.2749816)

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Table 8 Continued

	Model (1)	Model (2)	Model (3)
	Marginal effects	Marginal effects	Marginal effects
Wealth index squared	.0051722 (.2228919)	.0017142 (.7015862)	.0028559 (.5176818)
Log household size	-.028434* (.0794894)	-.0269932* (.0957263)	-.0277265* (.0871565)
Region: Central 2	.0882042*** (.0001685)	.0888337*** (.0001442)	.0888484*** (.0001439)
Kampala	.0798729** (.0254693)	.0753162** (.0393485)	.0778708** (.0310257)
East Central	.0666114*** (.0042793)	.0693523*** (.00274)	.0668551*** (.0041146)
Eastern	.0760662*** (.0013487)	.0782756*** (.0009027)	.0761738*** (.0013205)
North	.1290317*** (6.19e-09)	.1280916*** (8.22e-09)	.1272066*** (1.19e-08)
West Nile	.0780079*** (.0015777)	.0807956*** (.0009466)	.0791653*** (.001285)
Western	.0147237 (.5887321)	.0152938 (.573885)	.0139422 (.6093557)
Southwest	-.0503335* (.0975385)	-.0487052* (.1081792)	-.0520007* (.088014)
Location: Rural	-.0368685 (.1917742)	-.0353394 (.2136543)	-.0353138 (.2138963)
Religion: Protestant	-.0250124* (.0931719)	-.0229585 (.1228268)	-.0232227 (.1190258)
Muslim	-.0253737 (.2721736)	-.023646 (.3049533)	-.0247913 (.2827432)
Other	-.0826596*** (.0045865)	-.0803796*** (.005737)	-.0818835*** (.0049313)
Age Cohort: 20-24	.005429 (.8653078)	.0010743 (.9734113)	.0038522 (.9043449)
25-29	.0444789 (.1938247)	.0351326 (.3148584)	.0408962 (.2352386)
30-34	.0262135 (.478756)	.0161973 (.6689223)	.022665 (.5429877)
35-39	-.0057823 (.8871438)	-.0173881 (.678311)	-.0105679 (.7974071)

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Table 8 Continued

	Model (1)	Model (2)	Model (3)
	Marginal effects	Marginal effects	Marginal effects
40-44	.0241576 (.5534589)	.0123739 (.7700468)	.018394 (.6574801)
45-49	.0587746 (.1818381)	.0458339 (.3240206)	.0523585 (.246681)
Caesarean Section	.055013* (.0983483)	.0524654 (.1176403)	.0555063* (.0950656)
Birth Order: 2	.0145553 (.5890606)	.0153375 (.5686519)	.0137825 (.6094721)
3	-.0072169 (.8106604)	-.0047307 (.8746854)	-.0065506 (.8276145)
4+	-.0821391*** (.0043452)	-.0769023*** (.0079393)	-.0807778*** (.0050777)
Years of mother's education* wealth index		.018085** (.0182653)	
Years of mother's education* wealth index			.0123183* (.0635723)
Log likelihood	-2248.7005	-2245.9058	-2246.9814
LR Chi2 (27)	226.45	232.04	229.89
Prob>chi2	0.000	0.0000	0.000
Observations	4,424	4,424	4,424

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 9: Factors influencing the utilization of tetanus toxoid injection (marginal effects after a simple probit regression); comparing rural and urban samples

	Urban	Rural	Urban	Rural
	Marginal effects	Marginal effects	Marginal effects	Marginal effects
Years of mother's education	-.1539469 (.1536509)	-.0308268 (.2802607)	.0009804 (.9678353)	.0206063 (.1223592)
Years of father's education	.0378915* (.0838833)	.0245407** (.0299925)	.0287602 (.7370649)	-.004678 (.8435711)
Years of mother's education* wealth index	.0341947 (.1384129)	.0187586** (.0373979)		
Wealth index	.0677103 (.4712837)	-.0139 (.6099708)	.074986 (.4285179)	-.0186771 (.4937044)
Wealth index square	-.0080485 (.5506708)	-.0004913 (.9203774)	-.0052327 (.6949783)	.0009026 (.8524273)

