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Exposure to Armed Conflict and Fertility in Sub-Saharan Africa

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Abstract

Changes in fertility patterns are hypothesized to be among the many second-order consequences of armed conflict, but expectations about the direction of such effects are theoretically ambiguous. Prior research, from a range of contexts, has also yielded inconsistent results. We contribute to this debate by using harmonized data and methods to examine the effects of exposure to conflict on preferred and observed fertility outcomes across a spatially and temporally extensive population. We use high-resolution georeferenced data from 25 sub-Saharan African countries, combining records of violent events from the Armed Conflict Location and Event Data Project (ACLED) with data on fertility goals and outcomes from the Demographic and Health Surveys (n = 368,765 women aged 15–49 years). We estimate a series of linear and logistic regression models to assess the effects of exposure to conflict events on ideal family size and the probability of childbearing within the 12 months prior to the interview. We find that, on average, exposure to armed conflict leads to modest reductions in both respondents' preferred family size and their probability of recent childbearing. Many of these effects are heterogeneous between demographic groups and across contexts, which suggests systematic differences in women's vulnerability or preferred responses to armed conflict. Additional analyses suggest that conflict-related fertility declines may be driven by delays or reductions in marriage. These results contribute new evidence about the demographic effects of conflict and their underlying mechanisms, and broadly underline the importance of studying the second-order effects of organized violence on vulnerable populations.

Keywords Fertility · Fertility ideals · Marriage · Armed conflict · Africa

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Introduction

Armed conflict disrupts many domains of life beyond the immediate effects of violence and insecurity (Caldwell 2004; Ghobarah et al. 2003). Exposure to such events has been linked to adverse social and demographic outcomes, including poor child and adult health (Akresh et al. 2012; Minoiu and Shemyakina 2012; Torche and Shwed 2015), migration and displacement (Adhikari 2012; Bohra-Mishra and Massey 2011; Czaika and Kis-Katos 2009; Verwimp and van Bavel 2005; Williams et al. 2012), and declines in economic activity (World Bank 2011). Demographers have also hypothesized that conflict may affect reproductive goals and behaviors through mechanisms that include shifting patterns of marriage and spousal separation (Blanc 2004; Caldwell 2004; Cetorelli 2014), changing relative costs and risks of childbearing (Lindstrom and Berhanu 1999), the inducement of replacement effects in response to conflict-related mortality (Schindler and Brück 2011), and increased risk of sexual violence and intrahousehold conflict (Corno et al. 2017). However, these processes may not operate consistently, resulting in competing hypotheses about the strength and sign of conflict effects. Tests of these expectations across a range of contexts have yielded inconsistent results with respect to both the presence and direction of the relationship between conflict and fertility.

We contribute evidence to this literature and extend prior research by using georeferenced demographic and conflict data to evaluate the association between armed conflict and both fertility ideals and outcomes across a temporally and spatially extensive population of reproductive-aged women in sub-Saharan Africa (Boyle et al. 2018; Raleigh et al. 2010). Importantly, these data allow us to construct and employ new high-resolution measures of women's exposure to conflict events. As such, we build on existing research by simultaneously zooming out to study the demographic effects of conflict across a large target population and zooming in to measure conflict exposure at the spatial and temporal scales at which conflict events unfold and many of the processes linking conflict and fertility operate (Buhaug and Rød 2006; Williams et al. 2012).

The evidence we generate through this approach makes new theoretical contributions and has the potential to broadly inform development and humanitarian work as it relates to mitigating the second-order impacts of conflict. For one, we study the links between conflict and fertility across a large sample and using harmonized data and methods. This approach permits us to estimate average effects across an extensive population and to compare effects across subpopulations and contexts. Such comparisons are not confounded by differences in data and methods, as is often the case when comparing findings across single-country studies. By examining heterogeneous effects, our analyses provide insights into whether and how women vary in terms of their level of vulnerability (resilience) to conflict as well as in their ability and propensity to modify fertility in response to such events. Relatedly, we examine hypothesized mechanisms linking conflict and fertility, providing empirical evidence about which explanatory processes are most salient. Our findings may also have broader implications for theories of fertility by informing expectations about the demographic effects of comparable shocks to populations' health and wealth.

The results of this study are of practical interest given persistently high and increasing levels of political instability throughout the world as well as the corollary need to mitigate the effects of these events (World Bank 2011). It is important for policy-makers and practitioners to consider the secondary effects of conflict—including changes in reproductive goals and outcomes—which can have persistent if not always immediate consequences for affected populations (Ghobarah et al. 2003). These issues are particularly pertinent to the sub-Saharan African context that we consider here. Over recent decades, this region has experienced significant levels of conflict, resulting in at least 428,000 deaths since 2000 alone (Armed Conflict Location and Event Data Project (ACLED) 2019).[1] Although the dynamics of individual conflicts are often unique, the countries in our sample share a legacy of weak state institutions and chronic political instability that, in most cases, stems in part from prolonged periods of European rule (World Bank 2018).[2] These characteristics have manifest in unique conflict dynamics in the region *vis-à-vis* other parts of the world in terms of both the frequency and types of conflict that have occurred. For example, African conflicts in the post–Cold War era have often been so-called repeat civil wars, involved contestation of government transitions, and included complex sets of domestic and international state and nonstate actors (Williams 2017). Sub-Saharan Africa is also characterized by a distinctive set of demographic dynamics, with persistently high although heterogeneous birth rates across the continent (Bongaarts and Casterline 2013). For example, the most recent data from the Demographic and Health Survey (DHS) revealed total fertility rates above 4.0 in most African countries, ranging from 3.3 in Lesotho to 7.6 in Niger. Given these high average birth rates, the region will continue to account for a disproportionate share of global population growth into the future (Gerland et al. 2014).

In this study, we consider the relationship between these distinctive patterns of conflict and fertility in sub-Saharan Africa. We do so by estimating the effects of localized exposure to conflict on both fertility ideals and outcomes among women in 25 sub-Saharan African countries between 2000 and 2017.

Conflict and Fertility

Disruptions associated with armed conflict and other forms of political instability have been hypothesized to change the incentives for, and likelihood of, childbearing in affected populations. Such changes are expected to operate through multiple mechanisms, which function in complex and potentially offsetting ways. In stylized terms, these pathways can be separated into four sets of factors: shifts in patterns of marriage and coresidence, changes in the relative costs and risks of childbearing, replacement effects, and the consequences of sexual violence. First, conflict may change patterns of marriage and coresidence by shifting the incentive structure for marriage and changing the likelihood and duration of spousal separation (Caldwell 2004; Cetorelli 2014; Williams et al. 2012; Woldemicael 2010). For instance, spouses may separate as some

[1] The casualty figure is for all African countries from the period January 1, 2000–January 1, 2018. It includes deaths from intrastate and interstate conflicts, violent protests, terrorism, and government violence against civilians.

[2] Evidence of such weak institutions and political instability comes from the World Bank's Governance Effectiveness and Political Stability and Absence of Violence indicators. Both indicators range between –2.50 and 2.50. For 1996–2018, our sample's mean score is –0.75 for Governance Effectiveness and –0.65 for Political Stability and Absence of Violence.

household members—typically working-age men—are recruited into the military or militia groups or if conflict-induced migration patterns lead to the separation of household members (Agadjanian et al. 2011; McGinn 2000; Verwimp and van Bavel 2005). Similarly, persons who are displaced by conflict or mobilized for military activity may be less likely to marry given uncertainty associated with such events and the limited marriage markets among displaced populations and groups of combatants. Marriage markets may also be disrupted if bride prices or other costs of marriage change or if the resources to pay such costs are lost because of conflict (Corno et al. 2017). The incentives for marriage may also change because of the threat of military mobilization, particularly if unmarried males are targeted for recruitment (Williams et al. 2012).

