Time to first birth and its predictors among reproductive age women in high fertility countries in Sub-Saharan Africa: Inverse Weibull gamma shared frailty model

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Abstract
Background: Early initiation of childbearing leads to an increase in total fertility rate and population growth. It has been linked with both maternal and child morbidity and mortality. However, there is limited information on the timing of the first birth and its predictors in the area so far. Therefore, determining the time to first birth and its predictors will help to design strategies to improve fertility rate, maternal and child survival.

Methods: The survey used recent (2010 – 2018) Demographic and Health data; a stratified, two-stage cluster sampling technique was used to select the sample. Inverse Weibull gamma shared frailty model was used to model the data at 95% confidence interval. Adjusted hazard ratio (AHR) and median hazard ratio (MHR) were reported as effect size. Statistical significance was declared at \( p \) value < 0.05.

Results: The overall median age at first birth was found to be 19 years (IQR: 16, 21 years). Rural residency (AHR = 1.02, 95%, CI 1.00,1.04), agricultural employee (AHR = 1.14, 95%, CI 1.13, 1.17), and nonagricultural employee (AHR = 1.06, 95%, CI 1.05, 1.08), marriage below 15 years (AHR = 5.47, 95%, CI 5.37, 5.57) and 15 – 17 years (AHR = 3.27, 95%, CI 3.22, 3.32), had sex below 15 years (AHR = 1.57, 95%, CI 1.54, 1.61) and 15 – 17 years (AHR = 1.38, 95%, CI 1.38, 1.43), women who had unmet need for contraceptive (AHR = 1.39, 95%, CI 1.37, 1.42), and met need (AHR = 1.32, 95%, CI 1.30, 1.35), high spousal age gap (AHR = 1.17, 95%, CI 1.15, 1.19), not heard family planning message (AHR = 1.02, 95%, CI 1.01,1.04) were the higher hazard of early childbirth.

Conclusion: The median age at first birth was found to be 19 years. This is lower than the optimal age for giving first birth, which is between late 20 s and early 30 s years. Rural residences, occupation, hearing family planning message in the media, early sexual intercourse, early age at first marriage, high spousal gap, and unmet need for family planning were predictors of first birth at an early age. Thus, governments and non-governmental organizations should strive to implement programs that aim to reduce early age at first birth by considering these factors.

Keywords: Time to first birth, Predictors, Reproductive age women, High fertility countries

Background
Age at first birth refers to the age of the mother when she gave birth to her first child and is a transition mark for women into motherhood [1]. It plays a significant role in the future life of each woman and has a direct relationship with fertility [2]. A woman’s age at which she begins...
childbearing can affect the number of children she will have, which in turn impacts the size, composition, and future growth of the population [3, 4].

Women who had their first child at a young age were more likely to have more children than those who had their first child later in life [5]. South Asia and sub-Saharan Africa (SSA) continue to have the highest proportions of child brides (44 percent and 18 percent, respectively) [6]. At age 18, 20% of women around the world, give birth to a child [7]. In developing countries, 2 million of the 7.3 million births to adolescents under the age of 18 are to girls under the age of 15 [8]. Whereas East Asia and the Pacific had a median birth age of 20.2 years [9]. Studies from the perspective of individual countries reveal different mean times of motherhood. For example, the median age at first birth in Ethiopia [10] and Nigeria [11] was 20 years. In Angola, 1 in 20 women age 15–19 had their first birth before age 15 [12].

Early childbearing affects the health of the mothers and their infants negatively [13–15], and may also have an economic impact on the family [3, 4]. It has consequences such as: poor prenatal health care, low birth weights, and higher mortality [16, 17]. The growing body of literatures revealed that the timing of first birth has both demographic and non-demographic effects on the woman throughout her lifetime [18]. First births before the age of 20 affect future health and increase all causes of maternal mortality [19, 20]. Research from 36 countries revealed the average relative risk of death in children under five years old is about 46% higher than in children born to mothers under 18, and 12% higher than in children born to mothers between 18 and 19, compared to children of mothers between 20 and 34 [21].

In various literatures, socio-demographic and economic factors were identified as predictors of age at first childbearing. These include early age at first sex [10, 22, 23], high spousal age differences [10], no formal education or lower levels of education [22, 24]. Early age at first marriage is one of the most consistent findings across the countries taking into account the correlated nature of the data. Therefore, the study will be useful to researchers and planners who wish to improve the health of mothers and children from a cluster effect perspective. Considering the above justifications, the main aim of this study was to investigate age at first motherhood and the predictors of early childbirth among reproductive-age women in high fertility Sub-Saharan Africa. This is further justified because early childbirth is the most important factor of population growth in sub-Saharan Africa [10, 26].