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Table 9 Continued

	Urban	Rural	Urban	Rural
	Marginal effects	Marginal effects	Marginal effects	Marginal effects
Log of household size	.0161788 (.5984443)	-.0318528* (.0767227)	.0154017 (.6203721)	-.0325275* (.0708357)
Region: Central 2	.0504714 (.3452853)	.1012176*** (.0000439)	.0461183 (.4151859)	.1017064*** (.000039)
Kampala	.1023191 (.1248992)		.0941977 (.1582712)	
East Central	.07224* (.106902)	.0685949*** (.0062654)	.0681569 (.1628254)	.0659565*** (.0089769)
Eastern	.115662*** (8.21e-11)	.0736271*** (.0046687)	.1152052*** (6.96e-10)	.0717133*** (.0060974)
North	.0833145** (.0481869)	.1377128*** (1.27e-08)	.0759721* (.1051429)	.1371317*** (1.64e-08)
West Nile	.0791896** (.0487046)	.0823319*** (.0022437)	.0757151* (.0776919)	.0806749*** (.0029207)
Western	.0972678**** (.0006511)	.0098666 (.7371765)	.0948848*** (.00249)	.0083056 (.7783242)
Southwest	.0687851 (.1304867)	-.059088* (.0687483)	.0655503 (.1752613)	-.0623893* (.0559089)
Religion: Protestant	-.0768002* (.0884024)	-.0174051 (.2746333)	-.0800598* (.0779652)	-.0176481 (.2687545)
Muslim	-.1416942*** (.0085242)	.0039915 (.8734717)	-.1426636*** (.0084125)	.0027269 (.913492)
Other	-.147165* (.0602146)	-.0792711** (.0132164)	-.14858* (.0582762)	-.0809106** (.0114912)
Age Cohort: 20-24	-.0611064 (.4051107)	.0128707 (.7144328)	-.0553803 (.4452054)	.0149178 (.6703279)
25-29	.0199621 (.7763253)	.039371 (.3069667)	.0266733 (.6989739)	.0439684 (.2491569)
30-34	-.0578624 (.5470265)	.0262705 (.5247157)	-.0430856 (.6387655)	.0317834 (.4358263)
35-39	-.0007698 (.992789)	-.019003 (.6804941)	.0060609 (.9413135)	-.0133648 (.7692483)
40-44	-.0731687 (.6043018)	.0208581 (.6474647)	-.0543691 (.6814312)	.0257323 (.5669724)
45-49	-.3786751 (.313342)	.0577776 (.2374778)	-.3503316 (.3495042)	.0634124 (.1848203)

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Table 9 Continued

	Urban	Rural	Urban	Rural
	Marginal effects	Marginal effects	Marginal effects	Marginal effects
Caesarean Section	.0396518 (.3373741)	.057295 (.1532833)	.0400339 (.342247)	.0595365 (.1355663)
Birth Order: 2	.0223237 (.6104697)	.0087941 (.774962)	.0231382 (.5985757)	.0082116 (.7896344)
3	.0051056 (.9273048)	-.0115611 (.7330887)	.0037822 (.9468066)	-.0119223 (.7251242)
4+	-.0370815 (.5223805)	-.0819672** (.0106514)	-.0422708 (.4693252)	-.0846207*** (.0081828)
Years of father's education* wealth index			.002458 (.896809)	.0110114 (.1505471)
Log likelihood	-182.01525	-2043.7993	-183.14354	-2044.9454
LR Chi2	50.54	192.13	48.29	189.84
Prob>chi2	0.0039	0.0000	0.0071	0.0000
Observations	520	3904	520	3904

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 10: Factors influencing the utilization of tetanus toxoid injection (community fixed effects)

	(1)	(2)	(3)	(4)
Years of mother's education	0.0370* (0.0999)	0.0344 (0.126)	-0.0616 (0.208)	0.0318 (0.159)
Years of father's education	0.0614*** (0.00152)	0.0604*** (0.00181)	0.0590*** (0.00232)	0.0174 (0.666)
Years of mother's education* wealth index			0.0304** (0.0274)	
Wealth index	0.00611 (0.624)	-0.100** (0.0375)	-0.0905* (0.0608)	-0.101** (0.0353)
Wealth index square		0.0185** (0.0223)	0.0121 (0.160)	0.0155* (0.0678)
Log of household size	-0.0668** (0.0275)	-0.0675** (0.0258)	-0.0645** (0.0333)	-0.0668** (0.0275)
Location: Rural	-0.0449 (0.415)	-0.0266 (0.633)	-0.0224 (0.687)	-0.0238 (0.669)
Religion: Protestant	-0.0515* (0.0652)	-0.0468* (0.0945)	-0.0425 (0.129)	-0.0444 (0.113)
Muslim	-0.0407 (0.331)	-0.0368 (0.378)	-0.0337 (0.421)	-0.0355 (0.397)

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Table 10 Continued

	(1)	(2)	(3)	(4)
Other	-0.186***	-0.180***	-0.177***	-0.179***
	(0.000166)	(0.000258)	(0.000338)	(0.000284)
Age Cohort: 20-24	0.0131	0.0139	0.00497	0.0111
	(0.822)	(0.812)	(0.932)	(0.850)
25-29	0.0880	0.0848	0.0642	0.0782
	(0.181)	(0.198)	(0.335)	(0.236)
30-34	0.0549	0.0505	0.0293	0.0440
	(0.438)	(0.475)	(0.681)	(0.536)
35-39	0.0246	0.0195	-0.00410	0.0120
	(0.741)	(0.793)	(0.957)	(0.872)
40-44	0.0734	0.0695	0.0435	0.0600
	(0.364)	(0.390)	(0.594)	(0.460)
45-49	0.191*	0.188*	0.157	0.177*
	(0.0551)	(0.0592)	(0.118)	(0.0778)
Birth Order: 2	-0.0101	-0.0107	-0.00873	-0.0115
	(0.838)	(0.828)	(0.859)	(0.816)
3	-0.0723	-0.0712	-0.0649	-0.0697
	(0.177)	(0.183)	(0.226)	(0.193)
4+	-0.191***	-0.186***	-0.174***	-0.183***
	(0.000519)	(0.000727)	(0.00158)	(0.000885)
Caesarean Section	0.0989	0.0942	0.0905	0.0941
	(0.151)	(0.171)	(0.189)	(0.172)
Years of partner's education* wealth index				0.0147
				(0.222)
Constant	2.425***	2.525***	2.559***	2.556***
	(0)	(0)	(0)	(0)
Observations	4,424	4,424	4,424	4,424
R-squared	0.025	0.026	0.028	0.027
Number of region	9	9	9	9

