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# Survival analysis and prognostic factors associated with the timing of first forced sexual act among women in Kenya, Zimbabwe and Cote d'Ivoire

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ABSTRACT

The paucity of information on the age at which Forced Sexual Act (FSA) among women occur and the factors affecting the timings in Africa necessitated this study. We assessed the timing of first FSA and its prognostic factors among women in three African countries. We used sexual violence data of 18,528 women aged 15–49 years who participated in Zimbabwe (2011), Kenya (2014), and Cote d'Ivoire (2014) demographic and health surveys. The time of first FSA was censored as the current age of women who had not experienced FSA. Kaplan-Meier methods and Cox proportional hazard model were used at $p = 0.05$. The proportion who had ever experienced FSA was 13.9%, 21.7% & 27.2% while median time to FSA was 17, 20 & 18 years in Kenya, Zimbabwe, and Cote d'Ivoire respectively. The highest (41.8%) lifetime prevalence of forced sexual act was among divorced/separated women in Cote D'Ivoire. Women aged 15–19 years had earlier risk of FSA: Kenya (aHR = 3.60 (95% CI:2.43–5.34)), Zimbabwe (aHR = 2.91 (95% CI:2.32–3.65)), and Cote d'Ivoire (aHR = 2.72 (95% CI:2.22–3.33)) than women aged 40–49 years. Other significant prognostic factors of time of FSA are marital status, place of residence, employment status, religion, wealth index, and education. There are generational shifts in timing of first forced sexual act among women with girls born in the 1990s becoming victims at earlier ages than those born in the 1960s and 1970s. There is a need for a multi-sectoral approach to reduce the prevalence and halt the negative trend in forced sexual act in Africa.

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## Background

The United Nation described violence against women and girls as "one of the most systematic and widespread human rights violations" [1]. Violence against women is a worldwide public health problem associated with a wide range of negative consequences. These violations are gender-based (GBV) and comprise of physical and sexual violence. According to the United Nations, GBV is "any act of violence that results in or is likely to result in physical, sexual or psychological harm or suffering for women, including threats of such acts, coercion, or arbitrary deprivations of liberty, whether occurring in private or public life" [1]. The violence does not necessarily connote the use of force but may follow coercion [2]. Sexual

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violence is "any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic, or otherwise directed, against a person's sexuality using coercion, by any person regardless of their relationship to the victim, in any setting, including but not limited to home and work" [3]. Sexual coercion is a form of sexual violence. According to Ajuwon et al., it is "the use of force or attempts to force another individual through violence, threats, verbal insistence, deception, cultural expectations, and economic circumstances to engage in any sexual activity against his or her will" [4].

Non-consensual sex and other forms of sexual abuse are found in nearly all studied cultures of the world. Women are most frequently the target of sexual violence perpetrated by males [1,5]. It happens among women of all age groups, but those aged 15 years or younger are particularly vulnerable to unwanted sex [6–9]. This usually leads to different degrees of emotional and/or physical trauma forcing the victim to be isolated from social activities [5,10]. A 2001 Kenyan survey among young people aged 10–24 years in Nyeri, Kenya, showed that over 20% and 10% of the sexually-experienced young women and men respectively had non-consensual sex mostly perpetrated by their intimate partners [11]. Also, sexually active women in casual relationships were more likely to experience sexual violence than married women and the violence among the unmarried women in casual relationships was strongly associated with HIV infection [12].

Globally, it is estimated that a third of women experience physical or sexual violence [13]. The prevalence of coerced or forced sexual act among adolescents, aged 15 years or younger, is lower in the developed countries [10]. Lifetime history of sexual coercion in women in the US and Germany was about 13% [14]. Studies conducted in South Africa, Kenya, Ghana, and Uganda have found the prevalence of coerced sex ranging from 14% in rural Uganda to 32% in urban Capetown [2]. A study conducted among school-going youths across 10 southern African countries between 2003 and 2007 found 19.6% of female students and 21.1% of male students aged 11–16 years to have reported forced or coerced sex [15]. In Ghana, 25% of females in a recent study reported that their first sexual intercourse had been forced [16]. A multi-country study across 10 economically and culturally diverse countries found that experience of physical and sexual violence by an intimate partner among women ranged from 4% in Japan to 53% in Ethiopia within the 12 months preceding the survey [3]. Also, 63% of the sex workers in Chennai reported experiencing forced sexual act within three months preceding an Indian national survey [15].

Sexual violence is often caused by the desire of perpetrators to acquire power and control over the victims. Sexual violence can also be caused as a result of settings and circumstances such as conflict-related and domestic sexual violence. Conflict-related sexual violence is mostly perpetrated during conflicts and displacements by combatants, including rebels, militia, and government forces while domestic sexual violence is usually perpetrated by intimate partners and close relatives [17,18].

Literature is replete on the factors increasing women vulnerability to sexual violence. The factors include age, alcohol consumption, previous experience of sexual violence, poverty, socioeconomic status, educational attainment [1,2,6,7,19]. Young women have been found to be at higher risk of forced sexual act than older women, with sexual violence taking place in schools, colleges, among peasant sellers, hawkers and in the trafficking of women for sexual exploitation [16]. Alcohol consumption increases vulnerability and makes it more difficult for women to protect themselves and effectively act on warning signs [6,19]. Studies have shown that women who have been raped before are at greater risk of experiencing another episode of forced sexual act [20].

The effect of education and empowerment on sexual violence is bi-directional. Less educated girls are mostly deprived and they are often taken advantage of. Poor women and girls are at a greater risk of experiencing sexual violence especially in the course of their daily tasks compared to those who are better off [13,21,22]. Also, studies have shown that more educated and empowered women are at greater risks of sexual violence. Men often resort to sexual violence in order to gain control over women that resist patriarchal norms as a result of empowerment they acquired over time [3,16]. Other documented risk factors of forced sexual act include early sexual debut, multiple sexual partnering, trading sex for money or favour or gifts, the location of residence etc [23].

The consequences of sexual violence are enormous. In addition to adverse physical, mental, psychological, social, economic and reproductive health outcomes, studies have shown that sexual violence is strongly associated with HIV/AIDS [1,5]. It can also cause chronic pain, infection, and infertility. Rape, a form of sexual act, may cause traumatic gynaecological fistula [15]. Rape may also lead to pregnancy, miscarriage or abortion, each of which carries its own risk. The psychological implications are equally severe. Rape survivors often experience severe trauma and depression, long-term disease, sometimes leading to suicide [17].

Violence against women is one of the most pervasive, but apparently one of the least recognized human right abuse and it is affected by the socio-cultural context of women, and it varies widely across countries [15]. It is grossly underreported globally and available figures are not likely to reflect the true magnitude of sexual violence. Shame, fear of not being believed and closeness to the perpetrators are some of the reasons for concealment of sexual violence. The reluctance of men to report sexual violence as a result of negative dispositions of people about their masculinity and their inability to prevent the assault in the first place has done efforts targeted at reporting sexual violence a big blow [13].

Despite the availability of studies describing the sexual experiences at sexual debut, the prevalence of sexual violence among women and prevalence of GBV, there is a paucity of information on the timing of first forced sexual act among women in Africa. Literature has already documented that sexual abuse is a highly sensitive issue and its experience in early life is particularly difficult to explore [8,24]. However, due to the availability of DHS data, the current study focussed on forced sexual act and when it first occurred. This study is therefore aimed at filling the gap in knowledge on the timing of first forced sexual act and its determinants among women in selected African countries. It will also provide an evidence-

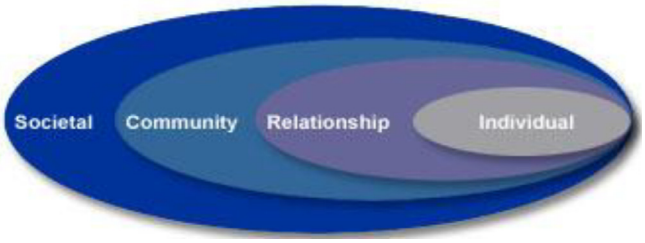


**Fig. 1.** The Social-Ecological Model: A Framework for Prevention of Sexual Violence [37].

based framework for parents, guardians, the community and the policymakers and stakeholders on tackling the problem of sexual violence against women in general and the girl-child in particular.

