THE IMPACT OF MOTHERS' EDUCATION ON MATERNAL HEALTH SEEKING PRACTICES IN UGANDA: EVIDENCE FROM THE DEMOGRAPHIC AND HEALTH SURVEYS

By

KIM, Se In

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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MASTER OF PUBLIC POLICY

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Approval as of December, 2017

ABSTRACT

IMPACT OF MOTHERS' EDUCATION ON MATERNAL HEALTH SEEKING PRACTICES IN UGANDA: EVIDENCE FROM THE DEMOGRAPHIC AND HEALTH SURVEYS

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In 1997, Uganda introduced the Universal Primary Education policy, making primary schooling free and expanding people's access to education. The primary purpose of this study is to examine how the education affects mothers' health seeking behaviors by taking a close look at the utilization of health services by women throughout their pregnancy. To investigate this question, the author utilizes Demographic and Health Surveys of Uganda in 2000/2001, 2006 and 2011, and adopts the method of instrumental variables (IV) by exploiting mothers' age of 1997 as an instrument. The study finds that primary education increases the probability of women seeking health services by 5.5%, use of contraceptive methods by 38.2%, and delivery in hospital by 90.6%. It was found that a year rise in schooling generates statistically significant impact on above the three factors as well. However, there is little evidence other health seeking practices such as the utilization of antenatal care services, are mainly impacted by the level of primary education. Such result implies that though there is a positive but somewhat limited correlation between schooling and health seeking behavior in Uganda's context.

Keywords: Universal Primary Education; years of schooling; antenatal care; postnatal care; delivery care; institutional delivery; natural experiment; instrumental variable; Uganda

ACKNOWLEDGEMENT

To my family and my Father who always believe in me, and be with me.

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ACRONYMES

MMR	Maternal Mortality Ratio
WHO	World Health Organization
DHS	Demographic and Health Survey
USAID	United States Agency for International Development
SDGs	Sustainable Development Goals
IV	Instrumental Variable
RDD	Regression Discontinuity Design
UPE	Universal Primary Education
PTA	(Uganda) Parents and Teachers Association
MoES	(Uganda) Ministry of Education and Sports
HIV	Human Immunodeficiency Virus
STI	Sexually Transmitted Infections
OLS	Ordinary Least Squares
WDI	World Development Indicators
ANC	Antenatal Care

1. Introduction

1.1. Objectives of Study

The purpose of this study is to investigate the impact of maternal schooling (whether women attend at least primary schooling and schooling years) on maternal health seeking behaviors, a factor affecting maternal mortality ratio[1] (MMR) in Uganda. This study uses three categories of proxies to measure maternal healthcare utilization as follows; antenatal care (ANC) service utilization during pregnancy; the place of delivery and the presence of skilled birth attendants during labor; and utilization of medical services after the delivery. Additionally, the study attempted to identify logical links between maternal schooling and the accessibility of health services and analyze other fertility issues.

1.2. Problem Statement

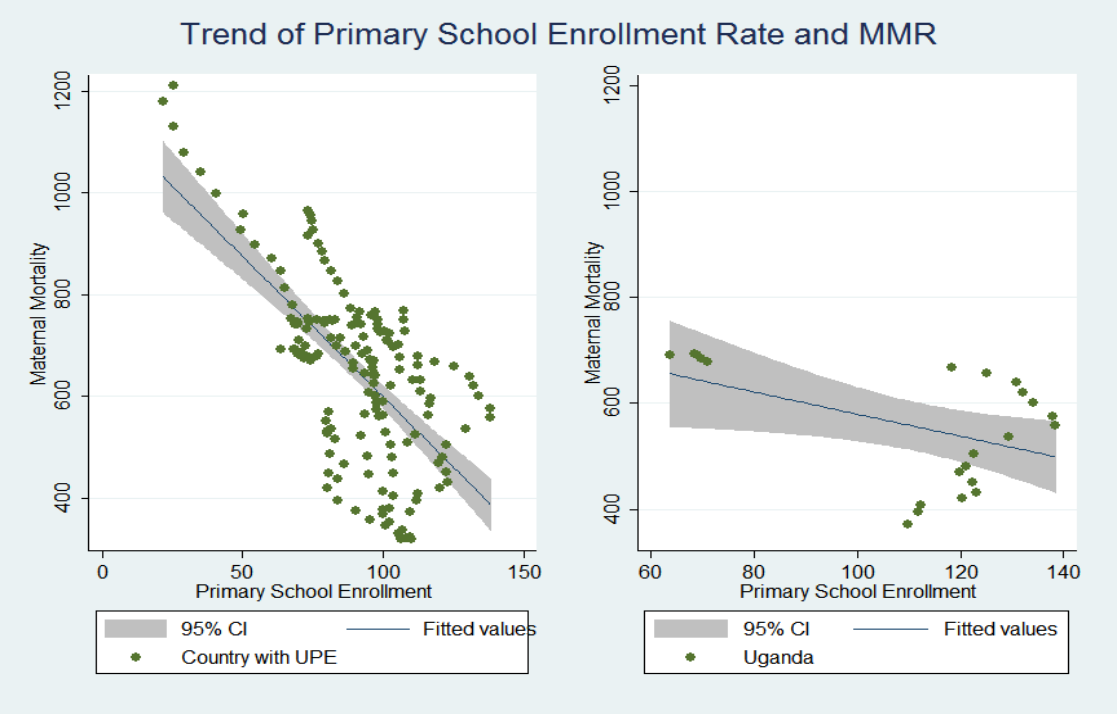
Empirical studies conducted by international organizations (UNESCO, 2014a) found that educated women are less likely to die during child birth due to labor and delivery complications (See [Figure 1]). In Uganda, gross primary school enrollment rate[2] has skyrocketed from 63.69% in 1992 to 138% in 2003, and has been maintained at around 109.89% since 2013(World Bank Database accessed on 10th June). Meanwhile, Uganda's maternal mortality represents 18 percent of all deaths of women aged between 15 and49. Its MMR was 343 deaths per 100,000 live births in 2015. Such figure is far higher than the global average of 231 deaths per 100,000 live births (WHO, 2016). During 1992-2013, the

[1] Numbers of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100, 000 live births

[2] Numbers of children enrolled in a level (primary), regardless of age, divided by the population of the age group that officially corresponds to the same level

MMR declined from 692 deaths per 100,000 live births to 372 deaths per 100,000, which is about 4%p annual decrease on average. Compared with other countries that achieved universal primary education, the elasticity of MMR vis-a-vis primary enrollment rate is rather small. As [Figure 1] shows, the relationship between primary school enrollment rate and MMR seems to be negative in Uganda. Nevertheless, the trend is rather gradual over time, compared with other universal primary schooling achievers.

[Figure 1] Primary School Enrollment Rate and MMR



Therefore, it is crucial to investigate a specific mechanism establishing a causal link between educational backgrounds of mothers and their health seeking behaviors and the degree to which education has contributed to a decrease in MMR in Uganda so far. In addition, analyzing key determinants of mothers' demands for health services is crucial to achieve public health goals. Strengthening health outcomes and realizing healthier lives for

people are keys to build up human capital essential to realize a competitive economy and raise people's income level.

However, it is hard to establish causality between education and maternal health seeking practices because multiple variables and factors play out in mothers' demands for healthcare. For example, Musoke (2002) argues that communication system provides channels for health consultation, and it contributes to lower maternal death in rural Uganda. Other scholars highlight socio-economic factors such as the distance to health facilities, household wealth, and reproductive autonomy motivate mothers to seek healthy life (Shen & Williamson, 1999; Ahmad et al., 2010). Only recently, scholars started to examine the causality of education on maternal and child health. For instance, Weitzman (2017) showed the causal impact of mothers' schooling on the rise of maternal healthcare utilization and changes in fertility practices in Peru, and Makate (2016) and Grépin & Bharadwaj (2015) showed the impact of free primary school on the rise in the survival of children aged under one and children under five in Uganda and Zimbabwe.

Given that aggregated panel data analysis is inadequate to provide country-specific policy interventions, it is worth conducting a thorough analysis into the relationship between education and health of mothers in the context of Uganda. From the methodological viewpoint, analysis using household level data would provide more robust results when it comes to individual decisions and behaviors pertaining to health services. Identifying whether increasing women's education actually alters individual health seeking preferences and improves their health outcomes is an imperative step to clarify determinants of maternal health, particularly in developing countries.

Aligned with recent studies, this research categorizes women into two groups, a treatment

group of women aged 5-12 and a control group of those aged 15-23 as of 1997. The author included age 5 because of the early entrance into the school in Uganda. On the other hand age 13 and 14 were not taken into consideration since some of them might be partially benefited from the new policy on education because of high failure rate and repetition of school years (Makate, 2016). The treatment group received free primary education in accordance with the Uganda education policy in 1997 while the comparison group was not benefitted from the policy. By instrumenting women's age in 1997, the author estimated the impact of education using IV approach for the two groups. The analysis made use of the cross-sectional household survey data from Uganda Demographic and Health Survey (DHS) conducted in 2000/01, 2006, and 2011. The survey data can be found in USAID DHS Program website and it can be obtained upon a request from users (www.dhsprogram.com). The data collects health information for women aged between 15-49 and their children.

