



HAL
open science

War, school dropout and adolescent motherhood in the Democratic Republic of the Congo: evidence from the 2007 and 2013/2014 Demographic and Health Surveys

Guerschom Mugisho

► **To cite this version:**

Guerschom Mugisho. War, school dropout and adolescent motherhood in the Democratic Republic of the Congo: evidence from the 2007 and 2013/2014 Demographic and Health Surveys. *Journal of Population Research*, 2024, 41 (4), pp.25. 10.1007/s12546-024-09345-y . hal-04722515

HAL Id: hal-04722515

<https://hal.science/hal-04722515v1>

Submitted on 5 Oct 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

War, school dropout and adolescent motherhood in the Democratic Republic of Congo: evidence from the 2007 and 2013/2014 Demographic and Health Surveys

Guerschom Mugisho^{1,2}

¹ Demography Institute, Paris 1 Panthéon-Sorbonne University, Paris, France ; ²Ecole des Hautes Etudes en Démographie (HED), Paris France

Table of contents

TABLE OF CONTENTS	1
ABSTRACT	2
INTRODUCTION	2
CONTEXT	4
ABOUT THIRTY YEARS OF CONFLICT, AGGRAVATION BETWEEN 1996 AND 2003	4
TRENDS IN ADOLESCENT FERTILITY RATES IN THE DRC	4
DECLINE IN PRIMARY SCHOOL ENROLMENT AND COMPLETION RATES FOR GIRLS DURING THE FIRST AND BEGINNING OF THE SECOND CONGO WAR	5
CONCEPTUAL AND THEORETICAL FRAMEWORK	6
HYPOTHESES	8
METHODS	8
DATA	8
STATISTICAL MODELING AND MEASURES	9
<i>Modeling the effect of war phases on adolescent motherhood</i>	9
<i>Modeling the effect of exposure to conflict during primary school on adolescent motherhood</i>	10
<i>Mechanisms</i>	12
RESULTS	13
SAMPLE DESCRIPTION	13
CHANGE IN THE PROBABILITY OF ADOLESCENT MOTHERHOOD BY CONFLICT PHASE	14
EFFECT OF EXPOSURE TO CONFLICT DURING PRIMARY SCHOOL ON ADOLESCENT MOTHERHOOD	16
MECHANISMS	16
<i>Effect of exposure to conflict during primary school age on school dropout</i>	16
<i>Effect of primary school conflict exposure on age of sexual debut and age of first adolescent union</i>	18
SENSITIVITY ANALYSES	19
DISCUSSION	20
CONCLUSION	23
ACKNOWLEDGEMENTS	24
ETHICS APPROVAL AND CONSENT TO PARTICIPATE	24
AVAILABILITY OF DATA AND MATERIALS	24
CONSENT FOR PUBLICATION	24
COMPETING INTERESTS	24
APPENDICES	25
REFERENCES	29

Abstract

Motherhood occurs early in the Democratic Republic of the Congo (DRC). According to the 2007 and 2013/2014 Demographic and Health Surveys (DHS), about 19% and 21% of adolescents had at least one child during adolescence. In addition, during the First and Second Congo Wars, schools were closed, and many school-age girls dropped out of school as a result. This study aimed to analyze the variation in the risk of adolescent motherhood by war phase in the DRC and the effect of war exposure during primary school on the risk of adolescent motherhood.

This study used pooled 2007 and 2013/2014 DHS data, including 28,822 women. A discrete-time logistic model was used to analyze changes in the probability of adolescent motherhood during the war phase. The Cox model was used to analyze the effect of exposure to war during primary school on the risk of adolescent motherhood.

The results showed a decrease in the probability of adolescent motherhood during the First Congo War and an increase during the Second Congo War, with a stronger effect in the Kivu region. In addition, exposure to war during primary school is associated with an increased risk of adolescent motherhood, with a less pronounced effect in Kivu. Teenage marriage and early sexual activity were the main mechanisms through which exposure to war during primary school increases the risk of adolescent motherhood.

The First and Second Congo Wars led to girls dropping out of school in the DRC, which in turn led to early sexual debut, child and adolescent marriages, and motherhood. To reduce the prevalence of adolescent motherhood, girls in the DRC need to be followed up and supported to complete their primary education.

Key words: Congo war, school dropout, adolescent motherhood, fertility, Kivu

Introduction

Motherhood begins early in the Democratic Republic of the Congo (DRC). Approximately 19% and 21% of adolescents had at least one child during adolescence, according to the 2007 and 2013/2014 DRC Demographic and Health Surveys (DHS) (Ministry of Health & ICF International, 2007, 2014). Adolescent motherhood is associated with a number of public health concerns, including an increased risk of maternal mortality, obstetric fistula, stillbirth, and neonatal morbidity (Ngum Chi Watts et al., 2015), as well as a range of socioeconomic disadvantages, including school dropout, poor access to employment and risk of domestic sexual violence (Urdinola & Ospino, 2015).

Following the independence conflicts of the 1960s, the Democratic Republic of the Congo (DRC) experienced more violent conflicts between 1996 and 2003 (Cooper, 2013). These conflicts had devastating socioeconomic and social consequences, including high adult mortality (Coghlan et al., 2006), destruction of schools, school dropouts and health infrastructure, mass displacement, poverty, and unemployment. All these factors can be associated with adolescent pregnancy and motherhood (Murphy-Graham et al., 2020; Wachter & Gulbas, 2018; Bell & Huebler, 2011; Koyame & Clark, 2002). In fact, the literature suggests that the likelihood of adolescent motherhood may decrease or increase during conflict, depending on the mechanisms through which the conflict operates (Neal et al., 2016). Conflict may reduce the risk of adolescent motherhood by reducing men's material and financial opportunities for formal union (Neal et al., 2016). Conflict also encourages transactional unions (Hutchinson et al., 2016), forced unions (Kramer, 2012) and sexual violence (Neal et al., 2016), which increases the risk of adolescent motherhood. It encourages girls to drop out of school and exposes them to early or forced marriages, increasing their risk of adolescent motherhood (Murphy-Graham et al., 2020). In the long run, school dropout may be associated with high fertility, as women with lower levels of education have more children in Africa (Goujon et al., 2015; Kravdal, 2002). A study in Cambodia found that interruptions in primary education during civil conflict were associated with higher fertility (Islam et al., 2016).

The DRC provides a suitable environment for investigating the influence of school dropout on adolescent motherhood. According to UNICEF, the DRC had the highest number of child soldiers and child laborers (Bell, 2006). During conflicts, rebels used many schoolchildren as soldiers. Schools have been closed, and many have been occupied by rebels, members of armed groups, or regular army soldiers (Bell & Huebler, 2011). The average number of years of education for school-aged girls decreased during the conflicts throughout the country. In addition, the literacy rate fell in the eastern of the country during the conflicts (Bell & Huebler, 2011).

In the literature review, I identified several studies on the effect of conflict on school dropout (Bell & Huebler, 2011; Verwimp & Van Bavel, 2014). I also found various papers on the impact of dropping out of school on teenage pregnancy (Ferre, 2009; Glick et al., 2015; Murphy-Graham et al., 2020). However, to my knowledge, no study has examined the association between the three phenomena—conflict, school dropout, and adolescent motherhood—in a single study.

The objectives of this study are to (i) analyze the variation in the probability of adolescent motherhood during the war phase and (ii) analyze the effect of exposure to war during primary school on adolescent motherhood in the DRC.

Context

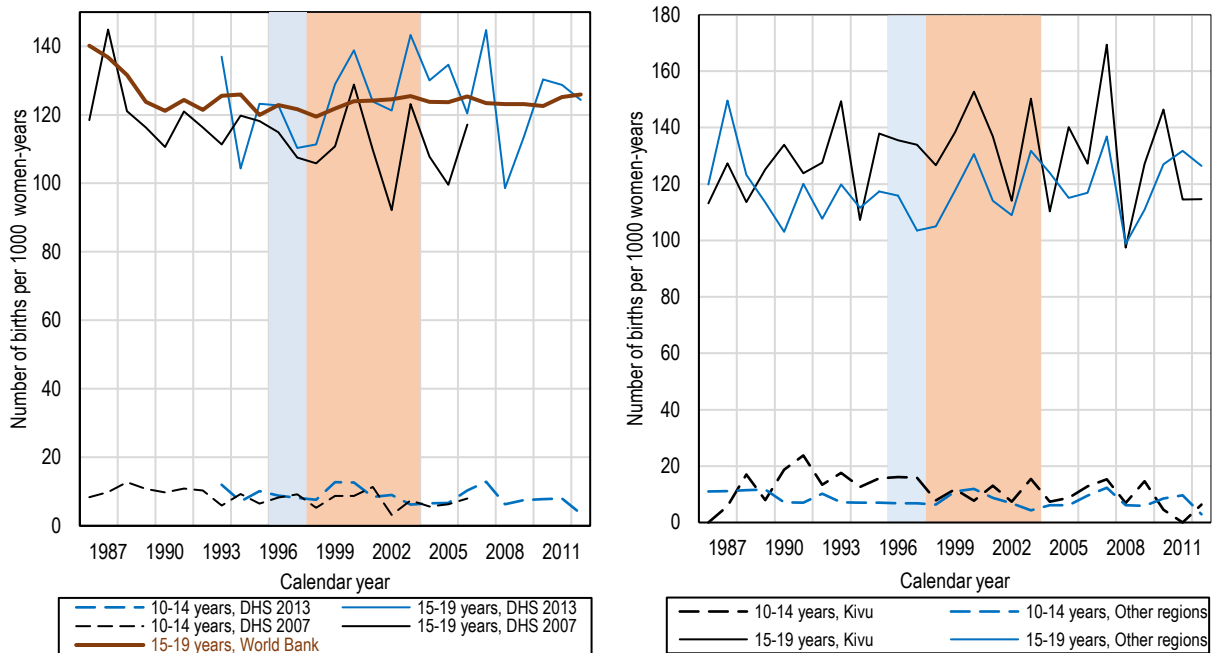
About thirty years of conflict, aggravation between 1996 and 2003

Recent conflicts in the DRC have occurred in three phases. The first two are known as the First and Second Congo Wars (Cooper, 2013). The First Congo War, which took place between 1996 and 1997, led to Laurent Désiré Kabila becoming President of the DRC with the support of several neighboring countries. This war took place throughout the country. The Second Congo War (1998–2003), also known as the 'Second Liberation War', involved nine neighboring countries (Rwanda, Uganda, Burundi, Angola, Zimbabwe, Namibia, Congo, Chad, Sudan) and approximately 30 armed groups. It was the largest interstate war in recent African history (Pourtier, 2009). This war took place primarily in Kivu, Province Orientale and Katanga. It took on the nature of both civil and international wars (Villers, 2005). The third phase was a continuation of the Second Congo War and took place mainly in Kivu, giving rise to another term, "the Kivu War" (Pourtier, 2011, 2016). Kivu is a former Belgian Congo province whose three subdivisions became provinces in 1988: North Kivu, South Kivu and Maniema, covering 320,000 km² (Pourtier, 2011) and approximately 14.76 million inhabitants in 2019 (World Bank, 2022). An estimated 5.4 million people have died as a direct and indirect result of these conflicts (Jacquemot, 2014). Several massacres and human rights violations have been reported during these wars (Emizet, 2000). According to some researchers, the 1996-2003 conflict in the DRC remained "the world's deadliest humanitarian crisis" until 2006 (Coghlan et al., 2006).

Trends in adolescent fertility rates in the DRC

Figures 1.a and 1.b depict the changes in teenage fertility rates in the DRC based on the regions that were most affected by the war (Kivu) and those that were least affected (other regions). Teenage fertility is high in the DRC. Between 1986 and 2012, there were over 120 births per 1,000 girls aged 15-19 and about 10 births per 1,000 girls aged 10-14. Overall, the adolescent fertility rate in the DRC remained stable from the early 1990s to 2012. However, estimates from the 2013/2014 DHS indicate a net increase in adolescent fertility rates from the start of the Second Congo War to 2005, with the rate increasing from 122 to about 135 births per 1,000 teenage girls

between 1996 and 2005 (Figure 1.a). World Bank estimates (apparently based on DHS 2007 and 2013/14 estimates, among others) also indicate a very slight increase in adolescent fertility rates since the second Congo war (from 119 births per 1,000 adolescents in 1998 to 125 births per 1,000 adolescents from 1999 to 2003) (Figure 1.a). Globally, fertility rates among 15-19 year olds are higher in Kivu than in other regions (Figure 1.b).