**Methods**

**Study settings and data source**

Community-based cross-sectional survey was conducted between January 2010 and December 2018 among reproductive age women in high fertility countries in SSA. Niger, Democratic Republic of Congo, Mali, Chad, Angola, Burundi, Nigeria, Gambia, and Burkina Faso were included in this study. These countries were selected because they are the top ten countries with high fertility rates in SSA, with fertility rates above 5.0, a value that is higher than the rate of 4.44 in Africa and 2.47 worldwide [27]. One country (Somalia) with no DHS data was excluded from the analysis.

After authorization was granted via an online request explaining the purpose of our study, we obtained data for these countries from the DHS program’s official database, (https://dhsprogram.com). We used the woman’s record (IR file) data set and extracted the dependent and independent variables. The DHS is a nationally representative household survey that is conducted across low and middle-income countries every five years [28]. It has been an essential data source on issues of reproductive health in low and middle income countries as it gathers data on a number of reproductive health issues such as marriage, fertility, fertility preferences, and contraception [28].

Study participants were selected using a two-stage stratified sampling technique. Enumeration areas (EAs) were randomly selected in the first stage, while households were randomly selected in the second stage. Women declared infecund were excluded from this study.

**Study variables**

The outcome variable of this study is the time to first birth (age in years) when a woman [15–49] years gave birth to her first childbearing until the data collection period [1, 2, 29]. The explanatory variables included socio-demographic and economic-related factors (educational status, employment status, residence, wealth index, and hearing family planning messages in the mass media), and age at first sex, age at first marriage, spousal age gap, and demand for contraceptives.

**Operational definitions**

**Event:** giving first birth.

**Censored:** Not giving first birth.

**Time to event/waiting time:** it is the time taken in years (age) from her birth to age at first birth [1, 2, 10, 29].
**Data analysis**

STATA version 14 Statistical software was used to extract, clean, code, and analyze data. Sample weights were done before further analysis, and descriptive statistics were described using frequencies, percentages, median, and interquartile range, and presented using tables, figures, and narratives. The Kaplan–Meier (K–M) method was used to estimate the time to first birth. The log rank test was used to compare survival experiences across categorical predictor variables and to reveal the statistical significance of the observed difference in the Kaplan–Meier survival plot. The Schoenfeld residual test was used to test the proportional hazard assumption.

Because the data were correlated at the cluster level, we used a shared frailty model to predict time to first birth among reproductive-age women in high fertility countries in SSA, assuming time to first birth is constant in the same clusters. Model adequacy was checked using Akaike Information Criteria (AIC).

Stratified analysis and a chi-square test were done for interaction terms. Finally, adjusted hazard ratio (AHR) was reported as a measure of effect size at 95% significant level and \( p \) value < 0.05. The median hazard ratio (MHR) was used to compare high and low risk clusters of time to early childbirth.

**Results**

A total weighted sample of 186,771 reproductive age women were included in the study. The majority (22.23%) of the women were from Nigeria (Table 1).

**Baseline socio-demographic and reproductive characteristics of the study participants**

A total weighted sample of 186,771 women was included in this study. Of the study participants, one-fifth (21.33%) were aged below 20 years. Three-fourths (75.49%) of the participants were married. Regarding residence, the majority (70.85%) of them were rural dwellers. The majority (74.67%) of the study participants had an age gap of five and above years with their partners (Table 2).

**Socio-economic and information related characteristics**

The result revealed that 78,169 (41.85%) of the respondents had not completed at least primary education. The majority (85.89%) of the participants were not used modern contraception (Table 3).

**Time to first birth among respondents**

Majority (73.57%) of the study participants had given their first birth. The overall median time to their first birth was 19 years (IQR: 16, 21) (Fig. 1).

**Predictors of time to first birth among reproductive age women**

Using the Kaplan–Meier failure function and the log rank test \( (X^2) \), all predictors were determined at baseline. According to the log rank test, all the predictor variables showed significant survival differences at \( p = 0.001 \) (Table 4).