1.3. The Significance of the Study

Despite global efforts to address maternal health issues, which tend to be more severe in developing countries, the international community failed to reach its target of reducing MMR 75% by 2015. The Sustainable Development Goals (SDGs) now brought a spotlight to maternal health issues once again by setting Goal 3 as "Good Health and Well-being". Therefore, considering the importance of achieving health at both individual and country levels, it would be appropriate to evaluate determinants affecting maternal health and the extent to which these factors contribute to healthy lives of mothers.

The other significance of this study is related to its methodological aspect. Previous literature contends that educational attainment has a positive correlation with the utilization of maternal health services. While there is a general consensus that education has a positive

impact on health seeking practices, some study also point out that its effect is overly estimated because there may be unobserved, omitted variables which lead to "failure to control for the backgrounds" (Somanathan, 2008, p.2). Because of the complex mechanism regarding maternal health, previous studies have not made a complete conclusion on the causal relation between education and maternal health. Thus, this study attempts to reduce estimation bias by applying an IV method. The approach would enable more accurate measurement of the impact of primary education on maternal health in Uganda.

1.4. Research Question

Thus, this study revolves around the following questions:

1) *Is there any statistically significant causality between free primary education policy and maternal demands for healthcare, which may contribute to lower MMR*?

2) *In specific, which health services pertaining to delivery would be influenced after adoption of universal education policy?*

1.5. Hypothesis and Assumptions

This study attempts to measure the impact of universal primary education on mothers' demands for health inputs and, more specifically, maternal health seeking behaviors throughout childbearing. Therefore, the author posed the following hypothesis for a test: *UPE policy has a positive impact on maternal utilization of health services during pregnancy.* In other words, demands for antenatal and postnatal care services and delivery at health facilities under the guidance of health professionals would increase for the educated mothers.

Meanwhile, the study is conducted on the assumption that there is little difference

between the treatment and control group in terms of the backgrounds of mothers in 1997. Even if the study present t-test result, it does not show the clear picture of baseline characteristics of two groups because study conducted retrospective analysis using 2000, 2006, and 2011 survey data.

1.6. Organization of the Study

The remainder of the paper is constructed as follows. Section 2 narrates the review of previous literature; Section 3 provides the background of UPE in Uganda; Section 4 will address model specification, methodology, sampled data and description on dependent and independent variables; Section 5 presents descriptive statistics and our empirical results; Section 6 discusses on the interpretation of the results, conclusions and policy implications.

2. Literature Review

2.1. Theoretical Review

UNESCO's empirical evidence from 108 countries over twenty years (2014a) has shown that if every mother receives primary education, it would reduce maternal death by 66%. The impact of education is particularly greater in sub-Saharan Africa, where education is attributable to a reduction of maternal mortality from 500 to 150 deaths per 100,000 child births (Sperling et al., 2016). Previous literature has how female schooling changed maternal health seeking behaviors and increased the probability of maternal survival. Mainly, there are three mechanisms relating to education and maternal health and this study examines how each pathway drives changes in mothers' health seeking behaviors. Since mothers' formal schooling is associated with their cognitive skills, socio-economic status, and autonomy within household, it is also thought to be closely related to their health seeking behaviors.

2.1.1. Education and Cognitive Skills

First, education can make people literate and improves their reasoning, comprehension, cognitive and communication skills (LeVine, 2012). Smith Greenaway (2013) argues literacy as a "social vaccine" for mothers to pursue healthier lives and become more risk-averse in their health issues. Educated women can better comprehend the meaning of health messages written in posters used in public health campaigns; have a greater understanding on health information and written instruction by health providers (Smith Greenaway, 2013). Elo (1992) also supports that increasing cognitive skills through education may alter mothers' traditional belief on why diseases are caused and how to cure them. As people become less fatalistic about their health with increased perceptions of diseases, they

are more likely to adopt new therapy in their health care (Caldwell, 1979). Therefore, educated mothers tend to have better knowledge of modern health facilities and demand better health services (Schultz, 1984; Caldwell & Caldwell, 1988).

In addition, enhanced communication skills can help mothers take advantage of services by interacting actively with health providers (Elo, 1992). As a result, they extract the quality of care as much as they can and adhere to the medical advices (Somanathan, 2008), which lead to a more efficient utilization of modern health inputs Moreover, educated mothers actively seek external solutions to their health issues, and avoid isolating themselves and family members from external help to deal with health issues, especially in emergencies (Musoke, 2002). This is because education alters woman's "predisposing characteristics switching the preferences for healthcare, independently of prices, income, and information" (Somanathan, 2008, p.5).

2.1.2 Education and Socioeconomic Factors

Another channel is related to socioeconomic factors, which may involve, inter alia, improving women's economic resources (Weitzman, 2017; Psacharopoulos and Patrinos, 2004; Ahmed et al., 2010). Women with formal schooling participate more in the labor market and have higher possibility to find jobs in order to earn enough salary (Ahmed et al., 2010) to cover costs for utilizing medical services, including transportation costs. On the other hand, educated women have higher preference to date with wealthier men and choose the spouse selectively in consideration of such factors as income, which raises potential wealth of household (Schultz, 1984). Also, since maternal schooling itself reflects the higher household income and standards of living, it is more likely that those women can afford and utilize a wider range of health services (Weitzman, 2017).

Moreover, educated women with greater economic potentials tend to postpone early child birth as teenagers and control the number of babies they have (Bhalotra & Clarke, 2013). Previous studies found child marriage hinders girls from continuing schooling and causes high risk of complications during early pregnancy (Sperling et al., 2016). Opportunity costs of childbearing relative to getting a job are too costly for educated women who can continue to participate in economic activities (Weitzman, 2017). Aligned with better economic status, education also empowers women in the political and social spheres. Literacy and analytical skills that women develop through education help women better express their opinion and exercise their rights in society (Sperling et al., 2016), which may be closely linked to empower women to exercise their autonomy for better health seeking behaviors.

2.1.3. Education and Women's Autonomy

As for the other mechanism, education would give women more leverage within the household. By altering the traditional balance of the power dynamics within family, it makes a household decision-making process and household resource allocation more favorable to women (Reddy & Caldwell, 1983). When women earn more through education, a higher proportion of family earnings will depend on women's employment. Women's greater contribution to household economy creates a family atmosphere in which family members become more comfortable in granting mothers and daughters more decision-making power (Weitzman, 2017), including more health spending for women (Ahmed et al., 2010). Since more women have better access to medical services with stronger economic power within household, it would improve women's health status (Weitzman, 2017). Data from 148 countries analyzed by McAlister et al. (2006) also supports gender inequality in education as a significant indicator to predict MMR.

Meanwhile, since women's autonomy strengthens their negotiation power at home, they can adopt healthier behaviors and practices, which may lead to more effective family planning and use of contraceptives while reducing the possible risk of short birth spacing, abortion because of unwanted pregnancy, and birth-related complications (Sperling et al., 2016). Klugman et al. (2014) analyzed the cases of Cameroon, Cote d'Ivoire, and Mozambique using data accumulated over a period of 12 years, and found that 61%-80% of uneducated women lack power to refuse sexual transaction, and insist on using contraceptive methods while educated women have greater freedom in expressing their preferences. This implies that education can be a powerful tool for women to "overcome unequal and oppressive social limits and expectations" so that women can have the freedom to make choices for their lives (Klugman et al., 2014)

In sum, women's schooling has positive impact on improving cognitive skills, economic status, and autonomy, which would lead to higher demands for health services, minimizing potential risks that women may encounter before and after pregnancy.

2.2. Empirical Review

Just as the aforementioned theory, empirical studies generally find the positive impact of schooling on maternal demands for health services. However, many studies mainly cover educational influences on childcare and child mortality, rather than maternal health itself. Following few studies dealt with the direct effects of education on the demands for mothers' health inputs to improve their health outcomes.

Caldwell (1979) successfully brought light to formal education as one of the most

significant factors for improving maternal and child health. The research analyzed CAFN1[3] survey data of 6,606 women (aged 15-59) in the city of Ibadan, Nigeria, and compare two mother groups: one group consisting of women without any education while the other completed at least primary or secondary education. Even though Caldwell inductively infers and simply compares groups regarding the child mortality ratio, use of modern medical service, and contraceptive methods, this profound research drew attention to the importance of education on maternal and child well-being.

Following Caldwell's approach, Elo (1992), Govindasamy & Ramesh (1997), and Bhalotra & Clarke (2013) adopted revised and more sophisticated model to control the external factors. Elo (1992) investigated Peru DHS of 1986 to examine the influence of schooling on maternal health service utilization, using fixed-effect and logistic model. Findings consistently suggest that while controlling other socioeconomic factors, the odds of women receiving delivery assistance with higher (more than 6 years) education is 1.30 ($p<0.01$), and the odds of taking up prenatal care reaches 1.17 ($p<0.01$) compared to mothers without education. Using the same methodology, Govindasmany & Ramesh (1997) also concluded that mothers with middle school-level education are 7.82 times ($p<0.01$) more likely to receive ANC, 7.81 times more likely to give birth at health facilities, and 6.79 times ($p<0.01$) more likely to receive the assistance than illiterate women in India. Besides, if 1% of population receives primary education, MMR declines by 196 per 100,000 births ($p<0.01$) and when there is 1% increase in primary enrollment rate, MMR declines by 11 per 100,000 live births in 108 developing countries (Bhalotra & Clarke, 2013).