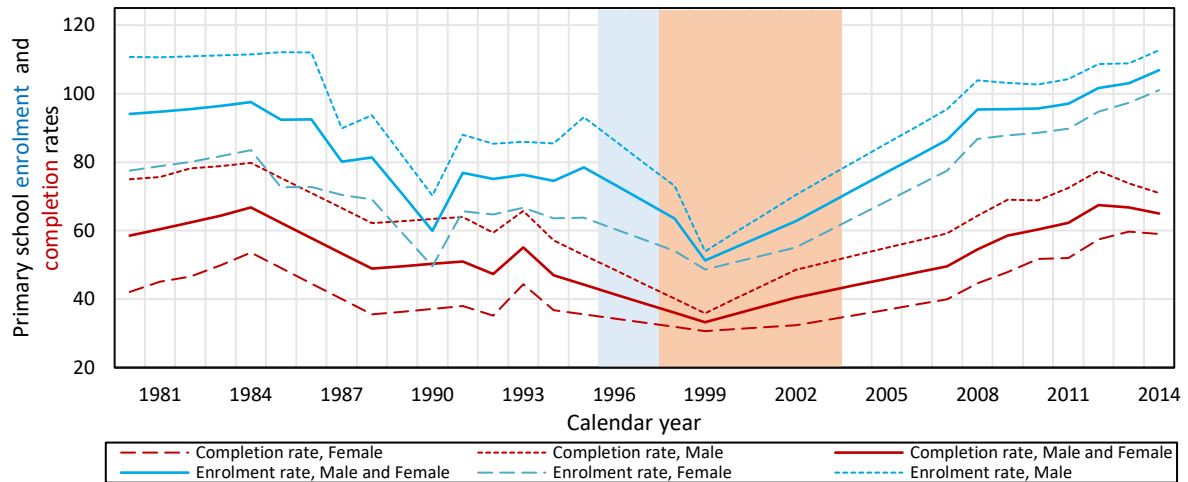


Note: Colors represent temporal delimitation of the First Congo War (1996-1997) and the Second Congo War (1998-2003). Fertility rates were calculated by dividing the total number of births between two exact ages by the total number of years women lived during the period
 Source: DHS DRC 2007 and 2013/14, World Bank

Fig.1.a (left) and 1.b (right). Trends in adolescent fertility rates in DRC (Fig. 1.a), Kivu and other regions (Fig.1.b).

Decline in primary school enrolment and completion rates for girls during the first and beginning of the Second Congo War

Figure 2 shows the evolution of the gross primary school enrolment and completion rates. Overall, two general trends can be observed: a decrease in gross primary school enrolment and completion rates until 1999 and an increase from 2000 onwards. However, these two main trends mask short-term variations. Gross primary school attendance and completion rates were more or less stable from 1990 to 1995, but dropped dramatically from the beginning of the First Congo War (1996) to 1999. This decline in school attendance during the war is thought to be the result of, among other things, the closure of schools, the loss of the teaching community, and the massive forced displacement of the population during the First Congo War (Bell & Huebler, 2011). Since 2000, school attendance rates have increased gradually.



Note: Rates for years with missing values were estimated by linear interpolation. Gross enrollment rates exceeded 100% in some years. This means that many children start or finish primary school outside the legal age range (6-11 years).

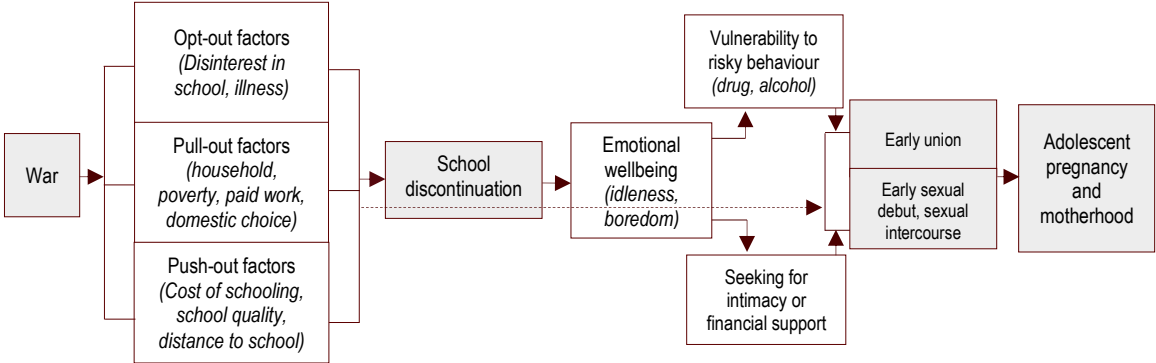
Source: World Bank (2022)

Fig.2. Trends in primary school enrollment and completion rates in the DRC

Conceptual and theoretical framework

Adolescence is generally defined as the period between the ages of 10 and 19 years. It is often divided into three phases: early adolescence (10–14 years), middle adolescence (15–17 years), and late adolescence (18–19 years) (Blum et al., 2014; Brown et al., 2020). Several studies have proposed theoretical frameworks for understanding the factors associated with school dropout among adolescent girls (Murphy-Graham et al., 2020; Singh & Mukherjee, 2018), and others to understand factors associated with marriage and teen motherhood (e.g., Blum et al., 2014). According to Singh and Mukherjee's (2018) theoretical framework, adapted from Bronfenbrenner's (1977) ecological model, factors associated with school dropout can be categorized as macro (national or international), micro (immediate environment), and chrono (factors that operate throughout the life course). Macro-level factors include laws, public policies, belief systems, economic models (poverty or prosperity), and socio-political conditions (peace, war). Chrono factors, or the chronosystem, involve the interactions of various factors throughout an individual's life (Murphy-Graham et al., 2020). Micro-level factors include family, school, religious institutions, culture, and neighborhoods. These micro-level factors are further grouped into three categories: pushed out, pulled out and opting out (Singh & Mukherjee, 2018). Push-out factors are those internal to the school that cause students to leave (abusive or disengaged teachers, unaffordable costs of education). Pull-out factors include influences external to school, such as the need to care for sick family members or children or the availability of paid employment. Finally, opt-out factors include personal characteristics, behaviors, and attitudes,

such as disinterest in school and lack of motivation. These opt-out, push-out, and pull-out factors are influenced by macro- and chrono-factors. I use a simplified conceptual framework adapted from that of Singh & Mukherjee (2018) (Figure 3) and Blum et al. (2014), considering conflict as the only macro factor. It impacts school dropout through opting-out, push-out, and pull-out factors.



Source : Adapted from Singh & Mukherjee (2018) and Blum et al.(2014)

Fig.3. Conceptual model of the effect of war on school dropout and adolescent motherhood

Conflict affects school dropout through opt-out factors, for example, by negatively affecting children's health. Some studies have shown that poor health in childhood is associated with a high risk of dropping out of school (Mikkonen et al., 2018). Conflicts cause or exacerbate family poverty (pull factor) as a result of the loss of assets during the conflict (Mercier et al., 2020). Previous studies have found that household income in early adolescence predicts school dropout, early union, and early childbearing (Murphy-Graham et al., 2020). This loss of wealth within families during conflicts can also result from the death of parents or family breadwinners, leaving orphaned students without financial or emotional support. Orphanhood has been found to be associated with a high risk of early marriage, sexual debut and teenage pregnancy (Chae, 2013; Palermo & Peterman, 2009). Finally, conflicts lead to school closures, loss of the teaching community, and a decline in the quality of education (push factors), resulting in lower school attendance and completion rates (Bell & Huebler, 2011). Dropping out of school can lead to immediate entry into the union. This has been observed in Uganda and the DRC, where students abducted while in school were forced into forced unions (Bennouna et al., 2016; Schlecht et al., 2013). Dropping out of school is often followed by idleness and boredom. Boredom is linked to a range of mental health problems, including impulsivity and risk-taking (Macklem, 2015), which makes adolescent girls vulnerable to risky behaviors such as smoking and drinking (Carney et al., 2020). It may also drive adolescents to seek intimacy or financial support (Hutchinson et al., 2016), exposing them to early sexual debut and prostitution (Clarke et al., 2012), early marriage,

and risk of teenage pregnancy. For example, in Uganda, young refugee girls who had dropped out of school entered into early marriages because of boredom (Schlecht et al., 2013). Early marriage and exposure to unprotected sex outside of marriage are two major mediating factors through which school dropout as a result of war has an impact on teenage motherhood (Baizán et al., 2004; Glick et al., 2015).

Hypotheses

The trends in the actual risk of teenage motherhood, after controlling for other covariates that may influence teenage motherhood, may differ from those observed in Figures 1.a-b. Thus, according to Lindskog (2016), the probability of having a first child in the DRC increased during and immediately after the First and Second Congo Wars. I hypothesize that the likelihood of adolescent motherhood also increased significantly during the First and Second Congo Wars (Hypothesis H_{1A}), with an amplification in Kivu (Hypothesis H_{1B}).

War has affected education in the DRC, reducing school attendance and encouraging school dropout (Bell & Huebler, 2011). I expect that women who spent primary education during the period of increased conflict (1996-2003) would be more likely to have children in their teens (Hypothesis H_{2A}). This association between exposure to war during primary school and adolescent motherhood (Hypothesis H_{2B}) would be stronger in Kivu.

Methods

Data

Data were obtained from the 2007 and 2013/2014 DRC DHSs. The data from these two survey waves were pooled to increase the sample size and precision of the estimates. They covered 28,822 women aged 15–49 years at the time of the survey, that is, 9,995 for the 2007 DHS and 18,827 for the 2013–2014 DHS. These nationally and provincially representative surveys were based on a stratified sample drawn at two levels in statutory cities and at three levels in the rest of the province. A total of 34 strata were created in the 2007 DHS and 66 in the 2013/2014 DHS. Each province is divided into three strata: statutory towns, cities, and sectors, or chiefdoms (rural areas). In statutory towns and cities, neighborhoods were drawn at the first level and households at the second level. In rural areas, sectors were drawn at the first level, villages at the second level, and households at the third level. In total, 300 clusters (urban neighborhoods or rural villages) were drawn in the 2007 DHS and 540 clusters in the 2013/2014 DHS (Ministry of Health & ICF International, 2007, 2014).

Statistical modeling and measures

First, I estimated discrete-time logistic models, including all independent variables, to examine the relationship between school dropout and adolescent motherhood. In these models, the number of years of exposure to conflict during the primary school and conflict periods were highly collinear (variance inflation factor of 12), as years of exposure to conflict refer to specific time periods. Given the importance of each variable in this study, I retained both the variables. I then ran separate regressions including each of the two variables. The conflict phase variable can only be measured using long-format data, whereas the number of years of conflict exposure during primary education is better measured using event history data. This explains the use of different statistical models in each case.

Modeling the effect of war phases on adolescent motherhood

A discrete-time logistic model was used to analyze the variations in the probability of adolescent motherhood by stage of war. A discrete-time model was selected instead of a Cox model because events were concentrated in a particular age range (approximately 63% of first teenage births occurred between the ages of 17 and 19). I began by estimating a basic hazard function for adolescent motherhood as a linear function of age or time.

$$\ln(P_{it}/(1 - P_{it})) = \beta_0 + \beta_1 Age_i \quad Eq. (1)$$

Other independent variables were then added:

$$\ln(P_{it}/(1 - P_{it})) = \beta_0 + \beta_1 Age_i + \beta_2 X_{it} + \beta_3 z_i \quad Eq. (2)$$

where P_{it} is the probability of adolescent motherhood for woman i during period t , β_0 is the intercept, X_{it} is the vector of time-varying variables (conflict period), and z_i is the vector of time-invariant variables. Parameters $\beta_1, \beta_2, \beta_3$ are vectors of the coefficients.

The data were converted into a person-period format, that is, each observation was repeated as many times as there were observation periods. Women were observed from the year in which they reached age 10 until the year of adolescent motherhood or until the year in which they reached age 19 if they did not have a child as an adolescent (right censoring). Observations in the survey years were excluded to focus on the period immediately after the Second Congo War and because some births that should have occurred in the survey years were not recorded, particularly among women who were pregnant at the time of the survey. The start of the observation was set at 10 years to account for births from the start of adolescence.