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 11: Factors influencing the choice of prenatal care assistant (coefficients and odds ratios after mlogit) for the entire sample

	Doctor		TBA		None	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
Years of mother's education	0.304* (0.0742)	1.35*	-0.0493 (0.865)	0.95	-0.486*** (0.00148)	0.61***
Years of father's education	0.402*** (0.00793)	1.49***	0.112 (0.651)	1.12	-0.239* (0.0691)	0.79*
Wealth index	-0.235 (0.559)	0.79	0.616 (0.288)	1.85	0.231 (0.467)	1.26
Wealth index square	0.0120 (0.856)	1.01	-0.124 (0.213)	0.88	-0.0585 (0.291)	0.94
Log of household size	0.178 (0.446)	1.19	0.0922 (0.816)	1.1	0.164 (0.417)	1.18
Region: Central 2	-1.262** (0.0169)	0.28**	-2.070*** (0.00731)	0.13***	-0.425 (0.240)	0.65
Kampala	-1.036** (0.0215)	0.35**	-15.29 (0.987)	0	-0.185 (0.783)	0.83
East Central	-0.935** (0.0333)	0.39**	-1.581*** (0.00403)	0.21***	-0.549* (0.0979)	0.58*
Eastern	-2.311*** (0.000396)	0.10***	-1.553*** (0.00410)	0.21***	-0.869** (0.0161)	0.42**
North	-1.427*** (0.00139)	0.24***	-1.762*** (0.000932)	0.17***	-0.832** (0.0120)	0.43**
West Nile	-2.477*** (0.00137)	0.08***	-1.813*** (0.00818)	0.16***	-2.602*** (5.02e-05)	0.07***
Western	0.367 (0.292)	1.44	-1.065** (0.0283)	0.34**	-0.630* (0.0665)	0.53*
Southwest	0.482 (0.175)	1.62	-1.289** (0.0202)	0.28**	-0.215 (0.508)	0.81
Location: Rural	-1.110*** (0.000979)	0.33***	-0.0434 (0.955)	0.96	0.130 (0.787)	1.14
Religion: Protestant	-0.270 (0.230)	0.76	-0.0850 (0.790)	0.92	-0.184 (0.302)	0.83
Muslim	-0.0968 (0.770)	0.91	-0.890 (0.160)	0.41	-0.454 (0.156)	0.64
Other	0.250 (0.481)	1.28	-0.206 (0.741)	0.81	-0.246 (0.459)	0.78
Age Cohort: 20-24	0.203 (0.679)	1.23	-0.945 (0.246)	0.39	0.480 (0.356)	1.62

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Table 11 Continued

	Doctor		TBA		None	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
25-29	0.0317 (0.953)	1.03	-1.410 (0.112)	0.24	0.772 (0.162)	2.16
30-34	-0.0476 (0.935)	0.95	-2.267** (0.0155)	0.10**	0.895 (0.120)	2.45
35-39	-0.0391 (0.950)	0.96	-2.382** (0.0162)	0.09**	0.951 (0.108)	2.59
40-44	0.0126 (0.986)	1.01	-2.665** (0.0188)	0.07**	0.987 (0.110)	2.68
45-49	0.818 (0.283)	2.27	-2.432* (0.0703)	0.09*	0.569 (0.437)	1.77
Caesarean Section	0.996*** (0.00477)	2.71***	-0.228 (0.826)	0.8	-0.753 (0.303)	0.47
Birth Order: 2	0.400 (0.266)	1.49	0.645 (0.445)	1.91	0.258 (0.493)	1.29
3	0.249 (0.544)	1.28	1.338 (0.129)	3.81	0.215 (0.581)	1.24
4+	0.319 (0.455)	1.38	2.385*** (0.00580)	10.86***	-0.136 (0.736)	0.87
Constant	-2.786*** (0.00146)	0.06***	-3.778*** (0.00864)	0.02***	-2.766*** (0.00150)	0.06***
N	3984					
Log likelihood	-1417.69					
LR chi2	263.87					
Prob>Chi2	0.000					

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 12: Factors influencing the choice of prenatal care assistant (coefficients and odds ratios after mlogit) for the rural sample

	Doctor		TBA		None	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
Years of mother's education	0.0327 (0.874)	1.03	-0.00574 (0.985)	0.99	-0.515*** (0.00131)	0.60***
Years of father's education	0.494*** (0.00520)	1.64***	0.0675 (0.795)	1.07	-0.204 (0.133)	0.82
Wealth index	-0.217 (0.624)	0.81	0.624 (0.301)	1.87	0.0727 (0.824)	1.08
Wealth index square	0.0159 (0.830)	1.02	-0.132 (0.210)	0.88	-0.0246 (0.665)	0.98