*Theoretical framework*

Several frameworks have been used to understand the occurrence, victimization, perpetration, re-victimization, recurrence of violence in literature [25–32]. For instance, Kelly developed an ecological model which posited clear interdependence between the functions of individuals and community organizations. The author stated that the patterns of experiences of violence among individuals are different depending on their different ecological settings [25–27]. Adapting the Bronfenbrenner's earlier concept of factors predisposing women to violence [28–30], Heise and White et al. stated that its causes and risk factors for perpetration shaped the theoretical models of sexual violence [31,32]. Also, the CDC and WHO adapted the Bronfenbrenner's approach to developing multilevel models for the prevention of gender-based violence [33–35]. In a more recent note, Campbell et al. developed an ecological model from Bronfenbrenner's approach to explaining the impact of sexual assault on women's mental health [36]. The authors examined the psychological impact of adult sexual assault from an ecological theoretical point of view. They identified how different factors at multiple levels of the social ecology contribute to post-assault life of the victims. In particular, they identified individual-level, assault characteristics, microsystem, mesosystem/exosystem, macrosystem, and chronosystem factors.

In this study, we adapted the social-ecological model [37] has shown in Fig. 1. The model posited that the best way to prevent sexual violence is a thorough understanding of its causes. The social ecological model, which has a four-level social-ecological model to better understand violence and the effect of potential prevention strategies, has been used by the CDC extensively [19].

The social-ecological model considered the complex interplay between individual, relationship, community, and societal factors. It showed that there is a diverse and complex range of factors that put people at risk of committing or being a victim of violence or protect them from experiencing it. The rings of each level (Fig. 1) overlapped and it depicted how the factors at one level influence factors at another level. In summary, the model suggested that in order to prevent violence, it is necessary to act across multiple levels of the model at the same time.

## Methods and materials

*Study setting*

This study used data from the most recent sets of Demographic and Health Survey (DHS) conducted in Zimbabwe (Southern Africa) in 2011, and in Kenya (Eastern Africa) and Cote d'Ivoire (Western Africa) in 2014. The data were collected by ICF Macro Calverton, Maryland, USA in conjunction with National Population Commissions of each country. The selection of these sub-Sahara Africa countries was through a random selection of one country each from those that had DHS data on sexual violence from Western, Eastern and Southern Africa to reflect cultural differences across Africa. The DHSs were cross-sectional and nationally representative. These series of surveys provided information about demographics, sexuality and other reproductive and sexual behaviour of men and women of reproductive age. All the DHS used in this study provided population and health indicator estimates at the national and provincial/district/state levels.

We hypothesized that there is no difference in the prevalence and timing of first forced sexual act and the factors influencing the timings across the three countries. We strived to answer the question: Are prevalence and timing of first forced sexual act and the factors contributing to it different across in Africa?

## Sampling methods

*Zimbabwe*

The sampling frame used for the 2010–11 Zimbabwe DHS was the 2002 Population Census. The 2010–11 Zimbabwe DHS sample was selected using a stratified, two-stage cluster design. Enumeration areas (EAs) were the sampling units at the

first stage. The sample for the survey included 406 EAs, with 169 urban and 237 rural EAs. The EAs were subdivisions of wards from all the districts in Zimbabwe. Households were used for selection at the second stage. A representative sample of 10,828 households was selected from a complete listing of households was done in each of the 406 selected EAs. A woman each was interviewed in the selected households. In all, 9171 women aged 15–49 were interviewed.

*Kenya*

The sample for the 2014 Kenya DHS was drawn from the Kenya Fifth National Sample Survey, and Evaluation Programme (NASSEP-V). Kenya is divided into 47 counties with each county stratified into urban and rural strata (clusters). Using a two-stage sampling design, samples were drawn in each stratum independent of other strata. In the first stage, 1612 clusters were randomly selected with equal probability selection method from the NASSEP-V frame, with 617 from urban and 995 from rural areas. Twenty-five households were randomly selected from each cluster using the list of eligible households at the second stage. A total of 40,300 households were visited among which 31,079 women were interviewed.

*Cote d'Ivoire*

The 2011–2012 Cote d'Ivoire DHS-MICS used a national sample of 10,413 households selected in a stratified two-stage sampling procedure. The population was stratified to provide adequate representation of urban and rural areas as well as eleven areas of study, corresponding to the ten former administrative regions and the city of Abidjan. The national territory was first divided into clusters or census districts (CDs), then 352 clusters, including 161 in urban areas and 191 in rural areas, were selected by systematically. At the second stage of drawing and according to the place of residence, a fixed number of households were drawn in each cluster counted by a systematic draw with equal probability. The average number of households in a cluster is 27 in urban areas and 32 in rural areas. All women aged 15–49 who usually live in selected households, or present the night before the investigation were eligible for interview. A total of 18,827 women were interviewed.

An overall total of 18,528 women aged 15–49 years were identified as eligible. This consisted of 5650 from Kenya, 6076 from Zimbabwe and 6802 from Cote d'Ivoire.

*Variables*

The outcome variables in this study are an experience of forced sexual act and the age (in years) at first forced sexual act. First forced sexual act is the age at which a woman was first forced to have a sexual act. Forced sexual acts consist of unwanted sexual intercourse and other sexual acts such as unwanted or unsolicited kiss, touch, oral sex etc. We reviewed the DHS questionnaires to arrive at this outcome. Respondents were asked the following questions: "At any time in your life, as a child or as an adult, has anyone ever forced you in any way to have sexual intercourse or perform any other sexual acts when you did not want to?", "How old were you the first time you were forced to have sexual intercourse or perform any other sexual acts by anyone, including (your/any) husband/partner?" and "How old were you the first time you were forced to have sexual intercourse or perform any other sexual acts?" The questions were recoded in the DHS data as variables: "ever forced to perform unwanted sexual acts" and "age at first forced sexual act". These informed the study outcome variable.

The independent variables are current age (15–19, 20–24; 25–34; 35+ years), marital status (never in union, currently married, living with sexual partner, widowed and divorced/separated), education (none, primary, secondary, higher), religion (Islam, Christian/Catholic, others), the area of residence (rural, urban), wealth index wealth (poorest, poorer, middle, richer, richest), occupational status (employed/unemployed) as identified in similar earlier studies to be associated with sexual violence [1,3,6,7,38–40].

## Data analysis

Descriptive statistics and survival analysis techniques were used to analyze the data at a 5% significance level. All data were weighed so as to ensure representativeness at the national, regional, and county levels because of the non-proportional allocation to the sampling strata and the fixed sample size per cluster.

*Justification for use of survival analysis*

The fact that every woman was at the risk of forced sexual act right from birth, made the data to follow the fundamental principle of survival analysis, wherein the women may or may not have experienced a forced sexual act. The event of interest in this study is the age (in years) as of the time the women experienced first forced sexual act. Survival analysis is the only choice when inferences are to be made on the time to occurrence of an event of interest in which case, all the respondents were susceptible to this particular event but not everyone has or will necessarily experience the event as of the survey date [41]. The event of interest is then censored among these subjects who did not experience the event by the end of the study and are included in the analysis.

