Determinants of Fertility Change in the Period 2006-2011 among Women Aged 15-49 Years in Uganda

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ABSTRACT

Background: Studies on fertility in Uganda have highlighted the importance of demographic and socioeconomic factors in fertility change but have not isolated the portion of fertility change attributable to changing characteristics of women from that due to changing behavioral effects.

Methods: Using DHS survey data for Uganda, we decomposed the 2006-2011 change in fertility among women aged 15-49 years into portions attributable to changing characteristics of women and changing behavioral effects.

Results: The overall change in fertility was largely attributed to changing characteristics of women aged 15-49 years in the 2006-2011 period rather than changing behavioral effects. Change in education level attained and age at first marriage contributed the biggest percentage to change in fertility between 2006 and 2011. Other significant contributors were changes in; family size preference, women's working status, contraceptive use, exposure to family planning messages, place of residence and age at first sex.

Conclusion: This paper suggests that improvements in social, economic and demographic characteristics of Ugandan women are the key drivers of the reduction in fertility levels in Uganda. With continued improvement in secondary school completion, age at first marriage, contraceptive use and family size preferences will continue to be an important factor of Uganda's fertility transition. It is imperative for government and other stakeholder to work out appropriate strategies to ensure that girls complete at least secondary level of education.

Key words: Change in fertility, Children ever-born, Decomposition, Socioeconomic factors, Demographic factors, changing characteristics, changing effects, Uganda.

INTRODUCTION

Fertility transition in Asia and Latin America and sub-Saharan Africa, respectively began in the mid-1970s, and 1990s (Beatty, 2016). Whereas Asia and Latin America have had rapid fertility declines, the declines in Africa and particularly Sub-Saharan Africa have been modest (United Nations, 2015). For example between 1950 and 2010, fertility in Asia and Latin America declined from 5.8 and 5.9 respectively to an equal of about 2.3 children per woman while Africa's fertility declined from 6.6 to 4.9 children per woman in the same period (United Nations, 2013).

Changes in fertility are strongly affected by personal attitudes, preferences, and motivations of women and their partners as shaped by the social and economic contexts within which they live (Swanson & Stephan, 2004). For instance; changes in fertility are influenced by changes in family size desires, contraceptive access and use and age at first marriage (Ramsay, 2014; Rutayisire, Hooimeijer, & Broekhuis, 2014; Westoff, Bietsch, & Koffman, 2013). Research in sub Saharan Africa has shown that that increasing women's education a very important factor contributing to fertility decline (Shapiro, 2012; Shapiro & Tenikue, 2017). This paper adopts and modifies Ezeh, Mberu & Emina (2009) framework for analyzing fertility patterns. According to the framework, three models; the reproductive behavior; the socio-economic and the institutional models can be used to explain changes in fertility in Sub Saharan Africa. The socio-economic model posits that differentials and changing fertility patterns are largely due to socio-economic and socio-cultural differences among groups while the institutional model focuses on the changes in the reproductive health service environment described by changing; patterns of unmet need for family planning, levels of unwanted childbearing, knowledge of family planning methods or sources, attitudes towards family planning, source of family planning services, among others (Ezeh et al., 2009). On the other hand, the reproductive behavior model asserts that changes in age at marriage, start of motherhood, birth intervals, out-of-wedlock childbearing, and contraceptive use result into fertility change.

Whereas some studies had reported that Uganda experienced a stall in fertility transition, recent evidence showed that the country was at the onset of fertility transition (Kabagenyi, Reid, Rutaremwa, Atuyambe, & Ntozi, 2015). With a fertility rate of 5.8 children per woman in 2016, Uganda had the tenth highest fertility in the world (Population Reference Bureau, 2016). Due to the persistent high fertility, Uganda's population has grown from 4.8 million people in 1950 to

16.7 in 1991 to 24.3 million in 2002 and to 34.6 million in 2014 (UBOS, 2016). Uganda's persistent high fertility has been attributed to low level of contraception among women (Haub & Gribble, 2011). High fertility poses health risks for children and their mothers, negatively affect schooling, slow economic growth and exacerbate environmental threats (Chowdhury, 2010).

