

# Predictors of time to first birth after first marriage among women in Uganda

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## Abstract

The objective of this paper was to investigate factors associated with time to first birth after first marriage among women in Uganda. The assessment was made using data sourced from the 2011 Uganda Demographic and Health survey. The analysis was done using a time-to-event approach involving life tables, log-rank and the Cox Proportional Hazards model. In the results, the median time to first birth after first marriage was 2 years (range, 1-36). The key predictors of having a live birth after first marriage were loss of a pregnancy either spontaneously or induced, knowledge of ovulation cycle and late sexual debut ( $p < 0.05$ ). In particular, the chances of first birth after first marriage were lower among women who had ever lost a pregnancy and women having their sexual intercourse at a later age. On the contrary, the chances of having a first child after marriage were higher among women at higher ages at first marriage and those who were aware of their ovulation cycle.

**Keywords:** First marriage, time to first birth, Uganda

## Introduction

The importance of the first child after marriage is recognized in all human societies. As a matter of fact, the joy, happiness and challenges married couples face in life cannot be compared to the occurrence of a first child (Anuwoje & Albert, 2013). In particular, being pregnant for the first time after marriage creates a lot of expectations of a child in the minds of most couples (Ronald & Rindfuss, 1983; Unicef, 2011). Certainly, the first child after marriage acts as a proof of a woman's fertility and serves as an event of great social and individual significance of a woman (Azad, Mohitul & Mohammad, 2013). The study further argues that the first birth after marriage plays a significant role in the future life of each individual woman and her family. It acts as an indicator of output realization after investment usually the bride price paid for having a legal marriage in most developing countries. On the other hand, the first child is also a proof of a man's fertility as well (Fisher, Mugisha & Klatsky, 2012).

In the study about family formation, Baizán, Aassve and Billari (2001) argued that forming first unions and entering parenthood are closely linked events both in terms of their timing over the life course and in terms of the intentions and life plans of individuals. Thus, the waiting time to first birth from first marriage, defined as the time when a couple starts staying together to the occurrence of the first birth, is critical to the sustainability of the union. Some scholars have showed that the interval from marriage to first

birth of a woman can determine the happiness and survival of a marriage (Martin 2002). On the other hand, delayed births can lead to contention, suspicions, even marriage breakups and disappointment (Dana, 2005). As a matter of fact, delay in having a child, especially among married women who are not using any family planning method is one of the leading causes of instability in marriage in Uganda (Nabaitu, Bachengana & Seeley, 1994). However it should also be noted that very early births - especially the unexpected and unwanted ones - can do the same or even worse to a couple.

Similar to the situation elsewhere, all communities and ethnic groups in Uganda consider marriage incomplete without children (Otiso, 2006). Everyone is always anxious to know the marriage outcomes of a couple shortly after union. In particular, women are expected to show signs of pregnancy at-least within the first year of marriage as a sign of realization of marriage output. For example, signs of whether the bride is having fever are common questions.

The time to first birth is noted to be highly influenced by several socio-economic, demographic and predisposing factors (e.g., Nath, Singh, Land, & Talukdar, 1993; Singh, Sharat & Narendra, 2011); Nath, Leonetti, & Steele, 2000; Löfstedt, Ghilagaber, Shusheng, & Johansson, 2005). Certainly, the evidence in these studies provide a grounding for understanding the factors associated with the timing of first birth after first marriage. However,

the findings in these studies cannot be entirely applied to women in all countries due to differentials in the socio-demographic and cultural settings of communities. In other words, the extent to which these factors apply to women in Uganda is yet to be established.

### Literature Review and Theoretical Framework

The theory adopted in the study is developed from Bongaarts (1982) model, in a study of the fertility inhibiting effects on intermediate fertility variables. In the fertility model, he assumed background factors, proximate determinants to have an influence on the outcome. He conceptualized that the background factors influence the proximate factors to have an impact on the fertility levels and that the background factors can directly influence the fertility levels. Figure 1 presents the conceptual framework in this study and how they are related. It consists of background factors (demographic and socio-economic factors) and proximate factors (enabling/predisposing factors) that are assumed to be the determinants of the waiting time to first birth after first marriage.

The relevance of prior studies on the predictors of the time to first birth after marriage cannot be under looked. Studies have been done on the factors associated with time to first birth after first marriage the world over and a review of the literature is subsequently presented.

Entry into marriage and adopting parenthood are two separable events, and the timing of each of them may independently affect fertility (Baizan et al, 2001). "Age at first marriage and age at first birth are highly related in part because age at first marriage tends to set a lower limit on the age at which first birth occurs" (Marini, 1981 p.27). According to UBOS and ICF International (2012), the age at which child bearing starts has important consequences for the level of fertility as well as the health and welfare of the mother and the child. The lengthening of the interval between marriage and first birth is an important goal of the state, although it may be in the interest of individual couples (Zhenzhen, 2000). In a retrospective study about the age at marriage and the time to first birth, Nath, Singh, Land, & Talukdar, (1993); Singh, Sharat & Narendra(2011); Nath, Leonetti, & Steele (2000); Gurmu & Etana (2014); Löfstedt, Ghilagaber, Shusheng, & Johansson(2005), found out that age at first marriage significantly determines the risk of bearing a child after first marriage. Women who marry at a lower age at first marriage have a lower chance of bearing their first child compared to women who marry slightly

at a higher age. However a survival analysis on the time to first birth after marriage by Anuwoje and Albert, (2013) contradicted to these findings, arguing that the time to first birth after marriage is independent of the age at first marriage. Also in a study about the changes in marriage age and the first birth interval in China by Löfstedt et al., (2005), it was found out that age at first marriage has no impact on the time to first birth after marriage; UN (1989); Dagne (1994) argue that early marriage particularly child marriage in which girls marry before puberty and are exposed to sexual relations could lead to late entry into motherhood due to its impact on their susceptibility to conceive and sustainability of that marriage. Furthermore, a study by Chung et al,(2006) about the effects of the late marriage of Korean women on the time to first birth after marriage revealed that women who marry at slightly a higher age (beyond 30 years) are more likely to have a long time to first birth after marriage as compared to women who marry at slightly a lower age. Amin and Bajracharya (2011) asserted that in countries where the median age at first marriage is under 17, median time to first birth after marriage is consistently higher than 2 years (24 months). According to Mukherjee & Tacharya (1994), as the beginning of sexual union starts after marriage, one can determine the exposure period between marriage and first birth exactly. This has for a long time encouraged demographers to study the period between marriage and first conception (or birth) for the estimation of fecundity in the western world.

