



## Effect of sexual violence on planned, mistimed and unwanted pregnancies among women of reproductive age in sub-Saharan Africa: A multi-country analysis of Demographic and Health Surveys

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### ARTICLE INFO

#### Keywords:

Sexual violence  
Planned  
Mistimed  
Unwanted pregnancies  
Reproductive health  
Sub-Saharan Africa; Public Health

### ABSTRACT

**Introduction:** Sexual violence plays a key role in women's pregnancy intention. We investigated the influence of sexual violence on planned, mistimed, and unwanted pregnancies in sub-Saharan Africa (SSA).

**Materials and methods:** Data from the Demographic and Health Survey (DHS) of 22 countries in SSA were used in this study. Both descriptive and inferential analyses were conducted. We carried out a multinomial logistic regression analysis to examine the effect of sexual violence on planned, mistimed, and unwanted pregnancies. STATA version 14.2 was used to carry out all analyses. Statistical significance was declared at  $p < 0.05$ .

**Results:** At the descriptive level, we found that 74.1% of women of reproductive age in SSA had planned pregnancies, with the remaining 25.9% having either mistimed (20.4%) or unwanted (5.5%) pregnancies. Women in Nigeria had the lowest proportion of mistimed pregnancies (7.5%) whereas those in Burundi had the greatest percentage of unwanted pregnancies (12.4%). Women who had history of sexual violence had increased risk of mistimed [ARRR = 1.5, CI = 1.3–1.7] and unwanted pregnancies [ARRR = 1.6, CI = 1.3–2.0], compared to those with no history of sexual violence. Women aged 40–44 [ARRR = 3.3, CI = 1.4–7.6] and 45–49 [ARRR = 4.4, CI = 1.7–11.2] had higher risk of unwanted pregnancies, compared to women aged 15–19. Women who were cohabiting had higher risk of mistimed [ARRR = 1.3, CI = 1.1–1.4] and unwanted pregnancies [ARRR = 1.6, CI = 1.3–2.1], compared to married women.

**Conclusion:** Sexual violence plays a key role in mistimed and unwanted pregnancies. It is, therefore, prudent to develop various assessment techniques to detect sexual violence in unions and refer victims to appropriate services to diminish the risk of mistimed and unwanted pregnancies. Our findings provide a basis for developing and implementing policies and interventions aimed at reducing mistimed and unwanted pregnancies.

### Background

Sexual violence is increasingly becoming a global concern. It encompasses every sexual act, attempting to have sex or verbally expressing unnecessary sexual remarks or advances, or actions to traffic or otherwise directed towards someone's sexuality by applying force, perpetrated by an individual irrespective of the relationship to the

victim in any setting which is not restricted to home or work place alone (World Health Organization, 2011). In most cases, perpetrators apply coercion such as physical force, psychological intimidation, and threats (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002) as well as rape (Koss, Gidycz, & Wisniewski, 1987). The act of sexual violence is not permissible across sub-regions (World Health Organisation, 2013). Therefore, in sub-Saharan Africa (SSA), legislation with clear penalties against

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<https://doi.org/10.1016/j.ssmph.2020.100601>

Received 19 February 2020; Received in revised form 11 May 2020; Accepted 12 May 2020

Available online 23 May 2020

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sexual violence have been formulated by Liberia, Kenya, Namibia, South Africa, and Tanzania (Kilonzo et al., 2009). Others, including Democratic Republic of Congo, Ethiopia, Botswana, Ghana, Lesotho, Malawi, Nigeria, and Uganda have made some laws and penal codes regarding sexual assault (Kilonzo et al., 2009).

Amidst these, cases of sexual violence frequently reoccur within the sub-region (Sodipo, Adedokun, Adejumo, & Olibamoyo, 2018). For instance, Bienfait et al. (2019) observed that about 31.1% of women in Lubumbashi, Democratic Republic of Congo have been sexually abused whilst in Ethiopia, Sendo and Meleku (2015) also reported cases of rape among university women. Available data show that about a quarter of all women are likely to experience sexual abuse by an intimate partner (Hakimi, 2001; Sodipo et al., 2018). It is further estimated that, worldwide, about 120 million girls (equivalent to one in ten girls) have had sexual violence or other forced sexual acts at some point in their lives (Bienfait et al., 2019; UNICEF, 2015). A trans-country study observed 59% of sexual violence among Ethiopians (WHO, 2012). This is a clear indication that sexual violence, which to some extent is preventable, is common in SSA.

Sexual violence complicates women's and newborn's health through depression and low birth weight (Han & Stewart, 2014; Rees et al., 2011; Stenson et al., 2003; Zinzow et al., 2011). In addition to sustained physical injuries (Tan & Gregor, 2006), mental indisposition associated with an increased propensity to mental disorders (Ludermir, Valongueiro, & Araújo, 2014), post-traumatic stress disorder, and postpartum depression (Howard, Oram, Galley, Trevillion, & Feder, 2013) are known challenges faced by women who have been violated sexually. Individuals who have experienced sexual violence may suffer a range of physical injuries, genital and non-genital injuries, or, in extreme cases, death. In addition, victims of sexual violence are at an increased risk of unwanted and mistimed pregnancies (Lukasse et al., 2015).