The results of the 2016 Uganda Demographic and Health Survey indicated that the total fertility rate has continued its downward trend; reducing from 6.7 in 2006 to 6.2 in 2011 and to 5.4 children per woman in 2016 (UBOS & ICF, 2018). Previous studies on fertility change in Uganda have documented differential change in fertility among population sub groups. For instance faster decline is shown among the most educated women; those residing in urban areas and women in specific regions of the country (Lubaale, Kayizzi & Rutaremwa, 2007; Ezeh, Mberu & Emina, 2009). These studies have highlighted the influence of women's social, economic and demographic characteristics such as women's education on fertility levels. Education has been pointed out as one of the factors that have influenced fertility declines in urban Uganda (Shapiro & Tenikue, 2017).The studies however have not isolated the change in fertility that is attributable to changing characteristics of women from that which is due to the changing effects. In this paper, we conducted a decomposition analysis of change in fertility in Uganda between 2006 and 2011. The paper specifically portioned the 2006-2011 variation in fertility into a component that can be attributed to changing socioeconomic and demographic characteristics of women aged 15-49 years and that which can be attributed to the changing behavioral effects of the characteristics on children ever born in the period.

METHODS

This paper analyses secondary data sourced from the Demographic and Health Surveys (DHS) for Uganda conducted in 2006 and 2011. The surveys were nationally representative cross-sectional surveys that collected comparable demographic and health data on women aged 15-49 years. The 2006 and 2011 samples were obtained using a two-stage cluster sampling process beginning with the selection of clusters or enumeration areas followed by the selection of households from each cluster (UBOS & ICF International Inc., 2012). We obtained approval to access and use the datasets from Measure DHS.

We only included women who had ever had sex in the two surveys since only these had known exposure to pregnancy and childbirth. Swanson & Stephan (2004) recognize that due to the growing tendency to have children in non-marital unions, it is necessary for the analysis of fertility to go beyond the bounds of traditional or legal marriages. In the DHS, women were asked *"how old were you when you had sexual intercourse for the very first time?"* This question was about the sexual activity of women. It is however possible that there was underreporting and misreporting as the question may be sensitive to young women and most especially unmarried adolescents who may not feel comfortable to disclose freely information related to sexual activities. It is thus possible that women who had ever had sex but did not declare so were excluded. The data was first weighted to ensure representativeness of the sampled data. Figure 1 below is a flow chart that shows how the sample was derived

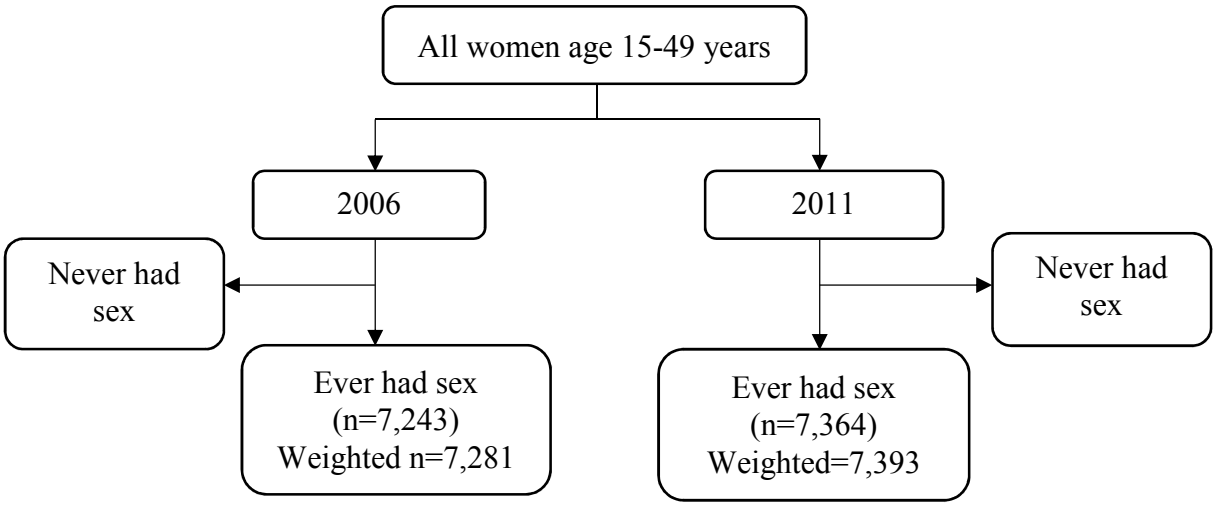


Figure 1: Derivation of the study sample

The dependent variable used in the study was the number of children ever born (CEB) to a female respondent in the two surveys. The independent variables were; age (current age of respondent in 5-year groups), education (highest education level attained by the respondent), residence (type of place of residence of respondent), religion (religion of respondent), wealth quintile (household wealth index), sex of household head (sex of the head of the household), having co-wives (whether the respondent is in a polygynous union or is aware of other cowives), working status of women (whether the respondent is currently working or not), exposure to family planning messages (whether respondent heard about FP on radio, TV and newspaper or not), knowledge about contraceptives (whether respondent has knowledge of any family

planning method or not), source of contraceptive (the last source of modern family planning methods for users or respondent is non-user), age at first sex (age of the respondent at first sexual intercourse), ideal family size (Ideal number of children the respondent would have liked to have irrespective of number she already has), age at first marriage (age at first start of marriage or union), marital status (current marital status of the respondent) and contraceptive use (current use of any contraceptive method).

