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Influence of child marriage on institutional delivery and high-risk births among young women in 31 sub-Saharan African countries

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ABSTRACT

While child marriage persists in sub-Saharan Africa (SSA), little is known about its influence on institutional delivery/high-risk births (IDHRB). We analyzed pooled data on young women aged 15–24 (N = 113,588) from the most recent Demographic and Health Surveys of 31 SSA countries to examine the influence of child marriage on IDHRB. Binary logistic regression analysis was done to explore statistically significant relationships. Findings showed that unskilled delivery was significantly higher among women who married before age 15 (67.2%) and at ages 16–17 (48.2%) compared to those who married at age 18+ (30.2%). The prevalence of high-risk birth was higher among women who married before age 15 (97.2%) and at ages 16–17 (80.8%) compared to those who married at 18+ (48.4%). Inferential analysis showed that respondents who married before age 15 and at ages 16–17, respectively, had five-fold and two-fold higher odds of experiencing unskilled delivery compared to those who married at age 18 +. Odds of having high-risk births were significantly higher among child-brides compared to those who had first marriage as adults. This study concludes that policies/programs that would successfully delay first marriage among women must be pursued to reduce high-risk births and unskilled delivery in SSA.

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Child marriage; high-risk births; institutional delivery; sub-Saharan Africa; young women

Introduction

Child marriage is internationally recognized as a form of violence against children and a human rights violation (United Nations Children's Fund 2014). Recent studies have established child marriage as a leading adolescent public health and development concern (Mobolaji, Fatusi, and Adedini 2020; United Nations Children's Fund 2014). Evidence shows that the 10 countries with the highest rates of child marriage are found in sub-Saharan Africa (SSA) and South Asia, with Niger in SSA having the highest prevalence of child marriage in the world, while Bangladesh in South Asia has the highest global rate of girls who married before age 15 (UNICEF 2018).

Child marriage, defined as a formal or informal union involving adolescents living in a marital dyad before age 18, affects both boys and girls; however, girls are the worse affected (United Nations Children's Fund 2021). Globally, more than 12 million girls below 18 years of age are married each year, while around 650 million girls and women still alive today were married off as children (UNICEF 2018; World Health Organization 2019). Target 5.3 of the Sustainable Development Goals (SDGs) aims to eliminate all harmful practices, including child, early and forced marriage by 2030. However, SSA has recorded a tardy progress in reducing the incidence of child marriage.

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Several studies have reported the diverse negative consequences of child marriage including a lifetime of suffering arising from poor educational and employment prospects for child brides (Adhikari 2018; Kidman 2017; Nour 2006; Wahhaj 2015; Westoff 2003). Nour (2006) argued that child marriage deprives girls of the opportunity of choosing their own marriage partners. In a study of impact of child marriage on fertility outcomes in SSA, Yaya, Odusina, and Bishwajit (2019) found that women who married before age 18 had a higher prevalence of lifetime pregnancy termination and higher lifetime fertility than those who married at age 18 or older. Meanwhile, a critical identified gap in literature is the influence of child marriage on institutional delivery and high-risk births in SSA. We hypothesize in this study that women who married earlier than 18 years of age are likely to have unskilled delivery and high-risk births compared to women who married at age 18 or older. Thus, in this study, we examined the extent to which child marriage influenced unskilled delivery and high-risk births in SSA.

Materials and methods

Data source

We utilized the most recent Demographic and Health Survey (DHS) data of the selected SSA countries collected between 2008 and 2019. The DHS is a nationally representative sample survey that provides up-to-date information on demographic and health indicators of women of reproductive age, their children, and partners. The samples were selected using a stratified two-stage cluster design, with enumeration areas (EAs) as the primary sampling unit.

Considering that the key explanatory variable in this study is child marriage, the study focused on SSA countries with at least 20% child marriage prevalence (Girls Not Bride, 2021) in order to have sufficient observations for assessing the influence of our explanatory variable on the outcome measures. Besides, the study is restricted to all women aged 15–24 years who have had at least one livebirth. Since our study focused on the type of delivery and high-risk birth (as outcome variables) among young women, including women below age 18 years is appropriate. Existing studies have also considered women below 18 years of age (Mobolaji, Fatusi, and Adedini 2020; United Nations Children's Fund 2015). Also, considering that our two outcome variables focused on children, we used children's dataset from 31 countries with a total sample size of 113,588. Analytic samples for the selected countries are presented in Table 1.