The dependent variable is having had a child before age 20. It takes the value 1 for the observation year in which the woman had her first child before the age of 20, and the value 0 for each observation year in which the woman did not have a child.

The independent variables were selected from the literature. The main independent variable was the conflict phase. It is used to compare the likelihood of adolescent motherhood during the different phases of war. It takes the following values: pre-war (1980-1995), the First Congo War (1996-1997), the Second Congo War (1998-2003), insurgency in the east (2004-2007) and post-war (2008-2012). This measure is similar to that used by Lindskog (2016), although the researcher combined the first two Congo wars into a single category. I separated these two categories to disentangle the impact of the two wars, the first of which took place throughout the country, and the second mainly in the east.

Based on the literature (Jayaraman et al., 2008; Pasqualini et al., 2021; Shi et al., 2022), I controlled for age, region, having ever used any contraceptive method (ever used, never used), first premarital sex during adolescence (no, yes), and the number of siblings born before the respondent's birth. The age variable starts at 10 and increases by 1 each year until the year of first birth during adolescence, or until age 19 if the woman did not have a child during her adolescent years. The region variable takes the value of 1 if the woman lives in the regions most affected by the conflicts, that is, the Kivu region (South Kivu, North Kivu, or Maniema), and 0 otherwise. I was particularly interested in how this variable interacts with the main variable of interest, war phases. This variable was measured under the assumption that women have not left their province of residence since the start of the war until the survey years, or if they have moved, they have moved within Kivu and not outside it, or within other provinces (outside Kivu) and not towards Kivu. This is a strong assumption, given that the interprovincial labor migration of young people is common, especially towards Kinshasa (Anglewicz et al., 2017). I assumed that fewer women have migrated between Kivu and the other provinces because transport costs are higher owing to the lack of road transport linking Kivu to the other provinces. The bias inherent to this variable would be greater if the geographical areas under consideration were finer. To limit this bias due to the lack of women's migratory trajectory, I did not control for the effects of province and place of residence.

Modeling the effect of exposure to conflict during primary school on adolescent motherhood

The Cox model was used to analyze the effect of exposure to conflict during primary school on the risk of adolescent motherhood. The Cox model was used instead of the discrete-time model because the data were in wide format.

In the Cox model, the baseline hazard rate $\lambda_0(t)$ (in this case, the risk of having a child during adolescence) is affected by various covariates that either favor ($\beta_i > 0$) or oppose ($\beta_i < 0$) the occurrence of the first pregnancy during adolescence. The model is given by:

$$\lambda(t) = \lambda_0(t) * \exp(\beta_i X_i) \text{ Eq.(3)}$$

where the parameter β_i ($i = 1, \dots, p$) is the vector of p coefficients and X_i ($i = 1, \dots, p$) the vector of p independent variables. The function $\lambda(t)$ is the instantaneous risk of having a child in adolescence by a woman at time t knowing that she had not yet had a child before t . The function $\lambda_0(t)$, called the baseline risk, corresponds to the instantaneous risk of having a child in adolescence when all variables are zero. The ratio $\lambda(t)/\lambda_0(t)$ corresponds to the hazard ratio (HR), which was reported in the results (Table 3). This ratio is assumed to be independent of time.

The variable of interest corresponds to the length of time between the age of 10 and the age when the woman had her first child as an adolescent or the age of 19 if the woman did not have a child as an adolescent (right censoring).

The explanatory variable is exposure to conflict during primary school. It is measured by the number of years of exposure to conflict in primary school. The variable was calculated by birth cohort based on the start and end years of primary school, the start year (1996), and the end year (2003) of the first two Congo Wars (Supplementary Tables 1-2). This measure is similar to that used by other researchers (Islam et al., 2016; Verwimp & Van Bavel, 2014). I assumed that primary education for each generation starts at the age of six and ends at the age of 11. This measure does not consider the staggered age at entry into primary school or grade repetition. Not considering the late start of primary school for some children leads to an overestimation of the actual number of years exposed to conflict during primary school age. Conversely, not considering grade repetition or temporary interruptions in schooling leads to an underestimation of the actual number of years of exposure to conflict during the primary school age. These two biases have opposite signs, which minimizes the overall bias.

I controlled for year of birth, region (Kivu or other regions), contraceptive use (ever used, never used), first premarital sex during adolescence (no, yes), and the number of siblings born before the respondent's birth. An interaction term between regions and primary school conflict exposure was added to compare the effect of primary school conflict exposure in more and less conflict-affected regions. I did not control for the effect of age. This is because age was included in the variable of interest. In line with Behrman (2015) and Bhuwania *et al.* (2023), I did not control for level of education, which is a mechanism through which conflict may potentially impact

adolescent motherhood. Based on some studies on the effect of conflict on first birth (Jayaraman et al., 2008; Thiede et al., 2020), I did not control for age at first union as it is the proximate factor through which exposure to conflict during primary school affects first birth during adolescence (see Figure 3). Including it in the model would therefore lead to no effect of exposure to conflict during primary school on first birth. Therefore, I separately analyzed the effect of exposure to conflict during primary school on each of the main hypothesized mechanisms (Figure 3).

Mechanisms

To explore the possible mechanisms underlying the relationship between exposure to war during primary school and adolescent motherhood, I conducted parallel analyses of the associations between exposure to war during primary school and three key outcomes (see Figure 3): school dropout, age at first union, and age at sexual debut. First, I used a logistic model to test the effect of war exposure during primary school on the probability of not completing primary school. The dependent variable was not completing primary school, which was used as a proxy for dropping out of school. It takes the value of 1 if the woman did not complete primary school, and 0 if she did. This was measured using the educational attainment variable. I controlled for the year of birth, region, and the number of older siblings. Second and third, I used Cox models to analyze the effect of exposure to war during primary school on age at sexual debut outside of marriage, and age at first marriage. In line with the existing literature (Jayaraman et al., 2008; Shi et al., 2022) and data availability, I controlled for the year of birth, region (Kivu, other regions), religion (Catholic, Protestant, other Christian, Muslim, other), number of siblings born before the respondent's birth, and place of residence (urban or rural). Religion is measured assuming that the woman's reported religion is the one she practiced prior to her first marriage or sexual intercourse. This is a strong assumption because some women change their religion because of marriage. Similarly, residence is measured assuming that the woman has not moved from urban to rural areas, or vice versa, since her first sexual encounter or marriage. The effects of these variables should be considered with caution.

Results

Sample description

Table 1. Sample description

		DHS 2007		DHS 2013/14		DHS 2007 and 2013/14	
		Mean or median	sd ^c	Mean or median	sd	Mean or median	sd
Quantitative variables							
Age at survey		28.19	9.4	28.3	9.4	28.26	9.4
Age at adolescent motherhood		17.0 ^a	1.8	17.0 ^a	1.8	17.0 ^a	1.8
Age at first union during adolescence		16.0 ^a	2.0	16.0 ^a	2.0	16.0 ^a	2.0
Age of sexual debut (outside of marriage) during the adolescent years		16.0 ^a	1.8	15.0 ^a	1.9	16.0 ^a	1.9
Number of older siblings		2.7	2.5	2.7	2.4	2.7	2.5
Number of years of education		5.38	4.2	5.71	4.09	5.6	4.1
Number of years exposed to conflict during primary school		1.28	2.1	1.9	2.21	1.67	2.2
Categorical variables	Values	N^b	%	N	%	N	%
Having had a child during adolescence	No	5,672	56.7	10,450	55.5	16,122	55.9
	Yes	4,323	43.3	8,377	44.5	12,700	44.1
Number of years exposed to conflict during primary school	0 year	6,716	67.2	8,890	47.2	15,606	54.1
	1 year	436	4.4	1,597	8.5	2,033	7.1
	2 years	513	5.1	1,639	8.7	2,152	7.5
	3 years	545	5.5	1,628	8.6	2,173	7.5
	4 years	379	3.8	1,370	7.3	1,749	6.1
	5 years	387	3.9	1,618	8.6	2,005	7.0
Primary school dropout	Completed primary school	7,914	79.2	15,924	84.6	23,838	82.7
	Did not complete primary school	2,081	20.8	2,903	15.4	4,984	17.3
Region	Other regions	8,899	89.0	15,281	81.2	24,180	83.9
	Kivu	1,096	11.0	3,546	18.8	4,642	16.1
Ever used contraception	Ever used	4,884	47.9	13,164	69.9	18,048	62.6
	Never used	5,111	52.1	5,665	30.1	10,776	37.4
All women		9,995	100	18,827	100	28,822	100
Conflict phases ^d	Pre-war (1980–1995)	37,880	47.7	53,001	34.5	90,881	39.0
	First Congo War (1996–1997)	7,108	9.0	10,567	6.9	17,675	7.6
	Second Congo WAR (1998–2003)	22,333	28.1	35,025	22.8	57,358	24.6
	Insurgency (2003–2007)	8,986	11.3	26,906	17.5	35,892	15.4
	Post-war (2008–2012)	3,036	3.8	28,330	18.4	31,366	13.5
Total number of women–years		79,343	100.0	153,829	100.0	233,172	100.0

a. Median

b. Frequency

c. Standard deviation

d. The Figures for this variable represent the years lived by women during periods of conflict from the age of 10 until the age of adolescent motherhood or until the age reached in 2012. They were calculated on long format data

Source: *The DRC 2007 and 2013/2014 DHS*

Table 1 describes the variables based on survey waves. Adolescent motherhood occurred before the age of 17 years for half of the women in both 2007 and 2013/2014. There was an improvement in school attendance over the years. The proportion of women who had not completed primary school decreased from 20.8% in 2007 to 15.4% in 2013/2014. Correspondingly, the average number of years of education increased slightly from 5.38 years in 2007 to 5.71 years in 2013/2014. Women interviewed in 2007 and 2013/2014 spent an average of 1.28 and 1.67 years, respectively,

of primary education in war. The median age at first adolescent marriage was 16. The median age at sexual debut was 16. The proportion of women who have never used contraception has decreased over the years (from 52% in 2007 to 30.1% in 2014).

Change in the probability of adolescent motherhood by conflict phase

A discrete-time logistic model was used to analyze the change in the probability of adolescent motherhood (Table 2) according to the conflict phases.

Table 2. Discrete-time logistic model analyzing adolescent motherhood probability by conflict phase in the DRC

Variables	Main effects model			Model with interactions		
	aOR [†]	95% CI [†]	p-value	aOR [†]	95% CI [†]	p-value
Main effects						
(Intercept)	0.00	0.00–0.00	<0.001***	0.00	0.00–0.00	<0.001***
Age	1.60	1.58–1.61	<0.001***	1.60	1.58–1.61	<0.001***
Region — Kivu (<i>Reference=Other regions</i>)	1.06	1.01–1.11	0.031**	1.28	1.06–1.55	0.009***
Contraception — Never used (<i>Reference=Ever used</i>)	0.95	0.92–0.99	0.017**	0.95	0.92–0.99	0.016**
First sex before marriage during adolescence — Yes (<i>Reference = No</i>)	1.16	1.11–1.21	<0.001***	1.16	1.11–1.21	<0.001***
Number of older siblings	1.02	1.01–1.03	<0.001***	1.02	1.01–1.03	<0.001***
Period (<i>Reference= First Congo War</i>)						
Pre-war	0.12	1.03–1.22	0.006***	1.16	1.06–1.28	0.001***
Second Congo War	1.10	1.01–1.20	0.030**	1.11	1.01–1.22	0.026**
Insurgency	0.98	0.90–1.07	0.635	1.01	0.92–1.22	0.825
Post-war	0.88	0.81–0.97	<0.007***	0.97	0.88–1.07	0.547
Interactions						
Pre-war (1980–1995)* Region (Kivu)				0.83	0.68–1.02	0.068*
2nd War (1998–2003)*Region (Kivu)				0.93	0.75–1.15	0.480
Insurgency (2004–2007)*Region (Kivu)				0.84	0.67–1.05	0.118
Post-war (2008–2012)* Region (Kivu)				0.60	0.48–0.75	<0.001***
Statistics	AIC=81,390, n=28,822 women, Observations =233,172 women– years			AIC=81,334, n=28,822 women, Observations =233,172 women– years		

[†] Lower and upper limit of the confidence interval (CI) of the adjusted odds ratios (aOR). aORs whose confidence intervals do not contain the value 1 are significantly different from 1.