Second, conflict may affect fertility goals and behaviors by changing the relative costs and risks of childbearing. Economic dynamics may spur some of these changes. Conflict often reduces wealth among affected households (Collier et al. 2003), which can in turn shape the calculus of fertility decision-making. Economic uncertainties associated with armed conflict may incentivize individuals to have additional children if those children are perceived as likely to increase future income levels or otherwise provide economic support (Berrebi and Ostwald 2015). Alternatively, women may perceive an additional child as unaffordable under conflict-induced income constraints if children are viewed as net consumers of household resources. Conflict may also affect the relative benefits of childbearing by influencing the costs of controlling fertility via changing access to contraceptives. Here, conflict is generally expected to disrupt access to contraceptives (McGinn et al. 2011; Urdal and Che 2013), and in some cases protracted violence may induce pronatalist sentiments that increase the social costs of limiting fertility (Palmer and Storeng 2016). Conflict may further change the costs and risks of childbearing in terms of maternal and child health, often adversely because of disruptions in health care access (Lindskog 2016; McGinn et al. 2011; Østby et al. 2018). In these and perhaps other ways, conflict is expected to affect demographic outcomes by elevating perceived uncertainty across many dimensions of life (Caldwell 2004).

Third, exposure to violence may change fertility goals and outcomes by inducing replacement effects, or increases in fertility in response to mortality. Such responses may be driven by the mortality of one's child or family member, as observed in the aftermath of the Rwandan genocide (Kraehnert et al. 2019; Schindler and Brück 2011). Replacement-effect dynamics may also occur at the community or group level, such as when post-conflict community-building efforts or a desire to increase ethnic group size lead to pronatalist sentiment (Chi et al. 2015; Palmer and Storeng 2016).[3] Although the evidence for replacement effects in conflict settings is limited, similar processes have been observed in response to child deaths in other settings, such as those affected by disease and natural disasters (Bongaarts 2001; Hossain et al. 2007; Lindstrom and Kiros 2007; Nobles et al. 2015; Olsen 1980).

Finally, armed conflict may affect fertility by increasing the incidence of sexual violence (McGinn 2000). Rape and other sexual assault have been used as a tool of

[3] Fertility may also increase in response to perceived child mortality risk due to conflict (i.e., "insurance effects"). However, such processes would require women to perceive that conflict will increase mortality risk over sustained periods, which has not been demonstrated empirically.

warfare in many conflicts in sub-Saharan Africa, including in recent civil violence in the Democratic Republic of Congo, Ethiopia, and Sudan (Hagan et al. 2009; Human Rights Watch 2008; Peterman et al. 2011). In addition to the perpetration of such violence by combatants, conflict has also been shown to increase intimate partner sexual violence through both psychological and socioeconomic pathways (Østby 2016; Wood 2014). In either case, these crimes may influence fertility directly by resulting in pregnancies and indirectly by affecting victim's physical and mental health (Dossa et al. 2014; Pallitto and O'Campo 2004).

These four sets of pathways can plausibly explain the relationship between conflict and fertility but do not suggest clear directional hypotheses because they may operate in different strengths and directions. In line with this conceptual ambiguity, the empirical record is inconsistent with respect to the direction of conflict effects. Several studies have found that conflict reduces fertility. For example, fertility rates declined during periods of conflict in Angola (Agadjanian and Prata 2002) and Mozambique (Agadjanian et al. 2011), and periods of concurrent war and famine in Ethiopia were associated with short-term declines in the probability of conception (Lindstrom and Berhanu 1999). Likewise, a secular decline in fertility in Eritrea was likely amplified by the 1998–2000 war with Ethiopia (Woldemicael 2010). According to an empirical study of terrorist attacks in 170 countries between 1970 and 2007, terrorism has also been linked to declines in the total fertility rate (TFR) and crude birth rate (CBR) (Berrebi and Ostwald 2015). Finally, violent conflicts were associated with an increase in contraceptive use—and thus presumable decreases in fertility—during a civil war in Nepal (Williams et al. 2012).

Other studies have found the opposite: that fertility rates increase during episodes of armed conflict. For instance, conflict intensity in sub-Saharan Africa, measured as battle-related deaths, has been associated with increases in national fertility rates among the poorest countries in the region (Urdal and Che 2013). There is also evidence from the Iraqi context of a sharp increase in fertility rates among women ages 15–24 following the 2003 U.S. invasion and subsequent civil conflict (Cetorelli 2014), and violent events during the Colombian civil war were associated with increased fertility in the rural areas where conflict was widespread (Torres and Urdinola 2019). In a final example, Cambodian women's exposure to conflict during adolescence has been linked to increased later-life fertility (Islam et al. 2016).

We contribute to this debate by conducting new tests of the relationship between conflict and fertility across sub-Saharan Africa and addressing existing limitations regarding the precision of conflict exposure measures and the ability to compare effects across subpopulations. Many previous studies have drawn inferences about the effects of conflict by tracking changes in national fertility rates before, during, and after a given conflict (Schindler and Brück 2011; Woldemicael 2008, 2010) or comparing fertility dynamics between more- and less-affected regions within countries (Lindstrom and Berhanu 1999). In either case, such national- or province-level measures of conflict and fertility are likely to mask substantial spatial variation.

Recent studies have overcome these measurement challenges by using georeferenced conflict data to produce measures of violence for subnational administrative units (e.g., districts) and examining the relationship between conflict exposure (so defined) and demographic outcomes (Dabalen and Paul 2014; Lindskog 2016; Minoiu and Shemyakina 2012). These analyses have improved measurement of conflict exposure by accounting for spatial heterogeneity within countries but have tended to rely on inconsistently sized, and sometimes large, administrative units. These studies have also focused on narrow geographic contexts (i.e., single countries), making it difficult to draw cross-national comparisons given methodological differences.[4] Using high-resolution measures of conflict, we apply harmonized data and methods to examine the effects of conflict on fertility across 25 sub-Saharan African countries and among key subpopulations. Such findings contribute to theory building and can shape expectations about the demographic implications of recent trends in conflict across the continent.

Research Objectives

The overall goals of this study are to estimate the associations between exposure to armed conflict and both preferred and recent fertility outcomes, and to explore the mechanisms that may underlie these relationships. We consider both reproductive preferences and outcomes, in part because the effects of conflict on the latter may be attenuated by some women's inability to act on conflict-induced changes in fertility preferences. For example, a lack of access to contraceptives will reduce one's likelihood of realizing conflict-induced declines in fertility preferences; conversely, spousal separation will prevent women from realizing increases in preferred family size. We take the nature and degree of such attenuation as an empirical question for our study.

Toward our overall goal, we take five steps. First, we analyze the overall association between exposure to armed conflict and women's family size preferences. Second, we test for variation in conflict effects between demographic groups and across contexts—defined by educational attainment, parity, and rural or urban residence—and reproductive setting as proxied by the national TFR. We also report the results of complementary country-specific models. As our third and fourth steps, we conduct a comparable set of analyses of the overall and group-specific associations between conflict and achieved fertility outcomes, operationalized as the probability of childbearing during the 12 months prior to the survey. Finally, we explore the pathways that may underlie the observed relationships (or lack thereof). We estimate parallel models of the respective associations between conflict and child mortality, marriage, and contraceptive use, which represent three plausible mechanisms underlying conflict-fertility relationships.

Empirical Strategy

Data

We construct a multicountry and multidecade database that includes records of women's fertility ideals and outcomes, their demographic and socioeconomic characteristics, and their exposure to armed conflict events. We draw on demographic and

[4] One study that has used high-resolution conflict and demographic data across a large multinational population focused on maternal and child health rather than fertility (Østby et al. 2018).

socioeconomic data for reproductive-age women (ages 15–49) from a series of DHS surveys fielded between 2000 and 2017. The DHS program has collected nationally representative demographic and population health data across many low- and middle-income countries, with multiple rounds of cross-sectional data collected in many of those places.[5] DHS data are collected using a standardized core questionnaire, which facilitates harmonization across contexts and makes these data particularly well-suited for our multicountry sample.[6] Our measures of armed conflict are derived from the ACLED. This project collects, analyzes, and maps the incidence and characteristics of a range of violent events, from interstate battles to riots and other forms of civil unrest (Raleigh et al. 2010). We use ACLED data on the date and location (latitude/longitude) of conflict events in sub-Saharan Africa, which are available from 1997 to the present.