Variable measurements

The outcome variables for this study are delivery type and high-risk births among young women aged 15–24 years. Delivery type was captured as skilled delivery and unskilled delivery. DHS questionnaire captured skilled delivery as birth delivered with the assistance of doctors, nurses/midwives, and auxiliary nurses/midwives. High-risk birth was measured in three ways: Too many births – when the number of births is greater than 4; too early births – when births occurred at age less than 18 years, and poor child spacing- when the birth interval is either less than 33 months or greater than 59 months (Ibrahim et al. 2019; World Health Organization 2005). These 3 measures were re-coded as one or more risk and no risk. Each of these outcome measures was dichotomized, coded as 1 for those who have experienced the event of interest, otherwise coded as 0.

The main explanatory variable is the child marriage status, measured as marriage before attaining age 18 years. Child marriage status was further categorized into two subgroups: marriage before age 15 and marriage at ages 16–17 in order to compare the reproductive health outcomes for the two categories. Other independent variables include age, categorized as 15–19 and 20–24, place of residence (rural or urban), wealth status (poorest, poorer, middle, richer and richest), and religion – categorized as Christians and non-Christians (traditionalists, animists, Muslim, no religion, and others). The intervening/control variables include spouse characteristics and fertility-related variables such as parity categorized into uniparous and multiparous, contraceptive use (grouped into user and

Table 1. Prevalence of child marriage, unskilled birth attendant and high-risk births among young women in sub-Saharan Africa, 2008/09 – 2018.

		Early/child marriage among ever married young women, age 15–24			High-risk birth	
Country	Total number of respondents	Early marriage (at <15 years)	Child marriage (at 15–17 years)	Proportion with unskilled delivery	Single risk	Multiple risks
Angola (2015/16)	4588	20.7	44.9	62.8	38.1	47.2
Benin (2018)	3706	20.9	40.4	30.4	42.6	23.8
Burkina Faso (2010)	5248	20.8	56.9	42.2	42.2	27.1
Burundi (2016/17)	2891	8.4	41.0	20.6	43.4	18.5
Cameroon (2018)	3158	30.5	41.9	48.4	38.3	44.8
Chad (2014/15)	7396	47.6	42.1	71.6	37.0	51.4
Comoros (2012)	1026	27.4	48.1	35.0	37.2	43.6
Congo (2012)	2804	16.0	46.0	24.2	42.6	31.5
DRC (2013/14)	5362	25.0	47.8	28.0	41.5	36.0
Cote d'Ivoire (2011/12)	2346	26.2	44.8	56.5	41.6	37.5
Ethiopia (2016)	3019	34.1	45.5	71.6	39.2	30.6
Gabon (2012)	1475	18.2	36.2	35.5	41.7	37.8
Gambia (2013)	2372	29.6	41.9	47.4	39.7	31.1
Ghana (2014)	1117	18.4	45.5	41.0	38.0	29.8
Guinea (2018)	2643	38.6	45.4	54.0	45.3	37.8
Kenya (2014)	6318	13.4	42.8	49.9	38.4	33.4
Liberia (2013)	1989	22.9	48.8	56.5	41.7	37.6
Mali (2018)	3594	31.2	49.1	41.9	42.8	37.9
Madagascar (2008/09)	5103	32.2	46.2	57.9	38.1	42.4
Malawi (2015/16)	7544	17.0	50.3	26.7	44.1	22.1
Mozambique (2011)	4618	27.2	45.7	54.0	42.5	35.5
Niger (2012)	4670	42.2	49.7	74.1	38.0	48.1
Nigeria (2018)	9675	36.7	45.0	69.7	38.8	40.6
Sao Tome & Principe (2008/09)	604	11.1	54.0	29.0	42.4	24.1
Senegal (2018)	1462	25.7	43.9	29.8	39.7	29.1
Sierra Leone (2019)	2742	23.1	45.3	33.9	39.6	35.2
Tanzania (2010–2016)	3262	13.6	47.9	45.2	40.8	28.7
Togo	1512	17.6	38.8	45.2	39.9	21.0
Uganda (2011–2016)	5957	16.1	46.2	37.6	40.8	35.0
Zambia (2014–2018)	3266	14.0	47.9	34.4	42.0	31.7
Zimbabwe (2015)	2122	9.0	54.0	34.7	39.9	22.1
Pooled data	**113588**	**28398 (24.2)**	**54090 (46.1)**	**53663 (45.8)**	**47592 (40.6)**	**40632 (34.6)**

nonuser), antenatal care (grouped into adequate – for four or more visits – and none/inadequate if otherwise), and the ideal number of children (categorized into 0–2, 3–5 and 6+ or non-numeric) and partner's education categorized into none/primary education and secondary/higher education.