The survivor function of the time to first forced sexual act is the estimate of the probability that a woman "survives" longer than some specified time $t$ without experiencing forced sexual act, while the hazard function gives the instantaneous rate per unit time of experiencing forced sexual act after time $t$, given that the individual women have not experienced forced sexual act before time $t$. Survival and hazard functions are mathematically denoted as stated in Eqs. (2) and (3) [11,42,43]

$$s(t) = S'(t) = \frac{d}{dt}S(t) = \frac{d}{dt}\int_t^{\infty} f(u)du = \frac{d}{dt}[1 - F(t)] = -f(t) \tag{1}$$

and

$$\lambda(t) = \lim_{dt \to 0} \frac{\Pr(t \le T < t + dt)}{dt(S(t))} = \frac{f(t)}{S(t)} = -\frac{S'(t)}{S(t)} \tag{2}$$

The "survival time" or "follow-up time", is assumed to be a discrete random variable that takes on only positive integer [44]. In the current study, the population at risk are all women involved in the surveys since they are all exposed to forced sexual act at one time or the other in their lifetime. Our survival time for women who had already experienced forced sexual act is the women's age at the time of the first forced sexual act while the current age is the censored time for women who have never had forced sexual act as of the survey date. Thus their censoring index were "1″ and "0″ respectively. The Kaplan-Meier method for estimating S(t) was used to compute the survival estimates as shown in Eq. (3)

$$s(t) = \prod_{j=1}^{k} \frac{(n_j - d_j)}{n_j} \tag{3}$$

Where $n_j$ is the number of participants observed at time $t_j$ and $d_j$ is the number of the participant that experienced sexual violence at time $t_j$.

The Cox Proportional Hazard (CPH), was used to model the factors associated with the timing of the first forced sexual act. The effect of each covariate viz-a-viz its levels was presented in Hazard Ratios (HR) and its confidence intervals. If HR>1, then there is a higher risk or more exposure to forced sexual act, HR < 1 implies low exposure while HR = 1 has no effect on the exposure. In the stratified Cox analysis, we tested if the assumptions of the proportional-hazards were violated or not. The significant variables in each of the bivariate Cox regression were used in the multiple Cox regression to assess association with the outcome variable while controlling for confounders. Statistical significance was determined at p-value = 0.05. SPSS version 20 was used for data analysis.

## Result

Of the 18,528 women eligible for this study, 28.3%, 25.5%, and 25.2% from Kenya, Zimbabwe and Cote d'Ivoire respectively were aged 30–39 years while 54.2%, 58.4%, and 47.8% respectively were currently married. Only 10.2%, 4.5%, and 3.5% had higher education, 60.3%, 61.8%, and 61.2% live in rural areas, 6.3%, 0.5%, and 1.3% are Muslims while only 24.2%, 24.5%, and 24.6% were from households in the richest wealth quintiles in Kenya, Zimbabwe, and Cote d'Ivoire respectively as shown in Table 1.

The lifetime prevalence of forced sexual act among the respondents is also presented in Table 1. The prevalence was 13.9% in Kenya, 21.7% in Zimbabwe and 27.2% in Cote d'Ivoire. The highest lifetime prevalence of forced sexual act was among divorced women in Kenya (31.7%), Zimbabwe (35.3%) and Cote D'Ivoire (41.8%). The lifetime prevalence of forced sexual acts was consistently higher among women that are employed. It was higher among urban dwellers in all countries except in Cote d'Ivoire where rural women had a higher prevalence. In terms of educational attainment, prevalence of forced sexual act was highest among those with primary education (17.7%) and least among those with higher education (8.3%) in Kenya, highest among those with secondary education (22.4%) and least among those with no education (19.2%) in Zimbabwe and highest among those with primary education (31.5%) and lowest among those with highest education (19.6%) in Cote d'Ivoire.

The timing (age) of first forced sexual act among women who have already experienced at least one episode of the forced sexual act is presented in Table 2. The median time to first forced sexual act was 17 years, 20 years and 18 years in Kenya, Zimbabwe and Cote d'Ivoire respectively. The timing varied generally across the countries and the women' characteristics considered. For instance, it was earlier among younger women than among older ones. The timing also increased with the level of educational attainment, while the timing was 16 years, 20 years and 18 years for women with no formal education in Kenya, Zimbabwe and Cote d'Ivoire respectively, it was 19 years, 23 years and 19 years among those with higher education. Nearly 2% of Kenya women had first forced sexual act before age 10 years compared with 1.6% in Zimbabwe and 1.1% in Cote d'Ivoire. Nearly 4.5% of women aged 15–19 years in Kenya had experienced forced sexual act before age 10 compared with 0.7% among those aged 25–34 years and 2.0% among those aged 35–49 years. Also, 4.5%, 3.3% and 1.9% of never-in-union women in Kenya, Zimbabwe and Cote d'Ivoire respectively had experienced forced sexual act before attaining age 10 years.

The comparison of the rate at which women experience forced sexual act as they grow older in the three countries showed that the risk of the forced sexual act was about zero in the three countries up to age 9 after when the forced sexual act started gradually. As early as age 12, there were observable differences in the rate of a forced sexual act in

**Table 1**
Distribution of respondents and prevalence of forced sexual act by selected socio-demographic characteristics.

| Characteristics | Distribution of Respondents (%) | | | | Prevalence of Forced sexual act (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Overall | Kenya | Zimbabwe | Cote d'Ivoire | Overall | Kenya | Zimbabwe | Cote d'Ivoire |
| **Age** | | | | | | | | |
| 15–19 | 20.6 | 17.9 | 21.6 | 22.0 | 14.0 | 6.5 | 16.3 | 17.0 |
| 20–24 | 19.7 | 18.8 | 20.9 | 19.3 | 22.5 | 12.5 | 25.2 | 27.8 |
| 25–34 | 33.5 | 35.1 | 32.0 | 33.5 | 24.0 | 15.5 | 24.2 | 31.3 |
| 35–49 | 26.3 | 28.3 | 25.5 | 25.2 | 22.9 | 17.5 | 20.6 | 30.2 |
| **Marital Status** | | | | | | | | |
| Never in union | 26.3 | 28.9 | 25.1 | 25.3 | 10.4 | 6.1 | 12.1 | 13.0 |
| Married | 53.2 | 54.2 | 58.4 | 47.8 | 23.2 | 14.9 | 23.8 | 30.0 |
| LW Sexual Partner | 8.9 | 5.1 | 3.0 | 17.4 | 28.6 | 13.6 | 28.2 | 32.3 |
| Widowed | 3.8 | 3.8 | 6.0 | 1.7 | 23.1 | 21.0 | 21.9 | 30.7 |
| Divorced/Separated | 7.8 | 8.1 | 7.5 | 7.8 | 36.5 | 31.7 | 35.3 | 41.8 |
| **Education** | | | | | | | | |
| Primary | 37.7 | 51.1 | 27.7 | 35.7 | 23.3 | 17.7 | 21.0 | 31.5 |
| Secondary | 47.8 | 31.8 | 65.5 | 45.2 | 20.3 | 10.1 | 22.4 | 23.5 |
| Higher | 5.9 | 10.2 | 4.5 | 3.5 | 13.5 | 8.3 | 19.2 | 19.6 |
| No Education | 8.6 | 7.1 | 2.3 | 15.6 | 24.1 | 11.5 | 18.4 | 29.6 |
| **Residence** | | | | | | | | |
| Urban | 38.9 | 39.7 | 38.2 | 38.8 | 20.5 | 15.2 | 23.5 | 22.5 |
| Rural | 61.1 | 60.3 | 61.8 | 61.2 | 21.9 | 13.1 | 20.7 | 30.1 |
| **Wealth Quintile** | | | | | | | | |
| Poorest | 17.1 | 15.9 | 16.8 | 18.4 | 22.4 | 13.7 | 19.7 | 30.8 |
| Poorer | 18.5 | 18.8 | 17.4 | 19.3 | 22.5 | 15.8 | 20.0 | 29.8 |
| Middle | 18.9 | 19.8 | 18.8 | 18.2 | 22.1 | 14.5 | 23.0 | 28.0 |
| Richer | 21.0 | 21.29 | 22.5 | 19.5 | 23.4 | 15.1 | 24.8 | 29.5 |
| Richest | 24.4 | 24.2 | 24.5 | 24.6 | 17.5 | 11.0 | 20.7 | 20.0 |
| **Employment Status** | | | | | | | | |
| Employed | 61.1 | 66.9 | 41.8 | 73.7 | 24.9 | 17.1 | 26.3 | 30.0 |
| Unemployed | 38.9 | 33.1 | 58.2 | 26.3 | 15.9 | 7.6 | 18.6 | 19.3 |
| **Religion** | | | | | | | | |
| Catholic | 20.2 | 20.0 | 8.2 | 31.1 | 22.0 | 14.5 | 19.7 | 26.6 |
| Other Christians | 72.5 | 71.1 | 84.5 | 62.8 | 21.6 | 14.7 | 22.2 | 27.4 |
| Islamic | 2.6 | 6.3 | 0.5 | 1.3 | 9.8 | 5.2 | 19.0 | 24.5 |
| Other religion | 4.8 | 2.6 | 6.8 | 4.8 | 20.7 | 8.9 | 19.1 | 28.0 |
| **Total** | **18,528** | **5650** | **6076** | **6802** | **21.3** | **13.9** | **21.7** | **27.2** |