Among the DHS samples that have been collected in the region, we restrict the analytic sample to countries and years for which conflict event data are available for at least three years prior to the DHS survey (i.e., years ≥2000) to allow for a 36-month lookback period for conflict exposure measures. We also restrict our analysis to samples for which geocodes are available at the cluster (i.e., community) level and that include information on women's time of residence in their cluster of enumeration. The former allows us to calculate the number of conflict events that occurred within a given radius of individuals' clusters of residence during the time intervals of interest. Using the latter, we can exclude all recent in-migrants, defined as women who did not reside in the cluster of enumeration throughout the entire period of conflict exposure. We exclude these observations because such recent in-migrants were exposed to other unobservable levels of conflict in their place of prior residence and may differ systematically from the population that resided in a cluster for the entire exposure interval. Individuals who migrated or were displaced from the enumeration areas because of conflict and before data collection cannot be observed in the sample given the cross-sectional design of the DHS. These out-migrants are likely to be positively selected on socioeconomic characteristics and therefore have below-average levels of fertility. Such dynamics would bias our estimates of conflict effects upward, which we consider in the discussion of results. After these restrictions, our data set includes a total of 368,765 observations from 41 DHS samples collected in 25 sub-Saharan African countries between 2000 and 2017.[7] The sample is described in Table 1, and the geographic distribution of the DHS clusters in our analytic sample is illustrated in Fig. 1.[8]

[5] DHS estimates are nationally representative when survey weights are applied.

[6] The DHS has implemented multiple phases of the survey, and in some cases, response options are tailored to the local context. However, the data sets and variables included in our analytic sample were sufficiently alike to permit harmonization. The use of IPUMS-DHS data also facilitated harmonization for many countries in the sample (Boyle et al. 2018).

[7] The countries (samples) in our data are Angola (2015), Benin (2001), Burkina Faso (2003), Burundi (2016–2017), Cameroon (2004), Democratic Republic of the Congo (2007), Eswatini (2006), Ethiopia (2000, 2005, 2016), Ghana (2003, 2006), Guinea (2005), Kenya (2003, 2008–2009), Lesotho (2004, 2009), Liberia (2007), Madagascar (2008), Malawi (2000, 2004, 2010, 2016), Mali (2001, 2006), Namibia (2000, 2006), Nigeria (2003, 2008), Rwanda (2005), Senegal (2005), Sierra Leone (2008), Tanzania (2004, 2015), Uganda (2001, 2006, 2016), Zambia (2007, 2013), and Zimbabwe (2005–2006, 2015).

[8] See Table A1 (online appendix) for the distribution of observations by country and the proportion of each sample exposed to conflict, as defined in the main specification.

Table 1 Description of sample

Variable	Mean	SD
Ideal Family Size	4.774	2.507
Birth in Prior Year (yes)	0.173	–
Conflict (yes)	0.131	–
Age (years)	28.765	9.540
Education		
None	0.313	–
Incomplete primary school	0.288	–
Complete primary school	0.400	–
Children Ever Born	3.028	2.842
Type of Residence		
Urban	0.288	–
Rural	0.712	–
Period		
2000–2005	0.383	–
2006–2011	0.334	–
2012–2017	0.283	–
Region		
Southern	0.074	–
Eastern	0.582	–
Western	0.265	–
Central	0.079	–
Sample Size	368,765	

Notes: Estimates are calculated using DHS person weights. Distribution by period and region is shown for informative purposes only; regression models control for province fixed effects and region-specific linear time trends.

Measures

Main Analysis

We focus on two primary outcomes in this study: ideal family size and recent fertility. We model ideal family size to capture women's preferred fertility outcomes regardless of their ability to achieve that goal. This first dependent variable represents the number of children that the woman would ideally like to have in her lifetime, irrespective of actual childbearing.[9] We use this variable as our preferred measure of women's reproductive goals because it theoretically allows for downward revisions below one's achieved fertility, whereas questions about preferences for another child do not. Although ideal family size has been shown to be a meaningful construct for capturing changes in women's reproductive goals (Yeatman et al. 2013), we test the robustness of

[9] We exclude nonnumeric responses (e.g., "up to God") from the analysis. The prevalence of such responses is typically less than 10% and has declined over time in sub-Saharan Africa (Frye and Bachan 2017).

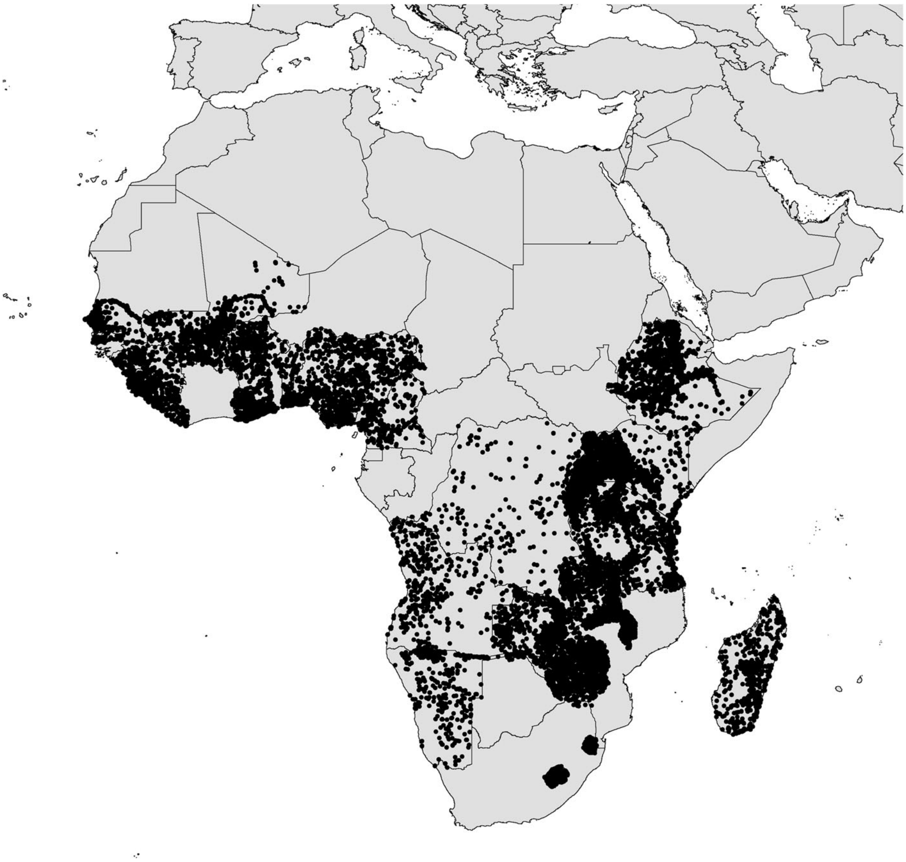

Fig. 1 Map of DHS cluster locations in the analytic sample

our findings by using a categorical fertility preference outcome in a supplementary analysis. The results of these models (see Robustness Checks) demonstrate that our substantive conclusions are not driven by the choice of outcome variable or patterns of nonnumeric responses about ideal family size.

Our second outcome of interest is recent fertility, which we measure using a binary indicator of whether a woman gave birth to a child during the 12 months prior to the survey. We use this cross-sectional measure of fertility (rather than the DHS birth histories) to facilitate direct comparison between our analyses of ideal family size and fertility outcomes. As described earlier, we expect that the association between conflict and fertility will be attenuated *vis-à-vis* the association of conflict with preferred family size given heterogeneity in women's ability to realize conflict-affected changes in preferences.

The independent variable of interest is exposure to armed conflict, operationalized as a binary indicator of whether one or more violent conflict events took place within a 10-km radius of women's communities of residence during the 36 months prior to data collection. This approach follows other demographic research (Williams et al. 2012) by focusing on exposure to discrete violent incidents—that is, one of the multiple events that typically constitute broader armed conflicts. We define conflict events as battles and incidents of remote violence.[10] Battles are violent events involving politically organized, armed state or nonstate actors. Examples include armed clashes between state security forces and insurgents, insurgent capture of territory through force, and state recapture of territory controlled by rebels. Incidents of remote violence are nonconventional violent acts where the mode of attack does not require the perpetrator's physical presence, such as terrorist bombings, the use of improvised explosive devices, shelling, and airstrikes. There is no minimum number of casualties required for an event to be classified as a battle or remote attack. Therefore, these measures capture instances of both high- and low-intensity violence.

We measure conflict events within a 10-km buffer with the goal of capturing events that directly impacted women, their families, and members of their social networks.[11,12] Our use of a 36-month lookback period allows sufficient time to capture lagged effects. For example, when modeling childbearing in the prior year, our measure will, on average, capture 21 months of conflict exposure prior to conception.[13] Because there is little evidence to guide these specific decisions, however, we test the sensitivity of our results to the use of alternative measures of conflict exposure. The results of these and other robustness checks are included in the online appendix.