In our analysis, we first described the composition of women by selected socioeconomic and demographic characteristics between 2006 and 2011. Secondly, a Poisson regression was run for each survey period to find out the factors associated with number of children ever born. The data was first weighted using a weighting variable generated using the sample weight variable in the DHS data. The weighting took into account the complex sample design used in the DHS**.** We controlled for the current age of the woman of reproductive age because the number of children ever born increases with the age. In addition, we controlled for marital status since marital status significantly related to the number of children ever born as married or formerly married women are more likely to have more children ever born than the never marrieds. The coefficients were exponentiated to yield incident rate ratio (IRR) to ease interpretation of the results. The incident rate ratio explains how changes in X (independent variable) affect the rate at which Y (CEB) occurs. The regression equation is as below;

$$\ln(\mu_i) = \alpha + X_i\beta_i + age + marital\ status \quad (1)$$

Where, $\mu_i$is the expected number of children born to a respondent based on the respondent's demographic and socioeconomic characteristics; X_i are independent variables; α is a constant and β_i represents coefficients associated with the independent variables. Age is the current age of the woman while marital status is the current marital status of the woman.

Finally, we applied a nonlinear multivariate decomposition (mvdcmp) analysis technique to portion change in mean number of children ever born between 2006 and 2011 into components attributable to change in distribution of selected characteristics of women as well as change in effects of the characteristics. The mvdcmp technique also partitions the two components into portions that represent the unique contribution of each predictor to each of the two components in a detailed decomposition (Powers, Yoshioka, & Yun, 2011). The overall contribution of a

characteristic to the difference in mean number of children ever born is obtained by summing the percentages for the various categories of the characteristic. For instance, change in fertility may be due to differences in distribution of women by education level attainment and also due to the effects of education between the surveys. The decomposition equation is as below

$$\overline{Y_B} - \overline{Y_A} = \left\{\overline{F(X_A\beta_A)} - \overline{F(X_B\beta_A)}\right\} + \left\{\overline{F(X_B\beta_A)} - \overline{F(X_B\beta_B)}\right\} \quad (2)$$

The summarized form of equation 2 is as in equation 3

$$\overline{Y_B} - \overline{Y_A} = \quad E \quad + \quad C \quad (3)$$

Where; $\overline{Y_B} - \overline{Y_A}$ is the Mean difference in children ever born between Year B (2011) and year A (2006), $F(\cdot)$ is a logarithmic function mapping a linear combination of X ($X\beta$) to Y, X represents predictors and β represents regression coefficients. The summarized component E refers to the part of the change attributable to changing characteristics while the C component refers to the part of the change attributable to changing behavioral effects of characteristics.

RESULTS

Changes in the socioeconomic and demographic characteristics of women

We analyzed selected demographic and socioeconomic characteristics of women to find out the changes in the characteristics between the two surveys. Our results indicate that the percentage of women by age, education level, religion, current working status, co-wife status, exposure to family planning messages, source of modern family planning methods, knowledge of any family planning methods, contraceptive use, age at first sex, family size preference and age at first marriage in 2006 was significantly ($p<0.05$) different from that of 2011. The findings on the distribution of women by selected socioeconomic and demographic characteristics of women and the associated difference in proportions between 2006 and 2011 are presented in Table 1

Table 1: Distribution of women by selected characteristics in 2006 and 2011

Variable	n=7281 2006 (%)	n=7393 2011(%)	Difference (%)	p-value
Age				
15-19	11.4	12.5	1.1	0.004
20-24	21.7	20.2	-1.5	
25-29	19.2	21.1	1.8	
30-34	16.7	14.6	-2.1	