In a study about early marriage and the time to first birth after marriage by Gurmu and Etana (2005) in Ethiopia, it was discovered that the education attainment of a woman has no influence on the length of the time to first birth after marriage. However, Azad et al., (2013) contradicted to these findings arguing that a woman's education level has a strong positive influence on the time to first birth after marriage, whereby women who attain primary or secondary education have higher risk of having first birth after their marriage than their illiterate counterparts. However these findings were in disagreement with the findings of Chung, Lee & Lee, (2006) who in their study about the Effects of the education of Korean women on the first-birth interval found out that women who attain more and more education tend to have a wider time to first birth after marriage compared to their counterparts who attain low or those with no education.

The place of residence has a great impact on the time to first birth after marriage of a woman,

(Nath, Singh, Land & Talukdar, 1993; Gurmu & Etana, 2009, Daury 2012, Zhenzhen, 2000). However, an investigation of the determinants of the time to first birth after marriage by Anuwoje & Albert, (2013) and Chung et al, (2006) revealed that whether a woman stays in an urban area or a rural area her time to first birth after her marriage is not affected.

According to a study about the determinants of the time to first birth after marriage, Daury (2012) found out that the work status of a woman is of great significance towards the length of the time to first birth after marriage, arguing that women who work after their marriage are more likely to have a longer time to first birth after marriage compared to their counterparts who are ever relaxed after their first marriage. However, these findings are contrary to findings of the study made by Azad et al., (2013) when analyzing the determinants of marriage to time to first birth after marriage, who found out that whether a woman works or not after marriage, her chance of having a first child after marriage is not affected. The debatable aspect is whether working after first marriage affects the time to first birth after marriage among women in Uganda.

Daury (2012) also clarified that, media access has a direct significant effect on reproductive information via media where women with access to media like radio, television and newspaper tend to have a shorter first birth interval than women without media access.

The wealth status of a woman and her religion significantly determine the time to first birth after marriage (Pandey, 2001). This was also in support of results from the study by Nath, Land & Goswami, (1999) about the determinants of the first birth interval where it was noted that a married woman's income group greatly influences the time to first birth after marriage; where by women in higher income groups tend to have longer time to first birth after marriage compared to their counterparts who are from the poorest class.

In a study about the Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands by (Katia & Melinda, 2012), it was found out that women employed in jobs with a higher numbers of women (low professional Jobs) have a significantly faster transition to first birth compared to those in jobs that are occupied by lower proportions of women (high professional Jobs).

More studies have been done on the effect of the region of residence and time to first birth. Gurmu and Etana, (2005) in a study about early

marriage and time to first birth after marriage in Ethiopia revealed marked differences in the interval between first marriage and first birth among residents of various regions. However, the potential evidence of this is only limited in those countries where studies have been conducted and it has not yet been discovered in Uganda.

With regard to the age at sexual intercourse Miller and Heaton (2014), in their study of the relationship between the age at first sexual intercourse marriage and the timing of the first birth interval found out that there is a high significant relationship between the age at first sexual intercourse and the time to first birth after marriage adding that early initiation of sexual activity is associated with a relatively slow initial pace of family formation. However this stands a question of investigation in Uganda. Hence the need to investigate the statistical significance of age at first sexual intercourse on the time to first birth after marriage in Uganda.

In a study by Anuwoje and Albert (2013) about the determinants of the time to first birth after marriage, it was found out that pregnancy termination which may be through induced abortion or miscarriages have a great impact on the length of the time to first birth after marriage, adding that "women who have ever terminated a pregnancy had significantly longer delayed time than their counter parts that have never terminated a pregnancy". However the debatable aspect is whether this is also the case with Ugandan women who loss pregnancies spontaneously or through induced abortions.

## **Methodology**

### **Data Source**

The study was based on secondary data sourced from the 2011 Uganda Demographic and Health Survey where a representative sample of 10,089 households was selected. In obtaining the data, a stratified two-stage cluster design was used. In the first stage, 404 enumeration areas were selected from a list of clusters sampled during the 2009/2010 Uganda National Household Survey (UNHS). The clusters in the UNHS were selected based on the 2002 Uganda Population and Housing Census sample frame. In the second stage, a fixed number of households in each cluster were selected from a complete listing of households, which was updated prior to the survey. All households in the 2010 UNHS that were in the 404 EAs were included in the UDHS sample. All women of child bearing age (15-49 years), who were either permanent residents of the households or visitors who slept in the

households the night before the survey, were eligible to be interviewed.

A sample of 8674 women was interviewed based on the women's questionnaire. However, the investigations in this study excluded women who had never been in a union and those had ever been in more than one union, those who had never had sexual intercourse, women using any contraception as well as those who gave birth before their first union. Thus, the illustration in Figure 2 shows that the assessment was based on a sample of 2043 women who were not falling in any of the aforementioned categories.

### Variables and their measurements

The time to first birth after first marriage, the dependent variable, was determined by the period between the age at first marriage and age at first live birth(s). All ever married women who had never had a live birth at the time of the survey were regarded as censored. Their time variable was the difference between their current age at the time of the survey and their age at first marriage. These women were recorded using a status value of zero (0); otherwise, a status value of one (1) was assigned. The independent variables were women's demographic and socioeconomic characteristics (Region of residence, religion, place of residence, partner's education, education level, work status after marriage, number of siblings, and exposure to media) and predisposing factors namely age at first marriage, age at first sex, ever terminated pregnancy and knowledge on ovulation cycle. Worth noting is the variable exposure to media which was assessed using a binary outcome i.e. whether or not a woman was exposed regularly (at-least once a week) to any type of media namely Radio, TV and newspapers.