Mechanisms

To explore the mechanisms that may underlie observed relationships between conflict and reproductive outcomes, we conduct parallel analyses of the associations between conflict and three outcomes that correspond to hypothesized causal pathways: the recent death of a child, marriage or cohabitation, and contraceptive use. First, we measure child deaths using a binary indicator of whether one or more of a woman's children died during the previous 36 months. We use the same lookback period as our conflict measure because we are interested in conflict-related child deaths. Our second pathway of interest is marriage, which we capture with a binary variable that differentiates between women who are and are not married. The former includes women who are formally married or cohabitating, and the latter includes those who are single and never married, widowed, separated, or divorced. The third outcome is current modern contraceptive use, which is modeled as a binary variable.[14] These three proposed

[10] ACLED includes other categories of violent events, such as violence against civilians and violent protests or riots. We exclude such events for two reasons. First, we are interested in the effects of armed conflict specifically rather than unrest and instability in general. Second, comparable measures for these types of violence are not available in the UCDP database, which we use to test the robustness of our findings with ACLED.

[11] We account for the error around GPS coordinates in the public-use DHS data by defining a 10-km radius as the minimum buffer in our analysis. The DHS program randomly displaces the GPS coordinates for all clusters to maintain confidentiality. The coordinates are displaced by 0–2 km for urban clusters and by 0–5 km for rural clusters, with 1% of rural clusters displaced by 0–10 km (Burgert et al. 2013). Our approach is consistent with that of other high-quality sources, including the DHS program's own geospatial data set and IPUMS-DHS.

[12] Some countries and regions in the sample did not experience conflict events during the study period. We check the robustness of our results to excluding these places from the analytic sample in Models A1–A4 of the online appendix.

[13] We assume a nine-month gestational period and that the average birth during the prior 12 months occurred at the midpoint of the interval.

[14] Models of any contraceptive use (current or previous) yield similar results.

mechanisms are not exhaustive, of course, but are theoretically relevant and observed across all rounds of the DHS included in our sample. We do not test the hypothesized sexual violence pathway because of data limitations, but we discuss existing evidence on this issue below (see Discussion and Conclusion).

Statistical Models

We estimate a series of multivariate regression models to evaluate the respective relationships between exposure to conflict and both ideal and recent fertility. In these models, the fertility outcome of interest is a function of woman *i*'s conflict exposure, measured at the community level over a 36-month period, and a set of social and demographic control variables. These control variables include the age of the respondent, an ordinal measure of educational attainment, the number of children ever born to the respondent, and a binary measure of whether the respondent lives in a rural or urban area. All models also include spatial fixed effects and linear time trends for each region of sub-Saharan Africa. The spatial fixed effects control for all time-invariant characteristics at the province level, defined as the first subnational administrative unit for each country. The region-specific time terms control for common changes that occur linearly within each of the four major regions of sub-Saharan Africa defined by the United Nations Statistics Division (1999). We cluster the standard errors on the DHS clusters and apply person-level survey weights throughout the analyses.

Within this overall framework, the models we estimate take multiple functional forms. We estimate linear regression models of the association between conflict and ideal family size; we estimate logistic regression models of the association between conflict and women's odds of giving birth in the past 12 months. We also estimate logistic regression models for our analysis of mechanisms given that all three outcomes are binary.[15] For each of the two main outcome variables, we test for variation in conflict effects across demographic groups of interest by including conflict-by-group interaction terms. These models allow for variation in the association between conflict and our two reproductive outcomes by women's educational attainment, parity, residence in rural or urban communities, and fertility context, as measured by the TFR in women's country of residence at the time of enumeration. We also estimate comparable country-stratified models as an alternative approach to assessing heterogeneous effects across contexts. The latter findings are briefly discussed below (see Results), and the full results are presented in the online appendix.

Results

Conflict and Fertility Ideals

We begin by analyzing the association between exposure to armed conflict events and women's ideal family size (Table 2). In the first model (Model 1), we compare the

[15] The number of children ever born is excluded as a control in the model of women's marital status. Although premarital childbearing is common and/or increasing in some parts of the region, a substantial majority of women still do not have a child before marriage (Clark et al. 2017), raising concerns about endogeneity.

preferred family size of women who were exposed to at least one conflict event during the 36 months prior to the survey with women living in areas that were conflict-free during the same time interval, controlling for a set of individual and household characteristics, time-invariant province characteristics, and region-specific time trends. The results reveal a negative association between conflict exposure and fertility ideals: compared with non-exposed women, conflict-affected women report ideal family sizes that are, on average, 0.05 children lower. This effect is just over 20% of the marginal difference in ideal family size associated with a one-child increase in parity (β = 0.241). The magnitude of this association suggests that, on average, conflict is a relatively limited source of cross-sectional variation in fertility ideals across sub-Saharan Africa. Given that ideal family size is a relatively "fuzzy" concept to begin with, even a one-child difference in the ideal family size of an individual woman may not represent a substantively meaningful change. On the other hand, it is important to recall that this figure represents an average across a large target population, such that small shifts in average preferences and probabilities may result in large aggregate changes. It is also worth noting that this negative association runs contrary to the aforementioned upward bias potentially induced by selective out-migration from conflict-affected communities. Moreover, high-fertility contexts—for example, demographic "youth bulges"—have

Table 2 Linear regression model predicting ideal family size

	Model 1
Variable	β (SE)
Conflict (yes)	–0.0501*
	(0.0253)
Age	–0.0259***
	(0.0035)
Age, Squared	0.0005***
	(0.0001)
Education (ref. = none)	
Incomplete primary school	–0.3889***
	(0.0174)
Complete primary school	–0.7757***
	(0.0196)
Children Ever Born	0.2406***
	(0.0035)
Type of Residence (ref. = urban)	
Rural	0.4313***
	(0.0187)
Province Fixed Effects	Yes
Region-Specific Linear Time Trend	Yes
R^2	.3450

Note: Standard errors are clustered on DHS communities.

*p < .05; ***p < .001

generally been found to produce more rather than less conflict (e.g., Brunborg and Urdal 2005; Urdal 2006). That we find measures of conflict to reduce women's ideal family size runs counter to the expected relationship if the results were driven by reverse causation.

We next evaluate whether the association between conflict exposure and fertility ideals varies across demographic groups and contexts (Table 3), which we expect given

Table 3 Linear regression models predicting ideal family size

Variable	Model 2 β (SE)	Model 3 β (SE)	Model 4 β (SE)	Model 5 β (SE)
Conflict (yes)	–0.3648***	0.1088***	–0.0191	0.3040*
	(0.0624)	(0.0279)	(0.0285)	(0.1364)
Conflict (yes) × Incomplete Primary School	0.3378*** (0.0559)			
Conflict (yes) × Complete Primary School	0.4084***			
	(0.0596)			
Conflict (yes) × Children Ever Born		–0.0603***		
		(0.0071)		
Conflict (yes) × Rural Residence			–0.0687	
			(0.0489)	
Conflict (yes) × National TFR[a]				–0.0666*
				(0.0259)
Age	–0.0261***	–0.0258***	–0.0259***	–0.0259***
	(0.0035)	(0.0035)	(0.0035)	(0.0035)
Age, Squared	0.0005***	0.0005***	0.0005***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Education (ref. = none)				
Incomplete primary school	–0.4220***	–0.3888***	–0.3885***	–0.3881***
	(0.0184)	(0.0174)	(0.0174)	(0.0174)
Complete primary school	–0.8247***	–0.7788***	–0.7752***	–0.7749***
	(0.0209)	(0.0195)	(0.0196)	(0.0196)
Children Ever Born	0.2406***	0.2467***	0.2406***	0.2407***
	(0.0035)	(0.0036)	(0.0035)	(0.0035)
Type of Residence (ref. = urban)				
Rural	0.4309***	0.4319***	0.4406***	0.4341***
	(0.0187)	(0.0187)	(0.0196)	(0.0188)
Province Fixed Effects	Yes	Yes	Yes	Yes
Region-Specific Linear Time Trend	Yes	Yes	Yes	Yes
R^2	.3454	.3455	.3450	.3451

Note: Standard errors are clustered on DHS communities.

[a] TFR = total fertility rate.