[3] Changing African Family Project Nigerian Segment Survey conducted from May to June of 1973

However, the methodology above cannot effectively address endogeneity issues. This motivated Breierova & Duflo (2004), and Somanathan (2008) to adopt the IV model to provide a better projection in analyzing the impact of education on maternal healthcare demands. Using the instrument as interaction term of age in 1974 and total number of schools in each region, the result shows that the age at which women give first birth increases by 0.7 year ($p<0.05$).The number of years at school has had no impact on fertility and institutional delivery. Nonetheless it has causal relationship with the rises in the probability of utilizing ANC as well as the probability of assistance by skilled birth attendants, which rose by 20.25%p ($p<0.05$) and 30.6%p, respectively.

Likewise, Koch et al. (2012) and Weitzman (2017) respectively regarded aggressive policy changes in education sector as a natural experiment[4]. The three waves of education, maternal health policy (1965), and repeal of abortion law (1989) in Chile demonstrated how the change of policy affects maternal mortality throughout 1957 to 2007 (Koch et al., 2012). Weitzman developed instrumented regression discontinuity design (RDD) and found that Peruvian governments' extension of compulsory education from six-years to eleven-years in 1993 was the major driving force behind a significant increase in maternal healthcare demands. One year increase in schooling resulted in the decrease in short birth spacing by 4 percentage ($p<0.1$), reduction in childbearing complications, and an increase in the utilization of ANC services by 1%p ($p<0.05$) and delivery in health centers by 4%p ($p<0.01$).

Duflo et al. (2015) conducted experimental program in Kenya, which included

[4] Makate (2016) and Grépin & Bharadwaj (2015) take the same instrumented IV methodology to measure maternal education on child mortality.

school subsidy program (uniform) and HIV education, and observed the program's impact on fertility and HIV infection. After seven years of implementation, school subsidy has lowered teenage pregnancy by 2%p ($p<0.1$), whereas HIV education alone has had no effect on reducing the rate of Sexually Transmitted Infections (STIs). When combining the effects of the two programs, only 2.3%p decrease in STI rate ($p<0.1$) was observed. For other related literature, the author summarized major empirical studies in the [Table 1]. Underlined studies are more directly related to the objective of this study, using the dependent variable for utilization of health services throughout the process of childbearing.

2.3. Implications of the Review

Comparably, various studies focused on the impact of schooling on child mortality, not maternal health practices that can protect mothers' health. Even though few previous studies demonstrated the positive effects of education on lowering maternal mortality and raising demands for maternal health services, the complex pathways that explain how education is connected to maternal healthcare decisions seem to require a further investigation. Existing literature using the fixed effect model only controls time-constant heterogeneity, which implies that time-variant omitted variables makes it more difficult for prediction to be unbiased and consistent. Logistic regression model or time series model also cannot be free from the endogeneity issues, if the data has unobserved variable inside of error term, or data collinearity between (N-1) year and N year data.

On the other hand, RCT or IV methods take advantage of reducing such bias from the endogeneity. Likewise, Duflo et al. (2015) showed that schooling also generates both significant and insignificant effects depending on the country context. The result of analysis of panel and collected global data using sophisticated methodologies may offer some level of

evidence on the positive *correlation* between the two factors. However, the author believes that there is a still room for more studies as to the *causal* impact of education on and the extent to which it affects mothers' health seeking behaviors in Uganda, so as to extract 'context-fitted' policy implications. Lastly, the IV methodology was scarcely used in the analysis of maternal health practices in African context, where the burden of disease and MMR is the greatest in the world. Thus, this study adds another evidence to clarify the ambivalence of the mechanism and to assess accurately how and to what extent schooling impacts on maternal health seeking demands and behaviors.

[Table 1] Summary of Empirical Review on the Impact of Education on Maternal Healthcare Utilization

Author	Sample	Data Type	Location	Method	Impact of Education	Key Y Variables	Key X Variable
Caldwell (1979)	Survey Data (CAFN1, 2)	Cross Sectional (Individual)	Nigeria	Simple Comparison	Reduced Child Mortality	Fertility and Child Mortality	Maternal Education
Ramesh (1997)	India NFHS	Cross Sectional (Household)	India	Logit	Increase	Maternal Healthcare Utilization, Child health Services	Maternal Education
Elo (1992)	Peru DHS 1986	Cross Sectional (Household)	Peru	Logit & Fixed Effect	Increase	Maternal Healthcare Utilization	Maternal Education
Breierova & Duflo (2004)	Intercensal Survey(SUPAS)	Cross Sectional (Individual)	Indonesia	IV	Reduced child mortality	Fertility and Child Mortality	Paternal Education
Somanathan (2008)	Indonesia Family Life Survey	Cross Sectional (Household)	Indonesia	IV and Probit-IV	Increase	Maternal Healthcare utilization for pregnancy & childbirth care	Construction of Schools
Ahmed et al. (2010)	31 countries' DHS	Cross Sectional (Household)	Global	Logit	Increase	Maternal healthcare utilization	Economic status, Girl's Education and Empowerment
Koch et al.(2012)	National Statistics (1957-2007)	Panel	Chile	Time series	Decrease	Maternal Mortality	Maternal Education
Bhalotra & Clark (2013)	Barro & Lee (2013, 2010), WHO, DHS	Panel	Global, Zimbabwe, Kenya, Nigeria	Fixed Effect, DID, IV, RDD	Reduced MMR	Maternal Mortality	Increase of National Average of Schooling Years, Change of Educational System
Duflo et al. (2015)	Program Survey	Panel (Individual)	Kenya	RCT	Partially increased	Dropout rate of Primary School, HIV and early fertility	Subsidy on Uniform, HIV education
Hahn et al.(2015)	Bangladesh DHS	Cross Sectional (Household)	Bangladesh	DID	Decrease Fertility	Fertility(adolescent) and marital outcomes	Female Stipend Program
Grépin & Bharadwaj (2015).	Zimbabwe DHS	Cross Sectional (Household)	Zimbabwe	IV	Reduced child mortality	Child mortality (Under 5 and Under 1)	Universal Secondary Education
Makate (2016)	Uganda DHS	Cross Sectional (Household)	Uganda	IV	Reduced child mortality	Child mortality (Under 5 and Under 1)	Universal Primary Education
Weitzman(2017)	Peru DHS	Cross Sectional (Household)	Peru	RDD with IV	Increase	Maternal Healthcare Utilization	Compulsory education

3. Universal Primary Education Policy of Uganda in 1997

Provision of universal primary education (UPE) has been a popular education policy in developing countries. After their independence in the 1960s, many developing countries believed that education is a prerequisite for nurturing human capital to establish a new nation (Nishimura et al, 2009). So far African countries, Malawi (1994), Uganda (1997), Ghana (2005), and Kenya (2003), abolished primary school fees while Rwanda, Tanzania, Cote d'Ivoire partially implemented the policy for targeted regions and certain aged groups.

In the last month of 1996, the then-President of the Republic of Uganda, Mr. Yoweri Kaguta Museveni, declared free primary schooling starting from 1st January 1997. Under the UPE, the cost of primary schooling became free for up to four children per a household (at least two girls should be beneficiaries) and Parents and Teachers Association (PTA)[5] charges were abolished (Deininger, 2003). However, UPE was extended to all children of schooling age because of the conceptual ambiguity of definition on family (Bategeka & Okurut, 2006). The Government of Uganda launched the Education Strategic Investment Plan (ESIP) in 1998 to effectively manage national wide educational reform considering both qualitative and quantitative aspects of the new policy (Ward et al., 2006). The UPE consists of four components. First, the program provides educational resources for every child to be able to access and remain in primary education. Second, primary education can contribute to eliminate inequalities and social disparities. Third, eliminating school fees can ensure education affordable for most of Ugandans. Lastly, UPE can alleviate extreme poverty

[5] PTA charges has been imposed in 1970s to extra-support the low salaries of teachers. PTA worked as an incentive and also an important budgetary sources for running schools. The amount of PTA was diversified from school to school depending on the agreement among parents and teachers.

through educating people with basic skills (Ministry of Education & Sports, 1999).

The Ministry of Education and Sports (MoES), local authorities, and school management committees were major policy implementing agencies which were responsible for, providing school grants, instructional materials, curriculum, and training sessions (Bategeka & Okurut, 2006). Primary schools were supported by government grant based on the numbers of enrolled students and their grades[6]. Meanwhile, local authorities reported and monitored implementation processes, ensured the accountability, and disbursed benefits promptly (Bategeka & Okurut, 2006).