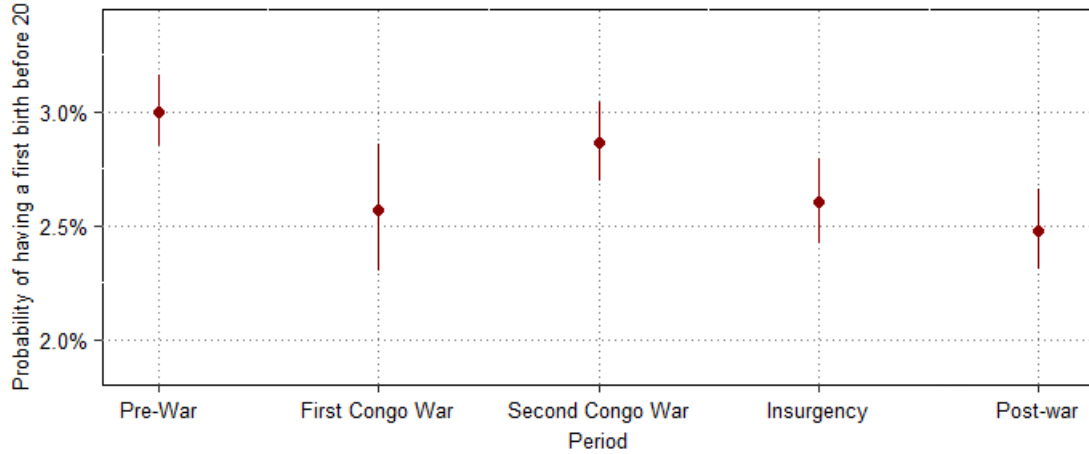
***P-value<1%, **P-value<5%, *P-value<0.1

Source: DRC 2007 and 2013/2014 DHS

The probability of teen motherhood was associated with increasing age (aOR=1.60 [1.58-1.61], $p<0.001$) and the number of older siblings (aOR=1.02 [1.01-1.03], $p<0.001$). It was lower among women who had never used contraception (aOR=0.95 [0.92-0.99], $p=0.017$). Teenage motherhood occurred early among women who had their first sexual intercourse outside of marriage during adolescence (aOR=1.16 [1.11-1.21], $p<0.001$).

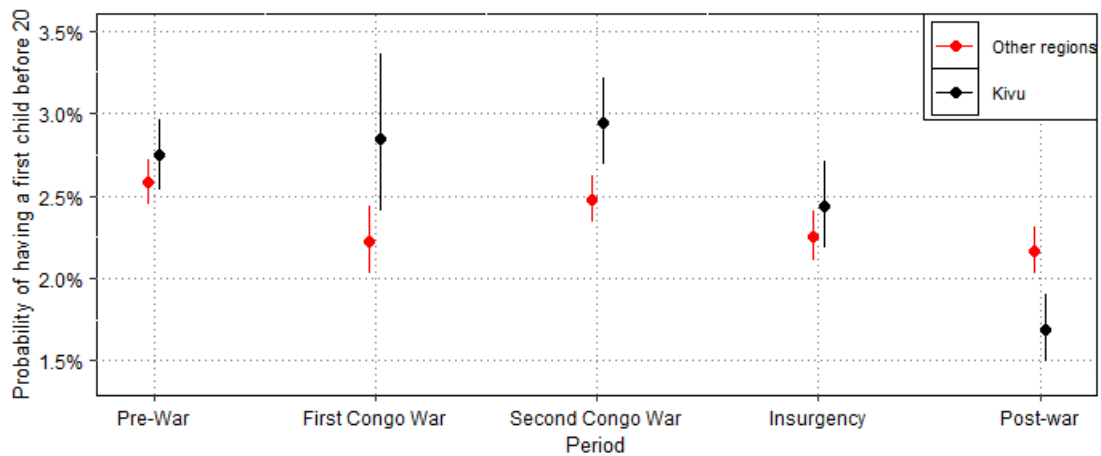
Overall, the probability of teenage motherhood was higher in Kivu than in other regions (aOR=1.06 [1.01-1.11], $p=0.031$), but was lower in Kivu than in other regions from 2008 (during the post-war period) (Figure 5). It tended to decrease over time in the country as a whole (Figure 4, Table 2). The probability of teenage motherhood decreased during the First Congo War but

increased during the Second Congo War for the country as a whole (Figure 4, Table 2). The increase in the probability of teenage motherhood during the Second Congo War was more pronounced in Kivu (Figure 5, Table 2).



The predictions are based on the discrete-time logistic model shown in Table 2
 Source : DRC 2007 and 2013/2014 DHS

Fig. 4. Predicted probability of adolescent motherhood in the DRC by conflict phases using the discrete-time logistic model



Note: Predictions are derived from the discrete-time logistic model presented in Table 2.
 Source: The DRC 2007 and 2013/2014 DHS

Fig. 5. Predicted probability of adolescent motherhood in Kivu and other regions by conflict phases using the discrete-time logistic model

Effect of exposure to conflict during primary school on adolescent motherhood

Table 3 shows the results of the Cox models relating the number of years of exposure to conflict during primary school to adolescent motherhood risk.

Table 3. Cox model of the effect of exposure to conflict during primary school on the risk of adolescent motherhood in the DRC

Variables	Main effects model			Model with interactions		
	aHR [†]	95% CI [†]	p-value	aHR [†]	95% CI [†]	p-value
Main effects						
Year of birth	0.98	0.98–0.98	<0.001***	0.98	0.98–0.98	<0.001***
Region (Reference : Other regions)						
Kivu	1.05	1.03–1.06	<0.001***	1.12	1.10–1.15	<0.001***
Contraception (Reference=Ever used)						
Never used	0.88	0.87–0.89	<0.001***	0.88	0.87–0.89	<0.001***
First sex before marriage during adolescence (Reference = No)						
Yes	1.08	1.06–1.10	<0.001***	1.08	1.07–1.10	<0.001***
Number of older siblings	1.02	1.01–1.02	<0.001***	1.02	1.02–1.02	<0.001***
Number of years exposed to conflict during primary school	1.01	1.01–1.02	<0.001***	1.02	1.02–1.03	<0.001***
Interactions						
Number of years exposed to conflict during primary school * Region (Kivu)				0.96	0.95–0.97	<0.001***
	Statistic (P-value)			Statistic (P-value)		
LR test	2,170 (<0.001***)			2,284 (<0.001***)		
Wald test	2,190 (<0.001***)			2,308 (<0.001***)		
	n=28,822 women			n=28,822 women		

[†] Lower and upper limit of the confidence interval (CI) of the adjusted hazard ratios (aHR). aHRs whose confidence intervals do not contain the value 1 are significantly different from 1.

***P-value<1%, **P-value<5%, *P-value<0.1

Source: DRC 2007 and 2013/2014 DHS

The number of years exposed to conflict during primary school is associated with an increased risk of adolescent motherhood (aHR=1.01 [1.01-1.02], $p<0.001$) in the DRC, with a less pronounced effect in Kivu (aHR=0.96 [0.95-0.97], $p<0.001$) (Table 3, Supplementary Figure 1.a & 1.b).

Mechanisms

Based on the conceptual framework (Figure 3), I explored three main pathways driving the relationship between exposure to conflict during primary school and teenage motherhood: school dropout, early sexual debut outside marriage, and marriage during adolescence.

Effect of exposure to conflict during primary school age on school dropout

To test a possible causal relationship between school dropout and adolescent motherhood, I tested whether exposure to conflict during primary school was actually associated with school dropout (Table 4).

Table 4. Logistic model analyzing the effect of exposure to conflict during primary school on the probability of not completing primary school

Variables	Main effects model				Model with interaction			
	95% CI			P-value	95% CI			P-value
	aOR ^a	Lower ^a	Upper		aOR	Lower	Upper	
Main effects								
Intercept	4.33	2.72	15.42	<0.001***	4.33	2.72	15.42	<0.001***
year of birth	0.97	0.96	0.97	<0.001***	0.97	0.96	0.97	<0.001***
Region – Kivu (Ref: Other regions)	2.13	1.99	2.29	<0.001***	2.30	2.11	2.51	<0.001***
Number of older siblings	0.97	0.96	0.98	<0.001***	0.97	0.96	0.98	<0.001***
Number of years exposed to conflict during primary school	0.99	0.97	1.00	0.138	1.00	0.98	1.02	0.973
Interactions								
Years exposed to conflict * Regions (Kivu)					0.95	0.92	0.98	0.002***
	<i>Statistics (df)^b</i>				<i>Statistics (df)</i>			
AIC	25,273				25,266			
Deviance	25,263 (27,491)				25,254 (27,490)			
	n=28,822 women				n=28,822 women			

***P-value<0.01, **P-value<0.05, *P-value<0.1

- Lower and upper limit of the confidence interval (CI) of the adjusted odds ratios (aOR). AORs whose confidence intervals do not contain the value 1 are significantly different from 1.
- df: degrees of freedom

The DRC 2007 and 2013/2014 DHS

The results show that the probability of dropping out of school does not increase as the number of years exposed to conflict during primary school increases (aOR = 0.99 [0.97–1.00], $p = 0.138$). However, having been exposed to conflict for at least one year during primary school was significantly associated with the likelihood of not completing primary school. This is illustrated by the results in Supplementary Figure 2, which show that women who spent at least one year of primary school during the first and second Congolese Wars are more likely not to complete primary school than those who did not spend any year of primary school during the two Congolese Wars. I took the analysis a step further by analysing the variation in the probability of dropping out of school according to the duration of exposure to conflict during primary school, measuring the variable number of years exposed to conflict during primary school on a qualitative scale. The results (Figure 6. a) showed that the probability of not completing primary school was higher for women exposed to conflict in primary school for one or two years. Women exposed to war during one or two years of primary school are either those of the 1985 and 1986 generations, that is, those who spent the last two years of primary school during the First Congo War (1996-1997), or those who were born during the First Congo war (1996-1997) (see Supplementary Tables 1-2). Women in this cohort also had a higher risk of teenage marriage than other women (aHR=1.13[1.09-1.18], $p<0.001$) (Supplementary Table 4), but they did not have a higher risk of first adolescent birth (results not shown).

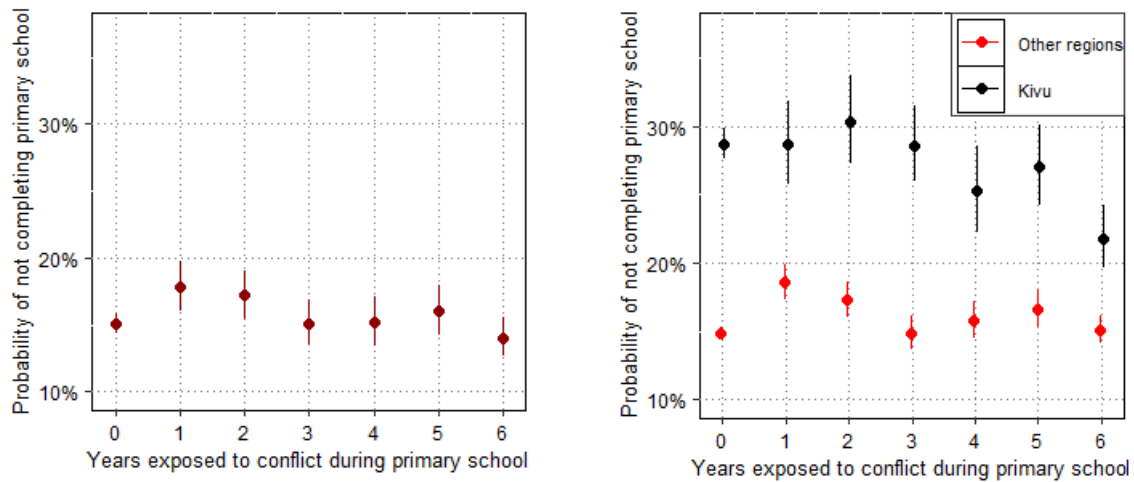


Fig.6.a (left) and 6.b (right). Predicted probability of dropping out of school by the logistic model according to the number of years exposed to conflict during primary school (on a qualitative scale) in the DRC (left) and by region (right)

Effect of primary school conflict exposure on age of sexual debut and age of first adolescent union

I analyzed the relationship between exposure to war during primary school and age at sexual debut outside of marriage during adolescence (Table 5). The results showed that the longer girls were exposed to conflict during primary school, the earlier they started sexual activity outside of marriage as adolescents (aHR=1.02[1.02-1.03], $p<0.001$). This association was stronger in Kivu (aHR=1.04[1.02-1.05], $p<0.001$). I also examined whether exposure to conflict during primary school was associated with adolescent entry into the union (Table 6). The results showed that exposure to conflict during primary school was strongly associated with early age at first union during adolescence (aHR=1.02[1.01-1.03], $p<0.001$), with comparable effects in Kivu and other regions (aHR=0.99[0.97-1.01], $p=0.299$).