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Table 12 Continued

	Doctor		TBA		None	
	Coefficients	Odds ratios	Coefficients	Odds ratios	Coefficients	Odds ratios
Log of household size	0.00171 (0.995)	1	0.199 (0.631)	1.22	0.124 (0.561)	1.13
Region: Central 2	-1.241** (0.0335)	0.29**	-2.032*** (0.00851)	0.13***	-0.445 (0.228)	0.64
Kampala	-1.557*** (0.00409)	0.21***	-1.846*** (0.00191)	0.16***	-0.642* (0.0583)	0.53*
East Central	-3.284*** (0.00186)	0.04***	-1.588*** (0.00355)	0.20***	-0.826** (0.0232)	0.44**
Eastern	-1.355*** (0.00480)	0.26***	-1.910*** (0.000511)	0.15***	-0.827** (0.0138)	0.44**
North	-2.250*** (0.00432)	0.11***	-1.762** (0.0107)	0.17**	-2.923*** (0.000127)	0.05***
West Nile	0.383 (0.309)	1.47	-1.090** (0.0261)	0.34**	-0.592* (0.0871)	0.55*
Western	0.433 (0.257)	1.54	-1.264** (0.0231)	0.28**	-0.187 (0.566)	0.83
Religion: Protestant	-0.0626 (0.804)	0.94	-0.190 (0.566)	0.83	-0.171 (0.351)	0.84
Muslim	0.0841 (0.850)	1.09	-0.823 (0.196)	0.44	-0.554 (0.122)	0.57
Other	0.423 (0.326)	1.53	-0.161 (0.797)	0.85	-0.222 (0.524)	0.8
Age Cohort: 20-24	-0.00248 (0.996)	1	-1.128 (0.187)	0.32	0.542 (0.343)	1.72
25-29	-0.342 (0.586)	0.71	-1.567* (0.0903)	0.21*	0.844 (0.161)	2.33
30-34	-0.586 (0.387)	0.56	-2.443** (0.0121)	0.09**	0.983 (0.116)	2.67
35-39	-0.750 (0.301)	0.47	-2.793*** (0.00780)	0.06***	1.065* (0.0965)	2.90*
40-44	-0.425 (0.589)	0.65	-2.850** (0.0144)	0.06**	1.132* (0.0883)	3.10*
45-49	0.283 (0.733)	1.33	-2.644* (0.0535)	0.07*	0.688 (0.374)	1.99
Caesarean Section	1.224*** (0.00584)	3.40***	-0.158 (0.880)	0.85	-0.530 (0.472)	0.59

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Table 12 Continued

	Doctor		TBA		None	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
Birth Order: 2	0.505	1.66	0.412	1.51	0.491	1.63
	(0.288)		(0.648)		(0.230)	
3	0.451	1.57	1.384	3.99	0.349	1.42
	(0.383)		(0.128)		(0.413)	
4+	0.687	1.99	2.426***	11.31***	-0.0275	0.97
	(0.198)		(0.00701)		(0.950)	
Constant	-3.457***	0.03***	-3.711***	0.02***	-2.656***	0.07***
	(0.000203)		(0.00320)		(0.000628)	
N	3516		3516		3516	
Log likelihood	-1243.42					
LR chi2	219.33					
Prob>Chi2	0.000					

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 13: Factors influencing the choice of birthcare assistant (coefficients and odds ratios after mlogit) for the entire sample

	Doctor		Nurse		TBA	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
Years of mother's education	0.880***	2.41***	0.565***	1.76***	0.333***	1.39***
	(1.51e-05)		(0)		(6.93e-07)	
Years of father's education	0.468***	1.60***	0.496***	1.64***	0.358***	1.43***
	(0.00824)		(0)		(1.82e-10)	
Wealth index	0.216	1.24	-0.120	0.89	0.0966	1.1
	(0.695)		(0.334)		(0.482)	
Wealth index square	0.00148	1	0.0601***	1.06***	-0.000575	1
	(0.986)		(0.00477)		(0.981)	
Log of household size	0.132	1.14	-0.157*	0.85*	0.0139	1.01
	(0.655)		(0.0565)		(0.880)	
Region: Central 2	-1.505**	0.22**	-0.234	0.79	-0.577***	0.56***
	(0.0199)		(0.126)		(0.000809)	
Kampala	0.930	2.53	-0.0264	0.97	-0.479	0.62
	(0.115)		(0.929)		(0.276)	
East Central	-0.786	0.46	0.220	1.25	-1.088***	0.34***
	(0.140)		(0.116)		(2.03e-10)	
Eastern	-1.732***	0.18***	-0.414***	0.66***	-0.910***	0.40***
	(0.00654)		(0.00408)		(1.61e-08)	

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Table 13 Continued

	Doctor		Nurse		TBA	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
North	-0.266 (0.639)	0.77	-0.0637 (0.666)	0.94	0.568*** (0.000193)	1.76***
West Nile	-1.550** (0.0202)	0.21**	-0.761*** (1.16e-06)	0.47***	-0.754*** (9.15e-06)	0.47***
Western	-0.194 (0.676)	0.82	-0.834*** (6.05e-08)	0.43***	-0.252 (0.101)	0.78
Southwest	-0.612 (0.189)	0.54	-1.273*** (0)	0.28***	-1.586*** (0)	0.20***
Location: Rural	-0.899** (0.0484)	0.41**	-0.820*** (3.86e-07)	0.44***	0.722*** (0.00255)	2.06***
Religion: Protestant	0.370 (0.171)	1.45	0.133* (0.0629)	1.14*	0.258*** (0.000864)	1.29***
Muslim	0.874** (0.0143)	2.40**	0.527*** (1.42e-06)	1.69***	0.258* (0.0571)	1.29*
Other	0.367 (0.407)	1.44	-0.0188 (0.886)	0.98	0.184 (0.192)	1.2
Age Cohort: 20-24	1.541 (0.153)	4.67	-0.158 (0.370)	0.85	-0.118 (0.544)	0.89
25-29	1.602 (0.145)	4.96	-0.0959 (0.614)	0.91	-0.433** (0.0405)	0.65**
30-34	1.760 (0.120)	5.81	-0.126 (0.535)	0.88	-0.453** (0.0435)	0.64**
35-39	1.797 (0.124)	6.03	-0.205 (0.334)	0.81	-0.610*** (0.00913)	0.54***
40-44	2.193* (0.0672)	8.96*	-0.377 (0.106)	0.69	-0.781*** (0.00206)	0.46***
45-49	3.345*** (0.00844)	28.37***	-0.0797 (0.785)	0.92	-0.489 (0.104)	0.61
Caesarean Section	5.141*** (0)	170.90***	1.802*** (1.22e-05)	6.06***	0.222 (0.702)	1.25
Birth order: 2	-0.393 (0.287)	0.68	-0.392*** (0.00147)	0.68***	-0.0430 (0.752)	0.96
3	-0.485 (0.231)	0.62	-0.486*** (0.000235)	0.61***	-0.0869 (0.551)	0.92
4+	-0.991** (0.0234)	0.37**	-0.651*** (1.55e-06)	0.52***	0.00230 (0.988)	1