Unwanted pregnancies are those that occur when no child or children are preferred whereas mistimed ones are pregnancies experienced when they are not expected (Centers for Disease Control and Prevention [CDC], 2015). Scholarly evidence indicates that women are barely able to prevent pregnancies when sexually assaulted (Maxwell, Devries, Zions, Alhusen, & Campbell, 2015; Miller et al., 2010). As such, it is not surprising that Africa alone chalks almost 14 million unintended pregnancies yearly (Hubacher, Mavranezouli, & McGinn, 2008), which predisposes women to several risky health complications including precarious abortion, maternal mortality, malnourishment, psychological anomalies, and mother-to-child transmission of HIV (Baschieri et al., 2017; Claridge & Chaviano, 2013). It is further known that such pregnancies have the potential to raise women's stress levels, which could influence their overall health status negatively and impoverish families as a whole (Messer, Dole, Kaufman, & Savitz, 2005; Shah et al., 2011).

Probable determinants of unwanted and mistimed pregnancies have been the focus of several studies. Ali, Tikmani, and Qidwai (2016), for instance, observed that maternal age, educational attainment, parity, past pregnancy intention, age of entering into marriage, socioeconomic and marital class, as well as religion of affiliation and ethnicity influence unintended and mistimed pregnancies. Sedgh et al. (2006) and Kassa, Berhane, and Worku (2012) also found a positive link between maternal age and unintended pregnancy in Ethiopia and Nigeria respectively. Additionally, in Kenya and Tanzania, it was found that chances of unintended pregnancy increases with increased number of children (Exavery et al., 2014; Ikamari, Izugbara, & Ochako, 2013). In Ghana, reproductive health decision-making capacity, age, occupation, education, marital status, number of children ever born, region of residence, women not living with a partner, and age at sexual debut have been revealed as significant predictors of unintended pregnancies (Ahinkorah et al., 2019; Ameyaw, 2018; Eliason, Baiden, Yankey, & Awusabo-Asare, 2014; Grindlay et al., 2018; Nyarko, 2019). This implies that socio-demographic factors of women play key roles in the pregnancy intentions of women in SSA. This has been corroborated by a recent multi-country study conducted by Ameyaw et al. (2019), who

investigated occurrence and underlying factors influencing unintended pregnancy in SSA, and reported age, marital status, residential status, educational attainment, and wealth status as determinants of unintended pregnancies in SSA. However, Ameyaw et al.'s (2019) study did not look at the relationship between sexual violence and unintended pregnancies and also did not categorise unintended pregnancies into unwanted and mistimed as this current study does.

Despite the link between sexual violence and planned, mistimed, and unwanted pregnancy, to the best of our knowledge no study has looked at the link between sexual violence and planned, mistimed, and unwanted pregnancies in SSA, using cross-country nationally representative surveys. Hence, this study investigated the influence of sexual violence on planned, mistimed, and unwanted pregnancies in SSA. The findings will provide significant bases for policy directives to provide evidence in relation to how sexual violence contributes to unintended pregnancies among women in sexual unions in SSA.

## Materials and methods

### Source of data

Our study used pooled data from the current versions of Demographic and Health Surveys (DHS) of 22 SSA countries, conducted from 2010-2018 among 14,598 women in sexual unions (see Table 1). The DHS is a nationally representative survey that is conducted in over 85 low- and middle-income countries globally. The survey focuses on essential maternal and child health markers such as "unintended pregnancy", "contraceptive use", "skilled birth attendance", "immunization among under-fives", and "intimate partner violence" (Corsi, Neuman, Finlay, & Subramanian, 2012). The surveys employ a two-stage stratified sampling technique, which makes the survey data nationally representative (Aliaga & Ren, 2006). Specifically, the initial stage had to do with the generation of a sampling frame, which contained a catalogue of enumeration areas (EAs) that covered the given country. The EAs are mostly generated based on the most recent national census data in the country. Each EA is subsequently segmented into standard size segments of about 100-500 households per segment. Thereafter, a sample of predetermined segments were selected randomly with probability

**Table 1**

Prevalence of planned, mistimed and unwanted pregnancies in sub-Saharan Africa.

Country	Weighted N	Weighted %	Pregnancy Intention (%)		
			Planned	Mistimed	Unwanted
Angola	759	5.2	69.3	24.4	6.3
Burundi	924	6.3	59.2	28.4	12.4
DR Congo	810	5.6	72.5	23.5	4.1
Cote d'Ivoire	523	3.6	78.8	18.0	3.2
Cameroon	425	2.9	72.4	22.6	5.0
Ethiopia	473	3.2	81.0	14.6	4.4
Gabon	436	3.0	65.6	27.1	7.3
The Gambia	402	2.8	83.7	14.9	1.5
Kenya	371	2.5	65.4	26.4	8.2
Comoros	224	1.5	68.3	26.5	5.2
Mali	460	3.2	85.3	12.3	2.5
Malawi	496	3.4	55.5	34.3	10.2
Nigeria	3,342	22.9	89.9	7.5	2.5
Namibia	91	0.6	66.0	24.7	9.3
Rwanda	202	1.4	63.8	25.5	10.7
Sierra Leone	414	2.8	80.9	11.6	7.6
Senegal	291	2.0	79.6	18.9	1.6
Chad	582	4.0	85.4	13.9	0.7
Togo	577	4.0	68.9	23.2	7.9
Uganda	909	6.2	59.8	32.8	7.4
Zambia	979	6.7	60.7	32.2	7.1
Zimbabwe	910	6.2	67.9	24.0	8.1
All countries	14,598	100.0	74.1	20.4	5.5

Source: Authors' computations.

proportional to the EAs. The second stage involved the systematic selection of households from a list of previously enumerated households in each selected EA. This stage then involved the conduction of in-person interviews in selected households with the various target populations: women (15–49) and men (15–64). In most instances, the number of selected households per EA ranged from 30 to 40 households/women per rural cluster and from 20 to 25 households/women per urban cluster. We pooled data from the women's file in the current DHS from the various countries for our analysis.