### Data analysis

The analysis was done using STATA 12.1 at three stages. First, a descriptive summary of women by socio-demographic, socio-economic

and predisposing factors was done using frequency distributions. Further, descriptive summary of the time to first birth after first marriage was made using the Kaplan-Meier survival estimate. In addition, a life table technique was used to summarize the survival function using the Kaplan Meier product limit estimate (Kaplan & Meier, 1958).

Second, differentials in time to first birth were investigated by socio-economic, predisposing and demographic factors using a Log rank Chi-square test (Peto & Peto, 1972). The test was used to test the equality of the time to first birth of the various categorical variables. This was geared towards determining whether there is a significant difference between the time to first birth from first marriage by women's socio-economic and demographic characteristics.

Third, the net-impact of the independent variables on time to first birth after first marriage was assessed using a Cox Proportional Hazard model. The model was used because it does not assume a functional form for the baseline hazard rate. Associations were established in the analysis at 1% and 5% levels, unless otherwise stated.

### Results

The subsequent sections presents results on demographic and socio-demographic characteristics of women, predisposing factors, and time to first birth after first marriage among women in Uganda. Further, differentials in the time to first after first marriage are assessed by the aforementioned variables in bivariate and multivariate levels.

### Characteristics of women

A descriptive summary of women by their socio-economic and demographic as well as predisposing factors as is presented in Tables 1 and 2.

**Table 1: Distribution of women by socio-economic factors and demographic factors**

Socio-economic factors	Frequency(n=2043)	Percentage (%)
Religion		
Catholic	982	48.1
Protestant	573	28.1
Muslim	224	11.0
Others	264	12.9
Place of residence		
Rural	1,637	80.1
Urban	406	19.9
Work status		
Worked	1,554	76.1
Did not work	489	23.9

Occupation		Not working	399	19.5
		Agriculture-self employed	1,020	49.9
		Agriculture-employee	114	5.6
		Sales and services	442	21.6
Education level		No education	435	21.3
		Primary	1,212	59.3
		Secondary	309	15.1
		Tertiary	87	4.3
Media access (radio, television & newspaper)		Has access	1,771	86.7
		Has no access	272	13.3
Partner's education		No education	322	15.8
		Primary	1,024	50.1
		Secondary	510	25.0
		Higher	187	9.2
Wealth index		poor	987	48.3
		Middle	358	17.5
		Rich	290	14.2
		Richest	408	20.0
Region			420	20.6
		Eastern	384	18.8
		Northern	464	22.7
		Western	775	37.9
Number of siblings		0-4	388	19.0
		5-9	1,362	66.7
		10 and above	293	14.3

According to Table 1, the characteristics of women assessed in the study can be categorized as predominantly rural women (80.1%); the highest proportion had primary as their highest level of education (59.3%), followed by 15.1% and 4.3% with secondary and post secondary education while the rest had no formal education. A similar pattern was exhibited with regard to the highest education level of partners. About nine-in-every ten women (86.7%) were exposed regularly to media. The highest proportion were women from the poorest wealth quintile (28.6%), followed by 20.0% and 19.7% in the richest and poorer quintiles while the rest were women in the middle (17.5%) and richer (14.2%) wealth quintiles. Pertaining to the number of siblings, majority (66.7%) had between 5-9 children while the rest had 0-4 children (19.0%) and at-least 10 children (14.3%). About three-in-every ten (31.9%) were

women from the western region while the rest were those from Northern (22.7%), Central (20.6) and Eastern (18.8%) regions. Regarding occupation, slightly more than a half of women were employed in agriculture (55.5%), followed by 21.6% employed in sales and services while the rest were not employed. Majority of the women had some knowledge on the ovulation cycle (71.4%). The Table further shows that many of the women had never had a pregnancy termination (68.5%). Regarding age at first union, results in Table 2 indicate that majority of the women got into their first union when they were between 15-19 years (75.2%), while a very small proportion of 0.7% joined cohabitation when they are between 10-14 years. Majority of the women had their first sex between the age of 16 and 18 (52.6%) while a small proportion engaged into first sex at less than 16 years.

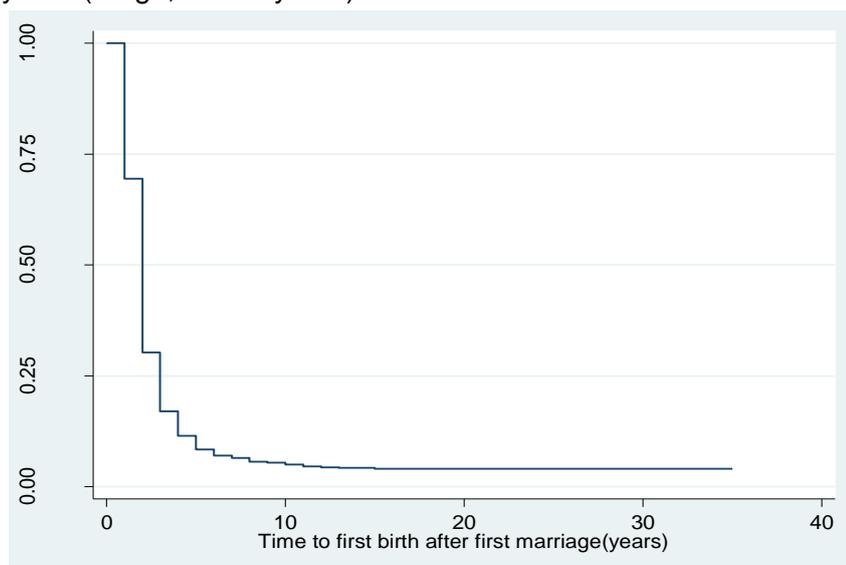
**Table 2: Distribution of women by predisposing factors**

Enabling factors / predisposing factors	Frequency(n=2043)	Percentage (%)
Age at first marriage	10-14	0.7
	15-19	75.2
	20 and above	
Age at first sex	<16	20.7
	16-18	52.6

	19 and above	546	26.7
Knowledge on ovulation cycle	Knows	1,458	71.4
	Don't know	585	28.6
Ever had a pregnancy termination	No	1,400	68.5
	Yes	643	31.5

### Time to first birth after first marriage

The illustration in Figure 3 shows that the median time to first birth after first marriage is about 2 years (range, 0 – 36 years).