**Table 1** Description of Surveys and sample size characteristics in high fertility countries in SSA

| Countries     | Survey year | Weighted sample (n) | Weighted percentage (%) |
|---------------|-------------|---------------------|-------------------------|
| Angola        | 2015/16     | 14357               | 7.69                    |
| Burkina Faso  | 2010        | 16978               | 9.09                    |
| Burundi       | 2016/17     | 17112               | 9.16                    |
| Chad          | 2014/15     | 17600               | 9.42                    |
| DR Congo      | 2013/14     | 37284               | 19.96                   |
| Gambia        | 2013        | 20348               | 10.89                   |
| Mali          | 2018        | 10465               | 5.60                    |
| Nigeria       | 2012        | 41525               | 22.23                   |
| Niger         | 2012        | 11102               | 5.94                    |
### Table 3  Socio economic and information related factors among reproductive age women high fertility countries in SSA (n = 186,771)

| Variables                        | Categories           | Weighted frequency | Weighted percentage |
|----------------------------------|----------------------|--------------------|---------------------|
| Educational status of the respondents | No formal education | 78169              | 41.85               |
|                                  | Primary education    | 43264              | 23.16               |
|                                  | Secondary and above  | 65338              | 34.98               |
| Educational status of the partner | No formal education  | 62561              | 33.50               |
|                                  | Primary education    | 23411              | 12.53               |
|                                  | Secondary and above  | 100799             | 53.97               |
| Occupation of the respondent     | No working           | 53239              | 28.50               |
|                                  | Agricultural employee| 48580              | 26.01               |
|                                  | Nonagricultural employee | 84952          | 45.48               |
| Occupation of the partners       | No working           | 4122               | 2.21                |
|                                  | Agricultural employee| 61679              | 33.02               |
|                                  | Nonagricultural employee | 120970         | 64.77               |
| Wealth index                     | Poor                 | 68873              | 36.88               |
|                                  | Middle               | 36003              | 19.28               |
|                                  | Rich                 | 81895              | 43.85               |
| Media exposure                   | Yes                  | 118920             | 63.67               |
|                                  | No                   | 67851              | 36.33               |
| Hearing family planning massage on media | Yes                  | 132333             | 70.85               |
|                                  | No                   | 54438              | 29.15               |
| Modern contraceptive use         | Yes                  | 26348              | 14.11               |
|                                  | No                   | 160423             | 85.89               |
| Demand for contraceptive        | No demand            | 64001              | 34.27               |
|                                  | Unmet need           | 35719              | 19.12               |
|                                  | Meet need            | 87051              | 46.61               |

![Kaplan-Meier survival estimates](image)

**Fig. 1** Kaplan–Meier failure estimates of time to first birth among reproductive-age women in high fertility countries in SSA.
Table 4 Kaplan–Meier failure estimate and log rank test comparison of time to first birth among women in high fertility countries in SSA (n = 186,771)

| Characteristics | Categories | N (%) weighted value | Ever given birth | Median (IQR) years | Log rank | P-value |
|-----------------|------------|----------------------|------------------|-------------------|----------|---------|
| Residence       | Urban      | 70578 46387          | 19(17,22)        | 1472.71           | 0.001    |
|                 | Rural      | 116193 91025         | 18(16,21)        |                   |          |
| Age at first sex| < 15       | 50831 18696          | 16(15,18)        | 21539.05          | 0.001    |
|                 | 15–17      | 98154 87416          | 18(16,20)        |                   |          |
|                 | ≥ 18       | 37676 31243          | 21(20,24)        |                   |          |
| Age at first marriage | < 15    | 26353 25203          | 15(14,16)        | 77828.67          | 0.001    |
|                 | 15–17      | 50350 46879          | 17(16,18)        |                   |          |
|                 | ≥ 18       | 64287 59407          | 21(19,24)        |                   |          |
| Spousal age gap | < 5        | 32419 30425          | 20(17,22)        | 2388.29           | 0.001    |
|                 | ≥ 5        | 95569 28908          | 18(16,21)        |                   |          |
| Demand for contraceptive | No demand | 64001 27518        | 18(16,22)        | 159.94            |          |
|                 | Unmet need | 35719 32840         | 18(17,21)        |                   |          |
|                 | Meet need  | 87051 77053         | 19(17,21)        |                   |          |
| Occupation of the respondent | No working | 53239 32316       | 18(16,21)        | 699.5            | 0.001    |
|                 | Agricultural employee | 48580 40676   | 19(17,21)        |                   |          |
|                 | Nonagricultural employee | 84952 64419 | 19(16,22)        |                   |          |
| Hearing FP massage on media | Yes    | 132333 98545        | 18(16,21)        | 87.42             | 0.001    |
|                 | No         | 54438 38866         | 19(16,21)        |                   |          |