Table 5. Cox model analyzing the effect of exposure to conflict during primary school on the risk of sexual debut during adolescence in the DRC

Variables	Main effect model			Model with interaction		
	aHR ¹	95% CI ¹	P-value	aHR ¹	95% CI ¹	P-value
Region (Reference=Other regions)						
Kivu	0.76	0.73–0.79	<0.001***	0.71	0.68–0.76	<0.001***
Number of years exposed to war during primary school	1.02	1.02–1.03	<0.001***	1.02	1.01–1.02	<0.001***
Region–Kivu * Number of years exposed to war during primary school				1.04	1.02–1.05	<0.001***
	Statistics (P-value)			Statistics (P-value)		
Likelihood ratio test	317.7 ($p<0.001$ ***)			335.9 ($p<0.001$ ***)		
Wald test	311 ($p<0.001$ ***)			322.3 ($p<0.001$ ***)		

¹ aHR = Hazard Ratio, CI = Confidence Interval

****P*-value<0.01, ***P*-value<0.05, **P*-value<0.1

Note: This model controls for the effect of year of birth, religion, number of siblings born before the respondent's birth and place of residence.

Table 6. Cox model analyzing the effect of exposure to conflict during primary school on the risk of first union during adolescence in the DRC

Variables	Main effect model			Model with interaction		
	aHR	95% CI	<i>P</i> -value	aHR	95% CI	<i>P</i> -value
Region (<i>Reference=Other regions</i>)						
Kivu	1.00	0.96–1.04	0.993	1.02	0.96–1.07	0.550
Number of years exposed to war during primary school	1.02	1.01–1.03	<0.001***	1.02	1.01–1.03	<0.001***
Region–Kivu * Number of years exposed to war during primary school				0.99	0.97–1.01	0.299
	Statistics (<i>P</i> -value)			Statistics (<i>P</i> -value)		
Likelihood ratio test	1,145 (<i>p</i> <0.001***)			1,146 (<i>p</i> <0.001***)		
Wald test	1,122 (<i>p</i> <0.001***)			1,124 (<i>p</i> <0.001***)		

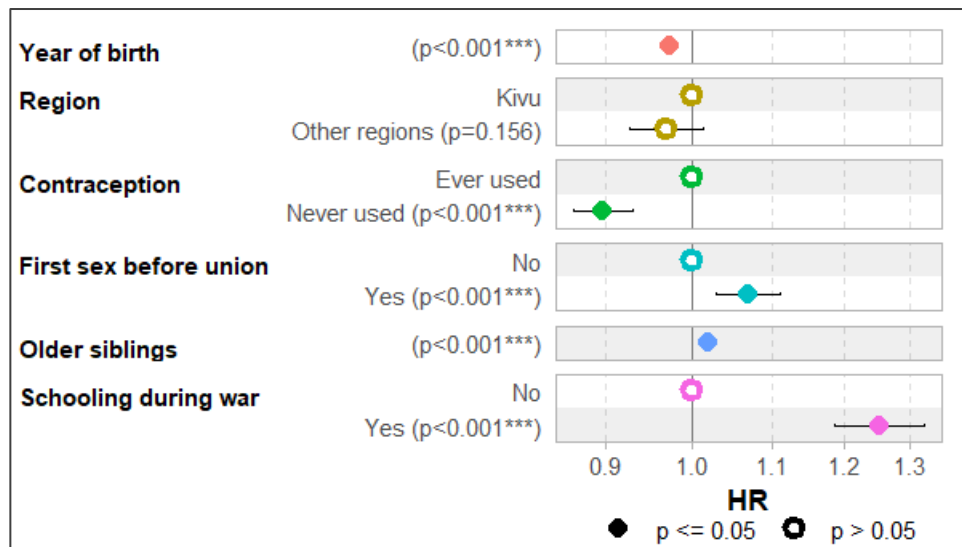
****P*-value<0.01, ***P*-value<0.05, **P*-value<0.1

Note: This model controls for the effect of year of birth, religion, number of siblings born before the respondent's birth, place of residence.

Sensitivity analyses

Some sensitivity analyses of the results to methodological choices made were performed. I used a logistic model (Supplementary Table 3) instead of the Cox model (Table 3) to examine the effect of exposure to war during primary school age on the probability of adolescent motherhood. The effect of years of conflict exposure during primary school on adolescent motherhood was also stronger in the latter model (aOR=1.07[1.05-1.09], *p*<0.001). It was also less pronounced in Kivu (aOR=0.96[0.93-0.99], *p*=0.002)

I used an alternative measure of exposure to conflict in primary school. I created a dichotomous variable that takes the value of 1 if the woman spent at least one year in primary school during the First and Second Congo Wars, and 0 otherwise. The results (Figure 7) show that exposure to conflict for at least one year in primary school (“schooling during war”) is associated with an increase in the risk of adolescent motherhood.



Note. Dots represent adjusted hazard ratios (aHR). The vertical line in the middle corresponds to an aHR of 1. The bars on either side of the points correspond to 95% confidence intervals of the hazard ratios. An aHR is significantly different from 1 at the 5% level if its confidence interval does not intersect the vertical line, that is, if its confidence interval does not contain the value 1.

Fig. 7. Foresplot from a Cox model of factors associated with the risk of adolescent motherhood in the DRC (with a dichotomous measure of exposure to war during primary school age).

Discussion

The first objective of this study was to analyze the variation in the probability of adolescent motherhood according to the different phases of conflict. I found that the likelihood of adolescent motherhood decreases slightly over time across the country. These findings appear to differ from those reported in the 2007 (19%) and 2013/2014 (21%) DHSs (Ministry of Health & ICF International, 2014) and from those found in other studies in sub-Saharan Africa (e.g., Huda et al., 2022) which showed an increase or stability over the years in the proportion of teenage girls who have a child. The calculation method explains this discrepancy in the results. The figures reported in the DHS reports and the results by Huda et al. (2022) refer to the percentage of women aged 15–19 in the survey year who had already had a live birth. The current results are derived from a longitudinal perspective for all women aged 15–49 in each survey wave, focusing on the year in which the woman had a live birth as an adolescent, not just a few years prior to the survey. This slight decrease in the likelihood of adolescent motherhood may be the result of a number of factors, including an increase in female primary and secondary school enrollment and completion rates (see Fig. 1), a growing awareness of the social and health consequences of adolescent motherhood (Bell & Huebler, 2011; World Bank, 2022), a reduction in the number of adolescent and child marriages (Male & Wodon, 2016), or a decline in practices that encourage early marriage (Koski et al., 2017). However, the likelihood of adolescent motherhood was unstable

during the study period. It decreased during the First Congo War and increased during the Second Congo War. This increase during the Second Congo War was higher in the Kivu region than in the other regions. The decrease in the probability of adolescent motherhood during the First Congo War does not support Hypothesis H_{1A}, which assumed an increase in the probability of adolescent motherhood during the war period. Among other things, this decrease is the result of a decrease in adolescent marriages (see Supplementary Figure 3), adolescent sexual activity (see Supplementary Figure 4), and sexual violence against adolescents. Indeed, previous studies showed that conflict-related sexual violence was much more prevalent during the Second War and was mainly perpetrated by armed groups, most of which started operating after 1998 (Meger, 2010). The increase in the probability of adolescent motherhood observed during the second war is in line with hypotheses H_{1A} and H_{1B}, which assumed an increase in adolescent motherhood during the war (H_{1A}), with a more pronounced effect in Kivu (H_{1B}). This finding may be explained by several factors. First, the resumption of marriage was postponed during the First Congo War (see Supplementary Figure 3). Second, the massive sexual violence perpetrated by rebels in Kivu during the Second Congo War primarily targeted girls under the age of 18 (Bartels et al., 2013; Goff, 2010; Rodriguez, 2007). This sexual violence may explain the increase in the probability of sexual debut observed during the Second Congo War (Supplementary Figure 4). The probability of adolescent motherhood was lower in Kivu than in other regions during the post-war period. This can also be explained by increased access to contraceptive methods due to the support of NGOs or access to post-exposure prophylaxis (PEP) kits, which have been made available in some hospitals in Kivu and given to victims of sexual violence to prevent unwanted pregnancies and sexually transmitted diseases (Amisi et al., 2018; Guerschom et al., 2024).

The second objective of this study was to analyze the effect of dropping out of school during the war on adolescent motherhood. I found that exposure to war while attending primary school is associated with an increased risk of adolescent motherhood in the DRC. This result is in line with Hypothesis H_{2A}. Nevertheless, the effect is less pronounced in Kivu, contrary to Hypothesis H_{2B}. The less pronounced effect in Kivu compared with other provinces means that exposure to war during primary school was a mechanism by which conflict affected entry into motherhood much more in other regions than in Kivu. In Kivu, conflict may have had a much greater impact on entry into adolescent motherhood through other mechanisms, such as sexual violence, as some studies have shown (Scott et al., 2017). My findings are comparable to those of Islam et al. (Islam et al., 2016), who found that conflict reduced the number of years girls attended school in Cambodia, thereby increasing fertility. They also support the World Bank's finding that for every

year a young woman stays in school after the age of 11, the risk of unplanned pregnancy decreases by 7% for women with at least primary education and by 6% for women with secondary education (Ferre, 2009).

I tested three mechanisms to explain the observed association between exposure to conflict during primary school and teenage motherhood: school dropout, teenage marriage, and early sexual debut. I tested whether exposure to conflict during primary school had a significant effect on the probability of dropping out of school. I found that spending one or more years in primary school during the First and Second Congo Wars was significantly associated with the likelihood of not completing primary school. Women who spent the last two years of primary school during the First Congo War and those born during the First Congo War were particularly likely to not complete primary school. Women in this cohort also had a higher risk of teenage marriage than other women did. Several factors may explain this high probability of not completing primary school among girls who started primary school during the First Congo War, particularly the reduction in the supply of education due to the loss of teaching staff or closure of schools. The heightened probability of school dropout and early marriage among girls born during the First Congo War can be attributed to the scarcity of parental resources caused by the war, the loss of parents, and consequently, the absence of educational assistance. The First Congo War lasted about two years, but resulted in more direct conflict-related adult deaths (see Supplementary Figure 6). Previous studies have already shown that orphans are less likely to be enrolled in and attend school than other children (Hampshire et al., 2015). Evidence from the remaining two pathways suggests that war-related school dropout increases the risk of teenage motherhood in the DRC by promoting early marriage and sexual activity, as corroborated by previous research (Murphy-Graham et al., 2020).

The effect of war on fertility through the school dropout mechanism can be short-, medium- or long-term. In the short to medium term, as I have just studied and has also been studied in Uganda (Schlecht et al., 2013), war can encourage out-of-school girls to marry out of idleness or boredom and enter reproductive life. In the long run, dropping out of school diminishes women's educational achievement and affects their subsequent reproductive decisions. This approach was taken by Islam et al. (2016), who analyzed the effect of the number of years of conflict during primary school on lifetime fertility. I did not analyze the long-term effects of dropping out of school as a result of the war on fertility because almost all the women surveyed in the DHSs were still of reproductive age.

The analysis of trends in the total fertility rate (TFR) (Supplementary Figure 5) indicates that during the Second Congo war, the TFR was marginally higher at 6.73 children per woman compared to the pre-war period, where it stood at 6.68 children per woman. The war not only hindered the ongoing decline in adolescent fertility, but also slowed the decline in the TFR. This slight increase in fertility during the First and Second Congo wars among women aged 15–49 is thought to be the result of an unmet need for family planning¹, as health structures were destroyed and health providers were forcibly displaced during the conflicts in the DRC (Herp et al., 2003).