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Table 13 Continued

	Doctor		Nurse		TBA	
	Coefficients	Odds ratios	Coefficients	Odds ratios	Coefficients	Odds ratios
Constant	-5.986*** (7.97e-05)	0.00***	0.643** (0.0491)	1.90**	-1.398*** (0.000390)	0.25***
Log likelihood	-6788.63					
LR chi2	2376.06					
Prob>Chi2	0.000					
N	6,994		6,994		6,994	6,994

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 14: Factors influencing the choice of birthcare assistant (coefficients and odds ratios after mlogit) for the urban sample

	Doctor		Nurse		TBA	
	Coefficients	Odds ratios	Coefficients	Odds ratios	Coefficients	Odds ratios
Years of mother's education	1.094*** (0.00804)	2.99***	0.972*** (0.000144)	2.64***	0.485 (0.214)	1.62
Years of father's education	0.311 (0.356)	1.37	0.156 (0.451)	1.17	-0.252 (0.429)	0.78
Wealth index	-1.227 (0.530)	0.29	0.0528 (0.946)	1.05	1.113 (0.445)	3.04
Wealth index square	0.173 (0.529)	1.19	0.0241 (0.828)	1.02	-0.130 (0.524)	0.88
Log of household size	0.267 (0.622)	1.31	0.00491 (0.987)	1	0.715 (0.135)	2.04
Region: Central 2	-13.33 (0.993)	0	0.705 (0.431)	2.02	0.951 (0.435)	2.59
Kampala	2.542* (0.0768)	12.71*	0.756 (0.339)	2.13	0.192 (0.860)	1.21
East Central	-13.68 (0.987)	0	-0.0583 (0.952)	0.94	-0.593 (0.705)	0.55
Eastern	-0.497 (0.794)	0.61	-0.724 (0.419)	0.48	-1.500 (0.314)	0.22
North	0.743 (0.674)	2.1	0.538 (0.537)	1.71	0.598 (0.623)	1.82
West Nile	0.830 (0.659)	2.29	0.945 (0.291)	2.57	1.032 (0.391)	2.81
Western	1.674 (0.347)	5.34	0.521 (0.594)	1.68	0.686 (0.625)	1.99

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Table 14 Continued

	Doctor		Nurse		TBA	
	Coefficients	**Odds ratios**	**Coefficients**	**Odds ratios**	**Coefficients**	**Odds ratios**
Southwest	1.319	3.74	-0.818	0.44	-16.77	0
	(0.419)		(0.348)		(0.993)	
Religion: Protestant	0.441	1.55	0.662**	1.94**	0.238	1.27
	(0.417)		(0.0397)		(0.661)	
Muslim	0.184	1.2	0.909**	2.48**	0.759	2.14
	(0.792)		(0.0178)		(0.186)	
Other	1.147	3.15	1.462**	4.32**	1.224	3.4
	(0.173)		(0.0126)		(0.140)	
Age Cohort: 20-24	0.788	2.2	0.507	1.66	-0.559	0.57
	(0.566)		(0.440)		(0.518)	
25-29	1.566	4.79	0.669	1.95	-0.741	0.48
	(0.286)		(0.381)		(0.470)	
30-34	1.212	3.36	0.440	1.55	-1.171	0.31
	(0.432)		(0.583)		(0.310)	
35-39	1.697	5.46	0.823	2.28	-1.925	0.15
	(0.306)		(0.345)		(0.206)	
40-44	-12.35	0	2.516*	12.38*	0.815	2.26
	(0.995)		(0.0586)		(0.657)	
45-49	-17.09	0	-1.387	0.25	-19.83	0
	(0.999)		(0.357)		(0.999)	
Caesarean Section	22.55	6.22E+09	19.17	2.12E+08	-0.286	0.75
	(0.997)		(0.998)		(1.000)	
Birth Order: 2	0.333	1.39	0.120	1.13	0.997	2.71
	(0.658)		(0.829)		(0.176)	
3	-1.259	0.28	-1.104*	0.33*	-0.467	0.63
	(0.140)		(0.0573)		(0.577)	
4+	-0.999	0.37	-0.725	0.48	-0.890	0.41
	(0.260)		(0.224)		(0.326)	
Constant	-4.300	0.01	-1.371	0.25	-3.881	0.02
	(0.269)		(0.406)		(0.178)	
Log likelihood	-435.80					
LR chi2	279.24					
Prob>Chi2	0.000					
Observations	679		679		679	679