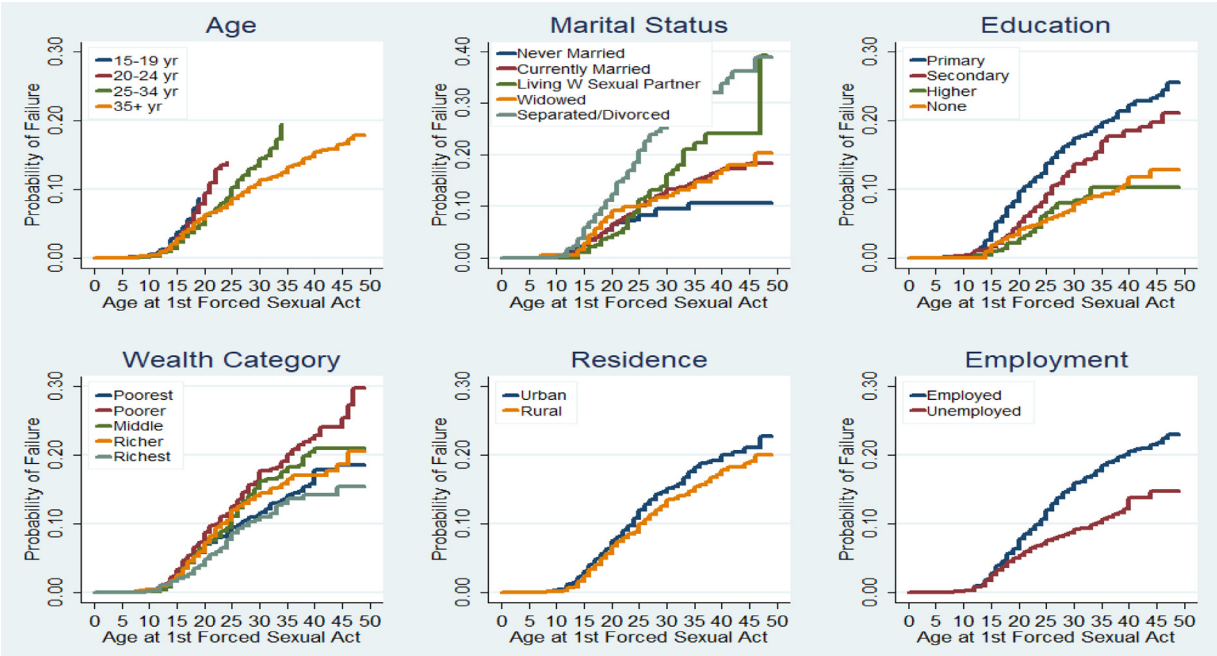


**Fig. 2.** The Kaplan Meier Survival functions of the age at first forced sexual act by selected socio-demographic characteristics in Kenya.

**Table 2**
Distribution of time to first forced sexual act among victims of forced sexual act in the three countries.

| Characteristics | Kenya Median age at FFS | Age* at FFS (%) 0–9 | 10–15 | >15 | Zimbabwe Median age at FFS | Age* at FFS (%) 0–9 | 10–15 | >15 | Cote d'Ivoire Median age at FFS | Age* at FFS (%) 0–9 | 10–15 | >15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age (years)** | | | | | | | | | | | | |
| 15–19 | 16.0 | 4.5 | 61.4 | 34.1 | 14.0 | 2.4 | 42.9 | 54.7 | 16.0 | 2.8 | 46.6 | 50.6 |
| 20–24 | 17.0 | 1.7 | 23.3 | 75.0 | 18.0 | 0.3 | 15.7 | 83.9 | 17.0 | 0.6 | 28.1 | 71.3 |
| 25–34 | 18.0 | 0.7 | 15.4 | 83.9 | 21.0 | 1.2 | 14.4 | 84.4 | 19.0 | 2.9 | 22.3 | 76.8 |
| 35–49 | 16.0 | 2.0 | 16.0 | 82.0 | 24.0 | 1.6 | 28.2 | 70.2 | 20.0 | 0.6 | 20.0 | 79.4 |
| **Marital Status** | | | | | | | | | | | | |
| Never in union | 15.0 | 4.5 | 50.9 | 44.7 | 17.0 | 3.3 | 33.2 | 63.4 | 16.0 | 1.9 | 35.6 | 62.6 |
| Married | 20.0 | 1.1 | 15.9 | 83.0 | 17.0 | 1.0 | 20.3 | 78.7 | 18.0 | 0.5 | 21.5 | 78.0 |
| Living with Partner | 24.0 | 0.0 | 2.5 | 97.5 | 17.0 | 0.0 | 22.3 | 77.7 | 18.0 | 1.7 | 24.8 | 73.5 |
| Widowed | 19.0 | 4.6 | 8.6 | 86.9 | 16.0 | 3.2 | 41.1 | 55.7 | 18.0 | 0.0 | 31.5 | 68.5 |
| Divorced or separated | 21.0 | 0.0 | 17.3 | 82.7 | 18.0 | 2.6 | 20.0 | 77.4 | 18.0 | 1.6 | 27.5 | 70.9 |
| **Education** | | | | | | | | | | | | |
| No Education | 16.0 | 0.0 | 25.4 | 74.6 | 20.0 | 0.0 | 41.7 | 58.3 | 18.0 | 0.6 | 26.2 | 73.2 |
| Primary | 16.0 | 1.7 | 22.7 | 75.5 | 20.0 | 1.5 | 37.8 | 60.8 | 18.0 | 1.0 | 26.9 | 72.1 |
| Secondary | 18.0 | 2.0 | 12.8 | 85.2 | 22.0 | 1.1 | 15.5 | 83.4 | 18.0 | 1.0 | 24.3 | 74.7 |
| Higher | 19.0 | 0.0 | 11.8 | 88.2 | 23.0 | 4.7 | 11.6 | 83.7 | 19.0 | 0.0 | 0.0 | 100.0 |
| **Residence** | | | | | | | | | | | | |
| Urban | 18.0 | 2.2 | 17.6 | 80.2 | 20.0 | 2.7 | 18.8 | 78.4 | 18.0 | 1.2 | 29.7 | 69.1 |
| Rural | 17.0 | 1.0 | 21.1 | 78.0 | 20.0 | 0.8 | 26.7 | 72.5 | 18.0 | 1.0 | 22.5 | 76.5 |
| **Wealth Index** | | | | | | | | | | | | |
| Poorest | 17.0 | 1.6 | 22.9 | 75.5 | 19.0 | 1.6 | 28.7 | 69.7 | 18.0 | 2.8 | 24.5 | 72.6 |
| Poorer | 17.0 | 1.5 | 22.8 | 75.7 | 20.0 | 0.6 | 32.1 | 67.3 | 18.0 | 0.2 | 27.7 | 72.1 |
| Middle | 17.0 | 0.3 | 20.6 | 79.1 | 20.0 | 0.4 | 25.4 | 74.2 | 18.0 | 0.9 | 24.1 | 75.1 |
| Richer | 18.0 | 3.4 | 12.3 | 84.3 | 20.0 | 1.8 | 17.0 | 81.3 | 18.0 | 0.7 | 22.8 | 76.5 |
| Richest | 18.0 | 0.3 | 21.0 | 78.7 | 21.0 | 3.2 | 19.6 | 77.2 | 18.0 | 0.7 | 25.7 | 73.6 |
| **Employment Status** | | | | | | | | | | | | |
| Not Employed | 17.0 | 1.4 | 15.5 | 83.2 | 17.0 | 1.1 | 20.7 | 78.2 | 17.0 | 1.0 | 24.7 | 74.4 |
| Employed | 17.0 | 2.2 | 38.6 | 59.2 | 21.0 | 2.1 | 26.3 | 71.6 | 18.0 | 1.6 | 25.9 | 72.5 |
| **Religion** | | | | | | | | | | | | |
| Catholic | 15.0 | 0.7 | 14.8 | 84.5 | 20.0 | 0.0 | 18.5 | 81.5 | 18.0 | 0.1 | 21.8 | 78.1 |
| Islamic | 18.0 | 1.5 | 20.9 | 77.6 | 20.0 | 1.8 | 22.8 | 75.4 | 18.0 | 1.2 | 26.3 | 72.5 |
| Other Xtian | 17.0 | 4.9 | 20.0 | 77.1 | 20.0 | 0.0 | 58.3 | 41.7 | 18.0 | 0.0 | 24.3 | 75.7 |
| Others | 17.0 | 7.8 | 18.3 | 73.9 | 15.0 | 0.6 | 37.3 | 62.1 | 17.0 | 5.1 | 24.1 | 70.8 |
| Total | 17.0 | 1.5 | 19.6 | 79.0 | 20.0 | 1.6 | 23.5 | 75.0 | 18.0 | 1.1 | 24.9 | 74.0 |