**Figure 3: Survival curve for the time to first birth after First marriage.**

In addition to the illustration in Figure 3, a life table technique was used to describe the distribution of time to first birth from marriage. From the results in Table 3, at least 30% of married women gave birth in their first year of marriage ( $F(t)=0.315$ ). And a very big proportion (70%) fail to deliver ( $s(t)=0.685$ ). This may represent the proportion of the few women who get pregnant with in the first three months of their marriage. By the end of the third year of marriage, up to 84% of the married women had their first birth (probability=0.837).

From the hazard distribution, the chances of a woman having her first birth is very high within the second, third fourth and fifth years of marriage after which they become fluctuating

declining until the fifteenth year in marriage beyond which the chances of a married woman having her first child after marriage tend to zero this may imply that it is seen as a surprise for a married woman to get live birth after the fifteenth year in marriage, and beyond this time (fifteenth years' duration in marriage) married couples and their relatives lose hopes of having a child). The married woman's high chances of giving birth after her marriage is between the second and third year where the chances of a woman, who has never given birth before is about 61% , followed by the fourth and fifth year which is at least 35%. All these high chances with in these years are highly likely to be attributed to the pressure put on couples to bear children.

### Predictors of time to first birth after first marriage

**Table 4: Regression estimates of time to first birth after first marriage**

Women characteristics	HR	Std. Err	p-value
<b>Religion</b>			
Catholic <sup>†</sup>	1.000	-	-
Protestant	0.898	0.054	0.073
Muslim	0.884	0.075	0.145

Others	0.953	0.075	0.539
<b>Residence</b>			
Urban <sup>†</sup>	1.000	-	-
Rural	1.062	0.090	0.477
<b>Woman's occupation</b>			
Not working <sup>†</sup>	1.000	-	-
Professional/technical/managerial	0.994	0.191	0.973
Agriculture-self employed	1.151	0.081	<b>0.046</b>
Agriculture-employee	1.012	0.122	0.922
Sales and services	0.956	0.075	0.565
<b>Partners education</b>			
No education	1.000	-	-
Primary	1.044	0.080	0.573
Secondary	0.988	0.089	0.897
Tertiary	0.936	0.116	0.594
<b>Age at first sexual intercourse</b>	0.912	0.018	<b>0.001</b>
<b>Woman's Education level</b>			
No education <sup>†</sup>		-	-
Primary	1.100	0.075	0.158
Secondary	1.130	0.115	0.230
Tertiary	0.891	0.188	0.583
<b>Ever terminated a pregnancy</b>			
No <sup>†</sup>	1.000	-	-
Yes	0.447	0.027	<b>0.001</b>
<b>Wealth index</b>			
Poorest <sup>†</sup>	1.000	-	-
Poorer	1.052	0.082	0.512
Middle	1.210	0.123	0.061
Richer	1.013	0.144	0.926
Richest	1.091	0.168	0.572
<b>Region</b>			
Central	1.000	-	-
Eastern	1.044	0.090	0.613
Northern	1.064	0.099	0.503
Western	1.015	0.080	0.855
<b>Age at first marriage</b>	1.095	0.021	<b>0.001</b>
<b>Knowledge on ovulation cycle</b>			
Don't know <sup>†</sup>	1.000	-	-
Knows	1.174	0.066	<b>0.004</b>

<sup>†</sup> is a Reference category, the assessment was based on a cox proportional hazards model where  $n=2,043$  and  $P<0.05$ ; HR is the hazard ratio; Std. Error is the standard error in HR

The findings show that having lost a pregnancy, woman's occupation, woman's knowledge on ovulation cycle, age at first marriage, age at first sexual intercourse are significantly associated with the time to first birth after marriage ( $p < 0.05$ ). In particular, the risk of first birth after first marriage increases with age at first marriage. In other words, women who get married at a relatively higher age are more likely to have a relatively short time to first birth after marriage as compared to those who marry at a relatively early age. High or increasing age at first sex reduces the chances of bearing a child for the first time by about 5%. The chance of bearing a child after marriage was at least 17% higher in women who have knowledge on the ovulation cycle as compared to women who are ignorant about the ovulation cycle after controlling for other factors. Loss of pregnancy lowers the chance of bearing a child after marriage there by

widening the time to first birth after marriage. The risk of giving birth to a live baby for women who lost pregnancy either spontaneously or not was 56% lower than women who had no pregnancy termination. Women who were self-employed in the agriculture sector had at least 15% higher risk of having a child earlier after their first marriage compared to women who were not working.

### Discussion

In this study, we investigate factors associated with time to first birth after first marriage in Uganda. The predictors of the time to first birth after marriage were the age at first sex, the age at first marriage, woman's knowledge on the ovulation cycle, ever lost a pregnancy either spontaneously or induced abortion, the religion of a woman and the woman's occupation. Chances of having a first child after marriage

were higher among women at higher ages at first marriage and women who were aware of their ovulation cycle. On the other hand, the chances were lower among women who had ever lost a pregnancy either spontaneously or induced abortion or miscarriages, and among women having their sexual intercourse at a later age.

