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Conflict and Girl Child Marriage

Global Evidence

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Abstract

Child marriage has lasting negative health, human capital, and welfare consequences. Conflict settings are characterized by a number of complex changes that can potentially increase the risk of child marriage, but there has been limited population-based research directly estimating the relationship between conflict and child marriage. Using Demographic and Health Survey data from 19 conflict-affected countries, this paper estimates the relationship between conflict and child marriage. It identifies the relationship based on variation over space and time in conflict intensity. The findings are mixed; in some countries conflict is associated with an increase in child marriage, in others it is associated with a decrease in child marriage, and in some cases there is not a statistically significant relationship. This overall pattern is robust to a variety of approaches to measuring conflict. These findings underscore how efforts to reduce child marriage need to consider conflict as a potential risk factor, but also one that is likely to interact with local economic, social, and demographic environments.

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Conflict and Girl Child Marriage: Global Evidence*

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1 Introduction

As of 2018, 650 million girls and women had married before the age of 18 globally (UNICEF, 2018a).[1] Child marriage, a formal marriage or informal union[2] before age 18, is a human rights violation[3] with a wide range of negative outcomes, including constrained access to education, poorer reproductive health and mental health, and increased risk of intimate partner violence (Lee-Rife, Malhotra, Warner, & Glinski, 2012). Child marriage is widely recognized as a form of gender-based violence (GBV) (Sakhonchik, Recavarren, & Tavares, 2015) and disproportionately affects girls, particularly those in low-income countries (Lee-Rife, Malhotra, Warner, & Glinski, 2012). Conflict settings are characterized by a number of complex changes that can potentially increase the risk of child marriage.

Sustainable Development Goal 5.3 aims to "eliminate all harmful practices, such as child, early and forced marriage and female genital mutilations"; 193 countries have agreed to end child marriage by 2030 under this commitment (Girls Not Brides, 2022). Achieving this goal has become even more difficult in the COVID-19 era, as the pandemic threatens to put millions of additional girls at risk of child marriage by 2025 (Yukich et al., 2021). Ongoing and increasingly protracted conflicts around the globe may further limit our ability to end child marriage (UNOCHA, 2019). While 153 countries have legislation regarding child marriage, many of these nations have exemptions and 38 countries have a different minimum age for marriage for boys and girls. Only six countries do not specify a minimum age for marriage (Theodorou & Sandstrom, 2016).

Earlier studies have suggested that the risk of multiple forms of GBV is exacerbated in conflict and crisis settings (Ekhator-Mobayode, Kelly, Rubin, & Arango, 2021; Girls Not Brides, 2017; Kelly, Rubin, Ekhator-Mobayode, & Arango, 2021; Kelly, Voors, & Holmes, 2021). In 2016, a UN Human Rights Council resolution expressed concern for increased risk of child marriage in humanitarian settings, which include conflict settings (United Nations General Assembly, 2017). However, there is a dearth of population-based studies on the impact of conflict on child marriage (Mazurana, Marshak, & Spears, 2019). The limited research to date on the impact of conflict on child marriage is mixed (Neal, Stone, & Ingham, 2016). Some studies find conflict increases child marriage (Randall, 2005; Shemyakina, 2013; Valente, 2011), others find conflict decreases child marriage (Blanc, 2004; Saxena, Kulczycki, & Jurdi, 2004), and still others find there is no relationship between conflict and child marriage (Sieverding, Krafft, Berri, & Keo, 2020).

[1] While 21% of young women were married as children, 5% of young men married as children. We focus this paper on the large population of girls, as the population that is most vulnerable to child marriage (Gastón, Misunas, & Cappa, 2019; UNICEF, 2018a).

[2] "An informal union is one in which a couple live together for some time, intending to have a lasting relationship, but do not have a formal civil or religious ceremony" (UNICEF, 2018b).

[3] International conventions that address child marriage include The Convention on the Elimination of All Forms of Discrimination against Women, the Universal Declaration of Human Rights, Convention on Consent to Marriage, Minimum Age for Marriage and Registration of Marriages (UNICEF, 2018b).

Using georeferenced Demographic and Health Survey (DHS) data from nineteen countries that have been affected by violent conflict, this paper analyzes the association between conflict and child marriage. For the purposes of this paper, violent conflict is defined as lethal armed force by an organized group. We measure the intensity of conflict primarily using four categories of conflict intensity, namely tertiles of conflict (low, medium, and high conflict) versus no conflict. These tertiles are based on fatalities recorded by the Uppsala Conflict Data Program (UCDP). Fatalities are measured for a particular year and in a particular location at the second level administrative geography. We also present alternative results accounting for (1) four years of lagged conflict using tertiles, (2) country-specific tertiles of conflict, and (3) how many of the preceding five years had conflict. We use discrete-time hazard models and variation in conflict over time and space to examine the relationship between conflict and the hazard of child marriage.

We find that conflict is associated with an increase in child marriage in some countries, in others it is associated with a decrease in child marriage, and in some countries there is not a statistically significant relationship. This overall pattern persists across a variety of approaches to measuring conflict. Thus, while conflict is a potential risk factor for child marriage, conflict's impacts can be heterogenous and may interact with local economic, social, and demographic environments.

Our paper deepens knowledge about the relationship between conflict and child marriage rates by expanding the number of countries and time periods studied. By undertaking cross-country research with comparable data and methods, we can assess whether the mixed results of past research are due to varying methods and data across single-country studies, or whether there really is country heterogeneity in the relationship between conflict and child marriage.

In the first section of the paper, we review the existing literature on the relationship between child marriage and conflict. The following section describes our data and methods, before presenting and discussing the results from our models of conflict and child marriage. In the final section, we discuss the policy and programming implications of our findings, their limitations, and possible areas for future research.

2 Literature review

Child marriage signals an abrupt and harmful end to childhood for individuals who experience this form of GBV. It is associated with a variety of negative social, economic, and health outcomes (Lee-Rife, Malhotra, Warner, & Glinski, 2012) with intergenerational impacts on the health of children born to women married as children (Nour, 2009). On an individual level, child marriage robs girls and boys of the opportunity to fully realize their human rights and forces rapid social and psychological development (Bartels et al., 2018; Mathur, Greene, & Malhotra, 2003; Mensch, Singh, & Casterline, 2005; Paul, 2019; Wodon, Nguyen, & Tsimpo, 2016).

Child marriage has substantial physical and mental health consequences for girls married early, including heightened risks for maternal and infant morbidity/mortality, anxiety and depression, sexually transmitted diseases, and intimate partner violence among others (Clark, 2004; Efevbera, Bhabha, Farmer, & Fink, 2017; Mathur, Greene, & Malhotra, 2003; Mensch, Singh, & Casterline, 2005; Nour, 2009; Raj, 2010; Raj & Boehmer, 2013). The economic costs of child marriage are high given the impacts on health, fertility rates, labor force participation, intimate partner violence, and educational attainment. For example, cost analysis for fifteen

countries estimated loss in women's earnings due to having married early to be 26 billion USD in 2015 (International Center for Research on Women, 2018).

Research has identified multiple drivers that interact to place a child at risk of child marriage. Generally, these drivers fall into three broad themes that are perceived to be relatively consistent across contexts: (1) *poverty*, including child marriage to strengthen social ties for economic gain and access to markets/resources, (2) *cultural perceptions of safety and honor*, including a belief that for girls it offers protection from sexual assault, premarital sex, and unintended pregnancy, and (3) *unequal gender norms* that constrain opportunities of girls and women, including a tradition of early marriage for girls and marriage and family responsibilities as central to the lives of girls and women (Cherri, Cuesta, Rodriguez-Llanes, & Guha-Sapir, 2017; Lee-Rife, Malhotra, Warner, & Glinski, 2012; Psaki et al., 2021; Sieverding, Krafft, Berri, & Keo, 2020). In relation to poverty, educating and feeding girls who may leave and not contribute to the household may also be seen as a burden. When families struggle to provide for daughters and girls face limited opportunities for employment, child marriage can become a livelihood strategy (International Center for Research on Women, 2018; Lee-Rife, Malhotra, Warner, & Glinski, 2012; Nour, 2009).

Protective factors against child marriage include better educational attainment and employment opportunities for women and girls. These may not only reduce the likelihood of child marriage (Hunersen et al., 2021; Jain & Kurz, 2007; Paul, 2019; Wodon et al., 2017) but may be the most important factors in determining age at marriage generally (Jain & Kurz, 2007). Minimum marriage age laws have also been shown to contribute to the reduction in child marriage, although laws alone are not sufficient to deter from the harmful practice (Maswikwa, Richter, Kaufman, & Nandi, 2015). High levels of wealth and exposure to media have also been correlated with lower levels of child marriage (Plesons et al., 2021; Rumble, Peterman, Irdiana, Triyana, & Minnick, 2018).

Interventions to reduce child marriage highlight the importance of factors at the national, community, family, and individual levels (Psaki et al., 2021). At the community level, it is important to include interventions that address social norms. Lee-Rife et al. (2012) undertook a systematic review of 23 evaluated child marriage interventions in developing countries and found that engaging communities and empowering girls can be effective in delaying marriage. At the family and individual level, a number of studies have examined interventions that can address drivers of child marriage. A recent review of interventions identified programs that support girls' schooling through cash or in-kind assistance as the most effective approach to reducing child marriage (Malhotra & Elnakib, 2021). Cash transfer programming has been shown to delay very early child marriage (girls aged 10-14) in Ethiopia (Erulkar, Medhin, & Weissman, 2017), reduce early marriage for Syrian refugee girls aged 15-19 years in Lebanon (Moussa et al., 2021), and agricultural seed support reduced child marriage in the Syrian Arab Republic (Baliki, Brück, & Stojetz, 2018).