FFS First Forced sexual act *Age in years.

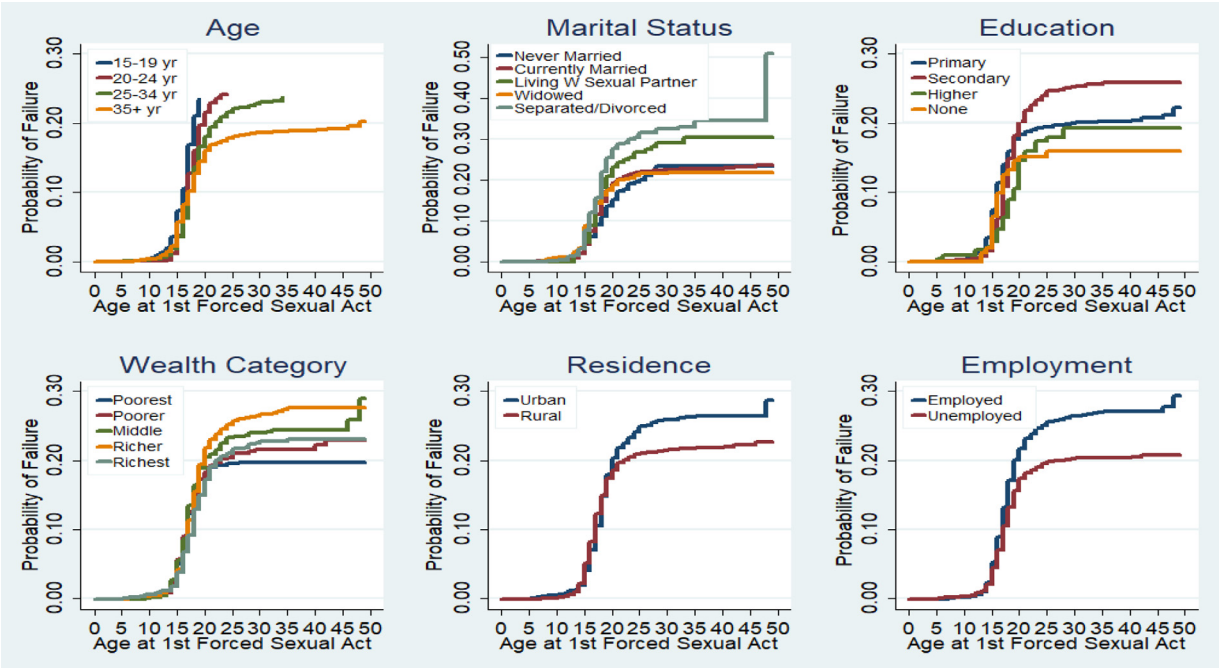


**Fig. 3.** The Kaplan Meier Survival functions of the age at first forced sexual act by selected socio-demographic characteristics in Zimbabwe.

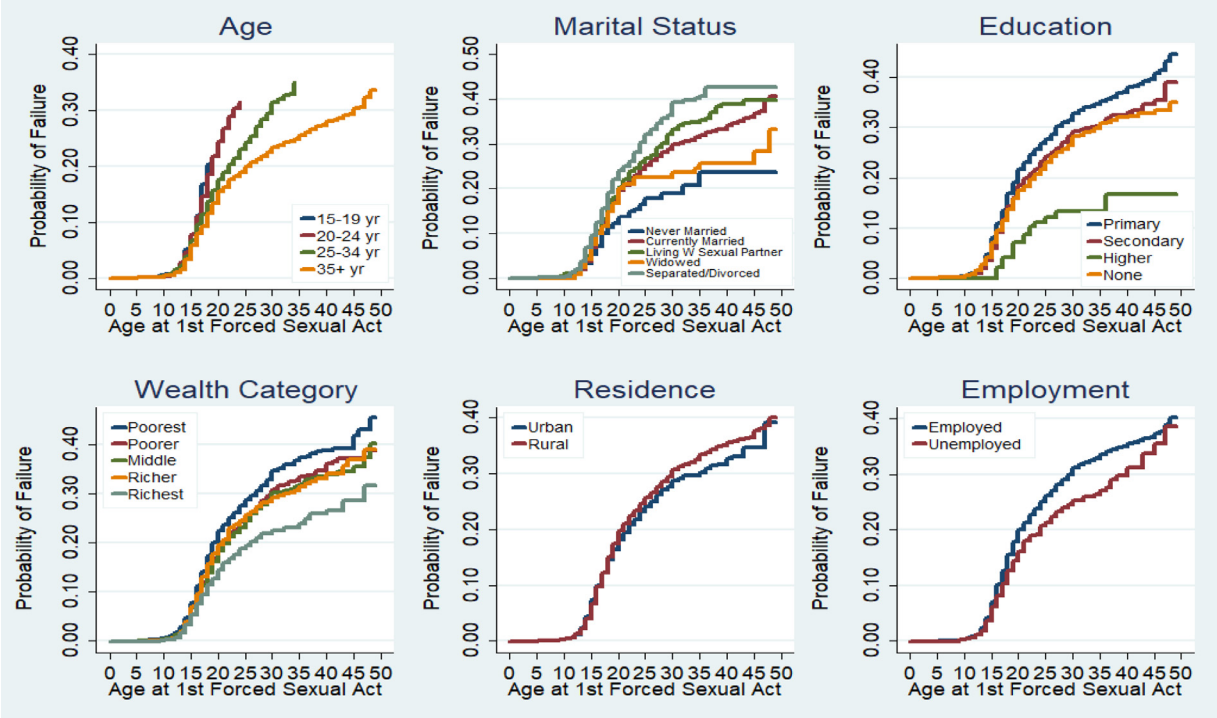


**Fig. 4.** The Kaplan Meier Survival functions of the age at first forced sexual act by selected socio-demographic characteristics in Cote d'Ivoire.

the countries as shown in Figs. 2–4. The probabilities of a forced sexual act as the participants get older by their selected characteristics in the three countries (Figs. 2–4). According to the Log-rank test of equality of the survival curves, the timing of forced sexual act among the women differed significantly by the women age, employment status, marital status, place of residence, educational attainment and wealth category. Also, all the timing of first forced sexual act differed significantly across all women' characteristics considered in the three countries except by place of residence of the women in Cote d'Ivoire.