The illustration in Figure 4 demonstrates that increasing age at first marriage increases the chance of having a first child; implying a short time to first birth after marriage. The chance of having a first child was high among women who marry between 20 and 31 years. The chances of having a child for women who marry beyond 31 years go on reducing. This could be attributed to the fact that women tend to be free from adolescent sub-fecundability at a relatively higher age at first marriage, which is the variable period of complete sterility after puberty. Women who married at slightly a lower age were more likely to enter into motherhood very late and this may be due to its impact on their susceptibility to conceive early and sustainability of that marriage (Nath et al., 1993; Singh et al., 2011; Nath et al., 2000; Lofseted et al., 2005).

From Figure 5, increasing age at first sex lowers the chance of having a first child thereby increasing the time to first birth after marriage. The findings of this study are in agreement with evidence by Miller & Heaton, (2014) where women who engage into sexual activity at an early age have a slightly shorter time to first birth after marriage as compared to women who take long into sexual relationships.

Losing a pregnancy through induced abortions or miscarriages lowers the chance of bearing a child after marriage there by widening the time to first birth after marriage. The chance of giving birth to a live baby for women who had pregnancy terminations through abortions or those who got miscarriages was 56% lower than women who had no pregnancy termination. This implies that women who enter marriage when having had a pregnancy termination are more likely for face delayed births compared to women who never terminated pregnancies. This could be attributed to the subsequent reproductive complications women go through after abortion. These findings are consistent with evidence by Anuwoje and Albert (2013) who argued that termination of pregnancy significantly delays chances of bearing a child as compared to women who do not have induced abortions or women who do not get miscarriages.

The chance of bearing a child after marriage was almost 16% higher among women who

have knowledge on the ovulation cycle as compared to women who are ignorant about the ovulation cycle after controlling for other factors. This should not be surprising since woman aware of when to get pregnant are more likely to plan for their first child; which tends to reduce their birth interval. On the contrarily, a woman's ignorance about when to become pregnant may lengthen the time to first birth after marriage.

In conclusion, in order to mitigate the negative effects of delayed births after marriage, there is need to sensitize women and even young girls on the dangers of induced abortions on their future fertility life and for the case of pregnancy terminations through miscarriages, the causes of miscarriages should be treated and women should be encouraged to go for antenatal care visits regularly (at least four times during pregnancy). Furthermore, the law of abortion should be strictly implemented by the concerned authorities. This will reduce abortions and will help in the reduction of the frustrations men face when their partners delay to bear children after marriage. Since at a higher age at first marriage women's chances of bearing children are slightly high, strict laws against early marriages should be setup and implemented. Furthermore early marriages should be discouraged as it has been proved by UNICEF, (2001) that they cause child mortality and morbidity, abuse of girls' human rights and they also cause morbidity during pregnancy as well as leading to premature births and stillbirths. Also based on the findings of this study, there is need to provide information on reproductive health and provide girls and women with basic life skills as a way of sensitizing them on time when they can get pregnant. This will enhance their chances of becoming pregnant when they wish to and avoiding it when they do not need as a way of promoting marriage sustainability

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### References

- Amin, S., & Bajracharya, A. (2011). *Marriage and First Birth Intervals in Early and Late Marrying Societies: An Exploration of Determinants* (pp. 1–26). Washington, D.C: population council.
- Anuwoje, I., & Albert, L. (2013). Survival analysis of time to first birth after marriage. *Research on Humanities and Social Sciences*, 3(12), 117–126.