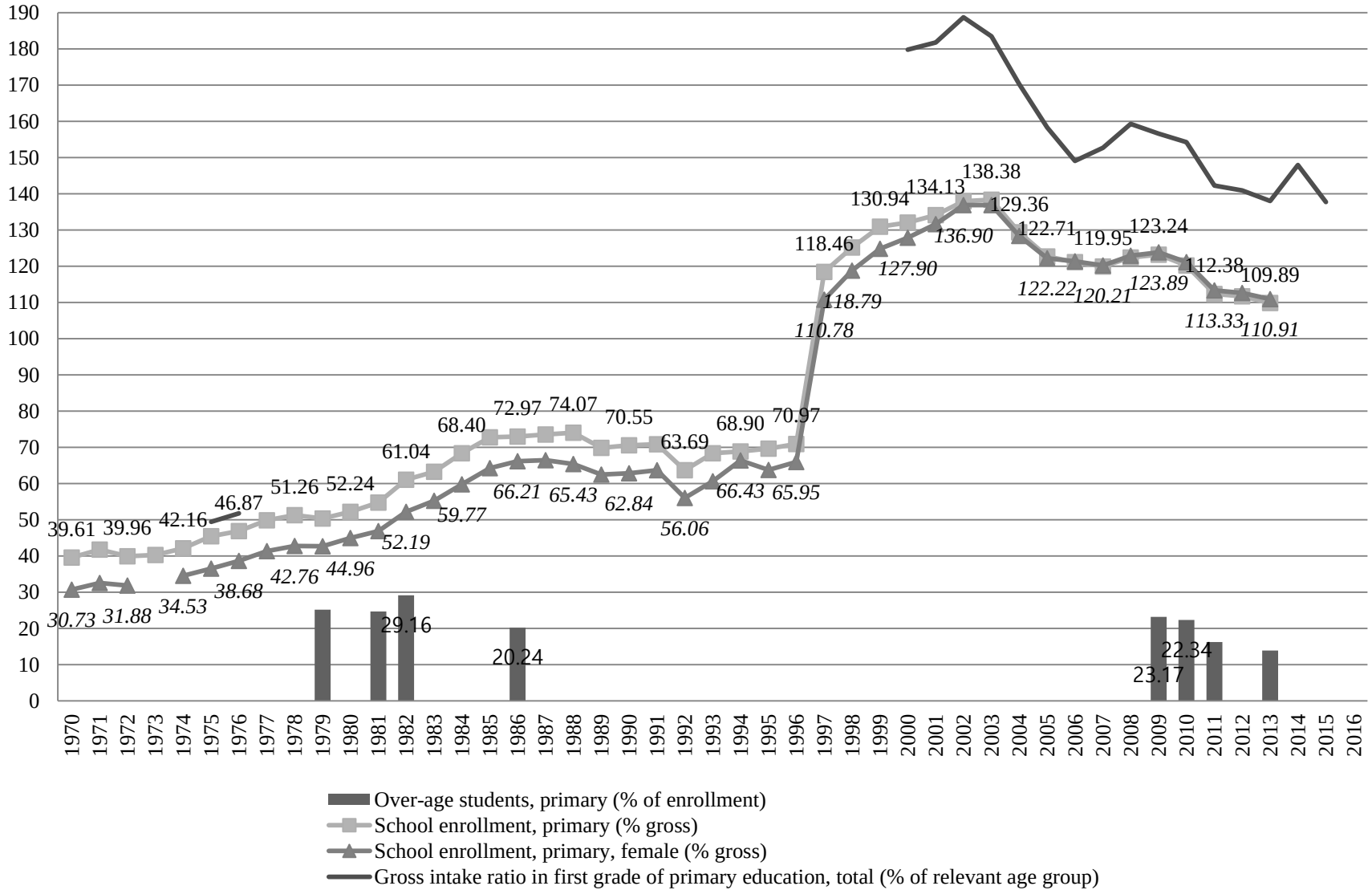
As shown in [Figure 2], gross enrolment in primary education jumped from 3.1 million in 1996 to 5.3 million in 1997, a 73% increase in just a year (Nishimura et al, 2009). It reached 8.4 million (109.8%) in 2013 (World Development Indicators, 2013). Furthermore, the government substantially raised its primary-level education budget to meet the needs of local people. At one point, primary schools and teachers accounted for as high as 66% of the total education budget (Ministry of Education & Sports, 1999). New schools were also built and the number of schools increased by 56% (from 8,531 in 1996 to 13,353 in 2003). The rapid pace was notable compared with 1986-1996 period when only 1,000 new schools were established (Bategeka & Okurut, 2006). Before UPE, the recruitment of new teachers stagnated. However, it was turned into an annual increase of 10% (World Development Indicators, 2016) as government provided better salaries, new textbooks, and supplementary materials to primary schools.

Meanwhile, improved access to education was accompanied by an unintended

[6] Classes from P1 to P3 received US$5 per a child, while those in P4-P7 were provided US$8

consequence of bringing down the quality of education. Critics cast doubts on the effectiveness of the UPE program because the pupil-teacher ratio in primary education rose swiftly from 37 pupils per one teacher in 1996 to 59 pupils in 1997. Moreover, the primary education completion rate remained almost the same at 54% on average. The ratio of repeaters has been rising since 2000s (World Development Indicators, 2016). This study cannot fully exclude the potential negative impact of low quality of education on health behaviors of mothers, because the author could not obtain sufficient data for measuring quality of UPE and its impact. Nonetheless, this study attempted to capture how primary schooling affects health seeking behaviors of different cohorts by controlling years of schooling and literacy as proxies.

[Figure 2] Uganda's Index for Education (Over-age students, School Enrollment, Gross intake ratio in first grade of primary education)



4. Methodology and Data

4.1. Methodology

Considering the nature and characteristics of UPE policy, which was implemented nationally but with specific targets for those in primary schooling age, this study utilizes instrumental variable approach by exploiting an instrument, mothers' age as of 1997. Simple OLS model can measure correlation between maternal primary schooling and their health. However, unobservable factors may possibly contribute to produce biased estimations. For instance, women's autonomy within household would contribute to both maternal primary education and healthcare utilization. Thus OLS results may not effectively deal with endogeneity, so that the estimation would have downward bias and be inconsistent. On the other hand, IV approach can better deal with the endogeneity issues thus provide unbiased results producing the consistent outcomes of the impact of education on maternal use of pregnancy care (Somanathan, 2008).

This empirical analysis uses the exogenous variability in education prompted by the implementation of 1997 Universal Primary Education as a natural experiment to estimate the causal influence of schooling on maternal health-seeking behavior. UPE policy sets the age twelve to be an exogenously imposed factor that impact on maternal education (Makate, 2016). Respondents aged 5-12 should have been beneficiaries for full coverage on primary education while those aged 15-23 were controlled since they already graduated primary school. Therefore this study adopts instrumental variable approach to evaluate local average treatment effect (LATE) of primary education on maternal health practices. Dummy for age in 1997 ((dummy =1) equals age in 1997 is 12 or less) will act as an instrumental variable determining cohort groups whether to be a treatment or control group for free education

policy. Then, explanatory variable, attainment of primary education instrumented by age in 1997, will able to estimate the impact of education on health seeking behaviors at the second stage.

In the same vein, IV method, instrumenting age in policy implementing year, was utilized by Somanathan (2008) and Weitzman (2017) to measure the impact of education on maternal tendency to maternal demands for healthcare. Along with above studies, various scholars widely adopted IV approach to investigate the impact of different types of education program or policy on child mortality as for instance, Breierova & Duflo (2004), Grépin & Bharadwaj (2015) and Makate (2016).

4.1.1 Model Specification

Narration in 4.1 can be expressed into empirical model equations below. As a baseline, the study evaluates equation (1) through OLS estimation. Dummy variable, $Education_i$ take 1 when mother attended primary education and otherwise 0. Other explanatory factors, X_k', such as region, household size, mothers' occupation, age difference with spouse, frequency to watch television, smoking, year of survey, mother's height, unwanted pregnancy, numbers of total children, mothers' year of birth, and linear trend have been controlled.

$$Health\ Practices_i = \delta_0 + \delta_1 Education_i + \delta_k X_k' + \mu_i \quad \cdots\cdots\cdots\cdots (1)$$

In order to minimize the risk of omitted variable bias, equation (1) is estimated through divided two equations, (2) and (3). Two-stage least squares estimation uses Age_{dum_i} as an instrument for instrumenting $Educ_i$. Here, Age_{dum_i} means the dummy variable for treated group whose age was lower than 12 in 1997, and $Educ_i$ indicates the dummy factor for

whether mother attended primary education or not.

$$Educ_i = \gamma_0 + \gamma_1 Age_{dum_i} + \gamma_k X_k{}' + \omega_i \quad \cdots\cdots\cdots\cdots (2)$$

At the second stage, instrumented $\widehat{Educ_\iota}$ estimates the impact of maternal health seeking practices, and the results of coefficient β_1 provide us causal influence of maternal primary education on maternal health seeking behaviors for their own healthy lives. In equation (1) the study included linear trends nearby the threshold, age 12.