This study has several limitations. I did not control for women's household characteristics at the time of their adolescent motherhood as the data were not available. Only the household characteristics of women in the survey year were available. Therefore, these characteristics were measured after events of interest. The year in which the respondent dropped out or completed primary school was not available in the DHS; therefore, primary school dropout was measured using a dummy variable. Finally, the measure of exposure to conflict during primary school may be biased because it does not consider the delayed age at which some children start primary school and the repetition or temporary interruption of studies. However, these two omitted phenomena lead to biases in opposite directions, minimizing the overall bias. I did not use geolocalized measures of conflict exposure using the Uppsala Conflict Data program or ACLED data (Sundberg & Melander, 2013) because the 2013/2014 DHS does not include information on mobility, that is, the variable "number of years lived in the place of residence at the time of the survey" was not recorded. This variable would make it possible to work with women who had never left their place of residence from the start of the follow-up until the age of 19 years, thus avoiding bias due to the lack of women's migration trajectories.

Conclusion

The purpose of this study was to examine changes in the risk of teenage motherhood by conflict phase in the DRC and the impact of exposure to war during primary school on the risk of teenage motherhood. The results showed a decrease in the probability of teenage motherhood during the First Congo War and an increase during the Second Congo War, with a more pronounced level in the Kivu region. In addition, having been in primary school during conflicts slightly increased the risk of adolescent motherhood, with a slightly less pronounced effect in Kivu. In Kivu, the conflict may have had a much greater impact on adolescent motherhood through other

¹ However, there are no data on contraceptive use from 1984 to 2001 to test this hypothesis.

mechanisms that require further investigation. Exposure to war during primary school increases the risk of adolescent motherhood by promoting teenage marriage and exposing adolescents to premature and unprotected sexual activity. The First and Second Congo Wars caused girls in the DRC to drop out of school, leading to early sexual debut, adolescent marriages, and motherhood. To reduce the prevalence of adolescent motherhood, girls need to be followed-up and supported to complete their primary education.

Acknowledgements

Our first thanks go to Professors Christophe Bergouignan and Armelle Andro for their valuable comments and guidance. I would like to thank my colleagues at the Demography Institute of Paris 1 (CRIDUP) for their valuable comments on improving the paper at a seminar where it was presented in May 2024. This work benefited from a French government grant managed by the National Research Agency under the Investissements d'avenir programme with the reference ANR-17-EURE-0011. Finally, I am grateful to the two anonymous reviewers for their constructive comments to improve this paper.

Ethics approval and consent to participate

Ethical clearance for using DHS data was obtained from The Demographic and Health Surveys (DHS) program.

Availability of data and materials

The DHS data are open-access upon request. R scripts used in this study are available upon request.

Consent for publication

Not applicable.

Competing interests

The author declares that he has no competing interests.

Supplementary tables

Supplementary Table 1. Calculation of years of exposure to conflict during primary school from the 2007 DHS

Year of birth	Mean number of years of education	Year turned age 6 (primary school start age)	Year turned age 11 (primary school completion age)	Year of start of war	End of the war	Years of schooling exposed to war
1957	3.4898	1963	1968	1996	2003	0
1958	3.40141	1964	1969	1996	2003	0
1959	4.25362	1965	1970	1996	2003	0
1960	4.23164	1966	1971	1996	2003	0
1961	3.50575	1967	1972	1996	2003	0
1962	4.32121	1968	1973	1996	2003	0
1963	4.74675	1969	1974	1996	2003	0
1964	4.83085	1970	1975	1996	2003	0
1965	4.10417	1971	1976	1996	2003	0
1966	4.77108	1972	1977	1996	2003	0
1967	4.61111	1973	1978	1996	2003	0
1968	5.60465	1974	1979	1996	2003	0
1969	5.52133	1975	1980	1996	2003	0
1970	5.41096	1976	1981	1996	2003	0
1971	5.28144	1977	1982	1996	2003	0
1972	5.25763	1978	1983	1996	2003	0
1973	5.40266	1979	1984	1996	2003	0
1974	5.57993	1980	1985	1996	2003	0
1975	5.06204	1981	1986	1996	2003	0
1976	5.68942	1982	1987	1996	2003	0
1977	5.64063	1983	1988	1996	2003	0
1978	6.02188	1984	1989	1996	2003	0
1979	6.14067	1985	1990	1996	2003	0
1980	5.84393	1986	1991	1996	2003	0
1981	6.15468	1987	1992	1996	2003	0
1982	5.61978	1988	1993	1996	2003	0
1983	5.68421	1989	1994	1996	2003	0
1984	5.84048	1990	1995	1996	2003	0
1985	5.24272	1991	1996	1996	2003	1
1986	5.80713	1992	1997	1996	2003	2
1987	5.44776	1993	1998	1996	2003	3
1988	5.90537	1994	1999	1996	2003	4
1989	5.71292	1995	2000	1996	2003	5
1990	5.75581	1996	2001	1996	2003	6
1991	5.04696	1997	2002	1996	2003	6
1992	4.13974	1998	2003	1996	2003	6

Source: The DRC 2007 DHS

Supplementary Table 2. Calculation of years of exposure to conflict during primary school from the 2013/2014 DHS

Year of birth	Mean years of education	Year turned age 6 (primary school start age)	Year turned age 11 (primary school completion age)	Year of start of war	End of the war	Years of schooling exposed to war
1963	9.333333	1969	1974	1996	2003	0
1964	4.174342	1970	1975	1996	2003	0
1965	4.007692	1971	1976	1996	2003	0
1966	4.039474	1972	1977	1996	2003	0
1967	4.710407	1973	1978	1996	2003	0
1968	4.946875	1974	1979	1996	2003	0
1969	4.964143	1975	1980	1996	2003	0
1970	4.652439	1976	1981	1996	2003	0
1971	5.393035	1977	1982	1996	2003	0
1972	5.092965	1978	1983	1996	2003	0
1973	4.641278	1979	1984	1996	2003	0
1974	5.321168	1980	1985	1996	2003	0
1975	5.139004	1981	1986	1996	2003	0
1976	5.937965	1982	1987	1996	2003	0
1977	5.397531	1983	1988	1996	2003	0
1978	5.120902	1984	1989	1996	2003	0
1979	5.664368	1985	1990	1996	2003	0
1980	5.292208	1986	1991	1996	2003	0
1981	5.183575	1987	1992	1996	2003	0
1982	5.085667	1988	1993	1996	2003	0
1983	5.004498	1989	1994	1996	2003	0
1984	5.487931	1990	1995	1996	2003	0
1985	5.081501	1991	1996	1996	2003	1
1986	5.30641	1992	1997	1996	2003	2
1987	5.901823	1993	1998	1996	2003	3
1988	5.984301	1994	1999	1996	2003	4
1989	6.905433	1995	2000	1996	2003	5
1990	6.875806	1996	2001	1996	2003	6
1991	6.598716	1997	2002	1996	2003	6
1992	6.683393	1998	2003	1996	2003	6
1993	6.055556	1999	2004	1996	2003	5
1994	7.094828	2000	2005	1996	2003	4
1995	6.547541	2001	2006	1996	2003	3
1996	6.47375	2002	2007	1996	2003	2
1997	6.197516	2003	2008	1996	2003	1
1998	5.563588	2004	2009	1996	2003	0
1999	4	2005	2010	1996	2003	0

Source: The DRC 2013/2014 DHS

Supplementary Table 3. Logistic model analyzing the effect of exposure to conflict during primary school on the probability of adolescent motherhood in the DRC

Variables and categories	Main effects model				Model with interaction			
	OR ^a	95% CI		P-value	OR	95% CI		P-value
		Lower ^a	Upper ^a			Lower	Upper	
Main effects								
Intercept	0.70	0.68	0.74	<0.001***	0.70	0.68	0.74	<0.001***
year of birth	0.96	0.96	0.97	<0.001***	0.96	0.97	0.97	<0.001***
Region - Kivu (Ref: Other regions)	1.05	0.98	1.11	0.147	1.13	1.04	1.22	0.002***
Contraception –Never used (Ref : Ever used)	0.83	0.79	0.88	<0.001***	0.83	0.79	0.88	<0.001***
First sex before marriage during adolescence –Yes (Reference = No)	1.08	1.02	1.13	0.008***	1.08	1.02	1.14	0.006***
Number of siblings born before the respondent's birth	1.03	1.02	1.04	<0.001***	1.03	1.02	1.04	<0.001***
Number of years exposed to conflict during primary school	1.07	1.05	1.09	<0.001***	1.08	1.06	1.10	<0.001***
Interactions								
Years exposed to conflict * Regions (Kivu)					0.96	0.93	0.99	0.002***
Statistics (df) ^b					Statistics (df)			
AIC	37,014				37,006			

Deviance (df)	37,000 (27,462)	36,990 (27,461)
n=28,822 women		
*** <i>P</i> -value<0.01, ** <i>P</i> -value<0.05, * <i>P</i> -value<0.1		

- Lower and upper limits of the confidence interval (CI) of the ORs (odds ratios). ORs whose intervals do not contain the value 1 are significantly different from 1
- df: degrees of freedom

The DRC 2007 and 2013/2014 DHS

Supplementary Table 4. Effect of being born during the First Congo War or of having started primary school during the First Congo War (“War cohort”) on the risk of first marriage in the DRC

Characteristic	aHR ¹	95% CI ¹	<i>P</i> -value
Year of birth	1.04	1.04—1.04	<0.001***
Region			
Kivu	—	—	
Other regions	1.09	1.05—1.13	<0.001***
Religion			
Catholic	—	—	
Muslim	1.3	1.16—1.45	<0.001***
Other	0.87	0.84—0.91	<0.001***
Other christians	1.23	1.18—1.29	<0.001***
Protestant	1.08	1.04—1.12	<0.001***
Older siblings	1.01	1.00—1.01	0.068
War cohort ^a			
No	—	—	
Yes	1.13	1.09—1.18	<0.001***

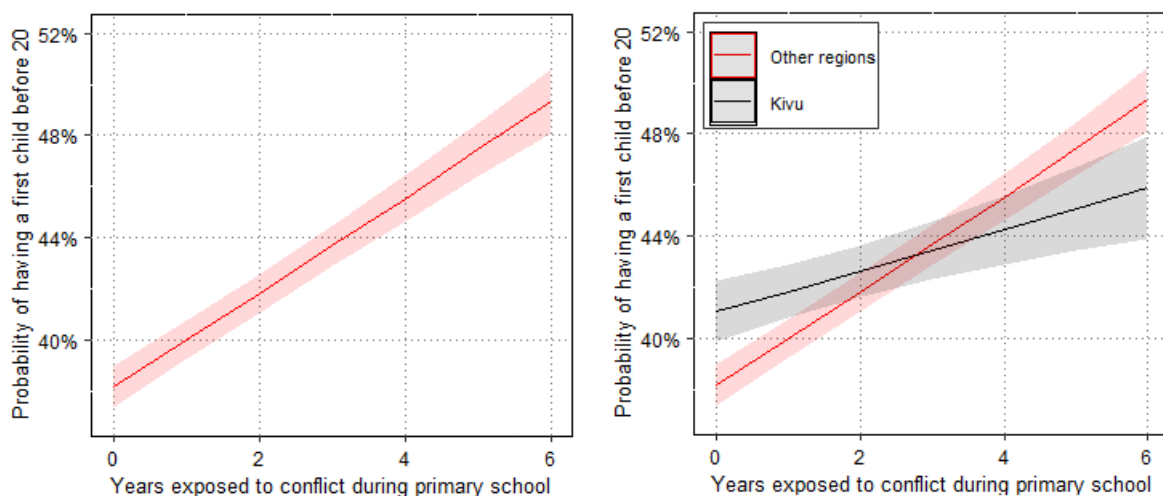
¹ aHR = Adjusted Hazard Ratio, CI = Confidence Interval