Possible model selection

**Cox proportional hazard model**

In bivariable analysis, seven predictors were significant at p-value of <0.2 and then entered into the multivariable Cox model. Marriage was reduced from the model due to collinearity. After that, the Schoenfeld test for proportional hazard assumption was conducted. The proportional hazard assumption was violated in both the global test and log rank test due to the correlation of time to first birth. Due to this, Cox model was excluded. Secondly, the stratified Cox model was excluded because none of the predictor variables fulfilled the proportional hazard assumption in the model. In the end, the parametric models were included in this study (Table 5).

**Parametric survival model selection**

**Parametric shared frailty model**

Variance of frailty (theta = 0) was statistically significant at p value of <0.001, for all baseline hazard function with both inverse Gaussian and gamma shared frailty distribution. In other words, the frailty component influences the model and there is a correlation within the cluster. Finally, the inverse Weibull gamma shared frailty model was used for this study due to its lowest AIC (Table 6).

Table 5 Schoenfeld residual test for proportionality assumption of the Cox model among women in high fertility countries in SSA (n = 186,771)

| Predictors                  | Rho | Chi²   | Degree of freedom | Prob > chi² |
|-----------------------------|-----|--------|-------------------|-------------|
| Residence                   | 0.01| 24.02  | 1                 | < 0.001     |
| Occupation of the respondent| 0.00| 4.04   | 1                 | 0.04        |
| Age at first sex            | 0.09| 1048.05| 1                 | < 0.01      |
| Age at first marriage       | 0.027| 6661.05| 1                 | < 0.001     |
| Demand for contraceptive   | 0.04| 222.8  | 1                 | < 0.001     |
| Spousal age gap             | -0.01| 23.21  | 1                 | < 0.001     |
| Hearing family planning massage on media | 0.01 | 21.13  | 1                 | < 0.001     |
| Global test                 | 12924.96| 7     |                   | < 0.001     |
Multi variable analysis of inverse Weibull gamma shared frailty model for time to first birth and its predictors

In the multivariable inverse Weibull gamma shared frailty model, there was a reduction of frailty from the null model (only with the cluster effect) of 0.19 to 0.084 in the full model (with predictor variables). Accordingly, residence, occupation of the respondent, hearing family planning messages in the media, age at first sex, age at first marriage, demand for contraceptive, and spousal age gap were significant predictors of age at 1st birth at 95% confidence level.

Having the same level of frailty, women with agricultural employee and nonagricultural employee had 1.14 times (AHR = 1.14, 95%, CI 1.13, 1.17) and 1.06 times (AHR = 1.06, 95%, CI 1.05, 1.08) higher hazard of first birth at an early age as compared with no working women, respectively.

Women who had below 15 years at marriage and aged 15–17 years were 5.47 times (AHR = 5.47, 95%, CI 5.37, 5.57) and 3.27 times (AHR = 3.27, 95%, CI 3.22, 3.32) increases the hazard of first birth at an early age, respectively.

Women who had first sex at the age of below 15 years increases the hazard of early childbirth by 1.57 times (AHR = 1.57, 95%, CI 1.54, 1.61) and 15–17 years 1.41 times (AHR = 1.41, 95%, CI 1.38, 1.43) than women aged 18 and above years keeping all other factors constant.

With the same level of frailty and keeping all other factors constant, women living in rural areas increase the hazard of early childbirth (AHR = 1.02, 95%, CI 1.00,1.04) than living in urban residents.

With the same level of frailty and adjusting for other factors, women who had an unmet need for contraceptives increases the hazard of early childbirth by 1.39 times (AHR = 1.39, 95%, CI 1.37, 1.42), and met need by 1.32 times (AHR = 1.32, 95%, CI 1.30, 1.35) than no demand for contraception.

Women who had a spousal age gap five years and above had 1.17 times (AHR = 1.17, 95%, CI 1.15, 1.19) more hazard of early childbirth than their counterparts.

Given that on the same cluster and holding constant all other factors, women who have not heard family planning messages in the media had a higher hazard of early childbirth (AHR = 1.02, 95%, CI 1.01,1.04) (Table 7).