### Definition of variables

#### Outcome variable

Pregnancy intention was our outcome variable. In the DHS, it was based on the question, "when you were pregnant with [Name of the child], was the pregnancy wanted?" The responses were "then", "later," or "not at all". These three responses were recoded as "0 = then", "1 = later", and "2 = not at all". By definition, these represented planned, mistimed, and unwanted pregnancy respectively as used in earlier studies (Exavery et al., 2013, 2014). The study included all women in sexual unions (married and cohabiting) who had information on this variable.

#### Predictor variable

The main predictor variable of our study was self-reported sexual violence. Qualified women were asked three questions: "Did you ever experience physical force by husbands/partner to have sexual intercourse when you did not want to?", "Did your husband/partner use physical force to perform any other sexual acts when you did not want to?", and "Were you ever forced by your husband/partner with threats or in any other way to perform sexual acts when you did not want to?". "Ever experienced sexual violence" (yes or no) resulted from the responses to the three aforementioned questions (Acharya, Paudel, & Silwal, 2019). If a woman answered "Yes" to at least one of the three questions, then she was regarded as "ever experienced sexual violence." If a woman answered "No" to all the three questions, then she was considered as "never experienced sexual violence". Ever experienced sexual violence was, therefore, coded "1" for "Yes" and "0" for "No".

#### Control variables

Apart from the main predictor variable (sexual violence), 14 control variables were considered in our study principally because of their statistically significant relationship with pregnancy intentions in previous studies (Acharya et al., 2019; Anand, Unisa, & Singh, 2017; Ameyaw et al., 2019; Ahinkorah et al., 2019). These are "age", "marital status", "place of residence", "wealth index", "parity", "occupation", "educational level", "religion", "contraceptive use intention", "knowledge of contraception", "frequency of reading newspaper/magazine", "frequency of watching television", "frequency of listening to radio," and "country of origin". We recategorised six of the variables for meaningful analysis. Marital status was recoded into "married (1)" and "cohabiting (2)". Type of occupation/employment was measured as "not working (0)", "managerial (1)", "clerical (2)", "sales (3)", "agricultural (4)", "household (5)", "services (6)", and "manual (7)". Parity (birth order) was classified into "zero birth (0)", "one birth (1)", "two births (2)", "three births (3)", and "four or more births (4)". With religion, it was coded as "Christianity (1)", "Islam (2)", "Traditional religion (3)", and "no religion (4)". Contraceptive knowledge was recategorised into "knows no method (0)", "knows traditional method (1)", and "knows modern method (2)". The intention of contraceptive use was also recategorised as "intends to use (1)" and "does not intend to use (2)".

#### Statistical analyses

Both descriptive and inferential analyses were conducted. We started the analysis with computation of the prevalence of planned, mistimed,

and unwanted pregnancies among women in SSA (Table 1). After that, we calculated the overall prevalence and proportions of planned, mistimed, and unwanted pregnancy, with their respective chi-square ( $\chi^2$ ) values reported (see Table 1). Afterwards, multinomial logistic regression analysis was carried out. We built two models at the regression analysis stage, where the first model (Model I) included the key independent variable (sexual violence) and pregnancy intention only. In Model II, we adjusted for the effect of the other explanatory variables that appeared significant during the bivariate analysis to ascertain how these variables affect pregnancy intention (see Table 3). We used multinomial logistic regression because our dependent variable (pregnancy intention) had three outcomes (Anderson & Rutkowski, 2008). Results for the regression analysis were presented as Crude Relative Risk Ratios (CRRR) and Adjusted Relative Risk Ratios (ARRR) with their corresponding 95% confidence intervals (CI). The results from our analysis were deemed statistically significant when  $p < 0.05$  (95%). Variance Inflation Factor (VIF) was used to check multi-collinearity of the independent variables before running the multivariable models (mean VIF = 1.44). We applied the inherent sample weight (v005/1000000) and the survey (SVY) command in STATA version 14.2 for MAC OS to adjust for the complex sampling structure of the data in the regression analyses.

#### Ethical approval

Ethical clearance for DHS was obtained from the Ethics Committee of ORC Macro Inc. as well as Ethics Boards of supporting organisations of the various countries such as the Ministries of Health. During each of the surveys, the women provided either written or verbal consent prior to the data collection. We sought permission from MEASURE DHS website and we were granted the permission to download the dataset on 27th January 2019.

### Results

#### Descriptive results

Table 1 shows results on the prevalence of planned, unwanted, and mistimed pregnancies in SSA. The results indicate that 74.1% of women of reproductive age in SSA had planned pregnancies, with the remaining 26% having either mistimed (20.4%) or unwanted (5.5%) pregnancies. The highest rate of planned pregnancies was experienced by Nigerians (89.9%), with Malawi having the lowest proportion (55.5%). The lowest rates of mistimed pregnancies were experienced by women in Uganda (32.8%) and the lowest among Nigerian (7.5%). Women of Burundi had the greatest percentage of unwanted pregnancies (12.4%), whereas unwanted pregnancies were lowest among women of Chad (0.7%).