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 15: Factors influencing the choice of birthcare assistant (coefficients and odds ratios after mlogit) for the rural sample

	Doctor		Nurse		TBA	
	Coefficients	Odds ratios	Coefficients	Odds ratios	Coefficients	Odds ratios
Years of mother's education	0.941*** (0.000280)	2.56***	0.537*** (0)	1.71***	0.338*** (8.20e-07)	1.40***
Years of father's education	0.421* (0.0726)	1.52*	0.524*** (0)	1.69***	0.387*** (0)	1.47***
Wealth index	0.363 (0.561)	1.44	-0.116 (0.372)	0.89	0.112 (0.429)	1.12
Wealth index square	-0.0198 (0.842)	0.98	0.0593*** (0.00823)	1.06***	-0.00485 (0.846)	1
Log of household size	0.222 (0.582)	1.25	-0.171** (0.0495)	0.84**	-0.0219 (0.816)	0.98
Region: Central 2	-1.497** (0.0238)	0.22**	-0.241 (0.121)	0.79	-0.610*** (0.000492)	0.54***
East Central	-0.781 (0.149)	0.46	0.233* (0.0987)	1.26*	-1.090*** (2.57e-10)	0.34***
Eastern	-1.983*** (0.00581)	0.14***	-0.402*** (0.00598)	0.67***	-0.912*** (2.03e-08)	0.40***
North	-0.191 (0.767)	0.83	-0.103 (0.494)	0.9	0.557*** (0.000293)	1.75***
West Nile	-1.495** (0.0458)	0.22**	-0.852*** (1.40e-07)	0.43***	-0.856*** (8.04e-07)	0.42***
Western	-0.134 (0.788)	0.87	-0.880*** (2.21e-08)	0.41***	-0.270* (0.0818)	0.76*
Southwest	-0.721 (0.156)	0.49	-1.297*** (0)	0.27***	-1.588*** (0)	0.20***
Religion: Protestant	0.528 (0.128)	1.7	0.0891 (0.229)	1.09	0.255*** (0.00114)	1.29***
Muslim	1.488*** (0.000787)	4.43***	0.458*** (7.01e-05)	1.58***	0.183 (0.195)	1.2
Other	0.715 (0.231)	2.04	-0.141 (0.311)	0.87	0.137 (0.339)	1.15
Age Cohort: 20-24	14.56 (0.986)	2.10E+06	-0.233 (0.201)	0.79	-0.0912 (0.652)	0.91
25-29	14.23 (0.986)	1.51E+06	-0.169 (0.389)	0.84	-0.399* (0.0675)	0.67*
30-34	14.41 (0.986)	1.81E+06	-0.169 (0.422)	0.84	-0.396* (0.0872)	0.67*

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Table 15 Continued

	Doctor		Nurse		TBA	
	Coefficients	Odds ratios	Coefficients	Odds ratios	Coefficients	Odds ratios
35-39	14.33	1.67E+06	-0.285	0.75	-0.565**	0.57**
	(0.986)		(0.197)		(0.0189)	
40-44	15.14	3.77E+06	-0.506**	0.60**	-0.749***	0.47***
	(0.985)		(0.0371)		(0.00399)	
45-49	16.14	1.02E+07	-0.0769	0.93	-0.418	0.66
	(0.984)		(0.797)		(0.173)	
Caesarean Section	5.200***	181.22***	1.660***	5.26***	0.210	1.23
	(0)		(0.000101)		(0.719)	
Birth Order: 2	-0.530	0.59	-0.417***	0.66***	-0.0871	0.92
	(0.297)		(0.00106)		(0.532)	
3	-0.247	0.78	-0.478***	0.62***	-0.0831	0.92
	(0.631)		(0.000464)		(0.576)	
4+	-0.774	0.46	-0.689***	0.50***	0.0111	1.01
	(0.189)		(8.66e-07)		(0.942)	
Constant	-20.37	0	-0.0226	0.98	-0.662**	0.52**
	(0.980)		(0.938)		(0.0351)	
Log likelihood	-6295.16					
LR chi2	1646.66					
Prob>Chi2	0.000					
Observations	6,315		6,315		6,315	6,315

pval in parentheses;*** p<0.01, ** p<0.05, * p<0.1

Table 16: Factors influencing antenatal care visits (community fixed effects; region is the group variable) for the entire sample

	(1)	(2)	(3)	(4)
Years of mother's education	0.0334**	0.0301**	-0.0120	0.0294**
	(0.0167)	(0.0306)	(0.692)	(0.0356)
Years of father's education	0.0811***	0.0801***	0.0795***	0.0674***
	(0)	(0)	(0)	(0.00670)
Years of mother's education* wealth index			0.0133	
			(0.118)	
Wealth index	0.0154**	-0.112***	-0.107***	-0.112***
	(0.0459)	(0.000167)	(0.000299)	(0.000159)
Wealth index square		0.0221***	0.0193***	0.0212***
		(9.27e-06)	(0.000269)	(4.70e-05)
Log of household size	-0.0137	-0.0149	-0.0136	-0.0146
	(0.464)	(0.426)	(0.468)	(0.434)