In a systematic review of quantitative country studies by Neal et al. (2016), the direct effects of conflict on child marriage were found to be mixed. Specific studies sometimes show conflict leads to an increase (Randall, 2005; Shemyakina, 2013; Valente, 2011), a decrease (Blanc, 2004; Saxena, Kulczycki, & Jurdi, 2004), or has no clear impact on child marriage (Sieverding, Krafft, Berri, & Keo, 2020). The mixed results may be because economic, social and demographic changes wrought by conflict can further alter the drivers of child marriage in complex ways (Neal, Stone, & Ingham, 2016; Staveteig, 2011).

Conflict settings are characterized by increased economic challenges, breakdown of social structures and changing norms, demographic changes due to migration and mortality, and other challenges (Girls Not Brides, 2017; Kohno et al., 2020; Presler-Marshall et al., 2020; Schlecht, 2016). The country context can interact with conflict specificities in complex ways to affect child marriage. For example, studies in Lebanon and the West Bank and Gaza have suggested that the economic destruction wrecked by conflict, in contexts with high costs of marriage, may decrease child marriage as young people cannot afford to marry (Khawaja, Assaf, & Jarallah, 2009; Saxena, Kulczycki, & Jurdi, 2004). However, in other conflict contexts, transactional marriages or child marriages to gain bride price may take place, increasing child marriage (Neal, Stone, & Ingham, 2016).

Social mechanisms, particularly gender norms, can shift during conflict to shape marriage practices, particularly around child marriage. For instance, increased fear that conflict may bring sexual violence or the risk of reputational harms for girls may increase child marriage (Neal, Stone, & Ingham, 2016). At the same time, such fears can also keep girls at home such that they meet fewer potential spouses, decreasing child marriage (Saxena, Kulczycki, & Jurdi, 2004).

Demographic changes wrought by violence and displacement can also mediate the effect of conflict on child marriage. For instance, the disproportionate death of men in conflict can affect child marriage in complex ways (Neal, Stone, & Ingham, 2016). Child marriage may decrease because there are simply fewer men to marry due to violence or migration (de Walque, 2006), or may increase due to competition for the relatively scarce remaining men (Heuveline & Poch, 2007). Countries may even experience factors that work in opposite directions, with varying effects over time. For example in Cambodia *during* the Khmer Rouge regime child marriage declined due to high mortality among men, but *after* the fall of the regime, there was a "rebound" increase in child marriage (Heuveline & Poch, 2007).

The mixed findings across country studies on the impact of conflict on child marriage could be the result of differing methods, specific contextual, temporal, or conflict differences, and/or data gaps. The current paper attempts to advance this literature by undertaking a multi-country study using consistent data and methods, substantively increasing our understanding of the relationship between conflict and child marriage.

3 Data

In this section, we discuss data used to measure conflict, survey data used to measure child marriage, and data on geospatial boundaries. We matched conflict locations by merging together conflict measures with geospatial boundaries and household survey data. We then describe our key variables – namely the outcome variable (child marriage), our key covariate of conflict, and other controls.

3.1 Conflict data

To measure conflict, we used the Uppsala Conflict Data Program (UCDP) [4] Georeferenced Event Dataset (GED) version 20.1 (Pettersson & Öberg, 2020; Sundberg & Melander, 2013),[5] which covered conflict events globally in 1989-2019. We discuss the variables used from the data in the key covariates section below.

[4] UCPD captures conflict events, defined as "an incident where armed force was used by an organized actor against another organized actor, or against civilians, resulting in at least one direct death at a specific location and a specific date" (Sundberg & Melander, 2013, p. 4).

[5] UCPD data publicly available from https://ucdp.uu.se/downloads/index.html#ged_global.

3.2 *Survey data*

Survey data from the Demographic and Health Survey (DHS) were used to examine child marriage. We reviewed the most recent standard or interim DHS survey for each country that had GPS identifiers available for the DHS. Countries were then selected based on:

- Country had at least 100 conflict deaths (per UCDP) within the five years preceding the survey (the most recent standard or interim DHS survey with GPS). This criterion ensures that countries are substantially conflict-affected and also that there is enough variation for our identification strategy, discussed below.
- A rate of child marriage from the survey in question (the most recent standard or interim DHS with GPS) above 10%.

These selection criteria yielded a sample of nineteen countries: Bangladesh (2017-18); Burundi (2016-17); Cameroon (2018); Chad (2014-15); Colombia (2010); Côte d'Ivoire (2011-12); Democratic Republic of the Congo (2013-14); Arab Republic of Egypt (2014); Ethiopia (2016); Guinea (2018); India (2015-16); Indonesia (2002-3); Kenya (2014); Mali (2018); Myanmar (2015-16); Nigeria (2018); Pakistan (2017-18); Peru (2009); and Philippines (2017).[6]

3.3 Geospatial boundaries data

To match conflicts and DHS clusters with locations, we relied on the Database of Global Administrative Areas (GADM) version 3.6 files. We downloaded the boundary files for the second level of administrative geography for each country.[7] Administrative boundaries were based on 2020 data; boundaries may have been different at the time of fielding, but using a constant set of boundaries is important to consistently measure conflict. It is, however, important to note that second level administrative geographies vary in size and number across countries,[8] which can introduce some variation in proximity to conflict across countries when discussing "local" (i.e. within an individual's second level administrative geography) conflict events.

3.4 Matching conflicts to locations

We matched each of the UCDP conflict events, based on latitude and longitude, to a unique second-level administrative geography location in the geospatial boundaries data.[9] We likewise matched the location of each DHS cluster to the same geographical unit and thus were able to merge the data.[10] Our analysis sample includes only those second-level administrative geography locations that, during some year in our data, had conflict. We thus are able to identify the relationship of between conflict and child marriage based on variation over time among

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[6] At the time the research was conducted in mid-2021, all data except Colombia (2010) were also the most recent DHS for the country.

[7] We then used the Stata package shp2dta (Crow, 2006) to convert the administrative boundary shapefiles into a Stata readable format.

[8] Within our analysis sample, the number of second-level administrative units per country is: 53 (Bangladesh); 48 (Myanmar); 99 (Burundi); 12 (Cameroon); 30 (Chad); 230 (Colombia); 120 (DRC); 53 (Ethiopia); 15 (Guinea); 337 (India); 22 (Indonesia); 18 (Cote d'Ivoire); 78 (Kenya); 24 (Mali); 248 (Nigeria); 31 (Pakistan); 107 (Peru); 301 (Philippines); 59 (Egypt). The population in a second level administrative unit has a median of 160,000, with a minimum of 44 individuals and a maximum of 22 million. The 25th percentile of administrative unit size in our sample is 66,267 individuals and the 75th percentile is 589,999 individuals.

[9] Matching was based on the Stata package geoinpoly (Picard, 2015).

[10] GPS coordinates in the DHS are available on the cluster level. To protect anonymity of respondents, GPS coordinates were displaced by a random distance, in a random direction, of up to two kilometers in urban areas and up to ten kilometers (usually less) in rural areas (Burgert, Colston, Roy, & Zachary, 2013).

locations that experienced conflict, which are a more appropriate comparison group than all locations.

3.5 Outcomes

The outcome of concern is female child marriage, a formal marriage or informal union before age 18. Since we are interested in how time-varying conflict may affect child marriage, we construct our analysis sample so that an observation is a child and her age in years (e.g. age 15, age 16). The age range for the DHS woman's module restricts our analysis sample to women aged 15-49 at the time of the survey. Girls are theoretically at risk of child marriage and thus potentially have observations from age zero to age 17.[11] Based on the age at first marriage question, we know the age a girl aged 15 or over first married, if she has ever married. We use this retrospective question to construct our "failure" indicator (our outcome). It is one if the girl marries at that observation's particular age and zero if, at that particular age, a girl is not yet married. Girl-age observations after she has married are excluded from our analysis sample ("failure" has already occurred), consistent with the concept of a hazard in survival analysis terms. So, for example, if a girl marries at age 15, she would have observations from ages zero to 15, including the indicator for getting married on her age 15 observation, and then she will no longer be in the sample as she is no longer "at risk" for the event of child marriage, since she has been married. The appendix and Table 12 provide an illustration and further discussion of this data structure.

3.6 Key covariates: Conflict

Our focus covariate of concern is conflict. From the UCDP data (Pettersson & Öberg, 2020; Sundberg & Melander, 2013), we calculated total fatalities for each calendar year. We matched and merged this conflict data to the girl-age analysis sample based on the DHS cluster location (second level administrative geography from GADM) and the calendar year corresponding to a particular time-varying year of age for that girl. Since the UCDP data are calendar year data, we match calendar years to years of age based on the birth year[12] plus the year of age for that observation. This means that if, for example, a girl was born on March 1, 2000, age zero is considered to have occurred in 2000, age one in 2001, etc. Although age zero actually spanned March 2000-February 2001, this means that conflict data always overlap with or slightly precede the year of age (never after that age). We excluded from our analyses observations where the calendar year was equal to the year of the interview, since these would be only a partial year. The appendix and Table 12 provide an illustration and further discussion of this data structure.

After thus calculating the total number of fatalities at the second-level administrative geography in each year, we normalized relative to the second-level administrative population.[13]

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[11] In our data, children marry as young as age zero (N=24). When modeling (see below) the hazard of marriage at each age is accounted for; there are lower hazards for very young ages. Since the model is effectively multiplicative, including all ages does not bias our estimates.

[12] In countries (Bangladesh, Egypt, Indonesia, Pakistan) where the women's questionnaire was only asked of ever-married women, we use the current age from the household roster, the day and month of the interview, and randomly assign a month of birth to calculate the year of birth.

[13] We used the DHS weights, which account for the sampling strategy (selection probability) and household response rate in the stratum in order to be representative (Rutstein & Rojas, 2006). We calculate the share of the population (all individuals) in each second-level administrative geography and multiplied this by the national

Thus, our key covariate is transformed into deaths per thousand population. We then calculated, across countries and years, the tertiles of conflict (low, medium, and high conflict as compared to none).[14] Tertiles are preferred to continuous measures of conflict, since outliers in continuous measures can be problematic. Previous studies that combine DHS data with conflict-intensity data have also looked at tertiles (Kelly, 2017; Kelly, Colantuoni, Robinson, & Decker, 2018, 2019). However, the population normalization is a new approach undertaken in this paper in order to account for the widely varying populations across countries and different locations within them.