Statistical analysis

We pooled DHS children's datasets of the 31 countries to have a single dataset. The data were weighted to adjust for the under- or over-sampling of different strata during sample selection (DHS Program 2021). Data were analyzed at univariate, bivariate, and multivariable levels using Stata software (version 15.1.0). In order to adjust for the sample size variations across the countries under study, we created a sample size weight for the pooled data using the equation $^{1}/_{[C * (n_c/n_p)]}$; where C is the number of countries involved in the analysis, n_c and n_p are the sample size for each country and the pooled data, respectively.

At the bivariate level, we investigated the association between the outcomes and child marriage using Chi-square test of independence. At the multivariable level, we fitted binary logistic regression models to examine how child marriage predicts the outcomes.

Binary logistic regression analysis is used when the outcome variable has binary outcomes irrespective of whether the explanatory variable is categorical or numeric. The binary logistic model is based on log transformation of the odds of an event of interest. The logistic regression model is expressed as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_n X_n$$

β_0 = is the intercept
β_i = is the regression coefficient for the predictor variable X_i
X_1-X_n = are the predictor variables

Where: $\left(\frac{p}{1-p}\right)$ is the odds of an event taking place. The ratio of an event occurring in one group to the ratio of its occurrence in the other group is called the odds ratio (OR). This ratio indicates whether the odds of an event in one group are different from the odds of the same event in another group, with an odds ratio of 1 implying no difference and used to determine the strength of the association between the predictor and the response variables.

The two outcome variables (delivery type and high-risk birth) were predicted using three models. This was done for the aggregate and individual countries. In the first model, we examined the association between child marriage and the outcome variables. In the second model, we added some intervening/control variables (partners' characteristics and fertility-related variables). In the third model, we further adjusted for some other independent (demographic and socioeconomics) variables. We set statistical significance for the study at $p < .05$. Considering that the study mainly focused on the influence of child marriage (which varies across countries) on delivery type and high-risk birth, employing single-level binary logistic analysis is appropriate for the study.

Results

Majority of the respondents used for this study were in the age group 20–24 years (76.5–94.1%) (table not displayed), which may be linked to one of our selection criteria – including only the young women who have had at least one live-birth. About one-quarter of the respondents had secondary/higher education except in Gabon (70.9%), Zimbabwe (64.0%) and Congo (61.2%). About 43.0–61.2% were in households with middle or higher wealth quintiles; majority (71.1%) were rural residents except in Gabon (81.9%), Congo (64.7%), and Angola (60.2%). Many of the countries were predominantly Christians (70–94.8%) except in Burkina Faso, Comoros, Gambia, Guinea, Mali, Senegal, Sierra Leone, and Niger.

In Table 1, the results show that about one-quarter of the respondents were married before age 15 while nearly half (46.1%) were married between ages 16 and 17 years, though with some country variations. Further descriptive results are as detailed in Table 1.

Estimates of the prevalence of unskilled delivery show that about half (46.1%) of the SSA young women had their child delivery by unskilled birth attendants. Additionally, the results on the prevalence of high-risk birth show that over three-quarters (75.2%) of the women have had high-risk births (about 40.6% with single high-risk and 34.6% with multiple high-risk births) in their lifetime. Overall, about 18.5–51.4% of the respondents had multiple high-risk births. Country-level stratifications for unskilled delivery and high-risk births are as detailed in Table 1.

Child marriage as a predictor of type of child delivery among married young women in sub-Saharan Africa

Generally, child marriage was significantly associated with type of delivery and high-risk births ($p < .05$). Unskilled delivery was predominant among young women who married below age 15 and between ages 16 and 17 years (table not shown). Of the women who married before age 15 years, 63.5% had unskilled delivery compared to the lower proportion among women who married at ages 16–17 years (45.9%). Skilled delivery was highest among women that married at age 18 years or above (69.0%).