$^{*}p < .05$; $^{***}p < .001$

hypothesized differences in populations' vulnerability and responses to conflict. We first test for differences by educational attainment (Model 2). Previous research has suggested that better-educated women are more likely than others to perceive that their fertility is within their control (Behrman 2015) and may therefore be more likely to respond to the impacts of violence by modifying their desired family size (upward or downward). On the other hand, better-educated women may have more resources to buffer the economic effects of conflict, making them less sensitive to these shocks (Zimmerman and Carter 2003). Consistent with the latter expectation, we find that conflict prompts only the least-educated women to reduce their desired family size and that more-educated women experience statistically different—and near-zero—changes in ideal family size when exposed to conflict. Among women with no education, exposure to conflict events is associated with a reduction in ideal family size of 0.37 children—a substantively meaningful association when considered in the context of other coefficients. The net conflict effects among women who completed some or all of primary school are both statistically nonsignificant at conventional thresholds ($\beta = -0.027$, $p = .396$; and $\beta = 0.044$, $p = .073$, respectively).

Next, we test for variation in armed-conflict effects by parity (Model 3), which may be expected given differential resource constraints between large and small families (Blake 1981; Smith-Greenaway and Trinitapoli 2014). Such variation may also be expected given women's differential likelihood of revising fertility goals across various stages of their reproductive careers (Bongaarts 1990; Casterline and El-Zeini 2007; Yeatman et al. 2013). We find that differences in conflict effects by parity are statistically and substantively significant. Women without children experience statistically significant increases in ideal family size when exposed to conflict, but this effect is moderated—and then reversed—as women's parity increases. As such, we observe increasingly large conflict-induced declines in ideal family size among women with large numbers of children. According to point estimates, for example, conflict exposure is associated with a 0.07-child decline in preferred family size among women with three children and a 0.25-child decline among women with six children. The pattern of conflict effects across a broader range of parities, holding other variables at their means, is plotted in panel a of Fig. 2. A notable implication of these findings is that women with large families are more likely to revise their preferred family size downward in response to conflict. This finding runs counter to the possible influence of *ex post* rationalization on estimates, whereby women with higher numbers of children ever born are less likely to revise their fertility ideals to a lower level (Bongaarts 1990; Casterline and El-Zeini 2007). In contrast, we find the opposite and speculate that higher-parity women are more responsive to conflict exposure than others because they have experienced the unique burdens of having multiple children in conflict zones and may already be facing resource constraints. Such an explanation is consistent with the economic and risk mechanisms linking conflict and fertility.

The next model tests for differences between rural and urban areas, which may be expected given systematic differences in wealth, resilience, and reproductive norms between such contexts in Africa (Eloundou-Enyegue and Giroux 2012; Sahn and Stifel 2003). On the one hand, rural dwellers may be more isolated in terms of markets and infrastructure (e.g., travel and communications) than urban dwellers such that violence may have a more localized impact in rural areas. On the other hand, populations in urban areas are wealthier, have better security infrastructure, and may therefore be more

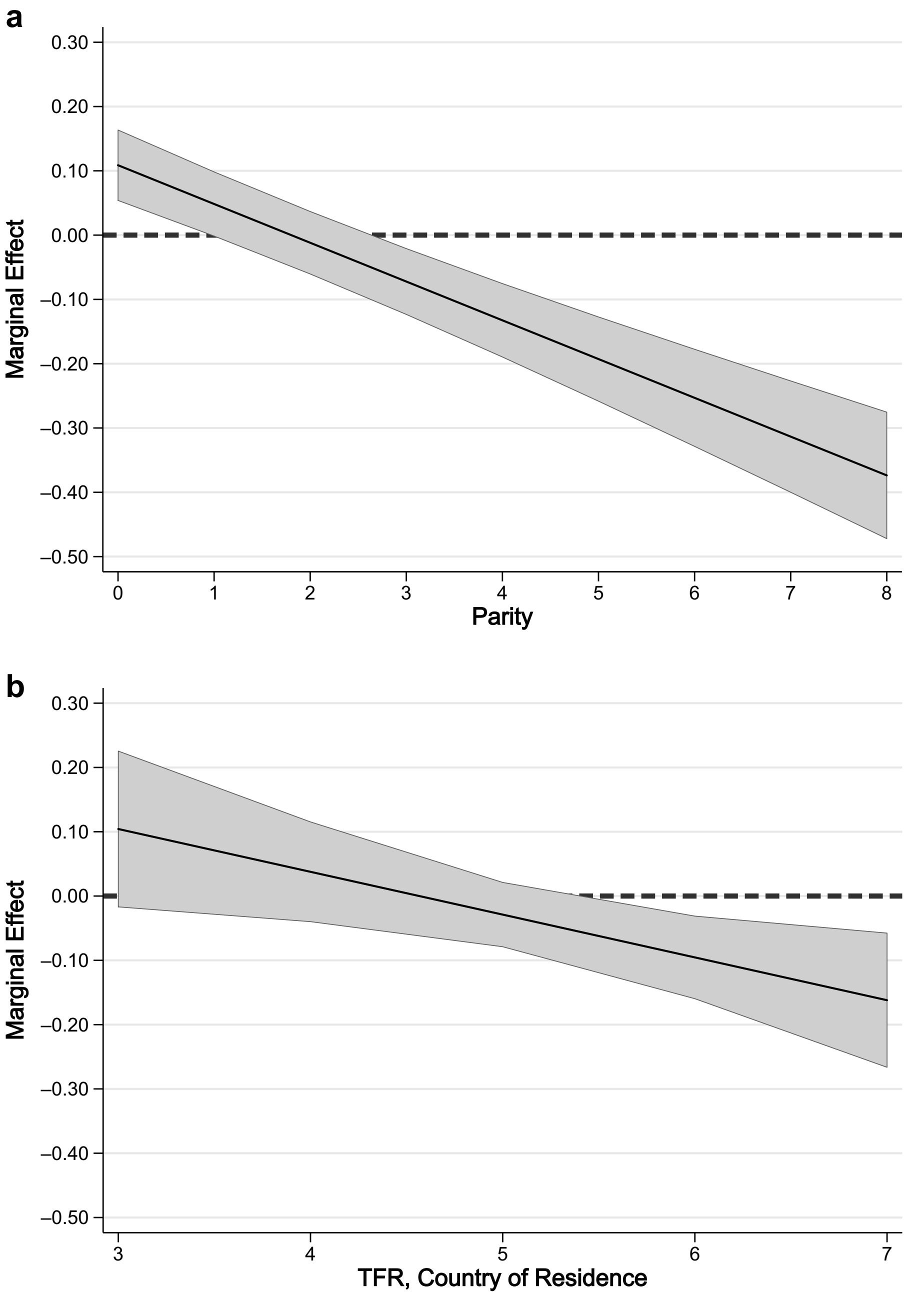

Fig. 2 Marginal effects of conflict on ideal family size, by parity (panel a) and total fertility rate of women's country of residence (panel b)

resilient in the face of conflict and violence than rural populations. The implications of exposure to violence as measured here may also vary between urban and rural areas in a more technical sense: given differences in population density and distribution, individuals in rural areas may be more likely to be personally exposed to a violent event that occurs within a given radius than an urban resident. Our results provide only limited support for these expectations. There are not statistically significant differences in conflict effects between rural and urban populations, but the point estimate of the conflict coefficient is statistically significant for the rural population (β = –0.088, p = .035) but not the urban population (β = –0.019, p = .504).

The fourth interaction model (Model 5) tests for differences in conflict effects across stages of the fertility transition, as indicated by the TFR of women's country of residence at the time of enumeration. Such differences may be expected because perceptions of control over reproduction and related norms vary across the fertility transition and may thus affect women's ability and inclination to modify their fertility (Coale 1973; Hayford and Agadjanian 2011). Overall levels of fertility may also be correlated with perceptions of children as either a net benefit or cost to the household (Caldwell 1976), which is an important determinant of how women may respond to conflict-induced economic pressures. The results indicate that conflict effects vary systematically across the sample, with the strongest negative effects occurring in high-fertility contexts. Here it is important to keep in mind that the observed TFR ranges from 3.3 to 7.2 across the sample (mean = 5.3), with the corresponding marginal effects of conflict plotted in panel b of Fig. 2. Across our target population, negative conflict effects are concentrated in the highest-fertility (and usually least-developed) contexts, whereas conflict has null effects in the lowest-fertility (and usually most-developed) places.