Discussion

In the current study, the median age at first birth was found to be 19 (IQR = 16, 21) years in high fertility countries. The result of the study showed that residence, occupation of the respondent, age at first sex, age at first marriage, demand for contraceptives, spousal age gap, and hearing family planning messages in the media were identified as the predictive factors for time to first birth among reproductive age women in high fertility countries in SSA.

This finding is in line with results from Ethiopia (20 years) [10], Bangladesh (16.34 years) [30], Kenya (20.3 years) [31], Swaziland (18.22 years) [32], Nigeria (19 years) [11], and Uganda (19.2 years) [33]. This might be because, in these countries, early marriage and sexual intercourse activities at an early age are highly prevalent [10, 34, 35]. Early marriage compromises women’s reproductive health decisions, leading to early childbearing [36]. The other possible reason for this similarity might be the limited educational opportunities for girls in these countries since most of the population lives in rural areas, which forces them to get married at an early age, to get social and financial support [35, 37–39].

However, our finding was significantly lower than that of developed countries (> 30 years) [40, 41]. The possible explanation might be that adolescent girls in developed countries are more likely to stay in school for their adolescent age and a number of women go out to work for their economic independence, which helps mothers delay their first birth [42, 43]. Another possible reason could be that women in developed countries have good awareness about the consequences of early childbirth and have access to family planning to delay the first birth. Moreover, in developed countries, women have the right to exercise their reproductive rights and make their own reproductive health decisions [42–44]. Our result was also lower than the results from Egypt 22.6 years [45], and Ghana 21.4 years [46]. It may be due to differences in the prevalence of unmet need for family planning, the median age at first marriage and the age at first sexual intercourse [47, 48]. For example, unmet need for family planning in Egypt was 13% [45] whereas in high fertility countries in SSA, unmet need for family planning was 24.9% [48].

| Model                      | Log-likely hood | DF | AIC    | Variance of theta | LR test of θ = 0 |
|----------------------------|----------------|----|--------|-------------------|-----------------|
| Inverse Weibull gamma      | 39,433.17      | 22 | -78822.35 | 0.085             | <0.001*         |
| Gompertz gamma             | 16,056.59      | 22 | -32069.18 | 0.13              | <0.001          |

* preferred model AIC Akakie information system, DF Degree of freedom
In this study, residence was one of the predictors for time to first birth. Women who lived in rural areas had higher hazards of having first birth at an early age than those who were lived in urban areas. This finding is similar to findings in Nigeria [11], Swaziland [32], Bangladesh [2], and Uganda [49]. The possible reason could be cultural malpractices like early marriage and abduction, which were highly prevalent in rural areas of SSA than their counterparts [37, 50]. Moreover, women in rural areas are less likely to be educated and less likely to be from educated parents, which means they have poor awareness of the consequences of early childbirth and a high unmet need for contraceptives [11, 37].

In this study, women's occupation was inversely associated with early childbearing. This result was corroborated with study findings in the USA [51]. Possible explanations for the inverse association between occupational status and childbearing at an early age may be women who have their own work, are usually educated and have good awareness of family planning methods [52]. Furthermore, women who have their own jobs had the autonomy to make decisions related to household expenditure. This is important to understand as women who have access to spending money have improved reproductive decision making power and freedom of movement to access contraceptive services [53].
Hearing family planning massage in the media was associated with increased hazards of early age maternity compared to the counterparts. The reason for this could be that women who did not hear about family planning massage in the media might have had limited knowledge about contraception and the consequences of early childbearing [54].

Women who began sexual intercourse at an early age had higher hazards of having their first birth at an early age than those who began intercourse at a later age. This is in consistent with studies done in Ghana [55], Bangladesh [56] and Swaziland [57]. The possible explanation might be due to the exclusion of adolescents from education and sociocultural misconceptions regarding female sexual and reproductive health issues in these developing countries [39]. In addition, modern contraceptive use among early sexual initiators is lower than late initiators [38].

Age at marriage was also another predictor for age at first childbirth, as women got married early. The hazard of early childbearing at an early age was increased. This finding is in agreement with findings from Ethiopia [10, 34], Nigeria [11] and Bangladesh [2, 58]. This may be due to the exclusion of adolescents from education and sociocultural misconceptions regarding female sexual and reproductive health issues in these developing countries [39]. Moreover, early marriage increases the frequency of fertile sexual intercourses, and it leads to early childbearing [50, 60].