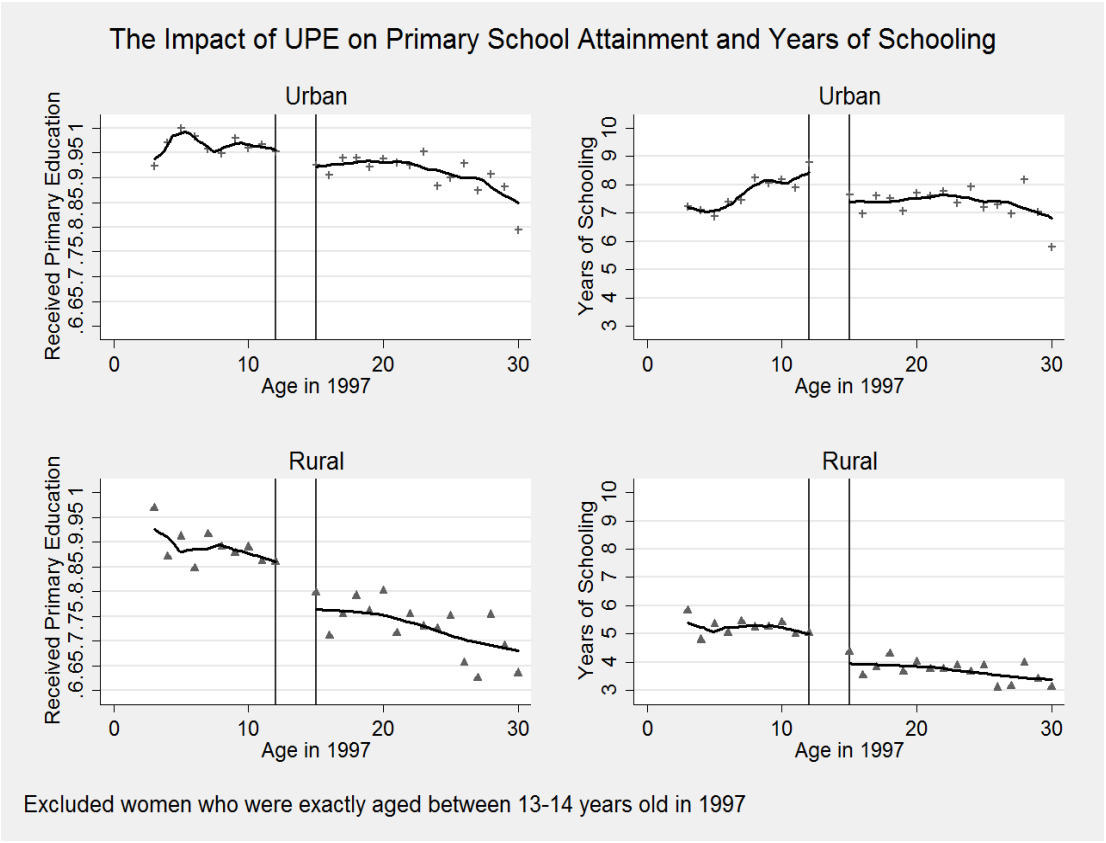
$$Health\ Practices_i = \beta_0 + \beta_1 \widehat{Educ_\iota} + \beta_k X_k{}' + \varepsilon_i \quad \cdots\cdots\cdots\cdots (3)$$

Although the research could not consider other factors affecting primary education enrollment for mothers, [Figure 3] supports our instrument (Age_{dum_i}) can play as a plausible instrument. The treatment and control group depending on the residence show differences in two aspects, primary education attainment and years of schooling. We excluded age 13 and age 14 since those cohorts may partially benefited from the program. Both rural and urban, treatment group (left side of x axis below 12) attends school longer than the control group (right side of x axis over 15). On the other hand, the attainment of primary school shows different trend that clear disparity on total schooling years is only shown in the rural area, considering the jumps nearby age 12-15. Because mothers living in the urban area already receive primary education even without new UPE policy; therefore we can interpret that the impact of policy becomes intensified in rural areas.

Aforementioned in 2.2, this study would humbly expands the literature by adopting an exogenous source of variation to explain a causal link between schooling and demands for maternal health while childbearing. Conventional methodologies of previous literature, such as fixed effect, logistic regression model, and time series implies unsolved endogeneity and is

complicated to deal with. As a result, estimated effects are hard to be recognized as the impact; rather, it is considered as correlation with statistical significance. In addition, this study sheds lights on maternal demands for health input as a key variable in contrast of the previous research's analysis on the child mortality only (Makate, 2016), and provides more accurate measurement of the impact of schooling particularly in Ugandan context.

[Figure 3] Comparison on Impact of UPE on Primary School Attainment and Years of Schooling



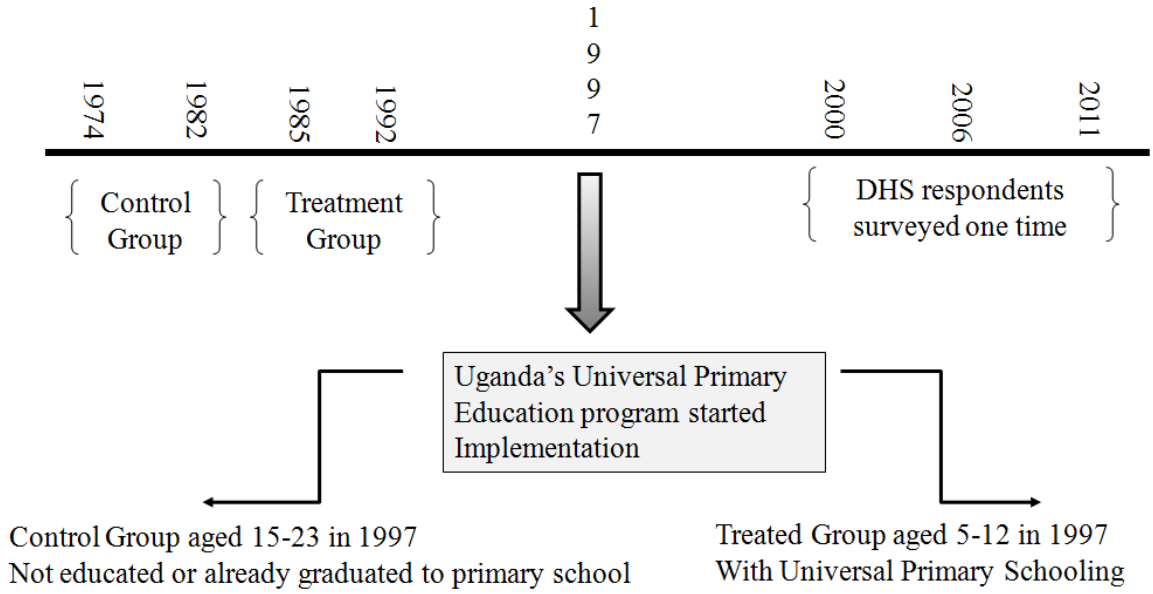
4.2. Data

This research utilizes Demographic and Health Surveys (DHS), which is nationally representative, cross-sectional data of Uganda in 2000/2001, 2006, and 2011. DHS collects data of mothers in the reproductive age of 15-49 and children on their marriage and sexual

activities, fertility, reproductive health, domestic violence, child health, nutrition, mortality, and diseases such as malaria and HIV (Uganda DHS, 2011). Three years of survey data are pooled for the analysis and total number of samples is 82,109. This study uses Uganda's UPE policy in 1997 as an exogenous variable to isolate the effects of education on mothers' health practices in Uganda.

The study compares two different cohorts - women born in 1974-1982 and those born in 1985-1992 - to isolate the impact of UPE policy. Respondents aged 5-12 (N=27,769) benefitted from the UPE policy to receive free primary education, while comparison group aged 15-23 (N=20,232) could not be the beneficiary (See details of settings in [Figure 4]). In the analysis, the author integrated the data from age 5 considering early school entrance and excluded age 13 and 14, because they were partially treated group, considering the average 10% of repetition rate in 2000s (According to WDI (2016), Ugandan children enroll the school at 6). DHS conducts surveys targeting mothers in the reproductive age of 15-49, therefore, sampled mothers in the analysis (mothers from 5 to 23 years-old in 1997) are in the range of reproductive ages from 19 and 37 years-old in DHS 2011 survey.

[Figure 4] Timeline of Events



4.3. Dependent Variables and Definitions

This study aims to evaluate the impact of primary education on mothers' health seeking practices associated with preventing possible maternal mortality risks. To estimate the degree of maternal utilization of health services, the study uses ANC, PNC and delivery care as proxies. Other dependent factors such as use of contraceptive methods, mothers' age for their first birth, and their autonomy to access to healthcare services are also estimated since these factors also represent mothers' behavior on the fertility practices.