As an alternative means of examining contextual variation in conflict effects, we also estimate and report country-stratified models of ideal family size. We present this extensive set of results in the online appendix (Table A4) but note that our findings show a nontrivial degree of heterogeneity across countries in the sample. Although in most cases the effects of conflict are negative or not statistically significant, in three countries—Angola, Cameroon, and Rwanda—we observe conflict-related increases in ideal family size. The implication is that the estimates of our global model cannot be generalized across all countries in the sample.

Conflict and Fertility Outcomes

The second set of analyses examines the association between exposure to conflict and recent fertility outcomes, operationalized as the odds of having a child in the year prior to the survey. Following a similar sequence of models as our analysis of preferred family size, we first compare the likelihood of recent fertility among women exposed to any conflict events in the prior 36 months with their non-exposed counterparts (Model 6, Table 4). We find that exposure to conflict is negatively associated with fertility: according to point estimates (odds ratio (OR) = 0.943), conflict-exposed women were approximately 6% less likely to have a child in the 12 months prior to the survey than women residing in areas without armed conflict events over the previous three years. With control variables held at their means, this estimated effect translates into an approximately 1.0 percentage point decline in the predicted annual probability of childbearing. When applied to our large target population, this relatively small change in probability may result in an absolutely large number of births that do not occur or are delayed. As with our model of ideal family size, the negative effect of conflict on recent

Table 4 Logistic regression model predicting any birth in prior year

Variable	Model 6 β (SE)
Conflict (yes)	–0.0582*
	(0.0250)
Age	0.3783***
	(0.0057)
Age, Squared	–0.0091***
	(0.0001)
Education (ref. = none)	
Incomplete primary school	–0.0827***
	(0.0178)
Complete primary school	–0.0872***
	(0.0186)
Children Ever Born	0.4821***
	(0.0047)
Type of Residence (ref. = urban)	
Rural	0.1538***
	(0.0177)
Province Fixed Effects	Yes
Region-Specific Linear Time Trend	Yes
Pseudo-R^2	.1537

Note: Standard errors are clustered on DHS communities.

$*p < .05$; $***p < .001$

fertility that we observe runs counter to the conflict-increasing effect of high birth rates hypothesized by some scholars and to the potential upward bias from selective conflict-related out-migration (Brunborg and Urdal 2005; Urdal 2006). This pattern suggests that our estimates are unlikely to be driven by reverse causality or selection bias and, if anything, will be conservative.

The next set of models tests for variation in conflict effects across demographic groups of interest, motivated by a similar set of expectations as our earlier models of fertility preferences. We first examine differences in conflict effects by women's educational attainment (Model 7, Table 5). The results show that exposure to conflict is not significantly associated with changes in recent fertility among women with no education, but conflict effects are statistically different and lower among women with an incomplete or complete primary school education. The net effects of conflict exposure among these latter two groups are β = –0.112 (p = .007) and β = –0.079 (p = .014), respectively. These results differ substantively from the models of ideal family size, which show negative conflict effects concentrated among women without formal education.

The second interaction model (Model 8, Table 5) tests for differences in conflict effects by parity. Exposure to conflict is associated with reductions in fertility among

Table 5 Logistic regression models predicting any birth in prior year

Variable	Model 7 β (SE)	Model 8 β (SE)	Model 9 β (SE)	Model 10 β (SE)
Conflict (yes)	0.0468	–0.2990***	–0.0390	–0.1232
	(0.0404)	(0.0322)	(0.0353)	(0.1737)
Conflict (yes) × Incomplete Primary School	–0.1591**			
	(0.0530)			
Conflict (yes) × Complete Primary School	–0.1263**			
	(0.0473)			
Conflict (yes) × Children Ever Born		0.0757***		
		(0.0072)		
Conflict (yes) × Rural Residence			–0.0368	
			(0.0468)	
Conflict (yes) × National TFR[a]				0.0120
				(0.0311)
Age	0.3783***	0.3784***	0.3783***	0.3783***
	(0.0057)	(0.0057)	(0.0057)	(0.0057)
Age, Squared	–0.0091***	–0.0091***	–0.0091***	–0.0091***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Education (ref. = none)				
Incomplete primary school	–0.0682***	–0.0828***	–0.0825***	–0.0828***
	(0.0186)	(0.0177)	(0.0178)	(0.0178)
Complete primary school	–0.0741***	–0.0832***	0.0870***	–0.0873***
	(0.0195)	(0.0186)	(0.0187)	(0.0186)
Children Ever Born	0.4821***	0.4750***	0.4821***	0.4821***
	(0.0047)	(0.0047)	(0.0047)	(0.0047)
Type of Residence (ref. = urban)				
Rural	0.1538***	0.1515***	0.1587***	0.1533***
	(0.0177)	(0.0177)	(0.0188)	(0.0177)
Province Fixed Effects	Yes	Yes	Yes	Yes
Region-Specific Linear Time Trend	Yes	Yes	Yes	Yes
Pseudo-R^2	.1537	.1542	.1537	.1537

Note: Standard errors are clustered on DHS communities.

[a] TFR = total fertility rate.

$^{**}p < .01$; $^{***}p < .001$

women with few or zero children, but this association is offset and eventually reversed as parity increases. For example, conflict is associated with a 16.8% increase in the odds of recent fertility among women with six children (see also panel a, Fig. 3). These findings would suggest that conflict-induced fertility declines among lower-parity women—who appear to increase their ideal family size when exposed to conflict—are in large part due to involuntary or indirect factors, such as delayed marriage, spousal

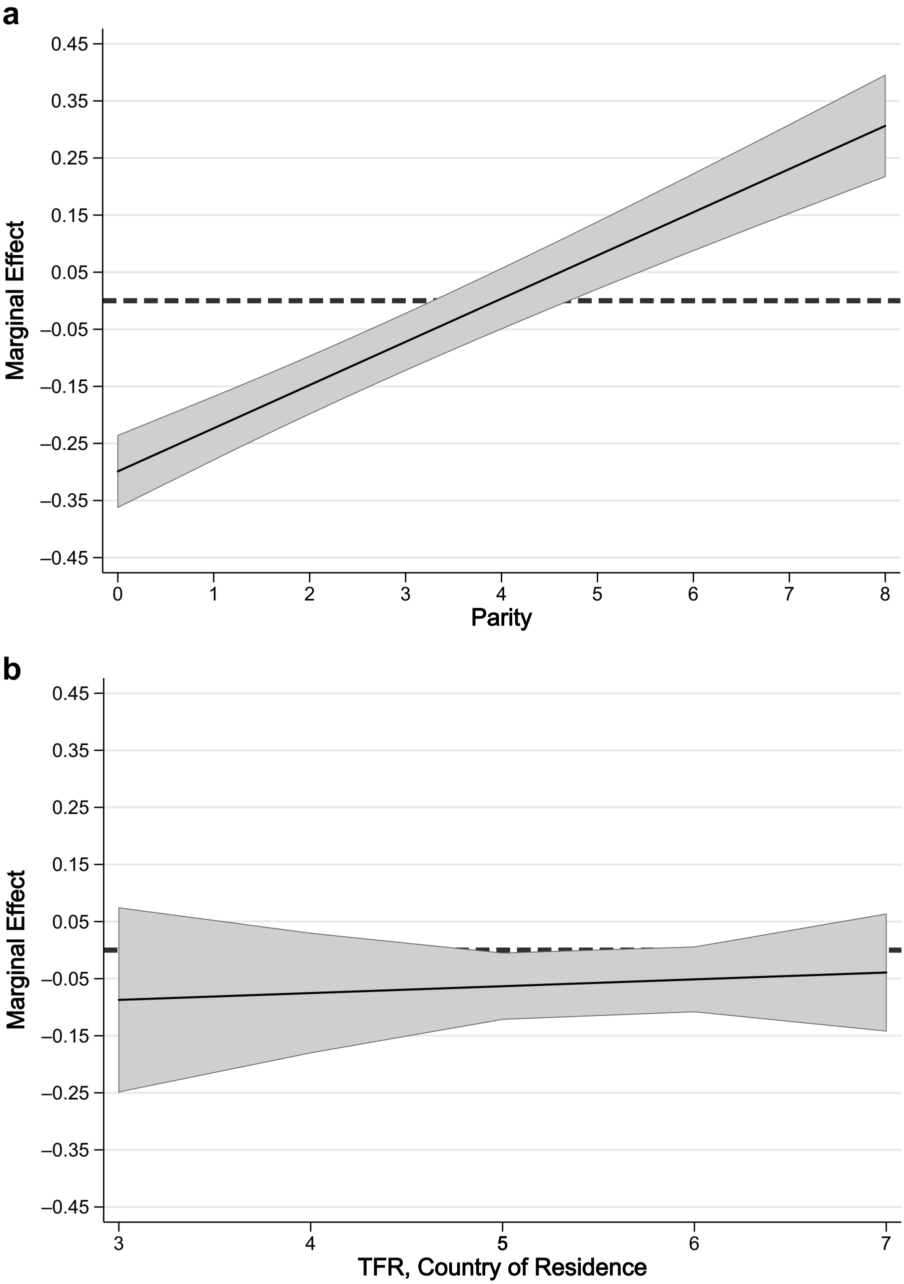

Fig. 3 Marginal effects of conflict on any birth in prior year, by parity (panel a), and total fertility rate of women's country of residence (panel b)

separation, or malnutrition-related infecundity. We explore a number of these pathways in further analyses reported later.