Table 2 presents the results of the binary logistic regression. As shown in Model 1[a] of the table, respondents who married before ages 15 (OR = 1.89, $p < .001$, 95% C.I. = 1.81–1.97) and at 16–17 years (OR = 3.88, $p < .001$, 95% C.I. = 3.69–4.08), respectively, had five-fold and two-fold higher odds of experiencing unskilled delivery at birth relative to those who married at age 18 or older. Significant results were further reechoed after adjusting for the influence of selected covariates.

Child marriage as a predictor of high-risk birth among married young women in sub-Saharan Africa

The prevalence of high-risk birth, single or multiple, was highest among women who married before age 15 years (97.1%) or at age 16–17 years (80.3%) compared to their counterparts who married at 18 or above (49.5%) (table not shown). Results from further analysis (Model 1[b] of Table 2) show that women who married before ages 15 (OR = 34.82, $p < .001$, 95% C.I. = 31.50–38.50) and at 16–17 years (OR = 4.17, $p < .001$, 95% C.I. = 3.97–4.37), respectively, were 34 and 4 times more likely to experience high-risk birth compared with those who married at age 18 years or above. Adjusting for the confounders in Models 2[b] and 3[b], the results show that the influence of child marriage on high-risk birth was stronger and significant.

The results in Table 3 show the unadjusted and adjusted odds of unskilled delivery and high-risk birth among the respondents. According to the unadjusted model, compared to Niger that has the highest prevalence of child marriage (91.9%) among the respondents, the odds of unskilled birth (Model 1[a]) among young women were about 19–89% significantly lower ($p < .05$) across all other selected SSA countries except Chad (OR = 1.19; $p < .05$; 95% C.I. = 1.00–1.42) which was higher and Nigeria and Ethiopia that were not significantly different from that of Niger. Results of adjusted models (Models 2[a] and 3[a]) indicate that the odds of unskilled delivery in many of the other SSA countries remained significantly lower compared to Niger

The results of the unadjusted model (Model 1[b] of Table 3) on high-risk birth among the respondents followed a pattern similar as that of unskilled delivery, though with some variations. Adjusting for child marriage in Models 2[b] and 3[b] yielded mixed findings. Detailed results are presented in Table 3.

Discussion

This study examined the influence of child marriage on institutional delivery and high-risk births among young women aged 15–24 in 31 SSA countries where girl-child marriage is highly prevalent. We found that high rates of child marriage persist in many of the selected countries. This is perhaps because the selected SSA countries remain predominantly patriarchal societies where no major interventions to address the problem of high child marriage have been implemented.

Expectedly, we found that the SSA countries with high prevalence of child marriage also have high proportions of births with unskilled delivery. This is perhaps because early marriage has implication for low human capital development (Assaad, Krafft, and Selwaness 2017) especially in critical sectors such as health. Also, women that marry early have less autonomy and resources to access health facilities (Adedini et al. 2014). Furthermore, we found that most countries (where relatively high

Table 2. Multivariable binary logistic regression showing the association between child marriage and the outcome variables – unskilled delivery and high-risk births.