4.3.1. Utilization of Antenatal and Postnatal Health Services

Specifically ANC services are assessed based upon the following: whether mothers were informed of signs of pregnancy complications (0/1); made more than four times of health visits during pregnancy in adherence with WHO recommendations (0/1); received key components of ANC including tetanus toxoid injections (0/1) and fansidar (0/1); quality index for ANC services (check for blood pressure (0/1), urine (0/1), height (0/1), weight (0/1), immunized by fansidar (0/1), tetanus (0/1), iron (0/1), received instructions for complications

of delivery (0/1), regular checkup in first 3 month (0/1), 6month (0/1), and 9 month of pregnancy (0/1), ranged from 0 to 9). On the other hand, PNC services are estimated based upon whether or not mothers received medical checkups after the delivery (0/1) and by health professionals (0/1); took vitamins two months after giving birth (0/1).

4.3.2. Mothers' Delivery Care and Delivery Assistance

Mothers' delivery care is the other indicator for evaluating maternal health practices. The place of delivery, whether it was public/private health facility (0/1), and home (0/1) or other places (0/1), can be a pertinent indicator. Also, type of person, providing delivery service such as doctors, nurses, midwife, clinical assistant, nursing assistant, traditional attendant, and others, can indicate whether mother can have access to health facilities and get helped for the safe delivery. Each data was transformed into dummy variables. For instance, if mother give her birth by a nurse it is categorized as 1, otherwise, 0.

4.3.3. Other factors

This study attempts to evaluate the impact of education on family planning, year of first birth, and degree of mothers' autonomy for access to health services. Except for the accessibility index, other two dependent variables are dummy variable. The index calculated divided into 7 categories and the range of level is from 0 to 7; whether mother has to get permission to go to health facilities (0/1), knows where to go if they get sick (0/1), can use money by their own (0/1), can go health facilities within proper distance (0/1), feels as problem if they go alone outside (0/1), has certain preference towards female health professionals (0/1), has transportation (0/1).

4.4. Explanatory Variables

Main explanatory variable is the binary variable for primary schooling. Moreover this study compares different cohorts to evaluate the impact of years of schooling under UPE program, assuming that respondents continued their primary schooling until graduation. In other words, we analyze treated age cohorts born from 1992 to 1985 to controlled cohorts born from 1974 and 1982. Other possible independent variables considered to affect mothers' health behavior are also included. In total, nineteen variables are controlled as following; household size, age difference with their spouses, mothers' year of birth, child year of birth, household wealth (whether the household in low income quintile or high income quintile), binary variable for regional residence (Central 1 and 2, Kampala, East central, Eastern, Karamoja, North, West Nile, Western and Southwest), binary variable for urban residence, year of survey, frequency to watching TV and radio (mothers' access on information), whether women have a job, whether pregnancy was unwanted, having experience of birth in last 5 years, having experiences of death of their child, whether mom smokes, linear trends, and total numbers of children.

4.5. Expected Results

Given the empirical model narrated in section 1.4 equation (3), the study assumes that the coefficient of instrumented dummy for primary education, $\boldsymbol{\beta_1}$, **is positive and statistically significant.** In other words, the attainment of primary education would increase mothers' practices to pursue healthier lives by learning about how to seek proper delivery care services and deliver in safe health facilities with the guidance of health professionals.

5. RESULTS OF EMPIRICAL ANALYSIS

This section presents a detailed account of the findings from pooled OLS and IV estimates from equation (1) to (3). [Table 4] and [Table 5] show general empirical results from the regression with pooled individual samples of DHS 2000, 2006, and 2011.

5.1. Descriptive statistics

Descriptive statistics for overall sampled group and the result of balance test between treatment and control group is stated in [Table 2]. On average, women aged between 6 and 23 received 3.891 years of education. Mothers give their first birth at age 18, and samples are from poor-middle (wealth quintile index 2 and 3) income households and only 17.9% of households live in urban areas. As the author projected in 4.5, treatment group has 0.10 point higher probability (0.870) of attending primary education, and also 1.18 more years of schooling (5.389 years) than those of the control group (4.201 years). Besides, the intervention group has higher probability of literacy and more frequent access to the media, and lower probability of unwanted pregnancy (0.041). The group is more likely to utilize ANC and PNC services during and after pregnancy, and deliver their babies in health facilities.

5.2. First Stage Results

[Table 3] explores the result of first-stage estimation testing equation (2). In this step, the research regress attainment of primary education and years of schooling on exposure to the UPE program in 1997. The results demonstrate that women aged 12 or less (dummy =1) would stay 0.67 year longer in school than those within control group, and the probability of attending primary schooling would increase 6.2 %p. Similar results hold when the author

adjusted age bandwidth narrower as stated in [Table 3] column (3)-(6), showing the instrumental variable is statistically significant positive relationship with our key independent variables.

Meanwhile, to make sure the F-statistics for excluded instrument (dummy for age of mothers in 1997) is strong enough, which is above 10, [Table 4-7] represents results of F-statistics. The instrument was not strong for examining the effects of primary education on ANC services (F-statistics less than 5), and postnatal delivery care in overall (F-statistics less than 9) which would make unconvincing interpretation. Nevertheless, for other dependent variables, F-statistics exceeds more than 10 indicating that the instrument is valid and IV inference to be reliable (Stock & Yogo, 2002).

[Table 2] Descriptive Statistics

VARIABLES	Mean	SD	MIN	MAX
Characteristics of Mothers				
Woman's Height(centimeters)	158.7	69.28	15.4	194.6
Woman's age at First birth	18.328	3.081	8	43
Dummy Urban Residence	0.179	0.383	0	1
Household Size	6.809	2.905	1	31
Mothers' Schooling Years	3.891	3.667	0	20
Dummy for Primary Education	0.715	0.452	0	1
Husband's Education by Year	6.233	11.53	0	21
Dummy for hearing news	0.176	0.381	0	1
Dummy for listening to radio	0.735	0.441	0	1
Dummy for watching TV	0.151	0.358	0	1
Married status	0.985	0.000	0	1
Wealth Quintile	2.948	1.444	0	5
Total Number of Children	6.246	2.855	1	17
Women's Literacy	0.497	0.500	0	1
Age Difference with Spouse	-7.013	8.384	-82	21
Usage of Family Planning	0.256	0.437	0	1
Unwanted Pregnancy	0.180	0.384	0	1
Antenatal & Postnatal Care related factors				

ANC - Immunized Tetanus	0.961	0.193	0	1
Received any ANC services	0.954	0.208	0	1
Numbers of ANC Visits	3.687	2.192	0	20
ANC Visits more than 4	0.479	0.500	0	1
Knowledge on Complications	0.358	0.480	0	1
ANC - Received iron	0.651	0.477	0	1
ANC Quality Index	4.056	2.081	0	9
PNC- Checkup after Delivery	0.252	0.434	0	1
PNC- Received Vitamin after Delivery	0.318	0.466	0	1
PNC- Checkup by health professionals	0.906	0.292	0	1
Delivery related factors				
Delivery with Doctor	0.0573	0.232	0	1
Delivery with Nurses	0.380	0.485	0	1
Delivery in Facility	0.479	0.500	0	1
Delivery in Hospital	0.135	0.342	0	1
Delivery by Caesarean	0.040	0.196	0	1
Access to Health Services	1.453	2.441	0	9

* Note : The minimum height of women(15.4cm) and age difference(Spouse is 82 year older than respondent) with spouse are possible to be collected mistakenly during survey.

[Table 3] First-Stage Estimation Results with Different Range of Age

	Overall Age 5-23 in 1997		Overall Age 8-19 in 1997		Overall Age 10-17 in 1997	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Years of Education	Primary Education	Years of Education	Primary Education	Years of Education	Primary Education
Dummy for Age 1997	0.677***	0.0620***	0.548***	0.0735***	0.537***	0.0231
(Exposure to UPE policy)	(0.0769)	(0.0107)	(0.116)	(0.0161)	(0.181)	(0.0249)
Dummy for Urban	0.524***	0.0101	0.416***	-0.00120	0.277***	0.00189
	(0.0602)	(0.00652)	(0.0788)	(0.00849)	(0.105)	(0.0117)
Wealth Index(High)	0.876***	0.0240***	0.787***	0.00318	0.950***	0.0112
	(0.0539)	(0.00697)	(0.0729)	(0.00899)	(0.0964)	(0.0119)
Wealth Index(Low)	-1.076***	-0.145***	-1.094***	-0.149***	-0.942***	-0.131***
	(0.0453)	(0.00694)	(0.0612)	(0.00877)	(0.0793)	(0.0112)
Husbands'	0.313***	0.0241***	0.322***	0.0256***	0.339***	0.0263***
Schooling Year	(0.00514)	(0.000643)	(0.00665)	(0.000843)	(0.00858)	(0.00111)
Experience of child	-0.134***	-0.00956	-0.0908	-0.00296	-0.109	-0.0144
death	(0.0501)	(0.00792)	(0.0665)	(0.0104)	(0.0884)	(0.0137)
Births_last5years	0.0340	0.0113***	0.154***	0.0168***	0.206***	0.0212***
	(0.0281)	(0.00392)	(0.0383)	(0.00534)	(0.0511)	(0.00746)
Constant	8.265	-4.272	46.71	12.00**	63.26	-11.83
	(20.55)	(2.879)	(41.64)	(5.400)	(76.40)	(10.15)
R-squared	0.475	0.197	0.5091	0.226	0.525	0.223
Observations	24,813	24,813	13,779	13,779	8,469	8,469

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

* Notes: Model controlled other factors for region, household size, whether mothers have job, age difference with spouse, watching television, whether mother smokes, year of survey, whether the pregnancy was wanted, number of total children, mothers' year of birth, linear trend nearby age 12, mothers' year of the first birth, and different ranges of age exclude age 13 and 14 (complete table provided by request).