Variable	n=7281 2006 (%)	n=7393 2011(%)	Difference (%)	p-value
35-39	12.9	13.9	1.0	
40-44	10.1	9.9	-0.2	
45-49	8.0	7.9	0.0	
Education level				
No education	22.2	14.7	-7.4	0.000
Primary	58.6	59.3	0.7	
Secondary+	19.2	26.0	6.8	
Place of residence				
Urban	16.5	19.7	3.3	0.243
Rural	83.5	80.3	-3.3	
Religion				
Catholic	43.1	40.9	-2.2	0.000
Protestant	34.3	29.6	-4.7	
Muslim	11.1	13.4	2.3	
Other	11.4	16.1	4.6	
Wealth quintile				
Poorest	19.0	18.4	-0.6	0.774
Poorer	19.8	18.7	-1.1	
Middle	18.9	18.6	-0.3	
Richer	18.8	19.0	0.2	
Richest	23.5	25.3	1.8	
Sex of household head				
Male	70.1	70.0	-0.1	0.927
Female	29.9	30.0	0.1	
Current working status				
Not working	14.6	26.1	11.5	0.000
Working	85.4	73.9	-11.5	
Polygyny				
No co-wife	50.8	52.6	1.8	0.029
Has co-wife	20.6	18.1	-2.6	
Not sure	28.6	29.3	0.8	
Exposure to family planning messages				
No	97.7	93.0	-4.6	0.000
Yes	2.3	7.0	4.6	
Source of modern family planning methods				
Non user	81.9	75.9	-6.0	0.000
Government	6.3	11.2	5.0	
Private	11.8	12.9	1.1	
Knowledge of any family planning methods				
No knowledge	2.4	1.1	-1.3	0.001
Has knowledge	97.6	98.9	1.3	
Contraceptive use				
Not using	77.1	72.3	-4.8	0.000
Using	22.9	27.7	4.8	
Age at first sex				
Below 15	20.1	16.1	-4.1	0.000
15-19	55.0	47.1	-7.9	
20+	5.7	6.4	0.7	
Don't know	19.2	30.5	11.3	

Variable	n=7281 2006 (%)	n=7393 2011(%)	Difference (%)	p-value
Family size preference				
<=2 Children	7.5	7.8	0.3	0.010
3-4 Children	40.8	44.5	3.7	
5+ Children	51.7	47.7	-4.0	
Marital status				
Single	10.7	11.3	0.6	0.548
Formerly married	16.0	15.4	-0.6	
Married	73.3	73.3	0.0	
Age at first marriage				
Never married	10.7	11.4	0.7	0.002
Below 15	15.2	14.7	-0.5	
15-19	56.4	52.8	-3.6	
20+	17.8	21.1	3.3	

Association between selected socioeconomic and demographic characteristics with CEB

For each survey period, we run a Poisson regression offset by the natural logarithm of the current age of women to find out the factors associated with number of children ever born in the surveys. The results in Table 2 reveal that the women who had attained at least a secondary level of education had a lower mean number of children ever born compared with their counterparts. Relatedly, in both 2006 and 2011, there was generally higher fertility as reported by incident rate ratio (IRR) among rural women compared to their urban counterparts. Regarding wealth status, the results indicate that women in the richest wealth quintile had a lower incident rate ratio (IRR) compared with their counterparts. The results further indicate that in the 2006 survey years, female headed households had lower number of children ever born compared with the male headed households. In terms of the working status of women, the results indicate that for the two surveys, currently working women had higher incident rate ratio. Women who had a cowife in both 2006 and 2011 had higher IRR compared with their counterparts.

The results further indicate that in both the 2006 and 2011 surveys, women who were exposed to family planning messages had lower rate ratios compared to their counterparts who were not exposed to the family planning messages. Women whose source of family planning methods was the private facility had lower fertility compared to their counterparts whose source was a government facility. Furthermore, women who were currently using a contraceptive method had higher fertility compared to those who were not. In both 2006 and 2011, the fertility was lower among women whose age at first sex was reported to be at least 20 years. Relatedly, the results indicate that in both 2006 and 2011, the fertility was lower among women whose age at first

marriage was at least 20 years. After controlling for current age of the woman and marital status; education, place of residence, wealth quintile, sex of household head, age at first sex and family size preference remained significant while contraceptive use was not significant. Table 2 shows the results.

Table 2: Socio-economic and demographic factors associated with children ever-born in 2006 and 2011