****P*-value<0.01, ***P*-value<0.05, **P*-value<0.1

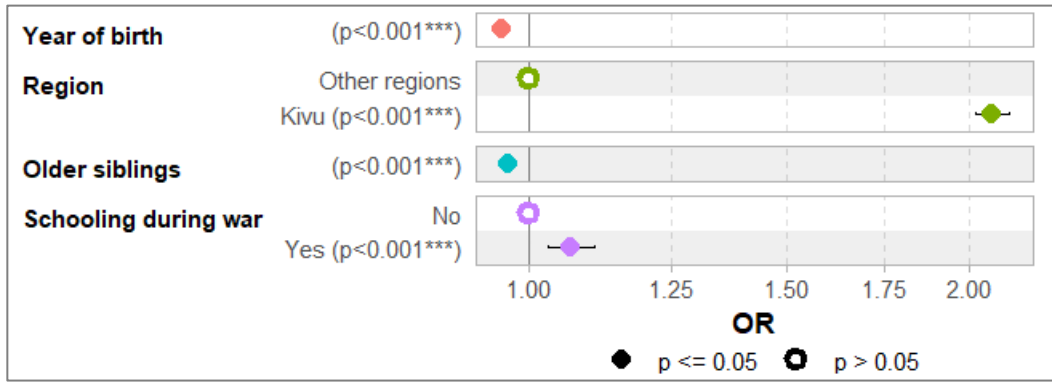
- Born during the First Congo War (1996-1997) or started primary school during the First Congo War

Source: The DRC 2007 and 2013/2014 DHS

Supplementary Figures

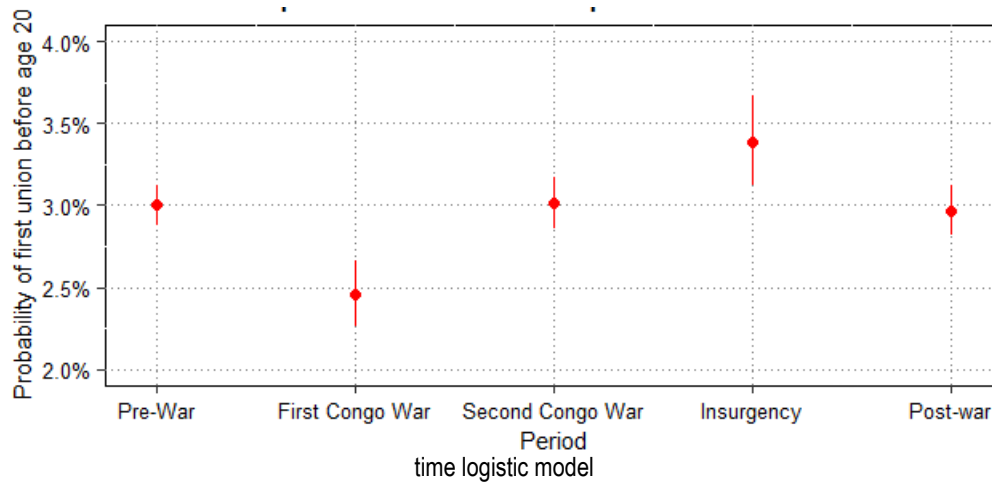


Supplementary Fig. 1.a (left) and Fig. 1.b (right). Predicted probability of adolescent motherhood by logistic model according to number of years exposed to conflict in primary school in the DRC (Fig.1.a) and by region (Fig.1.b) (see Supplementary Table 3)



Note. Same as Fig.7

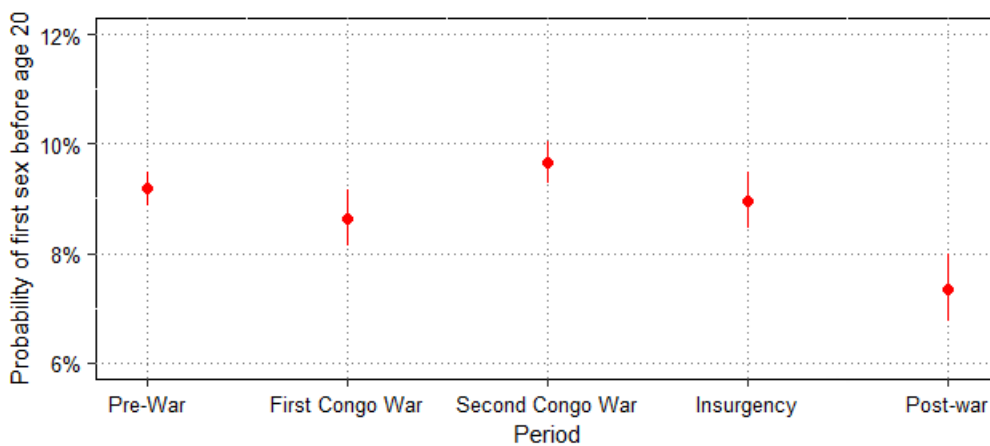
Supplementary Fig. 2. Foresplot of factors associated with the probability of not completing primary school (computed from logistic regression)



Control variables : Age, Region, Religion, number of older siblings.

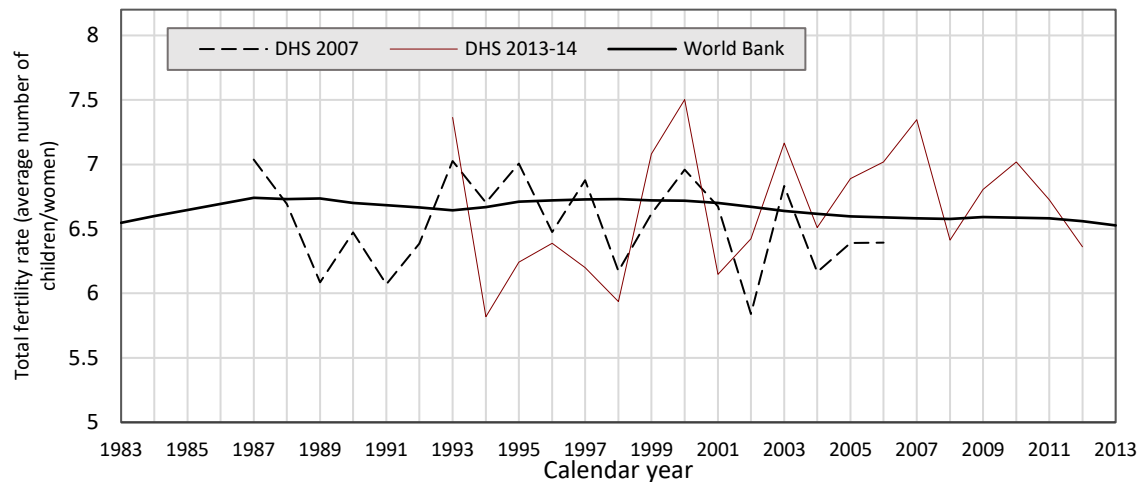
Source : DRC 2007 and 2013/2014 DHS

Supplementary Fig.3. Predicted probability of adolescent marriage in the DRC by conflict phases using discrete-time logistic model



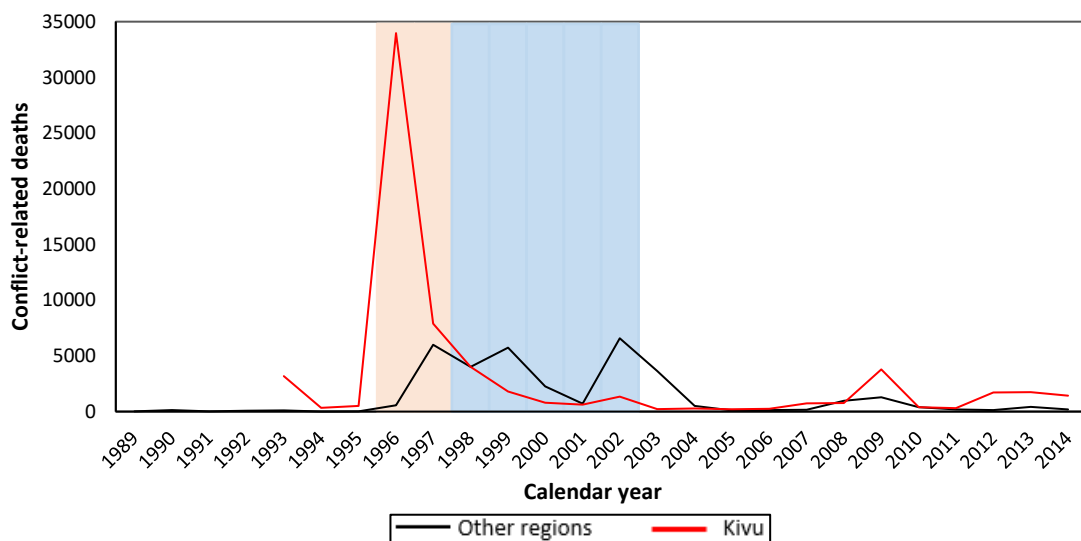
Source : DRC 2007 and 2013/2014 DHS

Supplementary Fig.4. Predicted probability of sexual debut in the DRC by conflict phases using discrete-time logistic model
Control variables: Age, Region, Religion, number of older siblings.



Source : DRC 2007 and 2013/2014 DHS, World Bank (2022)

Supplementary Fig. 5. Trends in the total fertility rate in the DRC



Source: UCDP-GED (<https://ucdp.uu.se/country/490>)

Supplementary Fig. 6. Trends in direct battle-related deaths in the DRC by region

References

- Amisi, C., Apassa, R. B., Cikara, A., Østby, G., Nordås, R., Rustad, S. A., & Quattrochi, J. (2018). The impact of support programmes for survivors of sexual violence: Micro-level evidence from eastern Democratic Republic of the Congo. *Medicine, Conflict and Survival*, *34*(3), 201–223. <https://doi.org/10.1080/13623699.2018.1541625>
- Anglewicz, P., Corker, J., & Kayembe, P. (2017). The fertility of internal migrants to Kinshasa. *Genus*, *73*(1), 4. <https://doi.org/10.1186/s41118-017-0020-8>
- Baizán, P., Aassve, A., & Billari, F. C. (2004). The Interrelations between Cohabitation, Marriage and First Birth in Germany and Sweden. *Population and Environment*, *25*(6), 531–561. <https://www.jstor.org/stable/27503901>

- Behrman, J. A. (2015). The effect of increased primary schooling on adult women's HIV status in Malawi and Uganda: Universal Primary Education as a natural experiment. *Social Science & Medicine*, 127, 108–115. <https://doi.org/10.1016/j.socscimed.2014.06.034>
- Bell, M. (2006). *Democratic Republic of Congo: Martin Bell reports on children caught. Child alert. United Nations Children's Fund (UNICEF)*. <https://reliefweb.int/report/democratic-republic-congo/child-alert-democratic-republic-congo-children-caught-war>
- Bell, S., & Huebler, F. (2011). The quantitative impact of conflict on education. *Education for All Global Monitoring Report*.
- Bennouna, C., Ali, I., Nshombo, M., Karume, G., & Roberts, L. (2016). Improving surveillance of attacks on children and education in South Kivu: A knowledge collection and sensitivity analysis in the D.R. Congo. *Vulnerable Children and Youth Studies*, 11(1), 69–77. <https://doi.org/10.1080/17450128.2016.1139221>
- Bhuwania, P., Huh, K., & Heymann, J. (2023). Impact of Tuition-Free Education Policy on Child Marriage and Early Childbearing: Does Secondary Matter More? *Population and Development Review*, 49(1), 43–70. <https://doi.org/10.1111/padr.12538>
- Blum, R. W., Astone, N. M., Decker, M. R., & Mouli, V. C. (2014). A conceptual framework for early adolescence: A platform for research. *International Journal of Adolescent Medicine and Health*, 26(3), 321–331. <https://doi.org/10.1515/ijamh-2013-0327>
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, 32(7), 513–531. <https://doi.org/10.1037/0003-066X.32.7.513>
- Brown, B., Myers, D., Casteel, C., & Rauscher, K. (2020). Exploring differences in the workplace violence experiences of young workers in middle and late adolescence in the United States. *Journal of Safety Research*, 74, 263–269. <https://doi.org/10.1016/j.jsr.2020.06.008>
- Carney, A., Kaaya, S., Kajula, L., Ibitoye, M., Marwerwe, G., & Sommer, M. (2020). 'Most of the Youth Are Drinking Because They Have Nothing to Do': How Idle Time Facilitates Adolescent Alcohol Use in Urban Tanzania. *Journal of Child & Adolescent Substance Abuse*, 29(2), 129–142. <https://doi.org/10.1080/1067828X.2021.1888169>
- Chae, S. (2013). Timing of Orphanhood, Early Sexual Debut, and Early Marriage in Four Sub-Saharan African Countries. *Studies in Family Planning*, 44(2), 123–146. <https://doi.org/10.1111/j.1728-4465.2013.00349.x>
- Clarke, R. J., Clarke, E. A., Roe-Sepowitz, D., & Fey, R. (2012). Age at Entry into Prostitution: Relationship to Drug Use, Race, Suicide, Education Level, Childhood Abuse, and Family Experiences. *Journal of Human Behavior in the Social Environment*. <https://www.tandfonline.com/doi/abs/10.1080/10911359.2012.655583>
- Coghlan, B., Brennan, R. J., Ngoy, P., Dofara, D., Otto, B., Clements, M., & Stewart, T. (2006). Mortality in the Democratic Republic of Congo: A nationwide survey. *The Lancet*, 367(9504), 44–51. [https://doi.org/10.1016/S0140-6736\(06\)67923-3](https://doi.org/10.1016/S0140-6736(06)67923-3)
- Cooper, T. (2013). *Great Lakes Holocaust: First Congo War, 1996-1997* (Heliom&Company).
- Emizet, K. N. F. (2000). The massacre of refugees in Congo: A case of UN peacekeeping failure and international law. *The Journal of Modern African Studies*, 38(2), 163–202. <https://doi.org/10.1017/S0022278X0000330X>
- Ferre, C. (2009). *Age at First Child: Does Education Delay Fertility Timing? The Case of Kenya* (SSRN Scholarly Paper 1344718). <https://papers.ssrn.com/abstract=1344718>
- Glick, P., Handy, C., & Sahn, D. E. (2015). Schooling, marriage, and age at first birth in Madagascar. *Population Studies*, 69(2), 219–236. <https://doi.org/10.1080/00324728.2015.1053513>
- Goujon, A., Lutz, W., & Kc, S. (2015). Education stalls and subsequent stalls in African fertility: A descriptive overview. *Demographic Research*, 33, 1281–1296. <https://www.jstor.org/stable/26332024>