5.3. Second Stage Results

The second stage result and OLS estimations are presented in parallel for comparison in [Table 4] and [Table 5] (Here, the author only posted IV regression results having some statistical significance with large F-statistics to make the interpretation reliable. The author can provide the full set of results upon request).

[Table 4] presents schooling's impact on maternal attitudes toward family planning, autonomous access to healthcare services, and the utilization of ANC services. IV estimates in (1) to (4) report reduced impact of primary education attainment and years of schooling on four indicators. First, in row IV (1), schooling has positive impact on mothers' independent access to health intakes by 5.5 %p ($p<0.05$). This indicates higher education led mothers to autonomously seek health services compared with those with a lower level education. Moreover, the probability of utilization of family planning increases by 38.2 %p ($p<0.1$) if mothers have primary education, and one year rise in schooling would increase the probability of using contraceptive methods (related to lower fertility) by 4.3 %p ($p<0.05$). However, the author failed to identify any meaningful impacts of education on the utilization of ANC services as stated in row (3) and (4), though the sign is positive.

[Table 5] describes educational impact on delivery care utilization. The only factor significantly affected by education was *delivery in hospital*, though the results are somewhat noisy. Shown in row IV (4), the attainment of primary education increases the probability of institutional delivery (in hospital) by 90.6 %p ($p<0.01$). Moreover, a year rise in mothers' schooling raises the chance of delivery in hospital ($p<0.01$) by 8.3%p. On the other hand, the author failed to identify any influence of education on mothers' probability of receiving delivery assistance by health professionals and delivery in health facilities such as primary

health posts and health centers. In particular, the correlation between educational attainment and delivery by health professionals in health facilities (row IV (1) and IV (3) in [Table 5]) turns into negative, which shows the opposite direction and significance in contrast to the author's OLS estimations.

Meanwhile, urban residence and wealth factors exhibit a high statistical significance with the three factors. IV results, row IV (1) to (4) in [Table 4], mothers living in cities are 5.1%p ($p<0.01$), 7.1%p ($p<0.01$), and 18.5%p ($p<0.01$) more likely to receive four times of ANC during pregnancy, adopt family planning and seek health services autonomously, respectively, than those who reside in rural areas. Also, urban residence increases the probability of utilization of health facilities for delivery by 18.8%p ($p<0.01$), and delivery by doctors and nurses by 7.3 %p and 8.7 %p, respectively at the significance level of 99%, as stated in [Table 5].

Additionally [Table 4] specifies mothers from wealthier households are 4.4 %p ($p<0.05$), 9.2%p ($p<0.01$), and 8.8%p ($p<0.01$) more likely to get ANC on a regular basis, seek health services, and use family planning, respectively. Moreover, women from wealthier households tend to seek guidance from health professionals and deliver in health facilities, as shown in [Table 5].[7] In contrast to this, poorer households are less likely to seek health services during pregnancy and delivery processes. The results are in consistent with the argument of Cutler & Lleras-Muney (2006) that income is a complementary factor to education as far as health is concerned since "education matters more among non-poor than among poor." OLS results

[7] We measure the impact of all other dependent variables mentioned in section 4.3; for example, educational impacts on ANC quality, knowledge on delivery complications, regular checkup every three months, postnatal medical checkups after the delivery, etc. However, these estimations showed no statistical significance and F-statistics for IV are not large enough to interpret results.

more clearly depict the behavioral differences among the rich and the poor in row OLS (1) to (4) in [Table 5].

The author identified a clear difference between OLS and IV estimation (For comparison, the author also present estimation using logistic regression model at [Annex 1]. OLS and logistic regression show parallel outcomes). OLS would underestimate the impact of education, at some point, and overestimate statistical significance of schooling on maternal healthcare utilization. As a result, OLS could provide inconstant and biased results because of potential endogeneity. For instance, OLS may understate (bias towards zero) educational impact of longer education on family planning (e.g. 0.004 vs. 0.043, see [Table 4]) because of potential biases such as measurement error. This is aligned with what Weitzman (2017) pointed out that the uncontrolled and unobservable factors may make OLS estimation biased and inconsistent.

[Table 4] Naïve OLS regression estimates and Second Stage IV estimation (Behavior on Health and Antenatal care Utilization)

VARIABLES	OLS(1) Self-Care Index	OLS (2) Family Planning	OLS (3) ANC visit >4	OLS (4) ANC any	IV (1) Self-Care Index	IV (2) Family Planning	IV (3) ANC visit > 4	IV (4) ANC any
Attainment of	0.011***	0.010	-0.005	0.016**	0.313	0.382*	0.149	0.074
Primary Education	(0.00)	(0.07)	(0.02)	(0.01)	(0.22)	(0.22)	(0.49)	(0.18)
Mothers'	0.0135	0.004**	0.006***	0.002**	0.055**	0.043**	0.022	0.006
Schooling Year	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.02)	(0.05)	(0.01)
Dummy for Urban	0.067***	0.061***	0.049***	0.005	0.185***	0.071***	0.051***	0.006
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Wealth Index(High)	0.028	0.024	0.041**	0.005	0.092***	0.088***	0.044**	0.005
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Wealth Index(Low)	0.029*	0.044***	0.024	-0.006	0.065**	-0.024	0.037	0.002
	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.06)	(0.02)
Frequency to	0.053***	0.069***	0.070***	0.008	0.008	0.027	0.091	0.018
watching TV	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.07)	(0.02)
Husbands'	0.010***	0.003**	0.009***	0.001*	-0.003	0.002	0.007	0.000
Schooling Year	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)
Experience of child	0.047*	-0.085***	-0.006	-0.020	-0.018	-0.035***	-0.009	-0.021
death	(0.02)	(0.02)	(0.03)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)
Births_last5years	-0.003	0.002	-0.031***	-0.011***	-0.044***	-0.049***	-0.032**	-0.012**
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)
F-stat(Primary)					32.242	32.242	8.760	8.760
F-stat(Schooling)					62.299	62.299	14.018	14.018
Constant					4.165	4.064	8.710	-7.116
R-squared	0.9094	0.1359	0.0498	0.0221				
Observations	4,362	6,836	6,841	6,841	24,813	24,813	6,841	6,841

Robust cluster standard errors in parentheses (clustered by region of residence and age in 1997) *** p<0.01, ** p<0.05, * p<0.1

* Notes: Model controlled other factors for region, household size, whether mothers have job, age difference with spouse, watching television, whether mother smokes, year of survey, whether the pregnancy was wanted, number of total children, linear trend, mothers' year of birth, linear trend nearby age 12, mothers' year of the first birth (complete table provided by request)

[Table 5] Naïve OLS regression estimates and Second Stage IV estimation (Institutional Delivery with the assistance of health professionals)

VARIABLES	OLS(1) Delivery by Doctor	OLS(2) Delivery by nurse	OLS(3) Delivery in Health Facility	OLS(4) Delivery in Hospital	IV (1) Delivery by Doctor	IV (2) Delivery by nurse	IV (3) Delivery in Health Facility	IV (4) Delivery in Hospital
Attainment of	0.010**	0.071***	0.096***	0.038***	-0.122	0.399	-0.100	0.906***
Primary Education	(0.00)	(0.01)	(0.01)	(0.01)	(0.14)	(0.28)	(0.28)	(0.23)
Mothers'	0.005***	0.014***	0.019***	0.011***	-0.016	0.051	-0.013	0.083***
Schooling Year	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.04)	(0.04)	(0.02)
Dummy for Urban	0.068***	0.086***	0.175***	0.094***	0.073***	0.087***	0.188***	0.091***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wealth Index(High)	0.011*	0.041***	0.065***	0.028***	0.017**	0.049***	0.082***	0.015
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wealth Index(Low)	-0.009*	-0.030**	-0.050***	-0.025***	-0.029	0.005	-0.083**	0.094***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)	(0.04)	(0.04)	(0.03)
Frequency to watching	0.051***	-0.018	0.010	0.008	0.034*	0.037	-0.003	0.128***
TV	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.04)	(0.04)	(0.03)
Husbands'	0.002***	0.012***	0.012***	0.006***	0.006*	0.007	0.020***	-0.012**
Schooling Year	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Experience of child	0.023***	0.023	0.033**	0.008	0.023***	0.023	0.033**	0.016
death	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
Births_last5years	0.002	-0.017**	-0.022***	0.033***	0.004	-0.023***	-0.021**	0.021***
	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
F-stat(Primary)					22.544	22.108	20.736	33.813
F-stat(Schooling)					24.228	24.305	23.521	77.517
Constant					2.098	4.574	2.621	-64.20
R-squared	0.0924	0.1957	0.2158	0.2974				
Observations	11,836	11,744	11,756	24,813	11,836	11,744	11,756	24,813

Robust cluster standard errors in parentheses (clustered by region of residence and age in 1997) *** p<0.01, ** p<0.05, * p<0.1

* Notes: Model controlled other factors for region, household size, whether mothers have job, age difference with spouse, watching television, whether mother smokes, year of survey, whether the pregnancy was wanted, number of total children, mothers' year of birth, linear trend around age 12, year of the first birth (complete table provided by request)

5.4. Limitations

The study is not without limitations that need to be addressed through further studies. Despite study's attempt to sort out all possible variations, the model could not perfectly solve the endogenity issues which implies the presence of uncontrolled explanatory variables in error terms, ε_i. For instance, the age at which mothers give their first birth ranged from 8 to 43. Experience of giving birth would directly affect the behavioral change in the utilization of healthcare service, meaning that the identification restriction would not be satisfied.