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Table 16 Continued

	(1)	(2)	(3)	(4)
Location: Rural	0.00512	0.0271	0.0285	0.0278
	(0.879)	(0.426)	(0.403)	(0.415)
Religion: Protestant	-0.00365	0.00226	0.00396	0.00286
	(0.832)	(0.896)	(0.819)	(0.868)
Muslim	0.0414	0.0464*	0.0478*	0.0467*
	(0.105)	(0.0693)	(0.0611)	(0.0671)
Other	-0.0568*	-0.0506*	-0.0492	-0.0503*
	(0.0603)	(0.0936)	(0.103)	(0.0956)
Age Cohort: 20-24	0.0625*	0.0640*	0.0602*	0.0632*
	(0.0803)	(0.0725)	(0.0916)	(0.0762)
25-29	0.0864**	0.0834**	0.0743*	0.0815**
	(0.0323)	(0.0386)	(0.0678)	(0.0436)
30-34	0.139***	0.135***	0.126***	0.133***
	(0.00138)	(0.00187)	(0.00409)	(0.00222)
35-39	0.134***	0.128***	0.118**	0.126***
	(0.00350)	(0.00496)	(0.0105)	(0.00587)
40-44	0.200***	0.197***	0.186***	0.194***
	(5.59e-05)	(7.42e-05)	(0.000212)	(9.86e-05)
45-49	0.221***	0.218***	0.205***	0.215***
	(0.000297)	(0.000339)	(0.000846)	(0.000435)
Caesarean Section	0.162***	0.156***	0.155***	0.156***
	(0.000113)	(0.000186)	(0.000219)	(0.000186)
Birth Order: 2	-0.0255	-0.0266	-0.0261	-0.0269
	(0.399)	(0.378)	(0.389)	(0.374)
3	-0.100***	-0.0992***	-0.0966***	-0.0988***
	(0.00246)	(0.00261)	(0.00339)	(0.00271)
4+	-0.0912***	-0.0862**	-0.0814**	-0.0855**
	(0.00707)	(0.0108)	(0.0164)	(0.0115)
Years of father's education* Wealth index				0.00430
				(0.562)
Constant	1.048***	1.168***	1.184***	1.178***
	(0)	(0)	(0)	(0)
Observations	4,210	4,210	4,210	4,210
R-squared	0.039	0.044	0.044	0.044
Number of region	9	9	9	9

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 17: Factors influencing antenatal care visits (simple OLS) for the entire sample

	(1)	(2)	(3)	(4)
Years of mother's education	0.0334**	0.0301**	-0.0120	0.0294**
	(0.0167)	(0.0306)	(0.692)	(0.0356)
Years of father's education	0.0811***	0.0801***	0.0795***	0.0674***
	(0)	(0)	(0)	(0.00670)
Years of mother's education* wealth index			0.0133	
			(0.118)	
Wealth index	0.0154**	-0.112***	-0.107***	-0.112***
	(0.0459)	(0.000167)	(0.000299)	(0.000159)
Wealth index square		0.0221***	0.0193***	0.0212***
		(9.27e-06)	(0.000269)	(4.70e-05)
Log of household size	-0.0137	-0.0149	-0.0136	-0.0146
	(0.464)	(0.426)	(0.468)	(0.434)
Region: Central 2	-0.130***	-0.127***	-0.126***	-0.127***
	(0.000418)	(0.000509)	(0.000583)	(0.000524)
Kampala	-0.140***	-0.165***	-0.168***	-0.166***
	(0.00468)	(0.000925)	(0.000762)	(0.000877)
East Central	-0.240***	-0.233***	-0.230***	-0.233***
	(0)	(0)	(0)	(0)
Eastern	-0.211***	-0.202***	-0.200***	-0.202***
	(1.62e-09)	(7.41e-09)	(1.07e-08)	(7.23e-09)
North	-0.122***	-0.133***	-0.134***	-0.134***
	(0.000403)	(0.000105)	(0.000100)	(9.66e-05)
West Nile	-0.0553	-0.0449	-0.0419	-0.0446
	(0.132)	(0.221)	(0.254)	(0.224)
Western	-0.182***	-0.166***	-0.165***	-0.166***
	(2.01e-07)	(2.25e-06)	(2.40e-06)	(2.11e-06)
Southwest	-0.194***	-0.175***	-0.174***	-0.176***
	(2.82e-08)	(5.63e-07)	(6.82e-07)	(5.18e-07)
Location: Rural	0.00512	0.0271	0.0285	0.0278
	(0.879)	(0.426)	(0.403)	(0.415)
Religion: Protestant	-0.00365	0.00226	0.00396	0.00286
	(0.832)	(0.896)	(0.819)	(0.868)
Muslim	0.0414	0.0464*	0.0478*	0.0467*
	(0.105)	(0.0693)	(0.0611)	(0.0671)
Other	-0.0568*	-0.0506*	-0.0492	-0.0503*
	(0.0603)	(0.0936)	(0.103)	(0.0956)
Age Cohort: 20-24	0.0625*	0.0640*	0.0602*	0.0632*
	(0.0803)	(0.0725)	(0.0916)	(0.0762)