Third, we examine differences between rural and urban areas. Consistent with models of ideal family size, results show nonsignificant differences in conflict effects between rural and urban populations. However, the results also suggest that the effects of conflict are null or quite weak in urban areas (β = –0.039, p = .269), whereas among rural populations, we find a substantively and statistically significant negative association (β = –0.076, p = .022). Exposure to conflict is associated with a 7.3% reduction in rural women's odds of giving birth within the last year.

We next test for differences in conflict effects across stages of the fertility transition, as proxied by the national TFR. In contrast to the model of ideal family size, we find no evidence of systematic variation in conflict effects on fertility according to the broader fertility context (panel b, Fig. 3). Finally, we again estimate country-stratified models as an alternative means of testing for heterogeneity across contexts (Table A5 in the online appendix). We find no instances in which the direction of conflict effects differs from the main model (i.e., is positive), but the coefficient estimates are not statistically significant for many countries.

Mechanisms

We further explore our findings by analyzing the relationship between exposure to conflict and three outcomes that correspond to plausible pathways between conflict and changing reproductive goals and outcomes. The first of these models examines the relationship between conflict exposure and the probability that one or more of a woman's children died during the same 36-month period over which we measure local conflict events (Model 11, Table 6). The results show a nonsignificant association between conflict and child deaths, which provides provisional evidence that most women exposed to conflict are not experiencing the child deaths that might spur a replacement effect. This finding is consistent with the results of the overall models of fertility goals and outcomes, which were negatively associated with conflict and thus contrary to what would be observed if replacement effects were strong.

The second model examines the relationship between exposure to conflict and women's marital status (Model 12, Table 6), differentiating between currently married and unmarried women. We find that conflict exposure is associated with a reduction in the odds that a woman was married at the time of the survey and thus an increase in the odds that they have never married or are widowed, separated, or divorced. Point estimates suggest that conflict exposure is associated with an approximately 7.4% reduction in the odds of being married at the time of the survey. This decline in marriage may be driven by conflict-related delays in marriage, union dissolution, spousal mortality, or some combination of these processes. Moreover, the negative association between conflict exposure and marriage is consistent with many of our findings already presented—most prominently, the negative association between conflict exposure and observed fertility. Given that a majority of women have children within marriage in most parts of sub-Saharan Africa (Clark et al. 2017; Smith-Greenaway and Clark 2018), a delay or decline in fertility will result in fewer recent births. The negative association between conflict exposure and marriage also helps explain the inconsistency in the direction of conflict effects on ideal family size (positive) and recent fertility (negative) among women without children. Because such women are most likely to be single and never married, conflict-related delays in marriage would reduce their likelihood of recently having children despite increased ideal family size.

Table 6 Logistic regression models predicting child deaths, marital status, and contraceptive use

Variable	Model 11 Child Death β (SE)	Model 12 Married β (SE)	Model 13 Current Contraceptive Use β (SE)
Conflict (yes)	–0.0324	–0.0764**	–0.0097
	(0.0412)	(0.0254)	(0.0277)
Age	0.1552***	0.7319***	0.3722***
	(0.0070)	(0.0042)	(0.0047)
Age, Squared	–0.0034***	–0.0103***	–0.0059***
	(0.0001)	(0.0001)	(0.0001)
Education (ref. = none)			
Incomplete primary school	–0.0724**	–0.3504***	0.5462***
	(0.0258)	(0.0191)	(0.0193)
Complete primary school	–0.3554***	–0.8217***	0.8448***
	(0.0301)	(0.0199)	(0.0215)
Children Ever Born	0.3086***	(excluded)	0.1497***
	(0.0051)		(0.0034)
Type of Residence (ref. = urban)			
Rural	0.1980***	0.4725***	–0.4396***
	(0.0285)	(0.0183)	(0.0199)
Province Fixed Effects	Yes	Yes	Yes
Region-Specific Linear Time Trend	Yes	Yes	Yes
Pseudo-R^2	.1027	.2934	.1784

Notes: Standard errors are clustered on DHS communities. Contraceptive use is defined to include only modern methods.

$^{**}p < .01$; $^{***}p < .001$

Third, we analyze the relationship between conflict exposure and current modern contraceptive use (Model 13, Table 6). We find no evidence of a relationship between recent exposure to armed conflict and the odds that a woman was using contraceptives at the time of the survey, suggesting that conflict events we observe did not systematically affect contraceptive use.[16] This result is consistent with our overall finding of a negative association between conflict and recent fertility given that conflict-induced disruptions to contraceptive use would have led to an increase rather than decrease in births. Overall, then, this analysis of hypothesized mechanisms is consistent with results from the main models: it suggests that delays and declines in marriage may explain at least some of the conflict-induced reductions in reproductive goals and fertility.

[16] Women who recently had children are less likely to be using contraception because of ongoing breastfeeding. We therefore estimate an identical model of current contraceptive use limited to the sample of women who did not have a child within the past 12 months (Model A5, Table A6; online appendix). We also estimate a comparable model that predicts unmet need for family planning (Model A6, Table A7). We find no statistically significant conflict effects in either model.

Robustness Checks

In addition to examining potential causal mechanisms, we conduct a series of supplemental analyses to evaluate whether our substantive conclusions about the effects of conflict on fertility goals and outcomes are sensitive to key methodological decisions. We summarize the results of these tests for our analyses of ideal family size and recent fertility, respectively, and we include a full set of results—including from additional supplemental analyses—in the online appendix.

Our finding that exposure to armed conflict is negatively associated with ideal family size is supported by a parallel logistic regression model predicting the desire for another child (Model A7, Table A8; online appendix), which suggests that our findings are not driven by our choice among these related outcome variables. We then estimate a series of linear regression models of ideal family size (Table A9) among a sample restricted to women within 10 years of their first marriage[17] (Model A8), using an ordinal rather than binary measure of conflict exposure (Model A9), and measuring conflict exposure to also include nearby riots and violence against civilians (Model A10). These models yield results consistent with the main specification and suggest that exposure to multiple conflict events has particularly strong effects. Additional models of ideal family size employ binary measures of conflict exposure using alternative radii (50 km and 100 km, Models A11 and A12) and time periods (24 months and 48 months, Models A13 and A14) to measure conflict exposure; all results are generally consistent with the main specification. The one exception is that the estimated coefficient on the conflict variable falls below conventional thresholds for statistical significance when measured over a 24-month lookback. Finally, we replicate our main specification using an alternative conflict data set from the Uppsala Conflict Data Program (UCDP) (Sundberg and Melander 2013), and results also show a negative association between armed-conflict exposure and ideal family size (Model A15). The point estimate of this model is larger in absolute magnitude than our main results using ACLED, which suggests that our estimates for this outcome may be conservative.