Table 2 shows results on the relationship among sexual violence, socio-demographic variables, and pregnancy intention in SSA. The results indicate statistically significant associations between sexual violence ( $\chi^2 = 178.7$ ,  $p < 0.001$ ), age ( $\chi^2 = 6.0$ ,  $p < 0.001$ ), marital status ( $\chi^2 = 145.0$ ,  $p < 0.001$ ), educational level ( $\chi^2 = 363$ ,  $p < 0.001$ ), wealth index ( $\chi^2 = 46.3$ ,  $p < 0.001$ ), parity ( $\chi^2 = 998.4$ ,  $p < 0.001$ ), occupation ( $\chi^2 = 152.5$ ,  $p < 0.001$ ), religion ( $\chi^2 = 475.0$ ,  $p < 0.001$ ), and pregnancy intention of respondents. Similarly, a statistically significant relationship was found between intention to use contraceptive ( $\chi^2 = 610.3$ ,  $p < 0.001$ ), knowledge on contraceptives ( $\chi^2 = 194.8$ ,  $p < 0.001$ ), frequency of watching television ( $\chi^2 = 98.6$ ,  $p < 0.001$ ), frequency of listening to radio ( $\chi^2 = 31.2$ ,  $p < 0.001$ ), and pregnancy intention of respondents.

#### Results of multinomial logistic regression analysis

The results in Table 3 show increased risk of mistimed [CRRR = 2.0, CI = 1.8–2.3] and unwanted pregnancies [CRRR = 2.1, CI = 1.7–2.6] among women who had history of sexual violence. This continued after

**Table 2**  
Sexual violence, socio-demographic characteristics and pregnancy intention in SSA.

Variables	Weighted n	Weighted %	Planned	Mistimed	Unwanted
<b>Sexual Violence (<math>\chi^2=178.7, p&lt;0.001</math>)</b>					
No	12,954	88.7	76.0	18.9	5.1
Yes	1644	11.3	60.6	30.8	8.7
<b>Age (<math>\chi^2= 6.0 p&lt;0.001</math>)</b>					
15–19	1630	11.2	79.8	19.6	0.6
20–24	3697	25.3	74.9	23.7	1.4
25–29	3976	27.2	76.2	21.1	2.7
30–34	2995	20.5	73.4	19.2	7.5
35–39	1630	11.2	68.2	17.0	14.8
40–44	553	3.8	64.6	10.2	25.2
45–49	116	0.8	65.8	6.7	27.5
<b>Marital status (<math>\chi^2=145.0, p&lt;0.001</math>)</b>					
Married	11,746	80.5	76.4	18.4	5.2
Cohabiting	2852	19.5	65.5	27.6	7.0
<b>Residence (<math>\chi^2=3.0, p=0.224</math>)</b>					
Urban	4785	32.8	75.2	19.5	5.3
Rural	9813	67.2	73.8	20.6	5.6
<b>Educational level (<math>\chi^2=363, p&lt;0.001</math>)</b>					
No education	5154	35.3	81.3	14.1	4.7
Primary	4913	33.7	66.4	26.0	7.6
Secondary	3990	27.3	73.3	22.3	4.4
Higher	541	3.7	86.5	10.8	2.7
<b>Wealth index (<math>\chi^2=46.3, p&lt;0.001</math>)</b>					
Poorest	3263	22.4	74.7	20.1	5.2
Poorer	3241	22.2	72.5	22.0	5.4
Middle	2860	19.6	73.2	20.8	6.1
Richer	2823	19.3	72.7	21.1	6.2
Richest	2410	16.5	79.5	16.0	4.5
<b>Parity (<math>\chi^2=998.4, p&lt;0.001</math>)</b>					
Zero birth	2202	15.1	87.1	12.2	0.6
One birth	2874	19.7	78.1	21.0	0.9
Two births	2685	18.4	76.0	22.4	1.6
Three births	2080	14.3	73.5	22.7	3.8
Four or more births	4757	32.6	65.7	21.1	13.2
<b>Occupation (<math>\chi^2=152.5, p&lt;0.001</math>)</b>					
Not working	4839	33.2	76.2	19.9	4.0
Managerial	492	3.4	82.1	13.9	4.0
Clerical	61	0.4	92.9	4.3	2.9
Sales	2990	20.5	77.9	16.9	5.2
Agricultural	4519	31.0	69.0	23.7	7.3
Services	820	5.6	71.3	21.5	7.3
Manual	877	6.0	76.2	18.3	5.5
<b>Religion (<math>\chi^2=475.0, p&lt;0.001</math>)</b>					
Christianity	8992	61.6	68.5	24.5	7.0
Islam	5068	34.7	85.0	12.2	2.8
Traditional religion	222	1.5	72.6	20.4	7.0
No religion	316	2.2	67.0	26.5	6.6
<b>Intention to use contraceptives (<math>\chi^2=610.3, p&lt;0.001</math>)</b>					
Intention to use	8765	60.0	66.7	26.0	7.3
No intention to use	5833	40.0	84.8	12.1	3.0
<b>Knowledge on contraceptives (<math>\chi^2=194.8, p&lt;0.001</math>)</b>					
No knowledge of any method	1108	7.6	89.9	8.4	1.8
Knowledge of traditional method	125	0.9	88.6	10.6	0.8
Knowledge of modern method	13,365	91.6	72.6	21.5	5.9
<b>Frequency of reading newspaper/magazine (<math>\chi^2=4.6, p=0.602</math>)</b>					
Not at all	12,141	83.2	74.3	20.2	5.5
Less than once a week	1369	9.4	73.1	20.9	6.0
At least once a week	972	6.7	76.1	19.5	4.4
Almost every day	116	0.8	70.8	22.9	6.3
<b>Frequency of watching television (<math>\chi^2=98.6, p&lt;0.001</math>)</b>					