*Unadjusted factors associated with the timing of forced sexual act*

The unadjusted (crude) hazard ratio of the determinants of the timing of forced sexual act among the women by selected characteristics are presented in Table 3.

*Kenya*

The risk of forced sexual act was 101% higher among women aged 15–19 years (HR = 2.01; 95% CI: 1.42–2.83), 110% higher among those 20–24 years (Hazard Ratio (HR) = 2.10; 95% Confidence Interval (CI): 1.65–2.68) compared to women aged 35–49 years in Kenya. The never-in-union and currently married women in Kenya had 62% (HR = 0.38; 95% CI: 0.28–0.52)) and 55% (HR = 0.45; 95% CI: 0.37–0.55) times lower risk of forced sexual act respectively than the divorced or separated women in Kenya.

*Zimbabwe*

In Zimbabwe, women aged 15–20 and 20–24 years had 86% (HR = 1.86; 95% CI: 1.53–2.26) and 43% (HR = 1.43; 95% CI: 1.21–1.68) times higher hazard of forced sexual act respectively than those aged 35–49 years. Also, the risk of forced sexual act was 45% times lower among never-in-union women than the divorced and separated women in Zimbabwe.

*Cote d'Ivoire*

Also in Cote d'Ivoire, the risk of forced sexual act nearly doubled among respondents aged 15–19 years (HR = 1.90; (95% CI: 1.59–2.29)) and 20–24 years (HR = 1.90; 95% CI = 1.59–2.22)) than among women aged 35–49 years. The risk of forced sexual act was 47% times lower among never-in-union women than the divorced and separated women in Cote d'Ivoire respectively.

**Table 3**
Unadjusted prognostic factors of the timing of forced sexual act among women by selected characteristics and countries.

| Characteristics | Kenya HR95%CI | Zimbabwe HR95%CI | Cote d'Ivoire HR95%CI |
|---|---|---|---|
| **Age (years)** | | | |
| 15–19 | 2.01(1.42–2.83) | 1.86(1.53–2.26) | 1.90(1.59–2.29) |
| 20–24 | 2.10(1.65–2.68) | 1.43(1.21–1.68) | 1.90(1.64–2.20) |
| 25–34 | 1.38(1.15–1.65) | 1.24(1.07–1.43) | 1.38(1.23–1.56) |
| 35–49 | 1.00 | 1.00 | 1.00 |
| **Marital Status** | | | |
| Never in union | 0.38(0.28–0.52) | 0.55(0.43–0.69) | 0.53(0.42–0.67) |
| Married | 0.45(0.37–0.55) | 0.64(0.54–0.78) | 0.77(0.65–0.91) |
| Living with Partner | 0.57(0.40–0.81) | 0.85(0.62–1.16) | 0.85(0.70–1.02) |
| Widowed | 0.45(0.32–0.65) | 0.62(0.47–0.82) | 0.59(0.40–0.86) |
| Divorced or separated | 1.00 | 1.00 | 1.00 |
| **Education** | | | |
| Primary | 2.29(1.77–2.97) | 1.36(0.90–2.06) | 1.24(1.09–1.41) |
| Secondary | 1.65(1.24–2.20) | 1.61(1.07–2.41) | 1.05(0.92–1.20) |
| Higher | 1.01(0.67–1.52) | 1.16(0.71–1.92) | 0.45(0.28–0.73) |
| No Education | 1.00 | 1.00 | 1.00 |
| **Residence** | | | |
| Urban | 1.17(1.01–1.36) | 1.16(1.03–1.30) | 0.93(0.84–1.03) |
| **Wealth Index** | | | |
| Poorest | 1.16(0.90–1.49) | 0.93(0.77–1.11) | 1.59(1.36–1.87) |
| Poorer | 1.65(1.29–2.12) | 1.01(0.84–1.21) | 1.38(1.16–1.64) |
| Middle | 1.41(1.09–1.83) | 1.13(0.95–1.35) | 1.33(1.12–1.58) |
| Richer | 1.33(1.03–1.72) | 1.22(1.04–1.44) | 1.36(1.14–1.62) |
| Richest | 1.00 | 1.00 | 1.00 |
| **Employment Status** | | | |
| Employed | 1.61(1.34–1.93) | 1.34(1.20–1.50) | 1.23(1.08–1.40) |
| **Religion** | | | |
| Catholic | 2.70(1.88–3.89) | 1.28(0.52–3.14) | 0.87(0.60–1.25) |
| Other Xtian | 3.03(2.16–4.25) | 1.36(0.57–3.28) | 1.03(0.71–1.48) |
| Others | 2.76(1.59–4.82) | 1.25(0.51–3.07) | 0.96(0.64–1.44) |
| Islamic | 1.00 | 1.00 | 1.00 |

On educational attainment, the risk of the first forced sexual act was higher among women with higher education in the three countries than among those with no formal education. Other significant characteristics were the wealth category, place of residence, employment status.

*Adjusted factors associated with the timing of forced sexual act*

In the multivariate analysis, we controlled for the presence of other characteristics of the women in each country. The adjusted hazard ratios (aHR) of time of first forced sexual act was higher among younger women than older women in the three countries as shown in Table 4.

*Kenya*

Women aged 15–19 and 20–24 years in Kenya had 260% (aHR = 3.60; 95% CI: 2.43–5.34) and 153% (aHR = 2.53; 95% CI: 1.97–3.24) times higher risk of forced sexual act than those aged 35–49 years. The risk of forced sexual act was 68% (aHR = 0.32; 95% CI:0.23–0.45), 51% (aHR = 0.49; 95% CI:0.40–0.60)) and only 46% (aHR = 0.56; 95% CI = 0.39–0.80) times less likely among the never-in-union, currently married women and women who were living with sexual partners respectively compared with the widowed and separated women in Kenya. The rural-urban differentials of where the women lived were significant. For instance, there was a significant difference in Kenya wherein urban women were more likely to experience forced sexual act than women in the rural areas (aHR = 1.35; 95% CI: 1.14–1.60). Women who had only primary education had 44% higher risk of an earlier forced sexual act (aHR = 1.44; 95% CI:1.07–1.95) than those without any formal education. Kenya women from households in the poorest of wealth quintile index had 50% higher risk of forced sexual act (aHR = 1.49; 95% CI = 1.09–2.02) compared with their counterparts from households in the richest wealth quintiles. The risk of first forced sexual act was over twice likely among Catholic and other Christian than the Muslim women in Kenya. The employed women have a lower risk of experiencing first forced sexual act in Kenya (32%) as shown in Table 4.