- Azad, M.R., Mohitul, A.M. & Mohammad, M.A. (2013). Analysis of the determinants of marriage to first birth interval in Bangladesh. *International Journal of Management and Sustainability*, 2(12), 208–219.
- Baizán, P., Aassve, A. & Billari, F. C. (2001). Union formation and first birth in Spain. Cohabitation, Marriage and First Birth: *The Interrelationship of Family Formation Events in Spain*, 49, 0–37. Retrieved from [www.demogr.mpg.de/papers](http://www.demogr.mpg.de/papers)
- Bongaarts, J. (1982). The fertility-inhibiting effects on the intermediate fertility variables. *Studies in Family Planning*, 13(6), 179-189.
- Bongaarts, J. and Greenhalgh, S. (1985). An alternative to the One-Child Policy in China. *Popul Dev Rev*, 11, 585 - 617.
- Chung, W., Lee K & Lee S. (2006). Effects of the late marriage of Korean women on the first-birth interval. *Journal of Preventive Medicine and Public Health*, 39(3):213-20
- covariates: parsimonious parametric
- Cox, B.Y.D. R. (1972). Models and Life-Tables Regression. *Journal of Royal Statistical Society. Series B*, 34(2), 187–220.
- Cutler, S.J. & Ederer, F. (1958).Maximum utilization of the life table method in analyzing data. *Journal of Chronic Diseases*, 8(1), 699-712.
- Dagne, H. (1994). Early Marriage in Northern Ethiopia. *Reproductive Health matters*. 4, 35-38.
- Dana, S. (2005). Delayed child bearing: Understanding psychological implications. Retrieved from: [http://www.redorbit.com/news/health/284538/delayed\\_childbearing\\_underestimated\\_psychological\\_implications/](http://www.redorbit.com/news/health/284538/delayed_childbearing_underestimated_psychological_implications/)
- Daury, S.C. (2012). *Bayesian Analysis of Cox Proportional Hazards Model for Time to First Birth after Marriage of Women in Bangladesh*. Dhaka: Population council
- Gehan, E. A. (1969). Estimating survival functions from the life table. *Journal of Chronic Diseases*, 21(9), 629–44. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/5770430>
- Gurmu, E., & Etana, D. (2009). *Early Marriage and First Birth Interval in Ethiopia: Evidences from EDHS 2005*. Addis Ababa: institute of population studies.
- Gurmu, E. & Etana, D. (2014). Age at first marriage and first birth interval in Ethiopia: analysis of the Roles of social and demographic factors: *African Population Studies*, 28(3)
- Harms, R.W. (1998). Female fertility: why lifestyle choices count. *Mayo Foundation for Medical Education and Research*. Retrieved from: <http://www.mayoclinic.org/healthy-living/getting-pregnant/in-depth/female-fertility/art-20045887>. *Health Matters*. 4(1), 35-38.
- Kalbfleisch, J.D., & Prentice, R.L. (1980): *The Statistical Analysis of Failure Time Data*. Canada: John Wiley & Sons.
- Fisher, T.E., Mugisha, J. & Klatsky, P (2012). Male factor infertility in Uganda: results of a qualitative study of men's beliefs. *Fertility and sterility*, 98(3): S247 doi: <http://dx.doi.org/10.1016/j.fertnstert.2012.07.899>
- Katia, B. & Melinda C.M. (2012). The Influence of Educational Field, Occupation, and Occupational Sex Segregation on Fertility in the Netherlands. *European Sociological Review*, 29(4), 720-742
- Kaplan, E.L. and Meier, P. (1958).Non applied estimation from incomplete observations. *Journal of the American Statistical Association*.53(1), 457-481
- Lee, T.E. (1992). *Statistical methods for survival data analysis*. 2nd Edition, New York: JOHN Wiley and Sons.
- Löfstedt, P., Ghilagaber, G., Shusheng, L., & Johansson, A. (2005). Changes in marriage age and first birth interval. *Marriage Age and First Birth Interval in China*, 36(5), 1329–1338.
- Marini, M. M. (1981). Effects of the Timing of Marriage and First Birth on Fertility. *Journal of Marriage and Family*, 43(1), 27–46. Retrieved from <http://www.jstor.org/stable/351415>
- Martin, S. P. (2002). Delayed Marriage and Childbearing: Implications and Measurement of Diverging Trends in Family Timing. Maryland: department of sociology and Maryland population research center.
- Miller, B. C., & Heaton, T. B. (2014). Age at First Sexual Intercourse and the Timing of Marriage and Childbirth. *Journal of Marriage and Family*, 53(3), 719–732.
- Mukherjee, S., & Tacharya, B. N. B. (1994). Distribution of Time of First Birth in Presence of Social Customs Regulating Physical Separation and Coital Frequency. *Mathematical Biosciences*, 31(1996), 1–21.
- Nabaitu J., Bachengana, C., and Seeley J. (1994). Marital instability in a rural population in south-west Uganda: Implications for the spread of HIV-1 infection. *Africa (Lond)*, 64(2):243-51.retrieved from: <http://www.ncbi.nlm.nih.gov/pubmed/12320088>
- Nath, D. C., Leonetti, D. L., & Steele, M. S. (2000). Analysis of birth intervals in a non-

contracepting indian population: An evolutionary ecological approach. *Journal of Biosciences*, 32(3), 343–354.

Nath, D. C., Singh, K. K., Land, K. C., & Talukdar, P. K. (1993). Age of marriage and length of the first birth interval in a traditional Indian society: life table and hazards model analysis. *Human Biology*, 65(5), 783–797. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8262506>

Nath, D.C., Land, K.C. & Goswami, G. (1999). Effects of the status of women on the first-birth interval in Indian urban society. *Journal of Biosocial Science*, 31(1), 55-69. retrieved from: <http://www.ncbi.nlm.nih.gov/pubmed/10081237>

Otiso, K.M. (2006). Culture and customs of Uganda. *Culture and Customs of Africa*. 1(1) 1530-8367.

Pandey, A. (2001). Some Survival Models to Study the Human Reproduction Process in India. New Delhi: Institute for Research in Medical Statistics.

Peto, R., & Peto, J. (1972). Asymptotically efficient rank invariant test procedures. *Journal of the Royal Statistical Society*, 135(2), 185–207. Retrieved from <http://links.jstor.org/sici?sici=00359238%281972%29135%3A2%3C185%3AAERITP%3E2.0.CO%3B2-Q>

Retrieved from: <http://www.ncbi.nlm.nih.gov/pubmed/16764495>

Singh, K.K., Suchindran, C.M., Singh, V. & Ramakumar, R. (1992). Age at return marriage and timing of first birth in India's Uttar Pradesh and Kerala states. *Social Biology*, 39(3-4):292-8.

Singh, S. N., Singh, S. N., & Narendra, R. (2011). Survival analysis of duration of waiting time to conception. *Electronic Journal of Applied Statistical Analysis*, 4(2), 144–154. doi:10.1285/i20705948v4n2p144

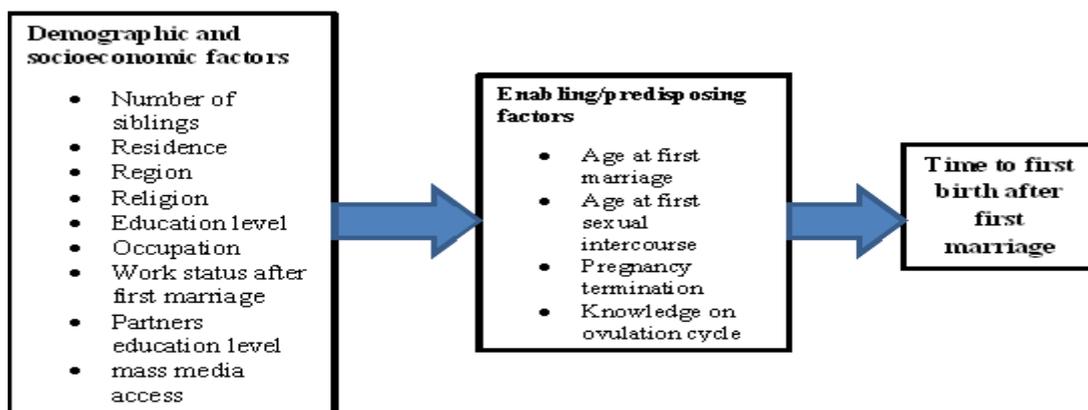
UBOS & ICF International. (2012). *Uganda Demographic and Health Survey 2011*. Kampala: Macro International.