**Table 2 (continued)**

Variables	Weighted n	Weighted %	Planned	Mistimed	Unwanted
Not at all	8880	60.8	72.9	21.1	6.1
less than once a week	1652	11.3	77.8	17.4	4.9
at least once a week	2878	19.7	79.5	16.3	4.2
almost every day	1188	8.1	66.6	27.9	5.4
<b>Frequency of listening to radio (<math>\chi^2= 31.2, p&lt;0.001</math>)</b>					
Not at all	6334	43.4	74.6	20.0	5.4
Less than once a week	2750	18.8	76.4	18.6	5.0
At least once a week	4780	32.7	73.7	20.7	5.6
Almost every day	734	5.0	66.4	25.6	8.0

Source: Authors' computations.

controlling for the effect of country and other sociodemographic variables. Women who had experienced sexual violence had higher likelihood of mistimed [ARRR = 1.5, CI = 1.3–1.7] and unwanted pregnancies [ARRR = 1.6, CI = 1.3–2.0] than those who had never experienced sexual violence. As evident in Model II, the highest risks of mistimed [ARRR = 1.9, CI = 1.4–2.6] and unwanted [ARRR = 4.2, CI = 2.4–7.3] pregnancies were recorded in Malawi while Nigeria and Chad had the lowest risk of mistimed [ARRR = 0.4, CI = 0.3–0.5] and unwanted pregnancies [ARRR = 0.2, CI = 0.1–0.5] respectively. Compared to women between the ages of 15 and 19, women of other categories of age had decreased risk of mistimed pregnancies whilst those aged 40–44 [ARRR = 3.3, CI = 1.4–7.6] and 45–49 [ARRR = 4.4, CI = 1.7–11.2] had increased risk of unwanted pregnancies. With marital status, women who were cohabiting had higher risk of mistimed [ARRR = 1.3, CI = 1.1–1.4] and unwanted pregnancies [ARRR = 1.6, CI = 1.3–2.1], compared to married women.

The risk of mistimed pregnancies was low among the richest women [ARRR = 0.8, CI = 0.7–0.9] whilst the risk of unwanted pregnancies was higher among richer women [ARRR = 1.4, CI = 1.0–1.8], compared to poorest women. Mistimed pregnancies were low among women who were engaged in an occupation, compared to those who had no occupation. There was an increased risk of mistimed and unwanted pregnancies among women whose educational level was either primary or secondary education, compared to women with no level of education. The risk of mistimed [ARRR = 0.7, CI = 0.6–0.8] and unwanted pregnancies [ARRR = 0.7, CI = 0.5–0.8] was low among Muslim women, compared to Christians. With parity, women who had either one child or two children had increased risk of mistimed and unwanted pregnancies respectively than those with zero birth. For women who had no intention to use contraceptives, the risk of mistimed [ARRR = 0.5, CI = 0.4–0.6] and unwanted pregnancies [ARRR = 0.4, CI = 0.4–0.6] was low. Finally, women who knew modern methods of contraception had higher risk of mistimed pregnancies [ARRR = 1.7, CI = 1.3–2.1].

## Discussion

In this study, we assessed the influence of sexual violence on planned, mistimed, and unwanted pregnancies in SSA. We found that, among women who delivered in the last 5 years preceding the DHS, slightly more than a quarter of them (26%) had experienced either mistimed or unwanted pregnancies. The proportion of both mistimed and unwanted pregnancies found in this study is comparatively higher than those found in other low- and-middle income countries outside SSA, such as Nepal (24.6%) (Acharya, Gautam, & Aro, 2016), but lower than what was found in Bangladesh (30%) (Bishwajit, Tang, Yaya, & Feng, 2017). A parallel study found a comparatively higher prevalence of both mistimed and unwanted pregnancies (29%) in 29 SSA countries (Ameyaw

**Table 3**  
Multinomial logistic regression on experience of sexual violence and pregnancy intention among women in SSA.