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Table 17 Continued

	(1)	(2)	(3)	(4)
25-29	0.0864**	0.0834**	0.0743*	0.0815**
	(0.0323)	(0.0386)	(0.0678)	(0.0436)
30-34	0.139***	0.135***	0.126***	0.133***
	(0.00138)	(0.00187)	(0.00409)	(0.00222)
35-39	0.134***	0.128***	0.118**	0.126***
	(0.00350)	(0.00496)	(0.0105)	(0.00587)
40-44	0.200***	0.197***	0.186***	0.194***
	(5.59e-05)	(7.42e-05)	(0.000212)	(9.86e-05)
45-49	0.221***	0.218***	0.205***	0.215***
	(0.000297)	(0.000339)	(0.000846)	(0.000435)
Caesarean Section	0.162***	0.156***	0.155***	0.156***
	(0.000113)	(0.000186)	(0.000219)	(0.000186)
Birth Order: 2	-0.0255	-0.0266	-0.0261	-0.0269
	(0.399)	(0.378)	(0.389)	(0.374)
3	-0.100***	-0.0992***	-0.0966***	-0.0988***
	(0.00246)	(0.00261)	(0.00339)	(0.00271)
4+	-0.0912***	-0.0862**	-0.0814**	-0.0855**
	(0.00707)	(0.0108)	(0.0164)	(0.0115)
Years of father's education* wealth index				0.00430
				(0.562)
Constant	1.193***	1.311***	1.326***	1.321***
	(0)	(0)	(0)	(0)
Observations	4,210	4,210	4,210	4,210
R-squared	0.065	0.070	0.070	0.070

pval in parentheses;*** p<0.01, ** p<0.05, * p<0.1

Table 18: Factors influencing antenatal care visits (simple OLS) for the rural and urban subsamples

	Urban	Rural	Urban	Rural
Years of mother's education	0.0634*	0.0214	0.0615	-0.0153
	(0.0848)	(0.160)	(0.757)	(0.651)
Years of father's education	0.0547	0.0825***	-0.263*	0.0930***
	(0.109)	(1.14e-10)	(0.0934)	(0.000829)
Years of mother's education* wealth index			-0.00171	0.0130
			(0.968)	(0.224)
Years of partner's education* wealth index			0.0704**	-0.00402
			(0.0386)	(0.661)
Wealth index	-0.239	-0.0994***	-0.276	-0.0960***
	(0.158)	(0.00140)	(0.104)	(0.00214)
Wealth index square	0.0466**	0.0197***	0.0384	0.0178***
	(0.0496)	(0.000199)	(0.114)	(0.00196)
Log of household size	0.0115	-0.0188	0.00874	-0.0178
	(0.818)	(0.354)	(0.861)	(0.383)
Region: Central 2	-0.0380	-0.127***	-0.0237	-0.127***
	(0.785)	(0.000832)	(0.865)	(0.000860)
Kampala	-0.112		-0.101	
	(0.323)		(0.373)	
East Central	-0.00498	-0.243***	0.00668	-0.240***
	(0.975)	(0)	(0.967)	(0)
Eastern	0.0488	-0.215***	0.0436	-0.214***
	(0.747)	(2.45e-09)	(0.773)	(3.11e-09)
North	0.0522	-0.140***	0.0699	-0.140***
	(0.717)	(8.43e-05)	(0.629)	(8.58e-05)
West Nile	0.0645	-0.0459	0.0682	-0.0441
	(0.644)	(0.232)	(0.625)	(0.251)
Western	-0.132	-0.170***	-0.124	-0.169***
	(0.375)	(2.94e-06)	(0.405)	(3.40e-06)
Southwest	-0.121	-0.178***	-0.108	-0.177***
	(0.402)	(8.28e-07)	(0.450)	(1.12e-06)
Religion: Protestant	-0.0584	0.0112	-0.0601	0.0120
	(0.301)	(0.539)	(0.287)	(0.508)
Muslim	0.0254	0.0560*	0.0225	0.0568**
	(0.674)	(0.0513)	(0.709)	(0.0480)
Other	-0.00166	-0.0647*	-0.00575	-0.0636*
	(0.983)	(0.0502)	(0.940)	(0.0544)
Age Cohort: 20-24	0.146	0.0509	0.133	0.0485
	(0.133)	(0.188)	(0.168)	(0.210)

continued next page

Table 18 Continued

	Urban	Rural	Urban	Rural
25-29	0.190*	0.0625	0.176	0.0571
	(0.0868)	(0.154)	(0.113)	(0.196)
30-34	0.325***	0.100**	0.301**	0.0946**
	(0.00753)	(0.0324)	(0.0136)	(0.0452)
35-39	0.365***	0.0895*	0.349***	0.0835*
	(0.00540)	(0.0695)	(0.00784)	(0.0929)
40-44	0.445***	0.159***	0.407**	0.153***
	(0.00564)	(0.00276)	(0.0118)	(0.00426)
45-49	0.490	0.186***	0.472	0.178***
	(0.178)	(0.00354)	(0.193)	(0.00545)
Caesarean Section	0.0833	0.172***	0.0945	0.171***
	(0.274)	(0.000674)	(0.215)	(0.000753)
Birth Order: 2	0.0655	-0.0492	0.0667	-0.0492
	(0.366)	(0.142)	(0.356)	(0.143)
3	-0.110	-0.0998***	-0.113	-0.0991***
	(0.209)	(0.00573)	(0.198)	(0.00608)
4+	-0.140	-0.0771**	-0.138	-0.0745**
	(0.109)	(0.0378)	(0.112)	(0.0451)
Constant	1.135***	1.363***	1.486***	1.369***
	(0.000558)	(0)	(6.74e-05)	(0)
Observations	500	3,710	500	3,710
R-squared	0.126	0.062	0.134	0.062

pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1

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