*Zimbabwe*

Women aged 15–19, 20–24 and 25–29 years were 2.9 (aHR = 2.91; 95% CI: 2.32–3.65), 1.6 (aHR = 1.61; 95% CI:1.35–1.91), and 1.3 (aHR = 1.26; 95% CI:1.09–1.47) times more likely to experience forced sexual act than women aged 35–49 years. The

**Table 4**
Adjusted prognostic factors of the timing of forced sexual act among women by selected characteristics and countries.

| Characteristics | Kenya aHR (95% CI) | Zimbabwe aHR (95% CI) | Cote d'Ivoire aHR (95% CI) |
|---|---|---|---|
| **Age (years)** | | | |
| 15–19 | 3.60(2.43–5.34) | 2.91(2.32–3.65) | 2.72(2.22–3.33) |
| 20–24 | 2.53(1.97–3.24) | 1.61(1.35–1.91) | 2.08(1.79–2.42) |
| 25–34 | 1.42(1.18–1.71) | 1.26(1.09–1.47) | 1.39(1.23–1.58) |
| 35–49 | 1.00 | 1.00 | 1.00 |
| **Marital Status** | | | |
| Never in union | 0.32(0.23–0.45) | 0.38(0.29–0.49) | 0.41(0.32–0.53) |
| Married | 0.49(0.40–0.60) | 0.67(0.56–0.81) | 0.77(0.65–0.91) |
| Living with Partner | 0.56(0.39–0.80) | 0.86(0.63–1.19) | 0.80(0.66–0.96) |
| Widowed | 0.54(0.38–0.79) | 0.76(0.57–1.01) | 0.70(0.47–1.02) |
| Divorced or separated | 1.00 | 1.00 | 1.00 |
| **Education** | | | |
| Primary | 1.44(1.07–1.95) | 1.22(0.80–1.84) | 1.19(1.04–1.35) |
| Secondary | 1.04(0.74–1.46) | 1.33(0.87–2.01) | 1.08(0.94–1.26) |
| Higher | 0.75(0.47–1.20) | 1.06(0.63–1.77) | 0.65(0.39–1.06) |
| No Education | 1.00 | 1.00 | 1.00 |
| **Residence** | | | |
| **Urban** | 1.35(1.14–1.60) | 1.18(1.01–1.39) | 1.21(1.05–1.39) |
| **Wealth Index** | | | |
| Poorest | 1.49(1.09–2.02) | 1.11(0.87–1.42) | 1.55(1.26–1.92) |
| Poorer | 1.46(1.10–1.93) | 1.14(0.90–1.44) | 1.35(1.09–1.68) |
| Middle | 1.34(1.01–1.78) | 1.21(0.97–1.50) | 1.31(1.06–1.62) |
| Richer | 1.23(0.94–1.61) | 1.18(1.01–1.40) | 1.28(1.06–1.56) |
| Richest | 1.00 | 1.00 | 1.00 |
| **Employment Status** | | | |
| Employed | 0.68(0.56–0.83) | 0.71(0.63–0.79) | 0.82(0.71–0.93) |
| **Religion** | | | |
| Catholic | 2.30(1.57–3.38) | 1.54(0.63–3.80) | 0.91(0.62–1.31) |
| Other Xtian | 2.57(1.79–3.69) | 1.63(0.68–3.93) | 1.04(0.72–1.49) |
| Others | 2.12(1.21–3.73) | 1.53(0.62–3.77) | 0.98(0.65–1.46) |
| Islamic | 1.00 | 1.00 | 1.00 |

never-in-union women were 62% (aHR = 0.38; 95% CI: 0.29–0.49) times less likely to have first forced sexual act respectively. The wealth quintile of households from which a woman comes from appeared to be an insignificant predictor of the timing of first forced sexual act in Zimbabwe. The employed women have a lower risk of experiencing first forced sexual act Zimbabwe (29%) as shown in Table 4.

*Cote d'Ivoire*

The never-in-union women were 59% (aHR = 0.41; 95% CI:0.32–0.53) times less likely to have first forced sexual act respectively. The rural-urban differential of where the women lived was significant in Cote d'Ivoire. Women who had only primary education had higher risk of an earlier forced sexual act in Cote d'Ivoire (aHR = 1.19; 95% CI: 1.04–1.35) times than those without any education. In Cote d'Ivoire, women from households in the poorest, pooper, middle and richer wealth quintiles had 55%, 35%, 31% and 28% higher risk of first forced sexual act respectively than those from richest wealth quintiles. The employed women have a lower risk of experiencing first forced sexual act in Cote d'Ivoire (18%) as shown in Table 4.

## Discussion

Sexual violence is a major public health problem both in developed and developing countries. Females in general and the young girls, in particular, are the most vulnerable population subgroups. Sexual violence comprises of unsolicited touch, oral sex, fingering, unwanted sexual intercourse etc. which we referred to as forced sexual act in this study. Forced sexual act affects women of all ages across different socio-cultural boundaries with family members, teachers, bosses, workmates, classmates, friends and even strangers been the perpetrators! A US study confirmed that 45% of the perpetrators are male acquaintances, followed by spouses/partners (42%) [45]. A forced sexual act is more worrisome in the developing countries, especially in Africa and Asian Countries [6] due to either non-availability of strict punitive laws or failure to implement the laws. This study sought to determine the time at which women in Kenya, Zimbabwe and Cote d'Ivoire experience forced sexual act for the first time and the socio-demographic factors influencing the timings.

The experience of forced sexual act varied across the three countries studied. This is consistent to the reported variabilities in the prevalence of IPV across 10 countries in a WHO multi-country studies [8] and a recent systematic review of

prevalence and associated factors with sexual violence against women in Asia and Africa [6]. Forced sexual act was commonest among women in Cote d'Ivoire with one in every four women have experienced forced sexual act at least once, and the lowest in Kenya at 13.9%. Our estimates are similar to lifetime sexual victimization of 15% found recently among South Africa girls [7]. The prevalence in Kenya is similar to the 13% reported in the US and Germany [14] but lower than the average of 20% found across 10 Southern African Countries [15]. The prevalence in Zimbabwe and Cote d'Ivoire is above the levels reported in US, Germany and other 10 Southern African countries. The high lifetime prevalence of forced sexual act could also be linked to a reported 92% prevalence of IPV among Zimbabwe women [6]. It is worth noting that these proportions translate to at least 1.7 million women among the 16 million people in Zimbabwe and 3.2 million women of the 24 million people in Cote d'Ivoire who had experienced at least one episode of forced sexual act. Although the studied countries are all in sub-Saharan Africa, they nonetheless differed in cultural and social practices and values. The disparities in the prevalence of forced sexual act in these countries may be due to different norms, values and legislation about the rights of women and young girls across these countries. However, the actual prevalence of forced sexual act might be higher than we found in this study as sexual violence is very sensitive and some respondents may be reluctant to "re-open" old wounds.

Our finding that women aged 15–19 years in all the countries had the lowest lifetime prevalence of forced sexual act is in agreement with a finding in the developed countries [10]. A systematic review has also identified higher preponderance of sexual assault among younger women [6], Similarly, a recent study in Lubumbashi, DCR on the prevalence of sexual violence in urban areas showed that the victims of sexual violence were mostly young people (94%) aged 14 to 17 years [40]. The most astonishing finding in our study is that the risks of earlier occurrence of forced sexual act are higher among younger women across the three countries. This is very worrisome. It is quite alarming that the highest proportions of women who had first forced sexual act before attaining age 10 years were among never-in-union women and those aged 15–19 years. This suggests that women get exploited sexually in their early ages now, more than ever before. This is a clear indication of a generational shift in the timing of forced sexual act. Our findings are corroborated by a UNICEF report that about 1 in 10 girls aged 15–17 years has been victims of forced sexual act in Zimbabwe [46]. The same report further showed that more than 100 Zimbabwe girls experience sexual violence daily. Women age has been identified as a risk factor of sexual violence in earlier studies [1,19,47]. Perpetrators of forced sexual act have been reported in the literature to include, siblings, cousins, uncles, fathers, co-workers as well as strangers [1,2,19,48]. There is a need for parents and guardians to ensure that their girl child, right from an early age, is not left "unprotected" from possible perpetrators of sexual violence. This should be coupled with a strong law as well as enforcement of such laws against forced sexual act.