Unicef. (2001). *The impact of early marriage*. Florence, Italy: Inocent Research Center.

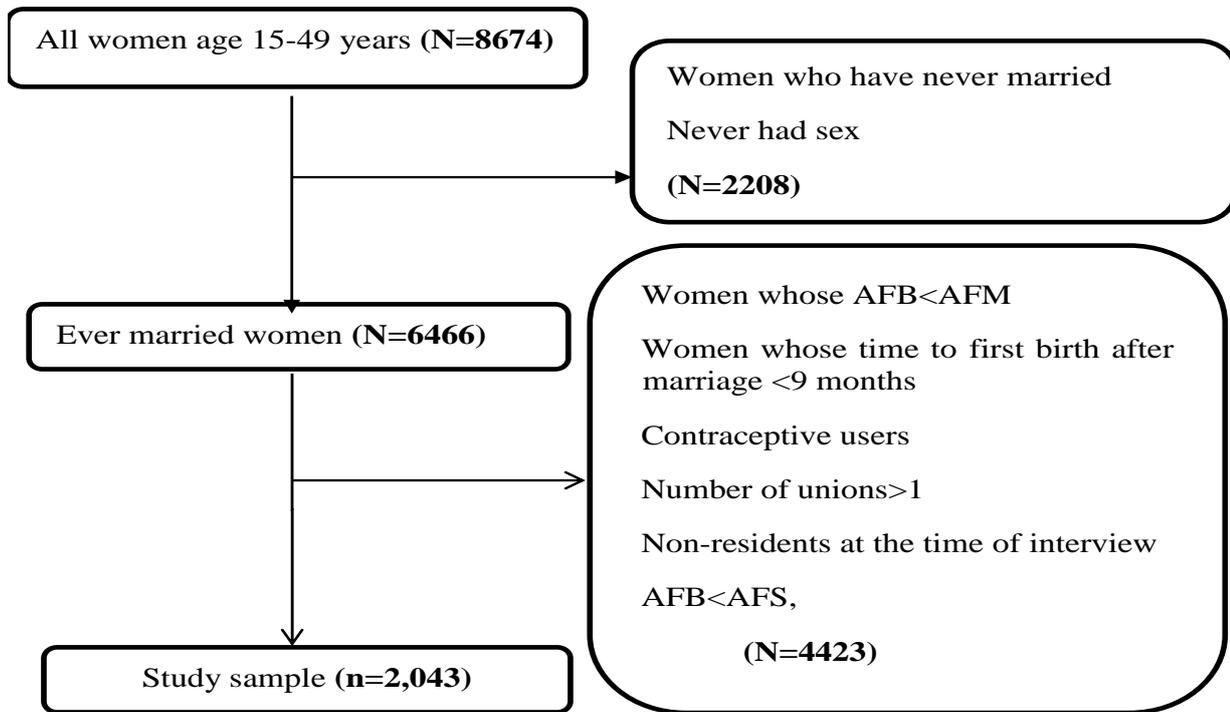
United Nations. (1989). *Adolescent Reproductive Health: Evidence from Developing Countries*. Vol.II. New York.

WHO, (2010). Mother or nothing: the agony of infertility. Vol 88: 877-953. Retrieved from: <http://www.who.int/bulletin/volumes/88/12/10-011210/en/>

Zhenzhen, Z. (2000). Social – demographic influence on first birth interval in China, 1980 – 1992. *Journal of Biosciences*, 32(3), 315–327. Retrieved from [http://journals.cambridge.org/abstract\\_S0021932000003151](http://journals.cambridge.org/abstract_S0021932000003151)



**Figure 1: Diagrammatic representation of predictors of time to first birth after first Marriage modified from Bongaarts model (1982)**



**Figure 2: Description of the sample adopted for the study**

**Table 3: Life table for time to first birth after marriage**

Time intervals (years)	Total	Number that give birth	Number censored	s(t)	h(t)	F(t)	Std.Err for s(t) & F(t)	Std.Err for h(t)
0-2	2043	625	117	0.685	0.187	0.315	0.010	0.007
2-4	1301	951	107	0.163	0.616	0.837	0.009	0.016
4-6	243	119	27	0.078	0.350	0.922	0.007	0.030
6-8	97	22	9	0.060	0.135	0.940	0.006	0.029
8-10	66	11	5	0.049	0.095	0.951	0.006	0.029
10-12	50	7	8	0.042	0.082	0.958	0.006	0.031
12-14	35	3	4	0.038	0.048	0.962	0.006	0.028
14-16	28	1	3	0.037	0.019	0.963	0.006	0.019
16-18	24	0	4	0.037	0.000	0.963	0.006	0.000
18-20	20	0	2	0.037	0.000	0.963	0.006	0.000
20-22	18	0	1	0.037	0.000	0.963	0.006	0.000
22-24	17	0	4	0.037	0.000	0.963	0.006	0.000
24-26	13	0	3	0.037	0.000	0.963	0.006	0.000
26-28	10	0	3	0.037	0.000	0.963	0.006	0.000
30-32	7	0	5	0.037	0.000	0.963	0.006	0.000
32-34	2	0	1	0.037	0.000	0.963	0.006	0.000
34-36	1	0	1	0.037	0.000	0.963	0.006	0.000

**Table 4: Differentials in time to first birth by demographic, socio-economic and predisposing factors**

Log rank test			
Categorical variables	df	Log rank $\chi^2$	p-value

Religion	3	12.43	0.001
Place of residence	1	24.17	0.001
Work status	1	1.24	0.265
Woman's occupation	4	43.15	0.001
Education level	3	15.76	0.002
Media(radio, television & newspaper)	1	0.17	0.684
Partner's education	3	18.62	0.001
Wealth index	3	39.44	0.001
Literacy level	2	0.75	0.686
Region	3	34.08	0.001
Knowledge on ovulation cycle	1	19.00	0.001
Ever had a pregnancy termination	1	333.07	0.001