Independent variables	Outcome: Unskilled delivery [a]			High-risk birth [b]		
Child marriage	UOR (95% C.I.) Model 1[a]	AOR (95% C.I.) Model 2[a]	AOR (95% C.I.) Model 3[a]	UOR (95% C.I.) Model 1[b]	AOR (95% C.I.) Model 2[b]	AOR (95% C.I.) Model 3[b]
Adult marriage (≥18 years)	1.00	1.00	1.00	1.00	1.00	1.00
Child marriage (<18 years)	1.89(1.81–1.97)***	1.40 (1.33–1.49)***	1.24(1.16–1.32)***	4.17(3.97–4.37)***	6.47(6.05–6.93)***	3.70(3.42–3.99)***
Early marriage (<15 years)	3.88(3.69–4.08)***	1.96 (1.82–2.10)***	1.65(1.52–1.80)***	34.82(31.50–38.50)***	39.64(35.25–44.58)***	19.33(17.18–21.76)***
Parity						
Uniparous	-	1.00	1.00	-	1.00	1.00
Multiparous		1.58 (1.50–1.67)***	1.56(1.47–1.66)***		18.81(17.46–20.26)***	50.86(46.66–55.45)***
Contraceptive use						
Nonuser		1.00	1.00		1.00	1.00
User		0.46 (0.43–0.50)***	0.53(0.50–0.58)***		0.96(0.89–1.03)	0.99(0.91–1.07)
Partner's education						
None/primary		1.00	1.00		1.00	1.00
Secondary/higher		0.47 (0.44–0.50)***	0.72(0.68–0.77)***		0.99(0.93–1.06)	1.05 0.97–1.14)
Antenatal care use						
Adequate (4 or more)		1.00	1.00		1.00	1.00
None/inadequate		2.61 (2.48–2.75)***	2.38(2.25–2.51)***		1.18(1.11–1.25)***	1.13(1.06–1.20)*
Ideal number of children						
0–2			-		1.00	1.00
3–5			-		0.94(0.83–1.05)	1.01(0.89–1.15)
6+ or non-numeric			-		1.06(0.95–1.20)	1.17(1.02–1.33)*
Age group						
15–19			1.00			1.00
20–24			0.95(0.89–1.02)			0.09(0.08–0.10)***
Place of residence						
Urban			1.00			1.00
Rural			1.85(1.68–2.03)***			0.81(0.73–0.89)***
Level of education						
None/primary			1.00			1.00
Secondary/higher			0.56(0.52–0.61)***			0.85(0.78–0.92)**
Wealth quintile						
Poorest			1.00			1.00
Poorer			0.79(0.73–0.84)***			1.04(0.94–1.15)
Middle			0.67(0.62–0.72)***			0.89(0.80–0.98)*
Richer			0.48(0.44–0.53)***			0.80(0.71–0.90)***
Richest			0.31(0.27–0.35)***			0.75(0.66–0.86)***
Religion						
Christian			1.00			1.00
Non-Christian			1.17 (1.10–1.25)***			0.90(0.84–0.97)*

* $p<0.05$ ** $p<0.01$ *** $p<0.001$; UOR – unadjusted odds ratio (Model 1a and 1b); AOR – adjusted odds ratio; RC – reference category; C.I – confidence interval; Model 2 – adjusted for fertility variables & partner's education; Model 3 – adjusted for fertility history, partner's education and socio-demographics.

Table 3. Binary logistic regression comparing the odds of unskilled delivery and high-risk birth among sub-Saharan African countries with varied prevalence of child marriage.