This pitfall raises weak instrument issues. We observe maternal age in 1997 cannot facilitate as a strong instrument particularly on educational impact on ANC services and PNC specifically (F statistics is less than 9 and 5, respectively). This study envisages that elderly mothers in 1997 possibly use more on healthcare services, thus it could affect the prediction of model negatively. The characteristics of DHS data restricts our analysis because the data is hard to meticulously show whether the sampled mother had prior experience of giving birth in 1997 or not.

6. DISCUSSIONS AND CONCLUSION

6.1. Discussion

The empirical results in the previous section shows that experiences of primary schooling and the number of years mothers spent at school have *partial* impact on maternal health seeking practices in Uganda. Overall, the result shows consistency with previous literature, in terms of (positive) sign, indicating maternal schooling is positively correlated with maternal health seeking behaviors. Nevertheless, the impact of education shows meaningful implications when assessed from the following three variables; autonomous health care seeking, use of family planning methods, and delivery in hospital. For other explanatory variables, the impact of education was not sufficiently large for childbearing mothers.

Then, we should ask *why* the results are different in Uganda. A weak causal connection between education and maternal health seeking behaviors may be explained by three possible scenarios. First, the impact of education would be amplified not at the primary level, but at secondary or postsecondary levels. The analysis of Edward (2011) only supports the effects of secondary and higher level schooling on the utilization of ANC services in Uganda whereas primary schooling turned out to have a negative impact. As this study mainly targets primary schooling as an explanatory variable for the analysis, the results would change if the data comes from different schooling levels, since female schooling is rather a long-term measure (Edward, 2011; Lazarus et al., 2012).

Another scenario is that the expansion of the coverage of primary education lowered the quality of education, which would not be effective in building human capital as cognitively and socio-economically empowered. Eventually, the causal link between education and maternal health has not been strong. The mean value of schooling year, 3.9 years (see [Table

2]), indicates that mothers generally have difficulty in completing seven years of primary education or secondary education. Deininger (2003) also contends that UPE was successful in narrowing down inequalities in education between rural and urban, and between the rich and the poor. Nevertheless, the number of teachers did not result in a dramatic rise in school attendance.[8] MoES (1999) also acknowledges challenges and describes "…T(t)he expansion was without proper planning…the quality of education suffered greatly. Many students dropped out…N(n)ot only has the quality of graduates deteriorated over the years but also most of courses taught have not been geared to manpower needs (p. 6)." Unfortunately, the causal linkage between quality of education and health outcomes has rarely been tested so far (Cutler & Lleras-Muney, 2006), and generally, the analysis has confined to use literacy level as its proxy (Weitzman, 2017).

The other scenario is associated with the fact that the low quality of health services poses challenges to mothers who are willing to utilize health services in Uganda. Bakeera et al. (2009) also identified the lack of proper attitude of health workers, their practices, and the shortage of adequate medical supplies as key barriers undermining health seeking processes. Since the level of trust among mothers in the quality of health service providers and community-level health facilities is low, they tend to avoid seeking health services from the early stages of their pregnancy unless there is any emergency and seek health services at a big hospital which make preventive interventions such as ANC services less effective (Bakeera et al., 2009). This explains no significant results in [Table 4] for utilization of ANC services, and [Table 5] delivery in health facility (usually health center where few nurses are in charge of delivery services) as more educated mothers would search for better medical services.

[8] As a result, student to trained teacher ratio skyrocketed from 37.85 to 65.2 in 1999.

Also, Xu et al (2005) contends Uganda's elimination of health user fees at primary health facilities in 2001 worsened the situation. It is reported that health workers frequently ask for unofficial fees or bribes which impose heavy burden to from mothers, eroding the effectiveness of the policy targeted at mothers (Bakeera, 2009).

6.2. Conclusion

The objective of this study is to measure the impact of maternal education on the healthcare service utilization of those who benefited from universal primary education policy in Uganda. Thanks to the introduction of the free primary education policy in Uganda, it was possible for the author to generate exogenous variation in attainment of primary schooling and duration of education for mothers. The results confirm previous findings that education has positive correlations with maternal health seeking practices. However, it should be noted that the study does not reject the hypothesis, nor verifies it completely. Particularly, the attainment of primary education and the number of years at school are significant in the following three factors: mothers' autonomous access to health services, use of contraceptive methods, and delivery at hospital.

6.3. Policy Implications

The study's findings provide important policy implications. First, mothers' health seeking practices do no change just because the coverage of free education is expanded. Simple expansion of free education program may not be the key determinant to change preferences of mothers for their health seeking practices. Considering that the effects of education are manifested in a long term (even though it is hard to calculate the time of measuring optimization point of educational impact), it would be better if policy-makers avoid focusing on short-term results of their policy and pay more attention to enhance the

average quality of education. Secondly, the overall quality of health services at first-aid community level should be improved, in order to activate maternal use of preventive and post-delivery medical treatments for better maternal health in Uganda.

6.4. Areas for Further Research

As mentioned in section 6.1, a further study to deeply understand the mechanism and find ways to encourage maternal health in Uganda would be worthwhile. In this regard, the author suggest how improvements in the quality of education following universal primary education can contribute to maternal healthcare and child mortality or child healthcare as a topic for the further study.

[Annex 1] Logistic Regression Estimations: Maternal Education and Health seeking Practices

VARIABLES	(1) Self-Care Index	(2) Family Planning	(3) ANC visit >4	(4) ANC any	(5) Delivery by Doctor	(6) Delivery by nurse	(7) Delivery in Health Facility	(8) Delivery in Hospital
Attainment of	0.324***	0.628***	-0.022	0.180**	0.378**	0.381***	0.463***	0.497***
Primary Education	(0.08)	(0.05)	(0.07)	(0.08)	(0.17)	(0.06)	(0.06)	(0.06)
Mothers' Schooling Years	0.064***	0.105***	0.025***	0.031***	0.058***	0.071***	0.106***	0.087***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Dummy for Urban	0.701***	0.288***	0.208***	0.051	0.697***	0.496***	1.081***	0.667***
	(0.09)	(0.05)	(0.08)	(0.10)	(0.11)	(0.07)	(0.08)	(0.06)
Wealth Index(High)	0.549***	0.370***	0.164**	0.087	0.270*	0.202***	0.257***	0.261***
	(0.10)	(0.05)	(0.08)	(0.10)	(0.14)	(0.07)	(0.07)	(0.06)
Wealth Index(Low)	0.078	-0.412***	0.102	-0.059	-0.427***	-0.138**	-0.192***	-0.233***
	(0.09)	(0.05)	(0.07)	(0.08)	(0.15)	(0.06)	(0.06)	(0.06)
Frequency to watching TV	0.104	-0.119***	0.301***	0.137	0.518***	-0.072	0.200***	0.015
	(0.11)	(0.04)	(0.07)	(0.09)	(0.10)	(0.06)	(0.06)	(0.05)
Husbands'	0.023**	0.028***	0.036***	0.016*	0.023*	0.059***	0.063***	0.048***
Schooling Year	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Experience of child	-0.017	-0.239***	-0.026	-0.205*	0.461***	0.110	0.179**	0.123*
death	(0.09)	(0.05)	(0.12)	(0.12)	(0.14)	(0.08)	(0.08)	(0.07)
Births_last5years	-0.243***	-0.275***	-0.130***	-0.127**	0.122	-0.100**	-0.121***	0.390***
	(0.07)	(0.03)	(0.05)	(0.05)	(0.09)	(0.04)	(0.04)	(0.04)
Constant		16.910*	62.936	-95.739	-55.059	-19.303	-19.914	-1,121.78***
		(8.80)	(50.96)	(65.26)	(60.88)	(30.07)	(30.13)	(16.39)
Observations	24,813	24,753	6,840	6,726	11,817	11,741	11,749	24,801

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

* Notes: Model controlled other factors for region, household size, whether mothers have job, age difference with spouse, watching television, whether mother smokes, year of survey, whether the pregnancy was wanted, number of total children, mothers' year of birth, linear trend nearby age 12, mothers' year of the first birth, and different ranges of age exclude age 13 and 14 (complete table provided by request). For evaluating self-care index, we used ordered logit regression.

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