#### Cox proportional hazards model

Continuous variables	HR	Std. Err.	p-value
Age at first sex	0.976	0.008	0.002
Number of siblings	1.002	0.009	0.851
Age at first marriage	0.994	0.007	0.395

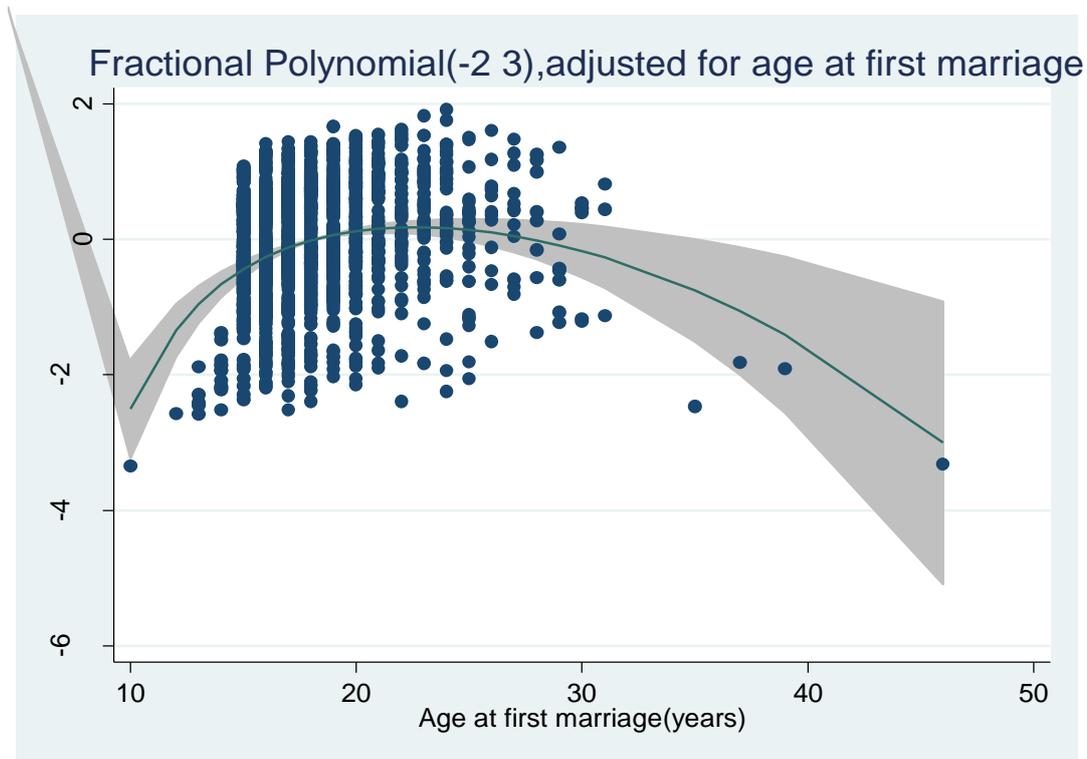
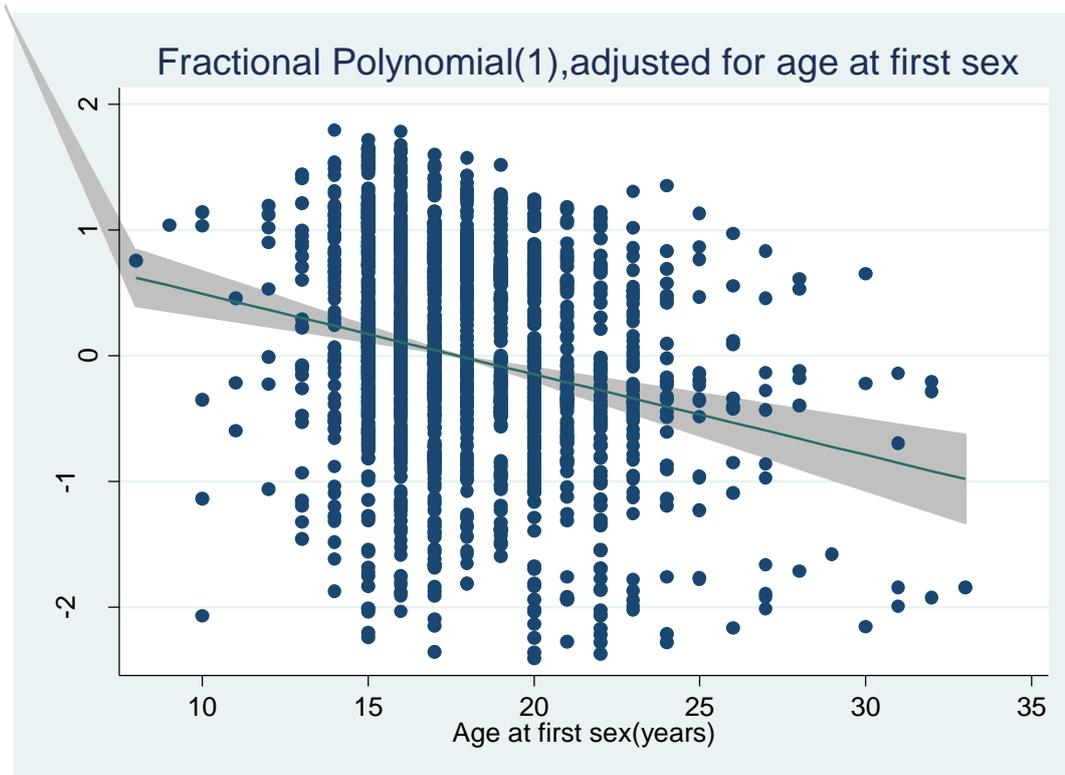


Figure 4: Adjusted fractional polynomial for age at first marriage



**Figure 5: Adjusted fractional polynomial for age at first sexual intercourse**