- Guerschom, M.-M., Alexandre, A. B., & Armelle, A. (2024). Individual and contextual determinants of early access to post-rape care: A retrospective cohort study of 4048 women in the Democratic Republic of Congo from 2014 to 2019. *Journal of Epidemiology and Population Health*, 72(4), 202534. <https://doi.org/10.1016/j.jep.2024.202534>
- Hampshire, K., Porter, G., Agblorti, S., Robson, E., Munthali, A., & Abane, A. (2015). Context matters: Fostering, Orphanhood and schooling in Sub-Saharan Africa. *Journal of Biosocial Science*, 47(2), 141–164. <https://doi.org/10.1017/S0021932014000169>
- Herp, M. V., Parqué, V., Rackley, E., & Ford, N. (2003). Mortality, Violence and Lack of Access to Healthcare in the Democratic Republic of Congo. *Disasters*, 27(2), 141–153. <https://doi.org/10.1111/1467-7717.00225>
- Huda, M. M., Finlay, J. E., O’Flaherty, M., & Mamun, A. A. (2022). Transition in social risk factors and adolescent motherhood in low- income and middle- income countries: Evidence from Demographic and Health Survey data, 1996–2018. *PLOS Global Public Health*, 2(5), e0000170. <https://doi.org/10.1371/journal.pgph.0000170>
- Hutchinson, A., Waterhouse, P., March-McDonald, J., Neal, S., & Ingham, R. (2016). Understanding Early Marriage and Transactional Sex In the Context of Armed Conflict: Protection at a Price. *International Perspectives on Sexual and Reproductive Health*, 42(1), 45–49. <https://doi.org/10.1363/42e0416>
- Islam, A., Ouch, C., Smyth, R., & Wang, L. C. (2016). The long-term effects of civil conflicts on education, earnings, and fertility: Evidence from Cambodia. *Journal of Comparative Economics*, 44(3), 800–820. <https://doi.org/10.1016/j.jce.2015.05.001>
- Jacquemot, P. (2014). Le Rwanda et la République démocratique du Congo. *Revue internationale et stratégique*, n° 95(3), 32–42. <http://www.cairn.info/revue-internationale-et-strategique-2014-3-page-32.htm>
- Jayaraman, A., Gebreselassie, T., & Chandrasekhar, S. (2008). Effect of Conflict on Age at Marriage and Age at First Birth in Rwanda. *Population Research and Policy Review*, 28(5), 551. <https://doi.org/10.1007/s11113-008-9116-3>
- Koski, A., Clark, S., & Nandi, A. (2017). Has Child Marriage Declined in sub-Saharan Africa? An Analysis of Trends in 31 Countries. *Population and Development Review*, 43(1), 7–29. <https://www.jstor.org/stable/44202627>
- Koyame, M., & Clark, J. F. (2002). The Economic Impact of the Congo War. In J. F. Clark (Ed.), *The African Stakes of the Congo War* (pp. 201–223). Palgrave Macmillan US. https://doi.org/10.1057/9781403982445_12
- Kramer, S. (2012). *Forced Marriage and the Absence of Gang Rape: Explaining Sexual Violence by the Lord’s Resistance Army in Northern Uganda*. 23(1), 11–49. <https://doi.org/10.7916/D8QC01G1>
- Kraval, Ø. (2002). Education and fertility in sub-Saharan africa: Individual and community effects. *Demography*, 39(2), 233–250. <https://doi.org/10.1353/dem.2002.0017>
- Lindskog, E. (2016). *War effect on fertility behavior in the Democratic Republic of Congo*. Working paper. <http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-128973>
- Macklem, G. L. (2015). The Academic Emotion of Boredom: The Elephant in the Classroom. In G. L. Macklem (Ed.), *Boredom in the Classroom: Addressing Student Motivation, Self-Regulation, and Engagement in Learning* (pp. 1–10). Springer International Publishing. https://doi.org/10.1007/978-3-319-13120-7_1
- Male, C., & Wodon, Q. (2016). *Basic Profile of Child Marriage in the Democratic Republic of Congo*. <https://doi.org/10.1596/25466>
- Meger, S. (2010). Rape of the Congo: Understanding sexual violence in the conflict in the Democratic Republic of Congo. *Journal of Contemporary African Studies*, 28(2), 119–135.

- Mercier, M., Ngenzebuke, R. L., & Verwimp, P. (2020). Violence exposure and poverty: Evidence from the Burundi civil war. *Journal of Comparative Economics*, 48(4), 822–840. <https://doi.org/10.1016/j.jce.2020.04.005>
- Mikkonen, J., Moustgaard, H., Remes, H., & Martikainen, P. (2018). The Population Impact of Childhood Health Conditions on Dropout from Upper-Secondary Education. *The Journal of Pediatrics*, 196, 283–290.e4. <https://doi.org/10.1016/j.jpeds.2018.01.034>
- Ministry of Health, & ICF International. (2007). *First Demographic and Health Survey (DHS-DRC)* (1; p. 499).
- Ministry of Health, & ICF International. (2014). *Second Demographic and Health Survey (DHS-DRC)* (2; p. 678). Rockville, Maryland. <https://dhsprogram.com/data/available-datasets.cfm>
- Murphy-Graham, E., Cohen, A. K., & Pacheco-Montoya, D. (2020). School Dropout, Child Marriage, and Early Pregnancy among Adolescent Girls in Rural Honduras. *Comparative Education Review*, 64(4), 703–724. <https://doi.org/10.1086/710766>
- Neal, S., Stone, N., & Ingham, R. (2016). The impact of armed conflict on adolescent transitions: A systematic review of quantitative research on age of sexual debut, first marriage and first birth in young women under the age of 20 years. *BMC Public Health*, 16(1), 225. <https://doi.org/10.1186/s12889-016-2868-5>
- Ngum Chi Watts, M. C., Liamputtong, P., & McMichael, C. (2015). Early motherhood: A qualitative study exploring the experiences of African Australian teenage mothers in greater Melbourne, Australia. *BMC Public Health*, 15(1), 873. <https://doi.org/10.1186/s12889-015-2215-2>
- Palermo, T., & Peterman, A. (2009). Are Female Orphans at Risk for Early Marriage, Early Sexual Debut, and Teen Pregnancy? Evidence from Sub-Saharan Africa. *Studies in Family Planning*, 40(2), 101–112. <https://doi.org/10.1111/j.1728-4465.2009.00193.x>
- Pasqualini, M., Sacker, A., & McMunn, A. (2021). Birth Order and First Sexual Experience: Do Siblings Influence Sexual Debut in Adolescents? *Archives of Sexual Behavior*, 50(6), 2395–2409. <https://doi.org/10.1007/s10508-021-01979-w>
- Pourtier, R. (2009). Le Kivu dans la guerre: Acteurs et enjeux. *EchoGéo*. <https://doi.org/10.4000/echogeo.10793>
- Pourtier, R. (2011). *Chapitre 17—Les enjeux miniers de la guerre au Kivu*. Armand Colin. <http://www.cairn.info/les-conflits-dans-le-monde--9782200272715-page-235.htm>
- Pourtier, R. (2016). Justine Brabant. « Qu'on nous laisse combattre, et la guerre finira ». Avec les combattants du Kivu. *Afrique contemporaine*, n° 257(1), 154–156. <http://www.cairn.info/revue-afrique-contemporaine-2016-1-page-154.htm>
- Schlecht, J., Rowley, E., & Babirye, J. (2013). Early relationships and marriage in conflict and post-conflict settings: Vulnerability of youth in Uganda. *Reproductive Health Matters*, 21(41), 234–242. [https://doi.org/10.1016/S0968-8080\(13\)41710-X](https://doi.org/10.1016/S0968-8080(13)41710-X)
- Scott, J., Mullen, C., Rouhani, S., Kuwert, P., Greiner, A., Albutt, K., Burkhardt, G., Onyango, M., VanRooyen, M., & Bartels, S. (2017). A qualitative analysis of psychosocial outcomes among women with sexual violence-related pregnancies in eastern Democratic Republic of Congo. *International Journal of Mental Health Systems*, 11(1), 64. <https://doi.org/10.1186/s13033-017-0171-1>
- Shi, Y., Liu, R., Yu, H., Fu, Z., & Guo, W. (2022). Sexual debut among college students in China: Effects of family context. *Journal of Biosocial Science*, 54(6), 1004–1023. <https://doi.org/10.1017/S0021932021000523>
- Singh, R., & Mukherjee, P. (2018). Push Out, Pull Out, or Opting Out? Reasons Cited by Adolescents for Discontinuing Education in Four Low- and Middle-Income Countries. In J. E. Lansford & P. Banati (Eds.), *Handbook of Adolescent Development Research and Its Impact on Global Policy* (p. 0). Oxford University Press. <https://doi.org/10.1093/oso/9780190847128.003.0012>

- Sundberg, R., & Melander, E. (2013). Introducing the UCDP Georeferenced Event Dataset. *Journal of Peace Research*, 50(4), 523–532. <https://doi.org/10.1177/0022343313484347>
- Thiede, B. C., Hancock, M., Kodouda, A., & Piazza, J. (2020). Exposure to Armed Conflict and Fertility in Sub-Saharan Africa. *Demography*, 57(6), 2113–2141. <https://doi.org/10.1007/s13524-020-00923-2>
- Urdinola, B. P., & Ospino, C. (2015). Long-term consequences of adolescent fertility: The Colombian case. *Demographic Research*, 32, 1487–1518. <https://www.jstor.org/stable/26350161>
- Verwimp, P., & Van Bavel, J. (2014). Schooling, Violent Conflict, and Gender in Burundi. *The World Bank Economic Review*, 28(2), 384–411. <https://doi.org/10.1093/wber/lht010>
- Villers, G. de. (2005). La guerre dans les évolutions du Congo-Kinshasa. *Afrique contemporaine*, n° 215(3), 47–70. <https://www.cairn.info/journal-afrique-contemporaine-2005-3-page-47.htm>
- Wachter, K., & Gulbas, L. E. (2018). Social support under siege: An analysis of forced migration among women from the Democratic Republic of Congo. *Social Science & Medicine*, 208, 107–116. <https://doi.org/10.1016/j.socscimed.2018.04.056>
- World Bank. (2022). *World Development Indicators*, The World Bank Group.