Our main specification uses this contemporaneous[15] tertiles of conflict (compared to none) model. As sensitivity analyses, we also estimate a number of other models. One is a tertiles of conflict with the contemporaneous conflict and four years of lagged tertiles. The different demographic, economic, and social channels for the impact of conflict on child marriage may act with some lag. For example, the economic destruction wreaked by conflict may impact local economies for a number of years after conflict subsides. There may also be rebound patterns as conflict subsides. As a further sensitivity analysis in terms of tertiles, we also estimate a model with contemporaneous tertiles of conflict (compared to none) where the tertiles are country-specific rather than global. Conflict intensity may be experienced relatively subjectively within a country and the intensity of conflict varies substantially across countries. In an additional sensitivity analysis, we estimate a model with non-normalized contemporaneous tertiles of conflict, that is, we do not divide by the population. The absolute (rather than relative) number of fatalities may be more salient.

Lastly, we estimate a model that measures the number of years with conflict out of the contemporaneous year and the preceding four years,[16] similar to our lagged tertiles model. The years of conflict covariate is categorized into none, one-two years, and three or more years (out of five). This model focuses on the duration of conflict as a form of intensity as an alternative approach to measuring conflict-affected contexts. Both the model with lags and the model with years of conflict necessarily limit our sample, effectively dropping observations for 1989-1993 since we do not observe sufficient preceding years of conflict.

3.7 Controls

In all our models we control for calendar year (as described above), current first level administrative geography and current urban/rural residence (DHS surveys generally lack full residential histories so using locations of birth is not possible). The calendar year controls (entered as calendar year fixed effects) are particularly important for accounting for time-varying country characteristics that may be related to both conflict and child marriage, for example, poverty. Additional controls, although desirable, are not possible since most of the factors that influence age at marriage relate to the natal household. Unfortunately, the DHS surveys do not collect natal household data, and while the unmarried are generally still in their natal households, the married are not. Other characteristics, such as a woman's education level, may also be

population in the year, based on UN population estimates (World Bank, 2021). This assumes that the shares of the population remained constant at the second-level administrative geography over time.

[14] The tertiles are calculated among observations with conflict; the low, medium, and high tertiles are thus equally sized among observations with conflict, across countries, but the category "no conflict" that the tertiles are compared to is much larger.

[15] We use contemporaneous here to refer to conflict in the same year (e.g. conflict in year 2000, when the girl was 0, if she was born in 2000), as compared to past (lagged) years' conflict.

[16] We tested initially up to ten lags, but past four lags was rarely statistically significant so we focused on four lags.

endogenous to child marriage (for example, women may leave school early to marry or may marry having left school early) and we cannot solve this potential reverse causality, which may also be correlated with conflict.

4 Methods

4.1 Descriptive methods

For our descriptive analyses, we rely on Kaplan-Meier failure estimates of age at marriage by country. "Failure," in this case child marriage, is denoted as F_a, with a denoting a specific age. The event is T_a, the age at first marriage. Thus the failure function is:

$$F_a = \Pr(T_a \leq a) \quad (1)$$

Which can be interpreted as the probability of marrying at or before a certain age. Thus F_{17} is the probability of child marriage (marrying at or before age 17, meaning before age 18), but we can also consider other ages, e.g. F_{14} would be marriage at or before age 14 (before age 15).

4.2 Discrete time hazard models of child marriage

In our multi-variate models, we rely on the idea of a hazard, $h_{i,a}$, which describes the probability of individual i marrying at a particular age, a, (T_a) for those who were not yet married (Allison, 1982; Jenkins, 1995):

$$h_{i,a} = Pr(T_a | T_a \geq a) \quad (2)$$

In our models, we incorporate a vector of time-varying (t=time) and location (second level administrative geography, l) specific measures of conflict, $C_{a,l,t}$. We also include vectors of geographic controls, X_g and year controls, X_t (effectively year and location fixed effects) as discussed above. Our models include $\theta(a)$, the baseline hazard, that is, they control for each year of age (with a series of dummies, one for each year of age). We estimate a complementary log-log model for each country (Allison, 1982; Jenkins, 1995):

$$h_{ia} = 1 - \exp\{-\exp[\theta(a) + \beta C_{a,l,t} + \gamma X_g + \delta X_t]\} \quad (3)$$

Either a complementary log-log model or a logit model can be used for discrete time hazard modeling; we use a complementary log-log model since the coefficients, once exponentiated, are hazard ratios, which are slightly easier to interpret than logit model odds-hazard-ratios. In our multivariate models, since the hazard of child marriage was very low before age 10, we combined the baseline hazards ($\theta(a)$) for ages 0-10 into a single control for that age group. Since our controls include time and location fixed effects, we identify the relationship between conflict and age at marriage based on variation within a first level administrative geography over time (and among an analysis sample of areas that were ever conflict-affected). We clustered the standard errors on the second level administrative geography (the level at which our key covariate was merged) and our models and descriptive statistics include weights.

5 Results

We provide a brief overview of patterns of child marriage and conflict in the countries we study, and then present and discuss the results from our main models of tertiles of conflict. We move on to discuss our alternative models: including lagged conflict, including recent years of conflict, and using country-specific tertiles.

5.1 Descriptives

The countries included in this analysis vary substantially in terms of both their patterns of child marriage and experiences of conflict. Table 1 in the appendix presents information for our analysis sample on: (1) the rate of child marriage (marriage before age 18) and (2) the distribution of conflict across tertiles (none, low, medium, high)[17] for each country. Rates of child marriage in our analysis sample range from a low of 11.2% (Indonesia) to a high of 62.1% (Chad).

Countries also varied in both their frequency and intensity of conflict. Indonesia, for example, had the most observations with no conflict (94.6%) with 1%-2% of observations in each of the low, medium, and high tertiles. Colombia has the most observations with conflict, with almost half (45.8%) of observations experiencing some conflict each year – either in the low, medium or high categories. Some countries also experienced no person-years in the "low" category, only the none and medium or high (Burundi, Chad, and Kenya).

5.2 Models

We have one main model: specification 1 includes the contemporaneous tertiles of conflict. We also present two key sensitivity analyses: specification 2 includes the contemporaneous tertiles and four lag-years (previous years' tertiles) and specification 3 focuses on the number of recent years that had conflict (out of the contemporaneous and past four years, the same time frame as the lags for specification 2). For countries with significant associations between child marriage and conflict, we present the hazard ratios (for statistically significant hazard ratios) graphically in Figure 1 (specification 1), in Figure 2, Figure 3, and Figure 4 (specification 2) and Figure 5 (specification 3). All results are presented in the appendix in Tables 2 and 3 (specification 1), Tables 4 and 5 (specification 2), and Tables 6 and 7 (specification 3). In the appendix we also present two further sensitivity analyses, the first using country-specific tertiles of conflict (specification 4, Tables 8 and 9) and the second using non-normalized tertiles of conflict (fatalities without dividing by population; specification 5, Tables 10 and 11). Hazard ratios of one mean there is no relationship between the covariate and child marriage; hazard ratios of less than one show that conflict is associated with less child marriage; hazard ratios of more than one mean that conflict is associated with increased child marriage.

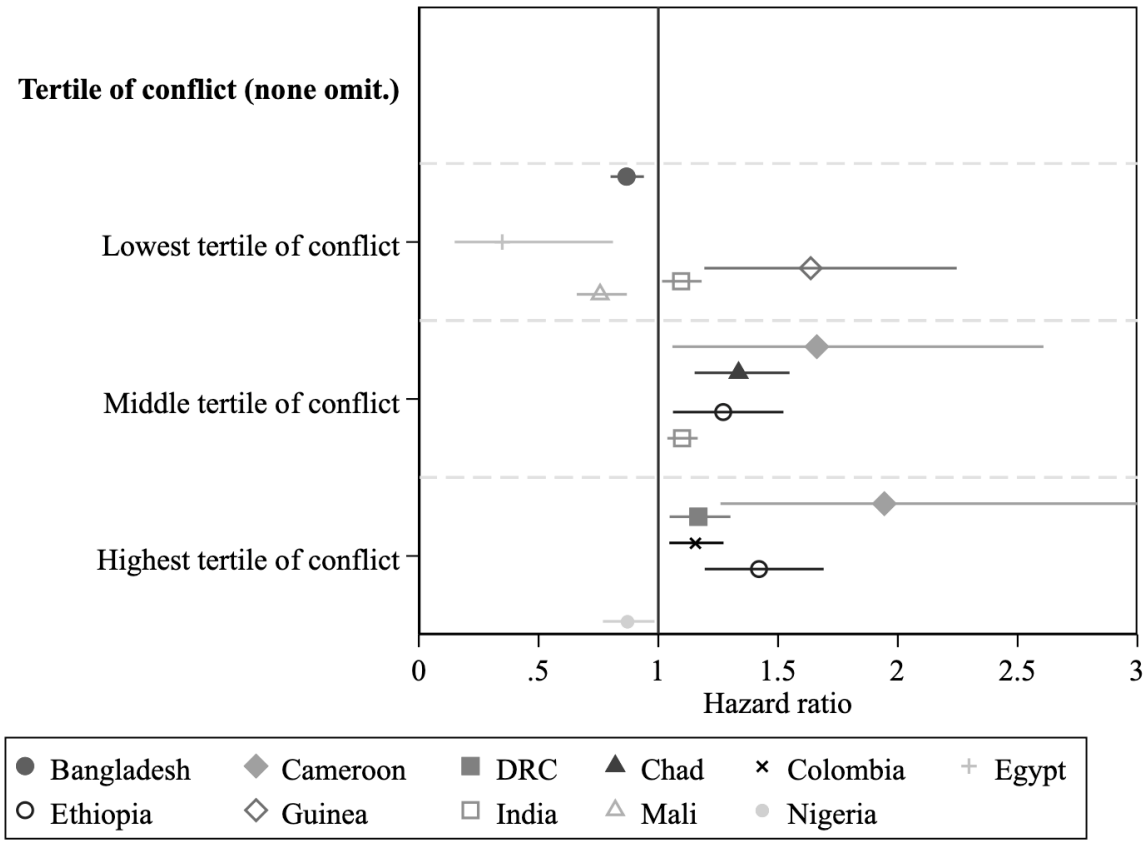
5.2.1 Main model: Contemporaneous conflict