Variable	2006(n=7243)		2011 (n=7364)	
	A(IRR)	A95%CI	A(IRR)	A95%CI
Education level				
No education	1.00		1.00	
Primary	1.03	0.99-1.06	**0.96*****	0.93-0.99
Secondary +	**0.70*****	0.67-0.73	**0.67*****	0.64-0.70
Place of residence				
Urban	1.00		1.00	
Rural	**1.28*****	1.23-1.34	**1.36*****	1.31-1.41
Religion				
Catholic	1.00		1.00	
Protestant	1.01	0.98-1.04	0.98	0.95-1.02
Muslim	1.02	0.98-1.07	0.99	0.95-1.04
Other	0.99	0.94-1.03	1.00	0.96-1.04
Wealth quintile				
Poorest	1.00		1.00	
Poorer	0.98	0.95-1.02	**0.96*****	0.92-1.00
Middle	0.98	0.94-1.02	**0.94*****	0.90-0.98
Richer	0.99	0.95-1.02	**0.92*****	0.88-0.96
Richest	**0.77*****	0.74-0.80	**0.69*****	0.66-0.72
Sex of household head				
Male	1.00		1.00	
Female	**1.04*****	1.00-1.07	1.03	0.99-1.07
Working status				
Not working	1.00		1.00	
Working	**1.14*****	1.09-1.19	**1.05*****	1.01-1.08
Polygyny				
No cowife	1.00		1.00	
Has cowife	0.99	0.94-0.99	1.03	1.00-1.07
Not sure	**1.39*****	1.30-1.49	**1.39*****	1.30-1.49
Exposure to family planning messages				
No	1.00		1.00	
Yes	**0.64*****	0.57-0.72	**0.66*****	0.61-0.71
Source of modern family planning methods				
Non user	1.00		1.00	
Government	**1.06*****	1.02-1.10	**1.08*****	1.04-1.12
Private	0.98	0.94-1.02	0.99	0.95-1.03
Knowledge of any family planning methods				
No knowledge	1.00		1.00	

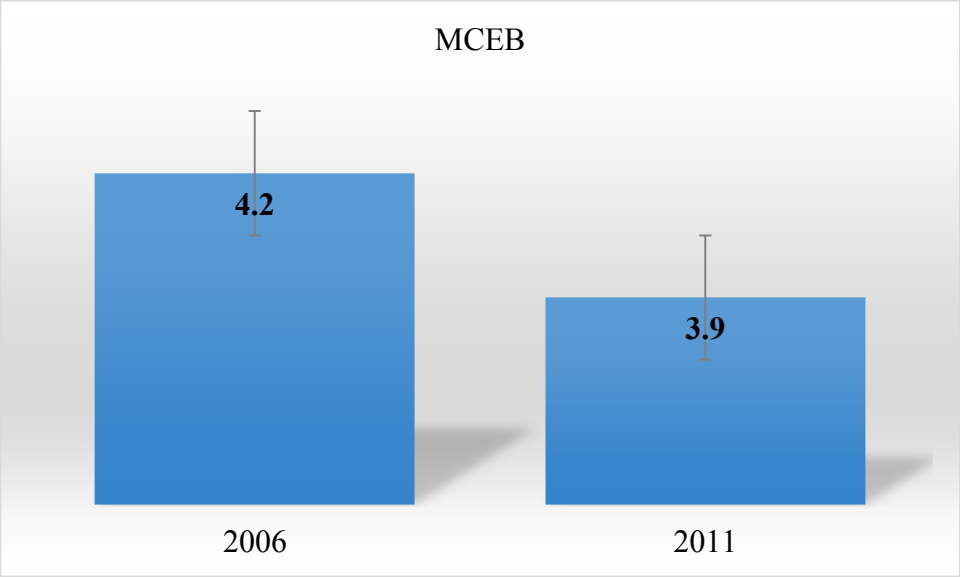
Has knowledge	**1.09*** **	1.03-1.16	1.04	0.93-1.15
Contraceptive use				
Not using	1.00		1.00	
Using	1.01	0.99-1.04	1.02	0.99-1.05
Age at first sex				
<=14	1.00		1.00	
15-19	0.85***	0.82-0.88	0.88***	0.84-0.91
20+	0.62***	0.58-0.66	0.57***	0.52-0.62
Don't know	0.90***	0.87-0.94	0.95***	0.91-0.99
Family size preference				
<=2 Children	1.00		1.00	
3-4 Children	1.26***	1.16-1.36	1.12***	1.03-1.22
5+ Children	1.53***	1.42-1.65	1.41***	1.307-1.53
Age at first marriage				
Never married	1.00		1.00	
<=14	3.43***	2.94-4.01	3.89***	3.26-4.64
15-19	2.99***	2.56-3.49	3.30***	2.78-3.93
20+	2.26***	1.94-2.64	2.50***	2.10-2.99

Note: IRR is Incident Rate Ratio. ****p<0.05. The incident rate ratio (IRR) is an exponentiation of the regression coefficients. The IRR quantifies the direction and strength of the relation between predictors and number of children ever born.*

Changes in Fertility

Changes in fertility in this study are described by changes in number of children ever born (CEB) to sexually active women aged 15-49 years in the two surveys. The Poisson regression of total number of children ever born in each survey yielded mean number of children ever born (MCEB) presented in Figure 1.

