



Contraceptive Choice as Risk Reduction?

The importance of local violence for uptake of female sterilization in Colombia

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Abstract

Altered childbearing behavior has been observed in many settings of violent conflict, but few studies have addressed fertility control. This is the first study to empirically investigate the relationship between local conflict and uptake of sterilization, the only contraceptive method that reflects a definitive stop to childbearing. It is based on the case of Colombia, a middle-income, low-fertility and long-term conflict setting. The study built on a mixed methods approach, combining survey and conflict data with expert interviews. Fixed-effects regressions show that local conflict was generally associated with an increased sterilization uptake. The interviews suggest that women may opt for sterilization when reversible methods become less accessible because of ongoing violence. Since sterilization is a relatively available contraceptive option in Colombia, it may represent a risk-aversion strategy for women who have completed their fertility goals. These findings can enlighten research and programs on fertility and family planning in humanitarian contexts.

Keywords: Armed conflict; contraception; sterilization; reproductive health; Colombia

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Introduction

Altered fertility behavior has been observed in many settings of armed conflict since World War II. The results have been mixed, suggesting both positive and negative effects on childbearing. Proximate determinants to fertility such as family planning have gained less attention in empirical research. Observing women's fertility control during conflict may indicate how a violent social context shapes both reproductive autonomy and fertility desires.

Two previous studies have directly measured exposure to armed conflict violence to address fertility control responses, in settings that vary considerably in terms of contraceptive and conflict profiles. In the Nepalese civil war, first contraceptive uptake increased in relation to violent and political events of conflict (N. E. Williams et al., 2012). In Colombia, exposure to local conflict was linked to a decrease in the use of short- and long-term reversible modern contraception, partially reflecting an increased fertility demand but possibly also a reduction in access due to health system failure (Svallfors & Billingsley, 2019). Exposure was not linked, however, to a shift in women's childbearing preferences (Svallfors, 2020a). None of the available studies have distinguished between fertility postponement, spacing or limiting.

Female sterilization (hereafter called sterilization; male sterilization is referred to as vasectomy) is the only contraceptive method that reflects a definitive and virtually irreversible stop in fertility. This study is the first to explore stopping behavior in conflict, by measuring how local violence relates to the uptake of sterilization. This is done in the case of Colombia, a middle-income country where contraceptive knowledge is well-established and contraceptive use is generally socially accepted. Sterilization is the most common family planning method, but past literature has only studied the use of reversible methods (Svallfors & Billingsley, 2019), which omits an important part of how family planning decisions and opportunities have played out during war. Whereas use of other modern contraceptive methods may reflect changes in postponement, spacing or stopping, sterilization is the only method that decisively reflects the end of women's childbearing.

The study focuses on the case of Colombia, which is a useful case study for four primary reasons. First, Colombia has had a unique history of long-term conflict since the 1960s with extensive tempo-spatial variation in conflict violence intensity. Second, women's experiences from war was given an unprecedented focus in the Havana Peace Accords adopted 2017 between the Colombian government and the left-wing guerrilla FARC (Gindele et al., 2018; Salvesen & Nylander, 2017), but there is still little research about how war has affected women's reproductive health and rights. Third, analyzing Colombia helps us better understand the relationship between war and family planning in a replacement fertility context (Colombia's total fertility rate hovers around two children per woman on average (DHS, 2000, 2005, 2011, 2017)), while much of the existing literature has focused on high-fertility settings. Fourth, Colombia is one of the few settings where collection of nationally representative survey data has gone on virtually uninterrupted despite ongoing conflict.

Relationships between conflict and sterilization uptake

As a means of fertility control, sterilization uptake may link both positively and negatively to armed conflict, and uptake may be either voluntary or coerced. This yields four separate hypotheses for the study, displayed in Table 1 and presented below.

Table 1 Hypotheses

<i>Hypothesis 1. Reduced demand for sterilization</i>	<i>Hypothesis 2. Increased demand for sterilization</i>
Losing kin Reduced sexual activity Anticipating re-partnering Reduced access to health care	Permanently avoid unwanted births Risk reduction Reduced access to reversible contraception
<i>Hypothesis 3. Involuntary decline in sterilization</i>	<i>Hypothesis 4. Increase in coerced sterilization</i>
Reduced access to health care Gender-based violence Reduced reproductive autonomy	Gender-based violence Reduced reproductive autonomy

Hypothesis 1. Reduced demand for sterilization

Hypothesis 1 suggests that the voluntary uptake of sterilization declines in armed conflict.

Conflict tends to increase mortality, including infant and child mortality (Elveborg Lindskog, 2016; O'Hare & Southall, 2007). Losing family members may lead to a substitution effect by which women want to have more children (Rutayisire et al., 2013).