A key finding is that the relationship between conflict and child marriage is heterogenous across countries even when using the same specification and data source. Focusing first on specification 1 (Figure 1, presenting only the statistically significant hazard ratios), we find that in four countries, conflict significantly reduces child marriage, in seven it significantly increases child marriage, and in eight there is no statistically significant relationship (not shown). Among the statistically significant results, the lowest tertiles of conflict tend to be slightly more often associated with reductions in child marriage, while the middle and highest tertiles of conflict are

[17] As a percentage of girl-year (of age) observations. "Low" includes 0.0000484 to 0.0013755 conflict fatalities per thousand persons per year; "Medium" includes 0.0013766 to 0.0089365 conflict fatalities per thousand persons per year; "High" includes 0.0089466 to 976.556 conflict fatalities per thousand persons per year. The data are very skewed with outliers (hence, we use tertiles); among observations with conflict, the 25th percentile is 0.0008984; the median is 0.0034537; the 75th percentile is 0.016516; the 90th percentile is 0.0889758; the 95th percentile is 0.2360265; the 99th percentile is 1.296891.

more often associated with increases in child marriage, but this pattern is not uniform across all countries.

Figure 1. Hazard ratios for tertiles of conflict (versus none), by country, significant results only



Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: Only significant hazard ratios are presented, see appendix Table 2 and Table 3 for full results.

Patterns of reduction in child marriage in at least one tertile occur in Bangladesh, Egypt, Mali, and Nigeria. Patterns of increased child marriage in at least one tertile occur in Cameroon, the DRC, Chad, Colombia, Ethiopia, Guinea, and India. There are no significant associations in Burundi, Côte d'Ivoire, Indonesia, Kenya, Myanmar, Pakistan, Peru, or the Philippines (and a variety of directions of hazard ratios). Notably, no country has one tertile significantly decrease and another significantly increase child marriage, underscoring the fact that interactions between conflict and child marriage are consistent across tertiles within countries.

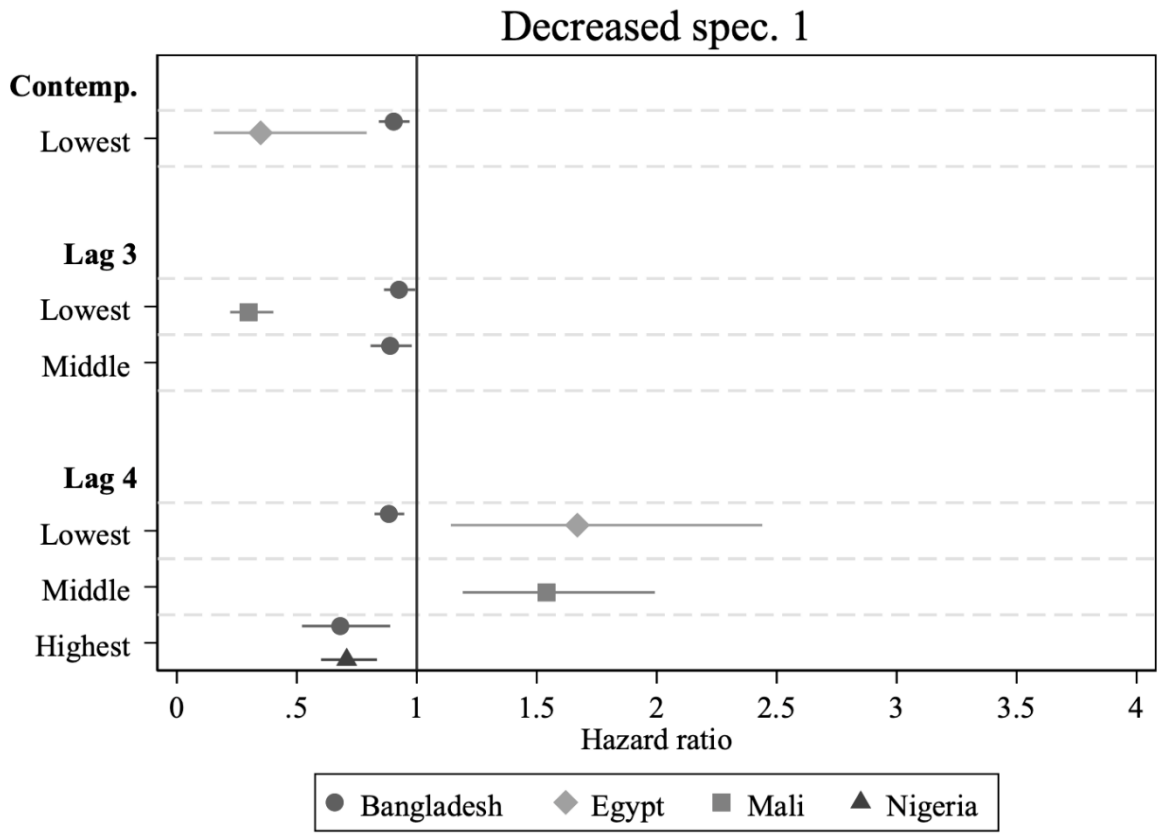
5.2.2 Model including lagged conflict

Turning to specification 2, the results show that lagged (historical) conflict as well as contemporaneous conflict are significantly associated with child marriage. This finding is consistent with other research indicating that the impact of conflict on child marriage and its

economic, social, and demographic drivers can persist or evolve over time (e.g. Heuveline & Poch, 2007). We organize the figures based on associations seen in specification 1. Figure 2 displays countries with significant reductions in child marriage in specification 1. Figure 3 shows countries that had no significant association with conflict, and Figure 4 presents countries that had significant increases in child marriage in specification 1.

Those countries that saw decreases in child marriage associated with conflict are presented in Figure 2. In some cases, such as Bangladesh, there are significant decreases in child marriage both contemporaneously (for low conflict versus none) and also in later lags (such as lag 3 for lowest and middle or lag 4 for lowest and highest versus none). In Egypt, the significant decrease contemporaneously persists but there is also an increase in lag 4. In other countries, such as Mali, the significant relationship contemporaneously disappears and there are complex lagged effects, significant decreases in child marriage in lag 3, but increases in lag 4. Nigeria had a significant decrease in child marriage persist but only in lag 4.

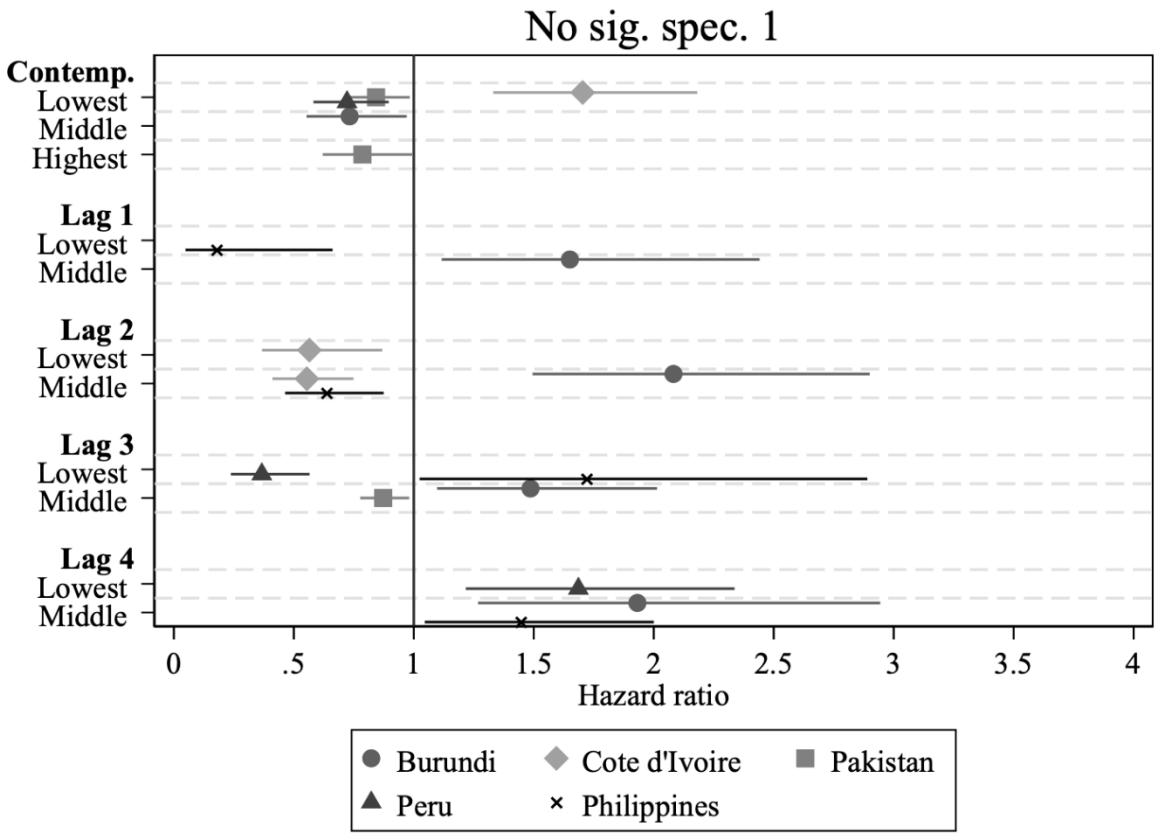
Figure 2. Hazard ratios for tertiles of conflict (versus none) and lags, by country, only including countries with significant decreases in specification one



Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: Only significant hazard ratios are presented, see appendix tables Table 4 and Table 5 for full results.