Figure 1: Mean number of Children Ever born for the periods 2006 and 2011



Decomposition of the change in fertility

The findings in Table 3 indicate that the overall change in fertility between 2006 and 2011 was entirely attributed to changes in characteristics (endowments). The effects (behavioral responses) of the predictors did not contribute significantly to the 2006-2011 change in fertility.

Table 3: Overall decomposition of Change in number of children ever born

Components	Coefficient	Std. Err.	P-value	Percent (%)
E	-5.745	0.479	0.000	151.9
C	1.964	1.326	0.139	-51.9
R	-3.781	1.197	0.002	100

E= Component representing changes in characteristics; C=Component representing changes in behavioral effects of characteristics

The changes in characteristics of women between 2006 and 2011 contributed about 151.9% to the total change in children ever born. More specifically, this contribution was due to changes in; education level, place of residence, wealth quintile, having a co-wife, sex of household head, exposure to family planning messages, contraceptive use, age at first sex, family size preference and age at first marriage. Results of the detailed multivariate Poisson decomposition model are presented in Table 4.

Table 4: Detailed Poisson Decomposition of Children Ever born

Variable	Due to change in characteristics (E)				Due to change in coefficients (C)			
	Coef	Std. Err.	P-value	%	Coef	Std. Err.	P-value	%
Education level								
No education	1.000				1.000			
Primary	-0.053	0.011	**0.000**	1.4	-765.44	314359	0.998	20242.0
Secondary+	-1.753	0.190	**0.000**	46.4	-28.271	11590	0.998	747.6
Place of residence								
Urban	1.000				1.000			
Rural	-0.418	0.071	**0.000**	11.1	-786.07	322935	0.998	20788.0
Wealth index								
Poorest	1.000				1.000			
Poorer	0.022	0.022	0.335	-0.6	-91.408	37548	0.998	2417.3
Middle	-0.001	0.006	0.907	0.0	-155.19	63742	0.998	4104
Richer	0.002	0.005	0.713	0.0	-347.88	142877	0.998	9199.8
Richest	-0.145	0.050	**0.004**	3.8	-756.05	310540	0.998	19994
Sex of household head								
Male	1.000				1.000			
Female	-0.003	0.002	0.168	0.1	-815.19	334804	0.998	21558
Current working status								
Not working	1.000				1.000			

Working	-0.899	0.199	**0.000**	23.8	21.264	8755.2	0.998	-562.33
Polygyny								
No co-wife	1.000				1.000			
Has co-wife	-0.119	0.041	**0.004**	3.1	322.61	132502	0.998	-8531.4
Not sure	-0.050	0.016	**0.002**	1.3	693.46	284800	0.998	-18339
Exposure to family planning messages								
No	1.000				1.000			
Yes	-0.480	0.167	**0.004**	12.7	-26.691	10956	0.998	705.85
Source of modern family planning methods								
Non user	1.000				1.000			
Government	-0.071	0.154	0.643	1.9	-215.68	88569	0.998	5703.7
Private	-0.060	0.035	0.082	1.6	30.392	12498	0.998	-803.7
Contraceptive use								
Not using	1.000				1.000			
Using	0.749	0.141	**0.000**	-19.8	190.36	78201	0.998	-5034.1
Age at first sex								
Below 15	1.000				1.000			
15-19	0.495	0.158	**0.002**	-13.1	168.79	69343	0.998	-4463.7
20+	-0.165	0.031	**0.000**	4.4	-212.45	87248	0.998	5618.3
Don't know	-0.323	0.221	0.143	8.5	278.52	114411	0.998	-7365.4
Family size preference								
<=2 Children	1.000				1.000			
3-4 Children	0.196	0.133	0.142	-5.2	-2017.9	828680	0.998	53363
5+ Children	-1.123	0.148	**0.000**	29.7	-2455.1	1008138	0.998	64925
Age at first marriage								
Not yet married	1.000				1.000			
Below 15	-0.772	0.041	**0.000**	20.4	1620.5	666173	0.998	-42855
15-19	-5.351	0.306	**0.000**	141.5	4335.6	1782919	0.998	-114655
20+	4.577	0.278	**0.000**	-121.0	1658.3	681762	0.998	-43853
Constant					-644.51	269343	0.998	17044
Total	-5.745	0.479	**0.000**	151.9	1.964	1.326	0.139	-51.9