Regarding the spousal age, a higher spousal age gap significantly increased the hazard of early age at first birth compared to a low spousal age gap. This finding was similar with the studies conducted in Ethiopia [10], Nigeria [61], and Bangladesh [62]. The possible explanation might be that a higher spousal age gap may lead to imbalanced power relations in the family and less probability of reproductive health discussions, including the decision to use family planning [53, 63].

Unmet need for family planning was found to be linked with higher early age maternity. This result was in agreement with reports in Nigeria [64], and Bangladesh [65]. The possible reason may be that sexually active women who have an unmet need for family planning may not be able to postpone unintended pregnancy and early births more often than those who do not have unmet need for family planning [34, 64].

The study’s main strength was that it used nationally representative survey data and concentrated on high fertility countries in SSA. In addition, the DHS uses validated instruments in its appraisals of datasets along with its large sample size and well-designed procedures, such as training field enumerators and employing well-tested methods for data collection. However, DHS surveys are based on self-reported information and thus are prone to recall and social desirability bias. For example, there may be under-reporting of births that end in death. Furthermore, due to the use of secondary data, essential factors like socio-cultural factors were not available in the DHS data set. Hence, it was not possible to incorporate these variables.

Due to the high fertility rate, sub-Saharan Africa has contributed most of the world’s unexpected population dynamics. Strategies targeting early child birth plays a crucial role in helping to regulate population growth, and to improve the physical and economic wellbeing of women and their families as well as for the countries. However, in Sub-Saharan African countries with high fertility, 50% of reproductive age women give birth before their 19 years. Thus, thousands of reproductive age women died because of pregnancy related complications. Moreover, teenagers (10–19 years) are at higher risk for eclampsia, puerperal endometritis, and systemic infections, as well as low birth weight, preterm birth, and severe neonatal conditions. In order to combat the problem and to control total fertility rate, the respective country governments, nongovernmental organizations and policymakers should try to enhance access to contraception, particularly for women living in rural areas. Moreover, as a strategy for fertility reduction and maternal health improvement, women can delay first births by being empowered with job opportunities and regular family planning messages through mass media.

Conclusion

In the current study, the median age at first birth was found to be 19 years, which is lower than the optimal age for giving first birth, which is between the late 20 s and early 30 s years [66–68]. Living in rural residences, early sexual intercourse, early age at first marriage, a high spousal age gap, and unmet need for family planning were predictors of first birth at an early age. On the other hand, occupation of the respondent and hearing family planning messages in the media were predictors of delayed first birth at an early age. Thus, governments and other responsible bodies should strive to implement programs to enhance access to contraception, particularly for women living in rural areas, to reduce unmet need for family planning. Since early childbirth, which often originated from early marriage, result in potential complications. Moreover, teenagers (10–19 years) are at higher risk for eclampsia, puerperal endometritis, and systemic infections, as well as low birth weight, preterm birth, and severe neonatal conditions. In order to combat the problem and to control total fertility rate, the respective country governments, nongovernmental organizations and policymakers should try to enhance access to contraception, particularly for women living in rural areas. Moreover, as a strategy for fertility reduction and maternal health improvement, women can delay first births by being empowered with job opportunities and regular family planning messages through mass media.

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health risks for the young mother and their child, as well as blurred future job prospects. As a strategy for fertility reduction and maternal health improvement, women can delay first births by being empowered with job opportunity and regular family planning messages through mass media.

Abbreviations
- AIC: Akaike Information Criteria; AOR: Adjusted Odds Ratio; CI: Confidence Interval; DF: Degree of Freedom; DHS: Demographic and Health Survey; MHR: Median Hazard Ratio; SSA: Sub-Saharan Africa; WHO: World Health Organization.

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Authors’ contributions
Both authors conceived the study, reviewed the literature, carried out the statistical analysis, interpreted the result, and wrote the manuscript. Gave final approval of the manuscript to be published, and agreed to be accountable for all aspects of the work.

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Availability of data and materials
Data for this study were sourced from Demographic and Health surveys (DHS), which is freely available online at (https://dhsprogram.com).

Declarations
Ethics approval and consent to participate
In this study, secondary data were collected from publicly available, aggregated sources that were not associated with study participants’ identifying information. All data were kept confidential anonymously. All the methods of the study were conducted according to the Helsinki declarations. More details regarding DHS data and ethical standards are available online at (http://www.dhsprogram.com).

Consent for publication
Not applicable.

Competing interests
The authors declare that there are no competing interests.

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