For countries with no significant contemporaneous association (Figure 3, showing only significant hazard ratios), significant associations often (but not always) appear in the lags. There remains no significant relationship in Indonesia, Kenya, or Myanmar. The significant results that do appear are mixed in terms of conflict being associated with a mix of increases or decreases in child marriage. For instance, for Côte d'Ivoire there is a significant increase in child marriage contemporaneously (for lowest tertile of conflict) and a decrease in child marriage for the lag 2 lowest and middle tertiles. Burundi, in contrast, has significant contemporaneous decreases (for the middle tertile of conflict) and a significant increase in child marriage for all lags of the middle tertile. Peru had significant increases in child marriage in lag 4, but decreases contemporaneously and in lag 3 (all for lowest tertile of conflict). The Philippines had significant decreases in child marriage at lags 1 and 2, but significant increases at lags 3 and 4. Pakistan has significant decreases in child marriage contemporaneously (lowest and highest tertiles) and in lag 3 (middle tertile).

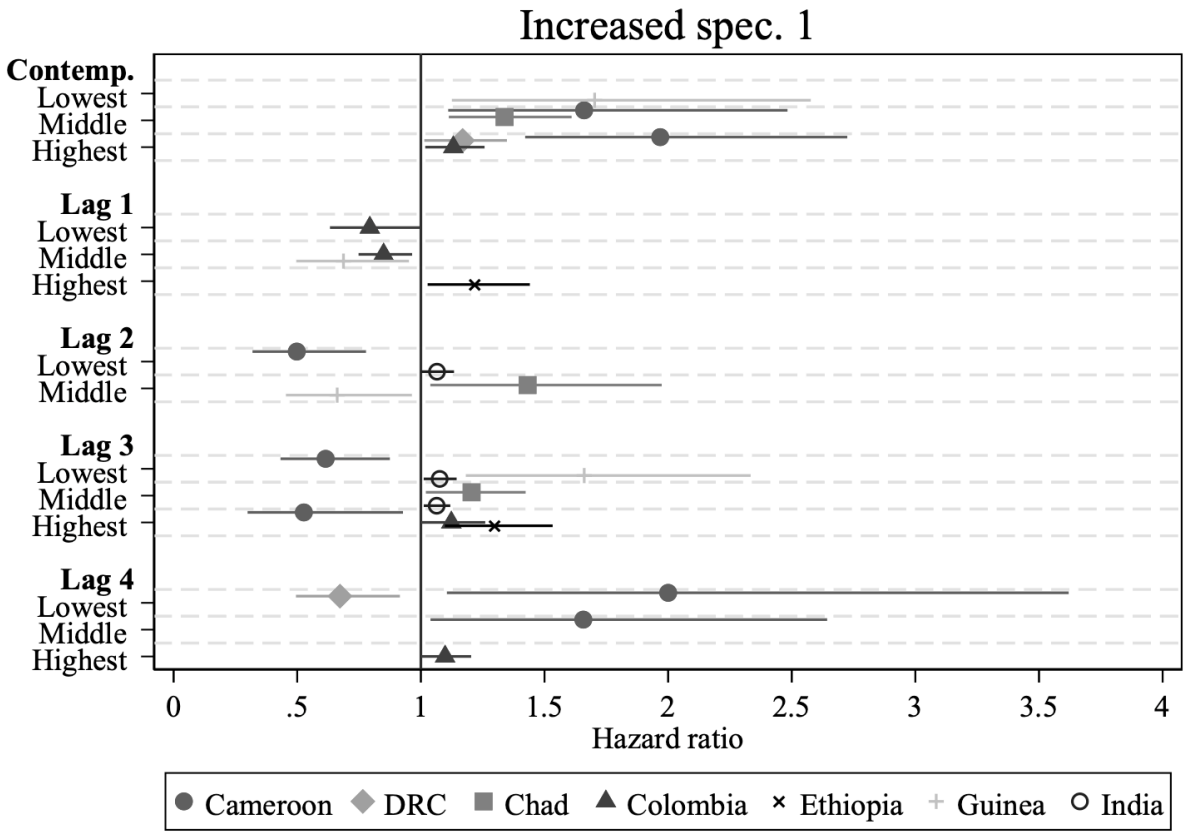
Figure 3. Hazard ratios for tertiles of conflict (versus none) and lags, by country, only including countries with no significant associations in specification one



Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: Only significant hazard ratios are presented, see appendix tables Table 4 and Table 5 for full results.

In countries where the contemporaneous conflict was associated with significant increases in specification 1 (Figure 4), in some cases the contemporaneous effect is insignificant, but significant increases in child marriage are associated with lagged conflict (India and Ethiopia). Other cases show significant increases in the lag as well as contemporaneously (Chad). However, for half the countries (Cameroon, DRC, Colombia, and Guinea), the increases persist contemporaneously and then there are a complex mix of increases and decreases in the lags.

Figure 4. Hazard ratios for tertiles of conflict (versus none) and lags, by country, only including countries with significant increases in specification one



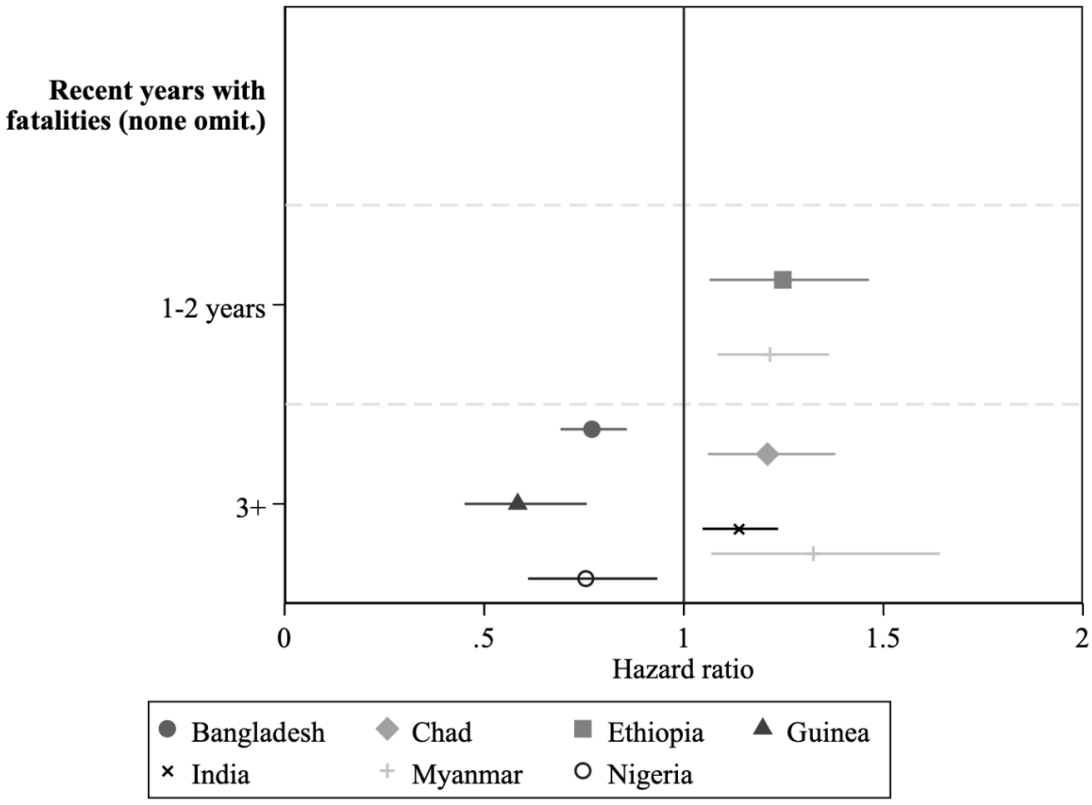
Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: Only significant hazard ratios are presented, see appendix tables Table 4 and Table 5 for full results.

5.2.3 Models of duration of conflict

As an alternative measure of conflict, we model how having recent conflict relates to child marriage. The models compare no conflict to 1-2 years or 3 or more years of conflict out of the contemporaneous and preceding four years (the same sample as the lagged model). These models emphasize the duration rather than intensity of conflict. These results, referred to as specification 3, are presented in Table 6, Table 7 and Figure 5. The overall picture of mixed results – some increases in child marriage, some decreases, and some insignificant relationships

with conflict – persists with this specification, although the details and countries are slightly different. One to two years of conflict is associated with significant increases in child marriage in Ethiopia and Myanmar, and in no country is there a significant decrease in child marriage associated with one to two years of conflict (most results are insignificant for one to two years of conflict). For three or more years of conflict (out of five years), in three countries there is a significant increase in early marriage (Chad, India, and Myanmar) and in three countries there is a significant decrease in early marriage (Bangladesh, Guinea, and Nigeria). Both increases and decreases are of fairly similar magnitude. Notably, only one country that had significant results in the duration of conflict model had an insignificant contemporaneous relationship (Myanmar) and some of the countries with initially significant relationships in the main model were not significant in the duration model (Cameroon, DRC, Colombia, Egypt, and Mali), which may be because intensity of conflict is a stronger driver of marriage behavior than duration, and the intensity models are thus our preferred models.

Figure 5. Hazard ratios for recent years with conflict (versus none), by country, significant results only



Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: Only significant hazard ratios are presented, see appendix tables Table 6 and Table 7 for full results.

5.2.4 Sensitivity analysis: Country-specific tertiles of conflict

As an additional sensitivity analysis to our main model, in Table 8 and Table 9 we present models using country-specific tertiles of conflict (contemporaneously). This alternative specification reflects potentially "relative" experiences of conflict, that is, in conflict-affected settings, potentially experiencing conflict relative to the level in other conflict-affected areas in the country rather than globally. The results are generally similar to our main model, with some shifts in specific countries. Burundi and Pakistan now have the middle tertile of conflict significantly decrease early marriage (results were insignificant previously). Egypt, which had conflict associated with a significant decrease in child marriage, and Guinea, which had conflict associated with a significant increase in child marriage, no longer have statistically significant results. Peru now has conflict associated with a significant increase in child marriage (middle tertile compared to none). Other results are generally similar in sign and significance as previously with the global tertiles.