Note: Coef is the change in mean number of children ever born expressed in 1000

Discussion

Using multivariate decomposition, our analysis shows that change in total number of children ever born between 2006 and 2011 largely due to changes in composition of women by the selected characteristics rather than and due to change in the women's reproductive behavior in the same period. The results of this paper indicate that between 2006 and 2011, change in education level attainment contributed the biggest variation in number of children ever born. Our findings are in agreement with those of Shapiro & Tenikue (2017) who in a study of fertility transition in sub Saharan Africa found that increased women's schooling accounted for more than half of observed decline in fertility in urban areas. In urban Uganda, increased women's education accounted for about 70% of the observed change in fertility between 1988 and 2011 (Shapiro & Tenikue, 2017). Attaining at least a secondary level of education delays entry into

marriage and also increases the likelihood of using contraceptive methods. The transition from higher to lower fertility is associated with improved female education (Jain & Ross, 2012). Our findings show that between 2006 and 2011 the proportion of women who had attained at least a secondary level of education increased by about 7%. The findings indicated that the 2006-2011 variation in number of children ever born would increase by about 47.8% if the distribution of women by education in 2011 was equalized to that of their 2006 counterparts. Shapiro & Gebreselassie (2008), Westoff, Bietsch, & Koffman (2013) and Shakya & Gubhaju (2016) also observed that increasing women's educational attainment is a key factor contributing to sustained fertility decline.

Fertility transition is not likely to begin in a country where the median age at first marriage for women has not reached at least 18 years (Beatty, 2016). The postponement of marriage contributed to the reduction of fertility in some countries over the 1990-2008 period (Ross & Blanc, 2012). In sub-Saharan Africa, age at first marriage has been found to be more instrumental in influencing fertility changes (Garenne, 2008). In countries like Colombia, Dominican Republic, and Turkey, a decline in the median age at marriage was followed by increases fertility (Bongaarts, 2006). In the absence of factors such as contraception, women who marry earlier (usually below the age 20) are more likely to have more children compared to their counterparts who marry at later ages due to increased number of reproductive years and exposure to childbearing. The findings revealed that after controlling for other variables, the fertility gap would increase by 40.9% if the age at first marriage for women in 2011 was similar to that of their 2006 counterparts. Between 2006 and 2011, more women reported their age at first marriage as 20 years and above and this represented a 4.1% reduction in the proportion of women marrying before age of 20 in 2006. This reduction partly explains the fertility variation especially considering that the utilization of contraceptives in Uganda is still low. Kabagenyi et al., (2015) also attributed persistent high TFR in Uganda to a young age at marriage that has remained considerably low.

The findings in Table 4 indicated that between 2006 and 2011, the variation in number of children ever born would increase by about 29.7% if there was no change in the women's preferred number of children in the two surveys. This could be linked to the observation that there was a shift into desiring smaller family size among women during the 2006-2011 period.

These findings support the view held by Bongaarts (2006) that "it is fertility desires that matter and not contraceptive access in fertility transition. Family size preferences affect people's fertility behaviors and especially decisions on whether to use or not to use fertility control measures such as contraceptives. Various studies have noted the importance of shift in desired family size in fertility decline (Westoff & Cross, 2006; Ezeh et al., 2009, Lyager, 2010; Bongaarts & Casterline, 2013; Ramsay 2014).

Relatedly, the findings showed that the observed 2006-2011 change in mean number of children ever born would increase by 23.8% if the proportion of women who were currently working in 2011 was the same as that in 2006. Female employment has been reported to reduce fertility rates and accelerate the demographic transition. This finding is partly in line with what other studies have reported about the importance of female employment in fertility transition. In Botswana, a study found that non-working mothers had more number of children ever born than their working counterparts (Dwivedi, Sediadie, & Ama, 2016). Relatedly, in women's participation in labor force reduces fertility rates by one quarter (Broeck & Maertens, 2015).

Exposure to mass media is among the factors that determine the number of children desired and increased use of modern contraceptives especially as they relay family planning messages (Westoff et al., 2013; Ramsay, 2014; Grimm, Sparrow, & Tasciotti, 2015). In this paper, we found that variation in exposure to family planning messages significantly contributed to the change in number of children ever born between 2006 and 2011. The paper indicates that variation in number of children ever born would increase by about 12.7% if the proportion of women who were exposed to family planning messages in 2011 was equal to that of their 2006 counterparts. This finding could partly be because exposure to family planning messages could have led to changes in attitudes towards large families and use of contraceptive methods which in turn lead to adoption of small family norms such as contraceptive use. Earlier studies (Bongaarts, 2006; Garenne, 2008; Westoff & Cross, 2006; Ezeh et al., 2009; Rutayisire et al., 2014 and Majumder & Ram, 2015) reported that contraceptive use is one of the factors that significantly drives fertility transition. On the other hand Shakya & Gubhaju (2016), reported a weak effect of contraceptive use in explaining the Nepal's recent fertility decline. Our findings also indicate that despite a mere 4.9% increase in the in the proportion of the women that reported having ever had sex and were currently using contraceptives between 2006 and 2011,

the difference in number of children ever born would increase by about 19.8% if the proportion of women using contraceptives in 2011 was equal to that of 2006.