Variables	Base outcome (Planned pregnancy)			
	Model I		Model II	
	Mistimed CRRR (95% CI)	Unwanted CRRR (95% CI)	Mistimed ARRR (95% CI)	Unwanted ARRR (95%CI)
<b>Experienced sexual violence</b>				
No	<b>Ref</b>	<b>Ref</b>	<b>Ref</b>	<b>Ref</b>
Yes	2.0*** [1.8–2.3]	2.1*** [1.7–2.6]	1.5*** [1.3–1.7]	1.6*** [1.3–2.0]
<b>Country</b>				
Angola			<b>Ref</b>	<b>Ref</b>
Burundi			1.6*** [1.2–2.2]	3.0*** [1.8–4.7]
DR Congo			1.0[0.8–1.3]	0.7 [0.4–1.2]
Cote d'Ivoire			0.9[0.6–1.2]	0.6 [0.3–1.1]
Cameroon			0.8[0.6–1.2]	0.8 [0.4–1.5]
Ethiopia			0.8[0.6–1.2]	1.2 [0.6–2.3]
Gabon			0.8[0.6–1.1]	0.9 [0.6–1.6]
The Gambia			1.1[0.7–1.6]	0.4 [0.2–1.2]
Kenya			1.3[1.0–1.9]	2.3** [1.3–4.1]
Comoros			2.0** [1.3–3.0]	2.2 [1.0–5.0]
Mali			0.7[0.5–1.1]	0.7 [0.3–1.5]
Malawi			1.9*** [1.4–2.6]	4.2*** [2.4–7.3]
Nigeria			0.4*** [0.3–0.5]	0.6* [0.4–0.9]
Namibia			1.0[0.6–1.8]	1.9 [0.8–4.6]
Rwanda			1.4 [0.9–2.2]	3.3*** [1.7–6.4]
Sierra Leone			0.7[0.5–1.0]	1.9* [1.1–3.5]
Senegal			1.3[0.8–1.9]	0.5 [0.2–1.3]
Chad			0.9[0.6–1.3]	0.2*** [0.1–0.5]
Togo			1.4* [1.1–1.9]	1.8* [1.1–3.1]
Uganda			1.3*[1.1–1.7]	1.5[0.9–2.4]
Zambia			1.3 [1.1–1.8]	1.1 [0.7–1.8]
Zimbabwe			1.0[0.8–1.4]	2.0* [1.2–3.3]
<b>Age</b>				
15–19			<b>Ref</b>	<b>Ref</b>
20–24			0.7*** [0.5–0.8]	1.0[0.4–2.1]
25–29			0.4*** [0.3–0.5]	0.6 [0.3–1.4]
30–34			0.3*** [0.2–0.4]	1.0[0.4–2.2]
35–39			0.3*** [0.2–0.3]	1.8 [0.8–1.0]
40–44			0.1*** [0.1–0.3]	3.3** [1.4–7.6]
45–49			0.2*** [0.1–0.3]	4.4** [1.7–11.2]
<b>Marital status</b>				
Married			<b>Ref</b>	<b>Ref</b>
Cohabiting			1.3*** [1.1–1.4]	1.6*** [1.3–2.1]
<b>Wealth Index</b>				
Poorest			<b>Ref</b>	<b>Ref</b>
Poorer			1.1 [1.0–1.2]	1.0 [0.8–1.3]
Middle			1.0 [0.9–1.1]	1.1[0.9–1.5]
Richer			1.1 [0.9–1.2]	1.4* [1.0–1.8]
Richest			0.8* [0.7–0.9]	1.1[0.8–1.6]
<b>Occupation</b>				
Not working			<b>Ref</b>	<b>Ref</b>
Managerial			0.7* [0.5–0.9]	0.6 [0.3–1.1]
Clerical			0.2** [0.1–1.6]	0.5 [0.1–2.1]
Sales				0.9 [0.7–1.1]

**Table 3 (continued)**

Variables	Base outcome (Planned pregnancy)			
	Model I		Model II	
	Mistimed CRRR (95% CI)	Unwanted CRRR (95% CI)	Mistimed ARRR (95% CI)	Unwanted ARRR (95%CI)
			0.8** [0.7–0.9]	
Agricultural			0.8** [0.7–0.9]	0.8 [0.7–1.0]
Services			1.0[0.8–1.2]	1.3 [0.9–1.9]
Manual			1.1[0.9–1.3]	1.0 [0.6–1.5]
<b>Education</b>				
No education			<b>Ref</b>	<b>Ref</b>
Primary			1.3*** [1.21–1.5]	1.5*** [1.2–1.8]
Secondary			1.5*** [1.3–1.8]	1.7*** [1.3–2.3]
Higher			1.3[0.9–1.9]	1.4[0.7–2.9]
<b>Religion</b>				
Christianity			<b>Ref</b>	<b>Ref</b>
Islam			0.7*** [0.6–0.8]	0.7** [0.5–0.8]
Traditional religion			1.0[0.7–1.4]	0.7[0.4–1.3]
No religion			1.2 [0.9–1.6]	1.[0.7–1.8]
<b>Parity</b>				
Zero birth			<b>Ref</b>	<b>Ref</b>
One birth			2.5*** [2.1–3.0]	1.8[0.9–3.7]
Two births			3.7*** [3.0–4.5]	3.7*** [1.8–7.6]
Three births			5.1*** [4.1–6.4]	10.2*** [5.0–20.6]
Four or more births			8.2*** [6.5–10.3]	38.5*** [19.0–78.0]
<b>Intention to use contraceptives</b>				
Intention to use			<b>Ref</b>	<b>Ref</b>
No intention to use			0.5*** [0.4–0.6]	0.4*** [0.4–0.6]
<b>Knowledge on contraceptives</b>				
No knowledge of any method			<b>Ref</b>	<b>Ref</b>
Knowledge of traditional method			0.9[0.5–1.8]	0.3[0.03–1.9]
Knowledge of modern method			1.7*** [1.3–2.1]	1.6[1.0–2.6]
<b>Frequency of watching television</b>				
Not at all			<b>Ref</b>	<b>Ref</b>
Less than once a week			1.00 [0.8–1.1]	0.9[0.7–1.3]
At least once a week			1.0 [0.9–1.2]	1.0 [0.7–1.3]
Almost every day			1.2[1.0–1.5]	1.0[0.7–1.5]
<b>Frequency of listening to radio</b>				
Not at all			<b>Ref</b>	<b>Ref</b>
Less than once a week			1.0 [0.9–1.1]	1.0 [0.7–1.2]
At least once a week			1.0 [0.9–1.1]	1.0[0.8–1.2]
Almost every day			0.9[0.7–1.1]	1.1[0.8–1.6]

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001; Ref = Reference, CI=Confidence Intervals, CRRR=Crude.

Relative Risk Ratio, ARRR = Adjusted Relative Risk Ratio.