5.2.5 Sensitivity analysis: Non-normalized tertiles of conflict

One further sensitivity analysis we undertake is to use non-normalized tertiles of conflict (tertiles calculated based on the number fatalities, without dividing by population). The results for these non-normalized tertiles of (contemporaneous) conflict are presented in Table 10 and Table 11. This approach assumes that it is the absolute number of fatalities, not relative to the population, that matters in conflict-affected settings. The results of the model are generally similar to our main model, with a few shifts in specific countries. Egypt, which in the main model had a significant decrease in child marriage associated with conflict, becomes insignificant. Pakistan, which was insignificant in the main model, now has a significant decrease in child marriage associated with conflict. Colombia and Guinea, which had a significant increase in child marriage associated with conflict in the main model, in this specification are insignificant. Peru, which was insignificant before, now has a significant increase in child marriage associated with conflict. The remaining results have the same sign and are significant as in the main model, although the exact tertile in some cases changed, which is unsurprising given the shift from normalized to non-normalized tertiles.

6 Discussion and Conclusions

Girl child marriage is an especially pernicious form of GBV, with cascading effects for the individual affected, as well as for her future children. Child marriage not only carries enormous costs in terms of opportunities and rights, but also for countries' economic success. A 2017 report estimated that child marriage costs trillions of dollars globally through myriad effects on fertility, population growth, missed education, lower earnings, poorer maternal and child health, and increased maternal and child mortality (Wodon et al., 2017).

6.1 Summary of findings

In this paper, we find that conflict has different associations with child marriage across different countries. This finding may be because of different country contexts, different manifestations and effects of conflict in different countries, or the interaction of specific conflicts and contexts. Contemporaneous conflict (our main model) increased child marriage in seven countries (Cameroon, DRC, Chad, Colombia, Ethiopia, Guinea, and India). In eight countries, there was no association (Burundi, Côte d'Ivoire, Indonesia, Kenya, Myanmar, Pakistan, Peru, or the Philippines), and in four countries, conflict was associated with a decrease in child marriage

(Bangladesh, Egypt, Mali, and Nigeria). Notably, in the models looking at tertiles of current conflict, the relationship between conflict and child marriage is consistent within each country. That is, no country has one tertile of conflict that significantly increased child marriage while another tertile significantly decreased it.

In order to explore whether *past* conflict might affect child marriage practices going forward, this analysis also looked at a four-year lag of conflict in each country prior to the DHS (importantly, all models had year fixed effects to account for any time trends). Lags are important because conflict may have both immediate and longer-lasting effects on economic, social, and demographic drivers of child marriage and these drivers may also have longer-term, as well as immediate impacts. Among the four countries that saw decreases in child marriage associated with current conflict, one had a persistent decrease in child marriage both contemporaneously and also in later lags (Bangladesh). In two countries – Egypt and Mali – there are complex effects, which include both increases and decreases. In Nigeria, the contemporaneous decrease in child marriage disappears, but a decrease is seen in lag 4.

Among the eight countries that showed no association between contemporaneous conflict and child marriage, half (Burundi, Côte d'Ivoire, Peru, and the Philippines) showed a mix of significant contemporaneous and lagged effects (both increases and decreases). In Pakistan the only significant results were decreases. In Indonesia, Kenya, and Myanmar, there remained no significant effect. Among those countries that had a significant increase in child marriage with contemporaneous conflict, one showed a significant association between both lagged conflict and increased child marriage (Chad). In other cases, the association between current conflict and child marriage shifted to the lag, as with India and Ethiopia. And in DRC, Guinea, Colombia, and Cameroon, a more complex pattern emerged with significant increases contemporaneously and both increases and decreases emerging during the four lagged years.

In additional models, we used years of recent conflict as an alternative duration measure to intensity of conflict and found recent conflict, particularly three or more years of conflict out of the past five, had a significant relationship with early marriage in seven countries. Recent conflict was associated with significantly increased early marriage in Chad, Ethiopia, India, and Myanmar, but decreased early marriage in Bangladesh, Guinea, and Nigeria. We further tested the sensitivity of our results to using country-specific tertiles of conflict or non-normalized (fatalities not divided by population) tertiles of conflict; the results were substantively similar (a mix of increases and decreases across countries) to the main model, although specifics by country changed somewhat. Across the models, the patterns underscore that while conflict can have strong associations with marriage patterns, the relationships are complex, and mediated by local context and conflict-specificities.

6.2 Contributions to the literature

These findings provide support for findings from previous syntheses that have identified the relationship between conflict and child marriage as mixed (Neal, Stone, & Ingham, 2016). Although fragile states have high rates of child marriage and conflict can be an additional driver of child marriage (Kohno et al., 2020), conflict can not only increase but also decrease child marriage through varying economic, social, and demographic mechanisms. The mixed results and mechanisms are reflected in the findings of single-country studies (Blanc, 2004; de Walque, 2006; Heuveline & Poch, 2007; Randall, 2005; Saxena, Kulczycki, & Jurdi, 2004; Shemyakina, 2013; Sieverding, Krafft, Berri, & Keo, 2020; Valente, 2011). The current study suggests that previous mixed findings related to conflict and child marriage may not only be a result of

methodological differences in studies looking at child marriage (Neal, Stone, & Ingham, 2016), but may also point to true variations in the relationship between these two phenomena. Specific country contexts as well as specific aspects of conflicts and their economic, social, and demographic consequences may generate diverse impacts on child marriage.

Studies of the impact of conflict on education have likewise found heterogenous effects, ranging from conflict reducing education to increasing education, in country- and gender-specific ways (Buvinic, Das Gupta, & Shemyakina, 2014; Liu, Modrek, & Sieverding, 2019; Pivovarova & Swee, 2015; Saad & Fallah, 2020; Singh & Shemyakina, 2016; Valente, 2014). In some cases, conflict may shift gender roles. Women may become heads of household, displacement may disrupt social norms, and women and girls may face shifting access to employment and education (Admasu et al., 2021). The long-term economic devastation wrought by conflict and shifting social norms or demographic change may serve as drivers or deterrents for child marriage (de Walque, 2006; Heuveline & Poch, 2007; Khawaja, Assaf, & Jarallah, 2009; Saxena, Kulczycki, & Jurdi, 2004).

6.3 Policy implications

These results point to a number of opportunities for intervention to reduce child marriage. Child marriage is a complex problem that requires change at the national, community, family, and individual level to fully address. At the national level, ministries of health and gender should monitor trends in child marriage to be aware of whether and how this form of abuse changes as a result of instability. In countries where child marriage is relatively high, there should be a clear national strategy to address this problem, including among the most vulnerable populations such as IDPs and refugees. Child marriage should be acknowledged as a potential consequence of conflict and, in contexts where this is a concern, post-conflict reconstruction plans should aim to address this form of GBV.

6.4 Strengths and limitations

This study is among the first quantitative multi-country studies using population-based data to examine the impact of conflict (both contemporaneous and lagged effects) on girl child marriage. This paper draws upon two robust data sources – DHS and UCDP – to examine this relationship, and to strengthen the literature on how conflict may impact child marriage across the globe.

While this study has a number of strengths, it also has some notable limitations. Firstly, DHS data did not allow us to add a number of covariates to the models which might have been informative. Few questions in the DHS asked about the respondent's experiences before getting married, making it difficult to include variables about individual risk factors prior to marriage. Age at marriage is also a recalled question and is subject to measurement error (Neal & Hosegood, 2015). Individuals may also have moved (and particularly done so in relation to conflict) but the DHS does not include a full residential history to account for this.

Although we do control for time and geographic fixed effects, identifying the relationship between conflict and child marriage based on local variation in the timing of conflict in conflict-affected areas, our results are primarily associations, as we lack a strong causal identification strategy. Local time-varying omitted variables may thus bias estimates, driving both conflict and early marriage, but detailed time-varying data on local conditions are not available to overcome this challenge.

Data on conflict intensity may also have systematic bias in some or all countries. Specific aspects of conflict and particularly its economic, social, and demographic consequences may drive our results, but there is not a data source that captures all these aspects of conflict locally and over time. Further research is needed on whether particular sub-groups may be particularly affected by conflict (e.g. those in poverty). Additionally, it is important to note that this paper does not look at all types of situations where child marriage might be affected, including during natural disasters and other forms of humanitarian crisis. As noted by the UN 2017 statement (United Nations General Assembly, 2017), child marriage may be affected by any kind of humanitarian crisis, not only conflict. The DHS does not specifically sample displaced individuals – the very populations that might face some of the largest pressures from conflict (Lu, Siddiqui, & Bharadwaj, 2021). Finally, we may see varying results as different push and pull factors for child marriage interact. Unfortunately, as noted above, the lack of available data on drivers of child marriage from the DHS or on the details of conflict makes it difficult to understand the mechanisms at play.

Future research could help address some of these challenges. Leveraging longitudinal data where it is possible to track risk factors prior to marriage would be highly informative. This would allow scholars to better understand which pathways are at play and their relative contribution to risk of child marriage, including which risk factors may be most important for increasing vulnerability when conflict breaks out. Better data on marriage customs, such as marriage costs, is needed to improve our understanding of country-specific mechanisms behind early marriage. Additional qualitative work that builds on the previous literature could provide further insight on the dynamics at play in different contexts and conflicts.