Across board, women who were separated or divorced had the highest prevalence of forced sexual act. It is not clear when this vulnerable population subgroup had the experience. Were they exploited after their divorce/separation? Or the forced sexual acts led to their divorce/separation? Unfortunately, the secondary nature of the data used in this study did not enable us to exploit these issues. There is a need for further qualitative research in the future to answer these questions. We found that the women who were unmarried but lived with their sexual partners in Zimbabwe and Cote d'Ivoire had high occurrences of forced sexual act. This finding confirmed the trend of intimate partner violence in most African settings. Our findings correlate with reports elsewhere that unmarried women living with sexual partners are more and very likely to experience sexual violence [12,39,49]. In addition, the practice of giving young girls out in marriage in some cultural settings in Africa [50] could have increased the likelihoods of earlier forced sexual act among these vulnerable women. The association between child marriage and forced sexual act have been well documented in Northern Kenya study [51]. The fact that women and girls in sub-Saharan Africa have weaker bargaining, decision powers, and autonomy [52,53] contributes to the extent to which they are vulnerable to sexual violence.

There appeared to be inconsistencies in the role of educational attainment the delay of the timing of the first forced sexual act across the countries. In general, we found that the risk of earlier occurrence of forced sexual act was significantly higher among women with primary education than those with no education. These relationships were more visible in Cote d'Ivoire and Kenya. It is however interesting to know that the risk of forced sexual act was similar among those with no education and those that had higher education in the three countries. Our finding is at consonance with the reports in some sub-Saharan African countries which found that the more educated a woman is, the more exposed to forced sexual act and other sexual harassment she is [3,16] but in agreement with findings of a systematic review of studies under the same theme in Africa and Asia [6]. Our finding is very plausible because education is a catalyst for better awareness which could propel greater resistance to the act. More so, education brings respect and it is likely that a school-going girl might have higher access to "protection" than her peer left at home without due care or those hawking on the streets. Education is therefore protective of early as well as the prevalence of forced sexual act. Empowerment of girls and women through adequate access to education should be prioritized by all policymakers.

Studies have shown an enormous gap in development and wealth quintile among people living in urban and rural areas with urban residents having greater protection from the government than those in rural settings. This gulf in development, policy application, and improved awareness between the poor and the rich, those in rural and urban settings colossally influence the perpetration of this vice [2,16,20,21]. Researchers unanimously believed that there could be a link between residence, wealth index, and occupation on the experiences of forced sexual act. However, our study showed that both the prevalence and the risk of forced sexual act on the basis of rural-urban location only differed significantly in Kenya in the adjusted model. This finding is in consonance with a recent South African study which reported a lower odds of sexual violence among rural dwellers in South Africa [7]. Our study further showed a high occurrence of forced sexual act among

employed women than the unemployed women in the three countries. This was at variance with reports elsewhere [3,18]. We also found prevalence as well as the risk of early forced sexual act to be lower among women from households in the upper wealth quintiles.

Although Africa is largely divided across religion, ethnicity and socio-cultural practices, most societies and religious bodies in Africa nonetheless frown at forced sexual act. Thus, it is surprising that women of different religion and socio-cultural affiliations are victims as shown in our results since the perpetrators are very close to the victims in one way or the other. Women and children are the most vulnerable during the conflict, acts such as rape, molestation, sexual slavery. The high prevalence of forced sexual act coupled with the higher risk of earlier occurrence of forced sexual act among younger women may not be disconnected from conflicts, political and economic instability to which some sub-Sahara Africa countries have been submerged in recent decades. For instance, UN reported that approximately 250,000–500,000 women and girls were raped in the 1994 Rwandan genocide, 50,000–64,000 women in Sierra Leone were sexually assaulted by combatants between 1991 and 2001, and at least 200,000 women and girls were victims of sexual violence since 1996 in eastern Democratic Republic of Congo [1]. Each of the three countries we studied has experienced one form of conflict, instability or the other in recent decades.

## Conclusion

Africa is faced with various developmental challenges, and issues at epidemic levels with gender-based violence such as forced sexual act is one of them, several factors such age, education, residence, marital status, wealth index, religion, and occupation have all significantly predicted the propensity of women to forced sexual act, with countries such as Zimbabwe and Cote d'Ivoire at crisis levels. It is particularly worrisome that the occurrence of sexual violence is higher in Africa than other countries as reported in a WHO multi-country study on sexual violence by intimate partners [8] and in a systematic review of sexual violence publications [6]. Sexually-related violence is believed to be deep-rooted in gendered social structures [38] with young girls been at higher risk of being forced into sex acts, by a family member, co-worker, or an intimate partner [1]. There are generational shifts across the age at which women first fall victim to forced sexual act. The ages at first occurrence are now earlier than it used to be. Nevertheless, older women are still prone to sexual act as was observed in earlier studies that with increased age of women comes greater vulnerability to forced sexual act. As shown in our findings, this is especially prevalent among divorced/separated women and those living with an intimate partner. Studies have also shown that women who have experienced forced sexual act at some point in their life are more prone to a reoccurrence [20].

## Recommendations

Sexual violence remained a public health problem of substantial magnitude and a big threat to the attainment of the SDG 3 on good health and well-being and SDG 5 on gender equality. The WHO had already declared that sexually-related violence is not inevitable. Therefore, multi-sectoral efforts should be taken to combat it. Firstly, parents and guardians, as well as women, should avoid situations and circumstance that can increase women vulnerability. Safe custody of children is a must. Community, in general, must be educated on these evil acts. The "Education for men" on respect for women as being done in Kenya and other parts of Africa could significantly help to curb this social problem and avoid its enormous consequences. More attention should be given to primary prevention of sexual violence via application of different methods such as support for programmes in the community through public health education in schools, refugee settings, prisons. Such programmes could be extended to address the underlying socioeconomic causes of violence, including poverty and lack of education; setting up interventions that address culturally sensitive and behavioural issues in the communities, among others. Obviously, there are needs for more research work on sexual violence in Africa to expose the magnitude, determinants and attending complications of this vice if forced sexual acts are to be put under control in the nearest future.

## Strengths and limitations of this study

The use of large nationally representative data from three different countries spread across Western, Eastern and Southern Africa has enhanced the credibility and generalizability of our findings. However, been secondary data, we were restricted in the choice of our explanatory variables. Also, there are possibilities of recall bias as respondents were made to recall events that happened in the past without any means of validating the responses. In addition, some women might have willingly refrained from disclosing their experience due to the sensitivity of forced sexual act and reluctance to open "old wounds ". It is, therefore, not impossible that the actual prevalence is higher than what we found. Nonetheless, the lifetime prevalence estimates we found in this study would help in a long way in understanding the full scope, burden and factors associated with sexual violence in Africa. Besides, the DHS data used in this study has worldwide recognition for reliability.

## Ethical approval

Ethical approval was sought from the Kenya, Zimbabwe and Cote d'Ivoire National Health Research ethics committee by the data originators and granted before the conduct of the survey as documented in the survey official reports by the

respective country's population board and the ICF Macro, USA. Also, informed consent was received from the participants before interviewing them.

We applied to ICF Macro, the owner of DHS data, on its online platform for permission to use the datasets. The permission was granted via email confirmation.

## Consent for publication

All authors read and consented to the publication of the final version of this manuscript.

## Availability of data and material

All materials, data, and methods used for this study are readily available and would be shared on demand from the ICF Macro United States.

## Competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sciaf.2019.e00092.

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