Sexual debut undoubtedly plays a significant role in fertility transitions. Delayed sexual debut implies delayed exposure to pregnancy and childbearing. The results indicate that the fertility variation would reduce by 8.7% if the observed age at first sex among women in 2011 was equated to that of their 2006 counterparts. This finding can partly be attributed to the fact that between 2006 and 2011, there was a reduction in the proportion of women whose sexual debut was below 20 years of age implying delayed sexual intercourse.

Studies have found faster change in fertility among women residing in urban areas compared to rural counterparts (Garenne, 2008; Ezeh et al., 2009; Westoff, Bietsch, & Koffman 2013; Kabagenyi et al., 2015 and Shakya & Gubhaju, 2016). Between 2006 and 2011, there was an increase in the proportion of Ugandan women residing in urban areas. Urban areas are usually associated with low fertility compared to rural areas partly due to increased access to family planning services in the urban areas. The variation in place of residence among the sexually active women could partly account for the observed change in number of children ever born during the period. The variation in number of children ever born would increase by 11.1% if the proportion of women residing in rural areas in 2011 was the same as that of their 2006 counterparts. The results may also not explain the slum populations that in most cases are underserved by existing services. It is important to note however that the findings by Westoff & Cross (2006) contended that urban or rural residence had no effect on the fertility change in Kenya.

The middle class and the rich class experience faster fertility transition compared to the poor (Dribe, Hacker, & Scalone, 2015). Our findings indicate that the fertility variation observed in the period 2006 to 2011 would increase by about 3.8% if the proportion of women in the richest wealth quintile in 2011 was equal to that belonging to the same category in 2006.

Polygyny was also found to have contributed significantly (3.4%) to the observed change in fertility. With the proportion of women who reported having co-wives experienced a 2.5% decrease in the 2006-2011 period, the results showed that if the proportion of women who

reported having a co-wife in 2011 was the same as that of 2006, the difference in number of children ever born would reduce by about 3.1%.

The findings indicated that the coefficients did not contribute significantly to the fertility change observed among sexually active Ugandan women aged 15-49 years in the 2006-2011 period. This could be linked to the fact that the study considered a short time period. Despite, the time period for this analysis being very short for detailed explanation of demographic transitions which are known to take longer periods, the study focused on the 2006 and 2011 survey years since they represented a period in which visible change in fertility was reported. Available statistics indicate that prior to the selected years, fertility had persisted just over 6.7 children per woman.

We only considered women who had ever had sex they were the only ones with known exposure to pregnancy and child birth. The selection was based on the question on the sexual activity of women. This question may be sensitive in the cultural setting where unmarried people are expected to abstain from sex until they are married. It is thus possible that there was either underreporting and/or misreporting. This could have excluded some women who had ever had sex but did not declare.

CONCLUSION

Fertility among Uganda's women aged 15-49 years declined between 2006 and 2011. This paper used the 2006 and 2011 UDHS data to determine how fertility rates among women who had ever had sex have changed between 2006 and 2011 and whether these changes have resulted from changes in women's characteristics or the effects of the characteristics of the women. The variation in fertility was entirely due to changes in the composition of women. The key factors that led to the changes were; increased educational attainment, delayed marriage, age at first sex, increased exposure to family planning messages, improved wealth, increased urbanization, change in ideal family size preferences and increased contraceptive use.

The decomposition results implied that further declines would be expected if more women completed at least a secondary level of education and thus keeping girls in school up to a post-secondary school education level would be a viable fertility reduction measure. A consistent shift in age at first marriage among women is expected as more women complete at least a secondary

education level due to improved access to secondary school education. This will be a key factor for sustained fertility decline. In order to achieve faster and further declines in fertility, government and its development partners need to strengthen mechanisms to ensure completion of the secondary level of education especially in rural areas.

Increased urbanization will play a significant role in fertility transition. The results imply that rural areas would experience a fertility decline if they had increased access to family planning service points and there were intensified outreaches focusing on fertility control in rural areas. As more rural areas urbanize, the establishment of new service delivery points will contribute to the lowering of fertility.

Our findings suggest that increased support for family planning activities and especially efforts to ensure increased availability and accessibility of quality family planning methods will be an important driver of the fertility transition. It is thus important to intensify mass media campaign efforts to provide messages on the benefits of family planning and fertility limitation. Increased exposure to such messages would not only contribute to utilization of contraceptives but would also lead to changes in attitudes towards large families.

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