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Appendix: Tables

Table 1. Conflict (percentage of person-years with no conflict or tertile of conflict) and rate of child marriage (percentage married before age 18), by country

Country	Year of Survey	Tertiles of conflict					Rate of child marriage	Number of person-years (observations)	Number of individuals
		None	Low	Medium	High	Total			
Bangladesh	2017-18	81.6	14.0	3.8	0.6	100.0	49.6	368,317	25,600
Burundi	2016-17	78.9	0.0	0.5	20.7	100.0	18.7	182,707	12,923
Cameroon	2018	93.1	1.7	0.9	4.2	100.0	30.9	48,318	3,374
Chad	2014-15	85.7	0.0	2.1	12.2	100.0	62.1	113,032	8,783
Colombia	2010	54.2	9.8	19.2	16.9	100.0	22.5	312,100	26,581
Côte d'Ivoire	2011-12	82.5	3.2	4.9	9.3	100.0	29.6	66,123	5,173
Congo, Dem. Rep.	2013-14	68.2	5.7	6.8	19.3	100.0	35.0	138,043	10,509
Egypt, Arab Rep.	2014	91.7	0.6	3.5	4.2	100.0	14.0	170,260	11,708
Ethiopia	2016	79.4	2.9	5.5	12.3	100.0	43.7	111,651	9,799
Guinea	2018	88.4	1.6	2.3	7.6	100.0	39.7	78,899	5,641
India	2015-16	81.6	6.9	6.7	4.8	100.0	32.1	4,181,373	313,722
Indonesia	2002-3	94.6	2.3	1.1	2.0	100.0	11.2	25,605	2,792
Kenya	2014	90.8	0.0	1.7	7.5	100.0	23.9	111,857	8,506
Mali	2018	92.1	1.2	2.2	4.5	100.0	45.7	83,368	5,981
Myanmar	2015-16	76.6	3.9	7.8	11.7	100.0	17.6	115,070	9,083
Nigeria	2018	90.5	0.6	2.4	6.6	100.0	37.0	246,160	17,750
Pakistan	2017-18	68.4	15.2	9.0	7.4	100.0	15.4	517,110	33,671
Peru	2009	64.7	7.3	14.6	13.4	100.0	16.9	121,727	10,677
Philippines	2017	85.4	1.6	5.9	7.1	100.0	13.8	148,736	11,028

Note: Based on analysis sample for years in the sample (1989-year before survey)
Source: Authors' calculations based on DHS surveys and UCDP conflict data.

Table 2. Hazard ratios for complementary log-log model with tertiles of contemporaneous conflict, by country, Bangladesh-Guinea

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.867***		0.942	0.975		0.983	1.140	0.348*	0.875	1.636**
	(0.036)		(0.184)	(0.076)		(0.104)	(0.145)	(0.150)	(0.191)	(0.264)
Middle tertile of conflict	0.919	0.918	1.662*	0.865	1.335***	0.895	0.849	0.735	1.271**	0.800
	(0.066)	(0.193)	(0.382)	(0.105)	(0.101)	(0.060)	(0.109)	(0.137)	(0.117)	(0.096)
Highest tertile of conflict	0.989	0.907	1.944**	1.167**	1.067	1.153**	1.030	0.962	1.420***	1.000
	(0.155)	(0.067)	(0.430)	(0.065)	(0.046)	(0.058)	(0.146)	(0.194)	(0.126)	(0.076)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	368317	181773	48307	138043	113032	312100	66123	170260	111651	78899

Source: Authors' calculations based on DHS surveys and UCDP conflict data.

Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 3. Hazard ratios for complementary log-log model with tertiles of contemporaneous conflict, by country, India-Philippines

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.095*	0.573		0.757***	0.905	1.064	0.821	1.002	0.642
	(0.042)	(0.412)		(0.053)	(0.120)	(0.189)	(0.092)	(0.065)	(0.256)
Middle tertile of conflict	1.099**	1.257	1.083	0.837	0.958	1.055	0.791	1.029	0.701
	(0.032)	(0.615)	(0.249)	(0.102)	(0.112)	(0.103)	(0.100)	(0.089)	(0.169)
Highest tertile of conflict	1.022	1.157	0.846	1.042	1.138	0.870*	0.800	1.107	1.099
	(0.044)	(0.457)	(0.097)	(0.100)	(0.120)	(0.055)	(0.094)	(0.099)	(0.150)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	4094245	15473	111857	83368	115070	246160	517110	121727	148191

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 4. Hazard ratios for complementary log-log model with tertiles of contemporaneous conflict and lags, by country, Bangladesh-Guinea

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.904**		1.076	1.043		1.045	1.704***	0.349*	0.959	1.703*
	(0.033)		(0.245)	(0.088)		(0.139)	(0.215)	(0.146)	(0.239)	(0.360)
Middle tertile of conflict	0.958	0.733*	1.660*	0.819	1.339**	1.004	0.955	0.744	1.242	0.796
	(0.070)	(0.105)	(0.341)	(0.092)	(0.126)	(0.085)	(0.119)	(0.141)	(0.155)	(0.110)
Highest tertile of conflict	1.144	0.905	1.968***	1.169*	1.073	1.131*	1.105	0.989	1.253	1.028
	(0.220)	(0.066)	(0.327)	(0.085)	(0.058)	(0.061)	(0.163)	(0.200)	(0.207)	(0.084)
Lag 1 - Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.992		2.320**	0.895		0.794*	1.066	0.906	0.771	1.185
	(0.039)		(0.709)	(0.131)		(0.092)	(0.225)	(0.233)	(0.133)	(0.238)
Middle tertile of conflict	0.846	1.651*	0.769	0.889	1.237	0.849*	0.908	0.841	0.865	0.687*
	(0.073)	(0.330)	(0.281)	(0.082)	(0.268)	(0.055)	(0.183)	(0.186)	(0.134)	(0.114)
Highest tertile of conflict	0.731	1.061	1.156	0.980	1.066	1.034	0.878	0.919	1.217*	0.913
	(0.216)	(0.081)	(0.231)	(0.101)	(0.070)	(0.054)	(0.138)	(0.149)	(0.105)	(0.093)
Lag 2 - Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.934		0.498**	0.895		0.900	0.565**	0.704	0.732	1.545
	(0.037)		(0.113)	(0.123)		(0.164)	(0.124)	(0.146)	(0.157)	(0.364)
Middle tertile of conflict	1.121	2.082***	1.747	0.905	1.432*	0.904	0.555***	1.040	0.912	0.662*
	(0.089)	(0.352)	(0.604)	(0.136)	(0.235)	(0.092)	(0.085)	(0.223)	(0.157)	(0.127)
Highest tertile of conflict	1.060	1.059	0.763	0.957	0.919	1.038	0.741	1.099	1.118	1.034
	(0.122)	(0.066)	(0.128)	(0.069)	(0.044)	(0.054)	(0.114)	(0.191)	(0.111)	(0.173)
Lag 3 - Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.926*		0.615**	0.905		0.939	0.671	1.202	1.030	1.661**
	(0.033)		(0.111)	(0.185)		(0.109)	(0.145)	(0.236)	(0.394)	(0.288)
Middle tertile of conflict	0.889*	1.486*	0.768	0.903	1.205*	0.921	1.091	0.959	1.117	1.119
	(0.044)	(0.230)	(0.274)	(0.132)	(0.103)	(0.071)	(0.196)	(0.210)	(0.132)	(0.300)
Highest tertile of conflict	0.701	0.986	0.527*	0.949	0.970	1.123*	1.026	1.000	1.297**	0.894
	(0.213)	(0.064)	(0.152)	(0.078)	(0.074)	(0.066)	(0.141)	(0.217)	(0.111)	(0.120)
Lag 4 - Fatalities tertile (none omit.)										
Lowest tertile of conflict	0.884***		2.000*	0.673*		0.964	1.065	1.669**	0.776	0.840
	(0.032)		(0.605)	(0.106)		(0.083)	(0.234)	(0.323)	(0.220)	(0.104)
Middle tertile of conflict	0.941	1.932**	1.657*	1.148	1.099	1.021	1.427	1.136	1.112	0.752

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
	(0.074)	(0.415)	(0.395)	(0.144)	(0.163)	(0.096)	(0.280)	(0.212)	(0.128)	(0.156)
Highest tertile of conflict	0.681**	1.030	1.077	1.045	1.045	1.098*	0.912	0.939	0.929	0.932
	(0.093)	(0.064)	(0.288)	(0.064)	(0.056)	(0.051)	(0.113)	(0.149)	(0.086)	(0.132)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	268476	131661	35142	97591	79144	211760	46193	123792	74513	57004

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 5. Hazard ratios for complementary log-log model with tertiles of contemporaneous conflict and lags, by country, India-Philippines

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.059	0.661		2.065	0.941	1.034	0.843*	0.722**	0.782
	(0.037)	(0.413)		(0.930)	(0.136)	(0.200)	(0.066)	(0.080)	(0.408)
Middle tertile of conflict	1.048	1.453	1.130	0.894	0.910	1.117	0.821	1.042	0.908
	(0.027)	(0.792)	(0.251)	(0.136)	(0.123)	(0.117)	(0.107)	(0.131)	(0.223)
Highest tertile of conflict	0.980	0.956	0.866	1.017	1.025	0.946	0.786*	1.128	1.186
	(0.053)	(0.418)	(0.118)	(0.106)	(0.126)	(0.059)	(0.095)	(0.126)	(0.178)
Lag 1 - Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.049			1.190	0.830	1.208	0.891	1.217	0.179**
	(0.029)			(0.146)	(0.194)	(0.435)	(0.096)	(0.256)	(0.119)
Middle tertile of conflict	1.025	2.546	1.079	0.551	0.991	0.930	0.865	0.921	0.821
	(0.026)	(1.752)	(0.278)	(0.250)	(0.130)	(0.098)	(0.088)	(0.106)	(0.147)
Highest tertile of conflict	0.954	1.378	0.901	1.180	1.223	0.942	0.993	1.146	0.986
	(0.031)	(0.887)	(0.099)	(0.108)	(0.150)	(0.063)	(0.109)	(0.116)	(0.136)
Lag 2 - Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.065*	1.772		0.782	0.937	0.877	0.850	1.535	1.696
	(0.034)	(0.554)		(0.150)	(0.152)	(0.194)	(0.091)	(0.404)	(0.942)
Middle tertile of conflict	1.031		0.564	0.841	0.979	1.000	0.924	0.793	0.637**
	(0.026)		(0.213)	(0.111)	(0.108)	(0.138)	(0.129)	(0.126)	(0.103)
Highest tertile of conflict	1.014	0.788	0.985	0.985	1.052	0.930	1.037	1.039	1.135
	(0.033)	(0.484)	(0.192)	(0.105)	(0.160)	(0.080)	(0.162)	(0.096)	(0.138)
Lag 3 - Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.076*	1.622		0.299***	1.102	1.298	1.026	0.367***	1.721*
	(0.034)	(0.496)		(0.045)	(0.207)	(0.313)	(0.128)	(0.081)	(0.455)
Middle tertile of conflict	1.064*		1.280	0.851	1.063	0.977	0.873*	1.112	0.977
	(0.027)		(0.399)	(0.159)	(0.156)	(0.137)	(0.052)	(0.120)	(0.179)
Highest tertile of conflict	1.027	0.483	0.912	0.832	0.975	0.987	0.967	0.828	0.954
	(0.040)	(0.420)	(0.090)	(0.091)	(0.162)	(0.085)	(0.127)	(0.087)	(0.124)
Lag 4 - Fatalities tertile (none omit.)									
Lowest tertile of conflict	1.057			1.152	1.013	0.652	1.089	1.686**	0.600
	(0.039)			(0.282)	(0.183)	(0.183)	(0.108)	(0.281)	(0.180)
Middle tertile of conflict	0.983		0.919	1.541***	1.116	0.901	0.969	1.095	1.447*