		Outcome: Unskilled delivery [a]			Outcome: High-risk birth [b]		
Country	Prevalence of child marriage (at <15 or <18 years) among married young women aged 15-24	UOR (95% C.I.) Model 1 [a]	AOR (95% C.I.) Model 2 [a]	AOR (95% C.I.) Model 3 [a]	UOR (95% C.I.) Model 1 [b]	AOR (95% C.I.) Model 2 [b]	AOR (95% C.I.) Model 3 [b]
Niger(2012)	91.9	1.00	1.00	1.00	1.00	1.00	1.00
Chad(2014/15)	89.7	1.19(1.00–1.42)*	1.14(0.96–1.35)	1.03(0.85–1.24)	1.38(1.19–1.61)***	1.29(1.11–1.50)**	1.23(1.01–1.50)*
Guinea(2018)	84.0	0.51(0.43–0.61)***	0.53(0.44–0.63)***	0.30(0.24–0.36)***	0.79(0.66–0.94)**	0.93(0.77–1.11)	1.29(1.00–1.67)*
Nigeria(2018)	81.7	0.96(0.82–1.12)	1.04(0.90–1.21)	1.09(0.92–1.31)	0.64(0.56–0.73)***	0.78(0.68–0.90)**	0.89(0.74–1.08)
Mali(2018)	80.3	0.35(0.29–0.43)***	0.37(0.31–0.45)***	0.19(0.15–0.24)***	0.78(0.66–0.92)**	1.04(0.87–1.23)	1.17(0.93–1.47)
Ethiopia(2016)	79.6	0.93(0.77–1.12)	1.05(0.88–1.25)	0.77(0.63–0.94)**	0.43(0.37–0.51)***	0.52(0.44–0.63)***	0.72(0.58–0.91)**
Madagascar(2008/09)	78.4	0.60(0.51–0.71)***	0.67(0.57–0.78)***	0.45(0.38–0.54)***	0.70(0.60–0.81)***	0.97(0.83–1.14)	1.22(1.00–1.49)**
Burkina Faso(2010)	77.7	0.29(0.24–0.35)***	0.34(0.29–0.40)***	0.12(0.10–0.15)***	0.37(0.32–0.43)***	0.54(0.46–0.63)***	0.56(0.46–0.69)***
Comoros(2012)	75.5	0.24(0.20–0.30)***	0.27(0.22–0.33)***	0.10(0.07–0.14)***	0.71(0.56–0.89)**	1.12(0.87–1.45)	1.00(0.70–1.44)
Mozambique(2011)	72.9	0.41(0.35–0.49)***	0.49(0.41–0.57)***	0.41(0.34–0.49)***	0.57(0.49–0.66)***	0.95(0.81–1.11)	1.09(0.88–1.34)
DRC(2013/14)	72.8	0.18(0.16–0.21)***	0.20(0.17–0.24)***	0.10(0.08–0.13)***	0.62(0.53–0.71)***	0.96(0.83–1.12)	0.97(0.80–1.18)
Cameroon(2018)	72.4	0.40(0.33–0.48)***	0.46(0.38–0.55)***	0.40(0.32–0.50)***	0.83(0.70–0.98)*	1.43(1.19–1.73)***	1.30(1.03–1.65)*
Liberia(2013)	71.7	0.61(0.51–0.74)***	0.74(0.61–0.89)**	0.61(0.49–0.77)***	0.77(0.64–0.92)**	1.32(1.10–1.60)**	1.25(0.97–1.61)
Gambia(2013)	71.5	0.43(0.35–0.53)***	0.49(0.40–0.60)***	0.39(0.29–0.52)***	0.42(0.36–0.50)***	0.58(0.49–0.69)***	0.70(0.56–0.88)**
Cote d'Ivoire(2011/12)	71.0	0.62(0.51–0.74)***	0.76(0.63–0.90)**	0.39(0.31–0.48)***	0.63(0.53–0.75)***	1.11(0.92–1.33)	1.10(0.87–1.40)
Senegal(2018)	69.6	0.22(0.18–0.27)***	0.25(0.21–0.30)***	0.08(0.06–0.10)***	0.42(0.35–0.50)***	0.61(0.50–0.73)***	0.82(0.62–1.08)
Sierra Leone(2019)	68.4	0.22(0.19–0.26)***	0.25(0.22–0.30)***	0.10(0.08–0.14)***	0.50(0.43–0.60)***	0.86(0.72–1.03)	0.99(0.78–1.26)
Malawi(2015/16)	67.3	0.15(0.13–0.18)***	0.19(0.17–0.22)***	0.04(0.03–0.05)***	0.35(0.31–0.40)***	0.62(0.54–0.71)***	0.84(0.69–1.01)
Angola(2015/16)	65.6	0.81(0.69–0.96)*	1.02(0.87–1.20)	1.29(1.06–1.58)*	1.07(0.92–1.26)	2.15(1.82–2.54)***	1.60(1.28–1.99)***
Sao Tome(2008/09)	65.1	0.19(0.15–0.24)***	0.25(0.20–0.31)***	0.15(0.11–0.21)***	0.39(0.30–0.50)***	0.73(0.56–0.95)*	0.92(0.65–1.30)
Ghana(2014)	63.9	0.29(0.24–0.35)***	0.37(0.31–0.45)***	0.28(0.21–0.37)***	0.34(0.28–0.42)***	0.66(0.53–0.83)***	0.78(0.58–1.05)
Zimbabwe(2015)	63.0	0.21(0.17–0.25)***	0.28(0.24–0.34)***	0.27(0.21–0.35)***	0.25(0.21–0.29)***	0.52(0.44–0.62)***	0.76(0.60–0.97)*
Uganda(2011–2016)	62.3	0.26(0.23–0.31)***	0.34(0.29–0.39)***	0.18(0.15–0.22)***	0.58(0.50–0.66)***	1.21(1.04–1.40)*	1.12(0.92–1.35)
Congo(2012)	62.0	0.18(0.15–0.21)***	0.22(0.18–0.26)***	0.08(0.06–0.10)***	0.57(0.48–0.67)***	1.10(0.93–1.31)	1.19(0.92–1.53)
Zambia(2014–2018)	61.9	0.23(0.19–0.27)***	0.30(0.25–0.35)***	0.15(0.12–0.19)***	0.46(0.40–0.54)***	1.02(0.86–1.20)	1.24(0.99–1.57)
Tanzania(2010–2016)	61.5	0.35(0.30–0.42)***	0.48(0.41–0.57)***	NA	0.42(0.35–0.49)***	0.90(0.76–1.07)	NA
Benin(2018)	61.3	0.19(0.16–0.23)***	0.24(0.20–0.28)***	0.13(0.10–0.16)***	0.35(0.30–0.40)***	0.65(0.55–0.77)***	0.64(0.52–0.79)***
Togo(2013)	56.4	0.41(0.33–0.51)***	0.55(0.45–0.68)***	0.43(0.34–0.55)***	0.27(0.23–0.33)***	0.55(0.45–0.67)***	0.79(0.61–1.03)
Kenya(2014)	56.2	0.53(0.46–0.62) ***	0.72(0.62–0.83)***	0.52(0.43–0.63)***	0.51(0.44–0.58)***	1.10(0.95–1.27)	1.18(0.94–1.47)
Gabon(2012)	54.4	0.27(0.23–0.33) ***	0.35(0.29–0.41)***	0.17(0.13–0.23)***	0.81(0.67–0.97)*	1.84(1.49–2.26)***	1.58(1.19–2.11)**
Burundi(2016/17)	49.4	0.11(0.09–0.13)***	0.16(0.13–0.18)***	0.05(0.04–0.06)***	0.27(0.23–0.32)***	0.71(0.60–0.84)***	0.75(0.61–0.94)*