The second set of robustness checks largely parallels the aforementioned analysis but for models of recent fertility (Table A10). We first reestimate our main specification using an ordinal measure of conflict exposure (Model A16). The point estimates of all conflict variables are negative, but only the indicator of exposure to one conflict event is statistically significant. We then employ a more expansive definition of conflict as described earlier (Model A17) and use alternative radii (50 km and 100 km, respectively, in Models A18 and A19) and periods (24 months and 48 months, respectively, in Models A20 and A21) for measuring conflict exposure. The models using a 50-km buffer and a 24-month lookback period to measure exposure both yield results that are consistent with the main findings, although the coefficient estimates are only marginally significant. The diminished precision is not necessarily surprising: the larger spatial radius represents a conservative test of conflict effects, and a 24-month lookback period represents a short time window when modeling recent fertility given a nine-month gestational period.

[17] Some analyses of fertility ideals have focused on this subpopulation under the assumption that such women's ideal family size is more dynamic and less prone to *ex post* rationalization (Bongaarts and Casterline 2013).

However, this logic is inconsistent with the null conflict effect when using a 48-month lookback period, which suggests that our findings from the main model should be interpreted with some caution. The models employing a broader definition of conflict and 100-km radius for measuring conflict each find nonsignificant conflict effects, which is in line with our argument that proximate exposure to armed conflict (as distinct from other forms of unrest) is most important for determining reproductive outcomes. Finally, we again replicate our main specification using UCDP data (Model A22), but here the results suggest nonsignificant conflict effects. This finding also suggests the need for some caution when interpreting the main estimates of conflict effects on fertility.

Discussion and Conclusion

In this study, we provide new evidence of how conflict has influenced reproductive goals and outcomes since the early 2000s across 25 sub-Saharan African countries. We build on prior work in this area by simultaneously zooming out to produce estimates across and within a geographically and temporally broad population, and zooming in to measure exposure to particular types of conflict events at a high spatial and temporal resolution. These localized measures correspond better to the periods and spaces in which conflict impacts are experienced, and thus affect fertility, than the coarse measures used in much of the existing literature.

Our approach yields results that significantly extend substantive knowledge about whether and how reproductive goals and outcomes are affected by conflict. We highlight three main conclusions. First, localized exposure to armed conflict is associated with reductions in both preferred family size and the probability of recent childbearing among women in the population we study. Conflict-exposed women have diminished reproductive goals and may also have fewer children—at least in the short run. The correspondence between these two findings suggests that, on average, conflict-induced fertility declines may be driven by processes that are intentional (e.g., preventing pregnancies because of economic concerns) or that affect reproductive goals and behaviors simultaneously (e.g., changes in relationship status). However the estimates of average conflict effects are modest in magnitude. Exposure to conflict influences reproductive goals and outcomes but not dramatically when averaged across our entire population of interest. This conclusion highlights the need to also consider other plausible ways that households may adapt to conflict (Williams 2013).

Second and relatedly, we find systematic variation in conflict effects between demographic groups and across contexts. The negative effects of conflict on ideal family size are concentrated among women with no education, at higher parities, and who reside in rural areas or countries early in the fertility transition. This set of findings is in line with a scenario in which the poorest are most vulnerable to conflict and conflict-induced resource constraints push women to desire smaller families. Such changes in reproductive preferences are likely correlated with other coping behaviors and point to a need for targeting interventions to the most vulnerable subpopulations (Korf 2004). Models of recent childbearing show that conflict also reduces fertility among rural women. In contrast to the models of ideal family size, however, conflict is associated with reductions in births among women who completed some or all of primary school and who are at lower parities. Although declines in ideal family size are not necessarily contradictory to recent childbearing, these findings suggest that women without education or at high parities may have been unable to realize conflict-related changes in reproductive goals. The implication for policy-makers is that unmet need for contraceptives, or a lack of empowerment to make reproductive decisions, may be exacerbated in conflict settings (McGinn et al. 2011).

Third, our parallel analyses of three plausible causal mechanisms show that conflict may lead to delays or a reduction in marriage, which is in line with a long historical record of demographic responses to unrest (Caldwell 2004). These changes are consistent with the overall negative associations between conflict and reproductive goals and outcomes that we observe. They may also explain corollary findings, such as the conflict-related decline in recent fertility among low-parity women, who are most likely to be unmarried. The policy responses to conflict-related delays or declines in marriage are not straightforward and will depend on the root cause of these changes (e.g., changing economic conditions, mobilization of men into armed groups). This finding nonetheless highlights the broader disruptions to social life caused by insecurity.

We find no significant associations between conflict exposure and either recent child deaths or contraceptive use and therefore find little evidence of replacement-effect and contraceptive-disruption pathways. These results are consistent with our overall findings: the latter two mechanisms would lead to increases rather than the observed decreases in fertility. Notably, we do not empirically assess whether conflict-related increases in sexual violence operated as a mechanism in our study because the requisite data were not available for a nontrivial share of our analytic sample. However, an analysis of many of the same DHS samples included in our study shows that conflict exposure increases women's risk of experiencing intimate partner sexual violence (Østby 2016). Read in parallel with our findings, this study suggests that conflict may also reduce reproductive goals and fertility by adversely affecting intrahousehold dynamics. With that said, Østby (2016) did not measure the effects of similar violent acts by combatants and other nonpartners in conflict settings, which is an important topic for future research.

Although many of our results are robust to a suite of alternative measurement and analytic decisions, the estimates of conflict effects on recent fertility were noticeably less consistent across sensitivity tests than our analysis of ideal family size. Conflict effects on recent childbearing may be weaker than on reproductive goals given heterogeneity in women's ability to realize the latter (Tsui et al. 2017; Wulifan et al. 2016). Further supplementary analysis suggests that the relationship between conflict and recent childbearing is robust among the subpopulations in which conflict effects were initially strongest. Readers should nonetheless draw conclusions about conflict and childbearing cautiously, and this relationship should be further examined in future research. Our results support the conclusion that conflict disrupts reproduction but in a manner that will not manifest as baby booms or baby busts.

Indeed, our findings and limitations therein raise multiple avenues for additional work on this topic. For one, although we examine variation in conflict effects across major subpopulations of interest, the harmonized data and methods we employ are well-suited to examine other socioeconomic and contextual modifiers of conflict effects. Examples include access to contraceptives, gender inequality, and the historical frequency of conflict (e.g., chronic insecurity vs. recent outbreaks of violence). The heterogeneous results of our country-specific models in particular suggest attention to macro-level modifiers is merited. By employing our harmonized approach to such questions rather than comparing results of case studies, researchers can be confident that observed cross-national differences (or similarities) reflect substantive moderating processes and not methodological artifacts.

Future research should also work to further explore the causal pathways from conflict exposure to reproductive goals and outcomes. Although our analysis of the relationship between conflict and plausible causal pathways provides valuable evidence to interpret our main findings, they are nonetheless limited by the cross-sectional nature of the DHS and the limited socioeconomic data collected in those surveys. Unpacking mechanisms will in part require the use of rich longitudinal data sets, which allow for the establishment of proper time order of mediation processes and that include detailed information on household socioeconomic conditions over time. Other novel data sets may also be valuable in this regard. For example, the Sexual Violence in Armed Conflict (SVAC) data set (Cohen and Nordås 2014) may help demographers understand the effects of conflict-related sexual violence on reproductive outcomes, which we cannot empirically study here.

Additional work is also needed to explore the temporal dimensions of fertility responses to conflict, such as whether conflict-induced fertility declines are persistent or followed by post-conflict rebounds among affected individuals (Agadjanian and Prata 2002; Agadjanian et al. 2011; Lindstrom and Berhanu 1999). Decomposing the quantum and tempo effects of conflict on fertility can enhance knowledge of the processes that explain this relationship and improve estimates of the demographic consequences of conflict over the long run. Panel data are again best suited for such analysis, but the DHS retrospective birth records can also be leveraged for these purposes. These and other extensions of the literature can significantly advance knowledge of how conflict and similar shocks affect human population dynamics. Given the persistently high levels of conflict across sub-Saharan Africa and other regions of the world, continued attention to the second-order consequences of violence will remain necessary to fully understand the impacts of insecurity and to enhance policy-makers' and practitioners' ability to assist conflict-affected populations.

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Authors' Contributions All authors contributed to the study concept and design. Data management, data analysis, and the preparation of the manuscript were led by Brian Thiede with significant contributions from all authors. All authors read and approved the final version of the manuscript.

Data Availability All data sets used are publicly available from the DHS, ACLED, and UCDP. Programming code is available upon request from Brian Thiede.

Compliance With Ethical Standards

Ethics and Consent The authors report no ethical issues.

Conflict of Interest The authors declare no conflicts of interest.

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