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
	(0.031)		(0.366)	(0.202)	(0.196)	(0.103)	(0.106)	(0.130)	(0.239)
Highest tertile of conflict	1.018	1.015	1.089	1.093	1.109	0.708***	1.136	1.146	0.885
	(0.033)	(1.098)	(0.141)	(0.123)	(0.175)	(0.059)	(0.103)	(0.103)	(0.110)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	2920224	8237	79127	60028	80370	177099	384767	81718	106033

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 6. Hazard ratios for complementary log-log model with recent years of conflict, by country, Bangladesh-Guinea

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
Recent years with fatalities (none omit.)										
One to two years	0.960	0.963	0.950	0.934	0.947	1.099	0.915	0.882	1.248**	1.004
	(0.036)	(0.067)	(0.099)	(0.064)	(0.049)	(0.061)	(0.107)	(0.095)	(0.101)	(0.088)
Three or more years	0.770***	1.043	1.529	0.950	1.210**	1.092	0.779	0.947	1.238	0.584***
	(0.042)	(0.103)	(0.375)	(0.092)	(0.081)	(0.078)	(0.142)	(0.202)	(0.175)	(0.077)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	268476	131661	35142	97591	79144	211760	46193	123792	74513	57004

Source: Authors' calculations based on DHS surveys and UCDP conflict data.

Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 7. Hazard ratios for complementary log-log model with recent years of conflict, by country, India-Philippines

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
Recent years with fatalities (none omit.)									
One to two years	1.046	1.037	0.891	1.077	1.216***	0.965	0.937	0.919	1.024
	(0.031)	(0.291)	(0.080)	(0.073)	(0.071)	(0.060)	(0.055)	(0.084)	(0.085)
Three or more years	1.138**		0.935	0.914	1.325*	0.755**	0.802	0.900	0.899
	(0.048)		(0.199)	(0.130)	(0.145)	(0.082)	(0.124)	(0.130)	(0.166)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	2920224	8615	79127	60028	80370	177099	384767	81718	106033

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 8. Hazard ratios for complementary log-log model with country-specific tertiles of contemporaneous conflict, by country, Bangladesh-Guinea

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
Country-specific fatalities tertile (none omit.)										
Lowest tertile of conflict	0.853***	0.970	1.413	0.965	1.280***	0.920	0.982	0.636	1.053	0.945
	(0.038)	(0.097)	(0.386)	(0.081)	(0.083)	(0.089)	(0.104)	(0.162)	(0.116)	(0.071)
Middle tertile of conflict	0.903*	0.754*	1.645*	0.928	1.091	0.892	0.969	0.831	1.467***	1.130
	(0.045)	(0.090)	(0.402)	(0.078)	(0.104)	(0.061)	(0.109)	(0.194)	(0.131)	(0.082)
Highest tertile of conflict	0.884*	1.012	2.102**	1.294***	0.911	1.177***	1.015	0.949	1.389***	0.876
	(0.054)	(0.122)	(0.544)	(0.101)	(0.055)	(0.058)	(0.195)	(0.216)	(0.133)	(0.140)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	368317	181773	48307	138043	113032	312100	66123	170260	111651	78899

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 9. Hazard ratios for complementary log-log model with country-specific tertiles of contemporaneous conflict, by country, India-Philippines

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
Country-specific fatalities tertile (none omit.)									
Lowest tertile of conflict	1.092*	0.574	0.873	0.790**	0.935	1.047	0.895	0.832	0.579
	(0.043)	(0.412)	(0.167)	(0.059)	(0.130)	(0.090)	(0.094)	(0.080)	(0.188)
Middle tertile of conflict	1.087*	0.959	0.720	0.986	1.107	0.911	0.723**	1.354**	1.109
	(0.039)	(0.480)	(0.121)	(0.115)	(0.108)	(0.073)	(0.090)	(0.140)	(0.181)
Highest tertile of conflict	1.064	1.457	1.002	1.081	1.064	0.816*	0.812	1.075	0.974
	(0.040)	(0.488)	(0.156)	(0.133)	(0.132)	(0.074)	(0.089)	(0.101)	(0.115)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	4094245	15473	111857	83368	115070	246160	517110	121727	148191

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 10. Hazard ratios for complementary log-log model with non-normalized tertiles of contemporaneous conflict, by country, Bangladesh-Guinea

	Bangladesh	Burundi	Cameroon	DRC	Chad	Colombia	Cote d'Ivoire	Egypt	Ethiopia	Guinea
Non-normalized fatalities tertile (none omit.)										
Lowest tertile of conflict	0.898**	0.859	1.347	0.956	1.355***	1.053	0.961	0.748	0.906	0.975
	(0.033)	(0.097)	(0.285)	(0.083)	(0.073)	(0.056)	(0.082)	(0.138)	(0.089)	(0.068)
Middle tertile of conflict	0.839*	0.902	2.361***	1.051	0.707	1.085	1.134	0.727	1.315	1.103
	(0.058)	(0.118)	(0.567)	(0.089)	(0.134)	(0.064)	(0.169)	(0.164)	(0.223)	(0.351)
Highest tertile of conflict	0.777	0.941	1.785**	1.151*	1.008	0.995	0.945	1.165	1.461***	0.922
	(0.136)	(0.086)	(0.360)	(0.069)	(0.058)	(0.064)	(0.155)	(0.339)	(0.106)	(0.068)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	368317	181773	48307	138043	113032	312100	66123	170260	111651	78899

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Table 11. Hazard ratios for complementary log-log model with non-normalized tertiles of contemporaneous conflict, by country, India-Philippines

	India	Indonesia	Kenya	Mali	Myanmar	Nigeria	Pakistan	Peru	Philippines
Non-normalized fatalities tertile (none omit.)									
Lowest tertile of conflict	1.079*	1.174	0.850	0.774**	0.973	1.008	0.929	1.037	0.879
	(0.034)	(0.293)	(0.129)	(0.063)	(0.108)	(0.089)	(0.095)	(0.072)	(0.144)
Middle tertile of conflict	1.098*	0.808	0.758	1.060	1.111	0.990	0.802	0.920	0.759
	(0.045)	(0.694)	(0.144)	(0.153)	(0.137)	(0.088)	(0.101)	(0.125)	(0.127)
Highest tertile of conflict	1.074*	1.004	1.034	1.043	1.058	0.828*	0.743**	1.239**	1.415
	(0.038)	(0.294)	(0.155)	(0.120)	(0.125)	(0.068)	(0.076)	(0.101)	(0.389)
Admin. 1 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban/rural residence	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline hazard (age in year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N obs.	4094245	15473	111857	83368	115070	246160	517110	121727	148191

Source: Authors' calculations based on DHS surveys and UCDP conflict data.
Notes: *p<0.05; **p<0.01; ***p<0.001. Clustered standard errors in parentheses.

Appendix: Data structure

Table 12 illustrates the data structure for four fictitious children. The numbers denote age in that calendar year. "B" denotes the year of birth, when the child is age zero. "C" denotes conflict (in the actual data this is specified as tertiles vs. no conflict, but simplified here to "C" for diagrammatic purposes). "M" denotes the outcome of marriage. This outcome equals zero in all the other years, then one in the year of (first) marriage ("M"). Once individuals turn 18, they are no longer at risk for child marriage and thus no longer in the data set. Once individuals marry, they are no longer at risk for marriage and are no longer in the data set.

In terms of the fictitious examples, child 1 was born in 1997, was not ever exposed to conflict in her location of residence, reached age 17 in 2014 and did not marry before age 18; she is therefore no longer in the data set in 2015. Child 2 was born in 2000 and was not exposed to conflict in her location of residence through 2015. The survey took place in 2016, so she is right-censored at age 15; the observations for ages 0-15 (2000-2015) are included in the analyses with the outcome of being unmarried (0s). Thus, children 1 and 2 have outcomes of not being married (0s) throughout their periods in the data. Child 3 was born in 1993. She was exposed to conflict locally in 1999, at age six, and also exposed to conflict locally in 2000, at age seven. From age 8-15 she was not exposed to conflict and remained unmarried. She married at age 16, in 2009 (1 for the outcome of marriage, in 2009). Child 4 was born in 1995. She was exposed to conflict locally in 1999, at age four, and also exposed to conflict locally in 2000, at age five. From age 6-17 she was not exposed to conflict and remained unmarried (0s for outcome). She was 18 in 2013 and therefore no longer in the data set.

Table 12. Example data structure by calendar year

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Child 1					0,B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Child 2								0,B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Child 3	0,B	1	2	3	4	5	6,C	7,C	8	9	10	11	12	13	14	15	16,M						
Child 4			0,B	1	2	3	4,C	5,C	6	7	8	9	10	11	12	13	14	15	16	17			

Source: Authors' construction

Notes: Numbers denote age in year, "B" denotes year of birth, "C" denotes conflict, "M" denotes marriage