NA estimate omitted by Stata due to unavailability of the variable 'religion.' UOR – unadjusted odds ratio (Model 1a and 1b); AOR – adjusted odds ratio; RC – reference category; C.I – confidence interval; Model 2a and 2b – adjusted for child marriage; Model 3a and 3b – adjusted for child marriage and all other variables.

proportions married early and were attended to by unskilled healthcare workers) had high prevalence of high-risk births. This lends credence to existing study which found that age at first marriage had influence on healthcare-seeking behavior (Godha, Hotchkiss, and Gage 2013).

Further, the study established a significant relationship between older age at first marriage and increased uptake of skilled delivery in SSA. Plausible explanation for this is that women who delay first marriage have more time to invest in formal education and other skill acquisition programs, and this will serve as sources of economic empowerment and autonomy in decision-making. Riaz and Pervaiz (2018) argued that women education and employment contribute significantly to household income which empowers women to be able to seek health care and benefit maximally from reproductive health programs.

Our study showed that women who married at age 18 or older (relative to child brides) had lower risks in all the three measures of high-risk births analyzed in this study. First, this category of women had fewer number of children compared to those that married early; hence, they face a less risk as far as the public health concern of too many births is concerned. Although there are scarcity of existing studies on child marriage and having too many births in the study area, there are studies that have suggested a negative relationship between age at first marriage and children ever born (Hertrich 2017; Ibrahim et al. 2019; Solanke 2015). Second, since most births in Africa occurred within marriage (Garenne et al. 2001), the lifetime exposure of women who married as an adult to the risk of having too early birth should be minimal. Beyond being a determinant of the onset and number of births, we have been able to link child marriage with poor birth spacing. We conjecture two possible reasons for this, on one hand, women that marry early are less likely to have autonomy regarding decision-making on family planning, therefore may have too close births. On the other hand, they tend to have a longer period to achieve their desired fertility; hence there is the possibility of wide spacing of births.

Our study further builds on the outcomes of previous studies and suggests that alleviating poverty will go a long way in reducing the incidences of child marriage and poor reproductive health outcomes in SSA. Children from a low-income family have higher opportunity costs of attending school, and could lack the resources to have long years of schooling, thus may find marriage more attractive.

The study has some strengths, including the use of nationally representative data across several countries. Besides, the DHS program employed similar methodology in data collection, thus permitting comparability of findings across the selected SSA countries. Despite these strengths, the study is not without some limitations. First, the DHS data were cross-sectional, and therefore we could not assume causality. Second, our analysis is constrained to the available variables in the DHS, thus limiting the examination of issues such as the gender norm and cultural values sustaining harmful practices of child marriage, high-risk childbearing and nonuse of skilled healthcare personnel during delivery. Also, the data from various countries were not collected at the same calendar year; however, we believe this would not invalidate our results as SSA had insignificant changes in key reproductive health indicators in those periods.

Conclusion

Our findings suggest that, to reduce high-risk births and increase institutional delivery in SSA, policies and interventions must give considerable attention to the education of girl-children. This would greatly serve as a catalyst for postponement of first marriage among women. Also, since marrying early can be discouraged only among unmarried adolescents, there is the need to implement policies that cut across experiences of women throughout their reproductive years.

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