Source: Authors' computations.

et al., 2019). The disparities in the prevalence of mistimed and unwanted pregnancies could be partly due to variations in inclusion criteria and sample size between the studies. Besides, the key independent variable “sexual violence” in the current study was not included in Ameyaw et al.’s (2019) study. Also, some countries in Ameyaw et al.’s (2019) study had not updated their DHSdata which only covered the survey period 2010–2016, unlike the current study which included 2010–2018 survey data of the SSA countries. Nevertheless, underestimation of the burden of unintended pregnancy among women in the current analysis is probable because only married and cohabiting women who had a live birth in the last 5 years preceding the DHS data collection were included while SSA countries that had no data on sexual

violence were excluded.

Women with history of sexual violence had increased risk of unwanted and mistimed pregnancies irrespective of their education, wealth status, and other socio-demographic factors. The findings support the findings of [Lukasse et al. \(2015\)](#) that women who had experienced any lifetime abuse had a high propensity of unintended pregnancy. In Nepal, [Acharya et al. \(2019\)](#) identified higher odds of unintended pregnancy among women who had ever been sexually abused by their husbands. Other studies in Pakistan ([Zakar, Nasrullah, Zakar, & Ali, 2016](#)), South Asia ([Anand et al., 2017](#)), and Bangladesh ([Raihana, Shaheen, & Rahman, 2012](#)) have also found intimate partner violence, which includes sexual violence, to influence mistimed and unwanted pregnancies. One of the possible reasons for this finding is that the supremacy of males in sexual decision-making can diminish women's power over fertility and contraceptive access and use ([Gomez, 2011](#); [Silverman et al., 2011](#)). Moreover, mistimed and unwanted pregnancies can ensue due to the refusal of men to use condom and the fear of women to negotiate for condom use ([Acharya et al., 2019](#); [Silverman et al., 2011](#)). Another possible reason could be that the experience of sexual violence by women increases their risk of experiencing coercion to get pregnant. Such women may also experience contraceptive sabotage, which can increase the risk of mistimed and unwanted pregnancies ([Miller et al., 2010](#)).

Aside the principal independent variable (sexual violence) that was explored, other key covariates were also associated with pregnancy intentions when they were controlled for in the second model of our analysis. Specifically, with country, the highest risk of unwanted and mistimed pregnancies was recorded in Malawi whilst Nigeria and Chad had the lowest risks of unwanted and mistimed pregnancies. Other studies in SSA and national studies in Malawi, Nigeria, and Chad on mistimed and unwanted pregnancies came out with findings that are similar to our findings. For instance, a recent study by [Ameyaw et al. \(2019\)](#) found that almost half of women aged 15–49 in Malawi had experienced either mistimed or unwanted pregnancies. [Palamuleni and Adebowale \(2014\)](#) had earlier found almost 43% of unintended pregnancies in Malawi, of which 25% were mistimed. In a similar study, [Hall, Barrett, Phiri, Copas, and Stephenson \(2016\)](#) found only 44.4% of planned pregnancies, with the remaining 55.6% either mistimed or unwanted. The plausible reason for the observation made about Malawi include the relatively high prevalence of sexual violence ([Ahinkorah, Dickson, & Seidu, 2018](#)), inadequate women empowerment ([Jonsson, 2015](#)), and poverty ([Ngwira, 2014](#)). The low prevalence of sexual violence in both Nigeria and Chad, compared to Malawi ([Ahinkorah et al., 2018](#)), could possibly explain why women in the two countries have a lower risk of mistimed and unwanted pregnancies.

In comparison to women between the ages of 15 and 19, those of all other categories of age had decreased risk of mistimed pregnancies whilst those aged 40–44 and 45–49 had increased risk of unwanted pregnancies. In relation to the high risk of mistimed pregnancies among women aged 15–19, some previous studies have provided findings which affirm the results of our study in the context of the whole Africa ([Darroch, Woog, Bankole, & Ashford, 2016](#)) and specific countries within SSA ([Adeniyi et al., 2018](#); [Ameyaw, 2018](#); [Ikamari et al., 2013](#); [Nyarko, 2019](#)). A study by [Ameyaw et al. \(2019\)](#) identified higher odds of both mistimed and unwanted pregnancies among older women, compared to younger women in SSA. Several reasons may account for this finding, including the evidence that young women in SSA have inadequate access to sexual and reproductive health information and services, including knowledge on contraception ([Durojaye, 2011](#); [Ivanova, Rai, & Kemigisha, 2018](#); [Munakampe, Zulu, & Michelo, 2018](#)). The possible reason for the finding that older women had an increased risk for unwanted pregnancies could be that older women might have given birth to the number of children they want to have and, as such, consider any additional pregnancy as not essential.

We found that women who were cohabiting had a higher risk of unwanted and mistimed pregnancies in comparison with married

women. This finding contradicts the finding of [Ameyaw et al. \(2019\)](#), who identified high rates of unintended pregnancies among married women, compared to unmarried women in SSA. Other studies within the SSA region, however, came out with findings that confirm the findings of the current study ([Ikamari et al., 2013](#); [Kassahun et al., 2019](#)). We argue that married women have a lower risk of unwanted and mistimed pregnancies, compared to cohabiting women, because of the relationship between marriage and reproduction ([Anderson, 2013](#), p. 2775; [Robb, 2006](#)). [Robb \(2006\)](#) and [Anderson \(2013, p. 2775\)](#) explain that reproduction can occur the most within marriage, compared to outside marriage. Furthermore, other studies within SSA have found high obstacles to access to sexual and reproductive health information and services, including contraception, among unmarried women, compared to married women ([Aloo-Obunga, 2003](#); [Rossier & Corker, 2017](#)). Although knowledge and intention to use contraception has been considered as effective in reducing the risk of unwanted and mistimed pregnancies in SSA ([Ameyaw et al. \(2019\)](#)), when linked to contraception use, we identified a rather counterintuitive finding that women who had knowledge of modern contraceptives had higher risk of mistimed pregnancies whilst those who had no intention to use contraceptives had lower risk of unwanted and mistimed pregnancies. We contend that knowledge and intention to use contraceptives may not necessarily lead to effective use of contraceptives ([Afolabi et al., 2015](#); [Nsubuga et al., 2015](#); [Roy, Ram, Nangia, Saha, & Khan, 2003](#)) and, hence, may not play a significant role in reducing the risks of unwanted and mistimed pregnancies.

The risk of mistimed pregnancies was low among women in the richest wealth quintile and those engaged in an occupation, whilst women who had attained primary and secondary level of education had increased risks of mistimed and unwanted pregnancies. The effect of wealth status and occupation on unwanted pregnancies corroborates the findings of previous studies within the SSA region ([Ikamari et al., 2013](#); [Haffejee et al., 2018](#); [Ameyaw, 2018](#)). A possible explanation to the link between wealth status, occupation, and unwanted pregnancies is that formal employment is connected to earning capacity and social networks ([Al Riyami, Affi, & Mabry, 2004](#); [Behrman, Kohler, & Watkins, 2002](#)). Again, women in formal employment are more likely to have more earnings, increased reproductive health knowledge, and participate in social networks that provide support for family planning and help to attain reduction in fertility ([Crichton, Okal, Kabiru, & Zulu, 2013](#); [Hindin, 2000](#)). Although higher levels of education have been found to be effective in reducing both mistimed and unwanted pregnancies in SSA through an increased knowledge and use of sexual and reproductive health information and services ([Ameyaw et al., 2019](#)), our finding that women with at least primary level of education had increased risk of unwanted and mistimed pregnancies can be explained within the context of the effect of pregnancy on schooling. That is, unintended pregnancies may hinder the furthering of one's education ([Nkosi, Makhene, & Matlala, 2019](#); [Yazdkhasti, Pourreza, Pirak, & Abdi, 2015](#)).

The risks of unwanted and mistimed pregnancies were lower among Muslim women, compared to Christians. Similar findings have been obtained by previous scholars who also identified Muslim women to be less likely to experience mistimed and unwanted pregnancies ([Ameyaw, 2018](#); [Mulatu, 2014](#)). Other scholars like [Ameyaw et al. \(2019\)](#), on the other hand, found Muslim women as having higher risk of unwanted and mistimed pregnancies, compared to Christians. This might be because of differences in doctrines among the women along the lines of religion ([Ameyaw, 2018](#)). Relatedly, women with at least one child or two children were at higher risks of unwanted and mistimed pregnancies, compared to those with zero birth. We argue that women who have never had a child may have desire for children and, hence, pregnancy whereas those who have had at least a child may already have had their desired number of children and can consider some pregnancies as unwanted or mistimed. The finding contradicts the finding of [Ameyaw et al. \(2019\)](#) that women with at least one child were less likely to

experience unwanted and mistimed pregnancies.

### Strengths and limitations

This study is strengthened by the use of large data sets from 22 countries under the DHS program. Again, we included only variables that showed significant associations with pregnancy intention. This supports the rigor of our models and buttresses the reliability and replicability of our findings. In terms of limitations, there is the need to take caution with the interpretation of the results since we used cross-sectional design that looks at association and makes it difficult to establish causality of pregnancy intention in SSA. There is also the tendency that respondents in this study answered questions in a manner that will be considered favourable by others, since the key independent variable was a self-reported variable that demanded women to state whether their partners had ever used physical force to perform any other sexual acts when they did not want to and whether their husbands used threats or in any other way to perform sexual acts when they did not want to. We also acknowledge that in our measure of desire of pregnancy intention, our findings could be masked by post-rationalist behaviour of the respondents.

### Conclusion and policy implications

The purpose of this study was to examine the effect of sexual violence on planned, mistimed, and unwanted pregnancies in SSA. Sexual violence plays a key role in mistimed and unwanted pregnancies. It is, therefore, prudent to develop various assessment techniques to detect sexual violence in union and refer victims to appropriate services to diminish the risk of mistimed and unwanted pregnancies. Our findings have provided the basis for developing and implementing policies and interventions aimed at reducing mistimed and unwanted pregnancies. Such policies and interventions can include health education, comprehensive sexuality education, and access to family planning services including counselling services, contraception, and skills-building. Such policies and interventions should target younger women, cohabiting women, poor women, non-working women, and uneducated women.

Such interventions should target reversing the current dynamics of mistimed and unwanted pregnancies in the SSA region. To be successful, the interventions should be supported by governments of SSA countries because national policies and programmes that aim to reduce mistimed and unwanted pregnancies should be backed by consistent political will. It is also essential to encourage women to use contraception instead of only having the knowledge and intention to use contraception.

### Authors' contributions

BOA conceived the study. AS designed and performed the analysis. BOA, FS, EB, EKA, BL, AS, JKO and FA designed first draft of the manuscript. EB, BL, FS, AS, JKO, BOA, EKA and FA revised the manuscript for intellectual content and gave consent for the version to be published. All authors have read and approved final manuscript and agreed to be accountable for all aspects of the work.

### Acknowledgement

We are grateful to MEASURE DHS for granting us access to use the data. The datasets were downloaded from <https://dhsprogram.com/data/available-datasets.cfm> Our sincere gratitude goes to Mr. Ebenezer Agbaglo of the Department of English, University of Cape Coast for proofreading this manuscript.

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