Women's demand for sterilization may decrease if sexual unions are interrupted. Men's morbidity, mortality, and migration related to conscription in conflict could disrupt unions, strengthen fertility intentions, or increase the urgency to have a child. In violent areas women's fertility trajectories may be altered anticipating the violent death of a partner (Jok, 1999; Navarro Valencia, 2009). Re-partnering is often linked to parity progression to 'confirm' the relationship (Schmeer & Hays, 2017; Vikat et al., 1999). Women who anticipate re-partnering due to the partner loss may avoid sterilization to enable future childbearing (Bumpass et al., 2000; Godecker et al., 2001). Childbearing across partnerships may follow a 'marriage squeeze' due to conflict-driven excess male mortality (Jones & Ferguson, 2006).

Evidence from Colombia suggest a positive fertility response to local violence in Colombian rural areas during 2000–2010, discussed as reflecting higher mortality levels and reduced access to health care and protection (Castro Torres & Urdinola, 2018). Past research has also shown a remarkable stability in fertility preference despite local violence (Svallfors, 2020a). Svallfors and Billingsley (2019) found that conflict reduced the probability of using reversible modern contraception, partially because women want more children soon, which may reflect a replacement effect or union uncertainty. But it is also likely that health care system deteriorations decreased access to contraceptive goods.

Hypothesis 2. Increased demand for sterilization

Hypothesis 2 suggests that the voluntary uptake of sterilization increases in armed conflict.

Women faced with conflict may want to sterilize instead of using reversible contraception to definitely and permanently reduce births because of deteriorating social conditions, such as a loss of security, certainty, economic opportunities, family, relationships social support, etc. (Chi et al., 2015a, 2015b; Ana M. Ibáñez et al., 2011; Speizer, 2006). This does not, however, necessarily reflect a change to women's childbearing preferences (Svallfors, 2020a).

In contexts of protracted violence, poverty and gender inequality, sterilization can be an instrument to reduce risk of additional births and a grasp for control in a position of vulnerability (Dalsgaard, 2004). Not least since predicting access to health care as well as costs and benefits of children may be more difficult due to the threat of harm and instability (Montgomery, 2000; Rangel et al., 2020). Women may opt for sterilization if access to reversible contraception becomes more unstable (Svallfors & Billingsley, 2019) to avoid unintended births, which has been linked to post-partum uptake of long-term and permanent contraceptive methods in Colombia (Batyra, 2020). Exposure to conflict-related sexual violence has been substantially present in Colombia (Kreft, 2020) and may also create a demand for sterilization. When choosing between different contraceptive methods, sterilization may be perceived as the most reliable option in an otherwise uncertain situation.

The evidence from psychological and economic research on risk preferences after political and natural catastrophes is mixed, suggesting both risk averse (Cameron & Shah, 2014; Cassar et al., 2017; Kim & Lee, 2014; Sacco et al., 2003) and risk tolerant (Eckel et al., 2009; Voors et al., 2012) responses. Post-crisis risk preferences tend to vary by gender, with men being more risk tolerant and women being more risk averse (Hanaoka et al., 2018; Lerner et al., 2003; Weber et al., 2002). Women's contraceptive choice could thereby reflect a risk-averse response to violent conflict.

Health system failures may occur in conflict because of relocated resources to military expenses (O'Hare & Southall, 2007), damaged infrastructure, limited human resources, weak management, increased difficulties in coordination among non-governmental organizations (Iqbal, 2010, pp. 81–82; McGinn et al., 2011), and direct attacks on health care professionals, facilities and shipments (Franco et al., 2006; ICRC, 2011). If women's access to health care and reversible contraception diminishes, as described above, they may opt for sterilization which only requires one visit to a health care facility. The same may follow if women's economic prospects are worsened, since conflict tends to create poverty traps (Ana María Ibáñez & Moya, 2010).

Previous literature show support for an increase in general fertility control due to conflict. According to Potter et al. (1976), the rapid fertility transition in Colombia during the 1960s may have been driven by conflict-related migration from rural to urban areas. Williams et al. (2012) found that exposure to conflict had a positive effect on the first contraceptive uptake in Nepal, attributed to a decreased desire for children. Evidence from Sub-Saharan Africa indicates that women want to take up contraception if made available in conflict or post-conflict environments (Casey et al., 2013; Casey & Tshipamba, 2017; Orach et al., 2015).

Hypothesis 3. Involuntary decline in sterilization

Hypothesis 4. Increase in coerced sterilization

Hypothesis 3 postulates an involuntary decline in sterilization uptake, whilst hypothesis 4 an increase in coerced sterilization. The mechanisms are largely the same, except that the reduced access to health care described above may also create an involuntary decline in uptake if women cannot choose sterilization as their preferred method.

Multiple forms of gender-based violence (GBV) tend to increase in war (Kreft, 2020; La Mattina, 2017; Østby et al., 2019; Svallfors, 2020b; Wirtz et al., 2014). GBV is strongly associated with reproductive issues, such as contraceptive discontinuation, parity progression, unwanted pregnancy, miscarriage, and induced abortion (Cripe et al., 2008; Gomez, 2011; Kishor & Johnson, 2004; Pallitto et al., 2013). GBV has been linked to a reduced use of reversible contraception in Colombia (Svallfors & Billingsley, 2019). GBV could thus affect

sterilization uptake positively or negatively through reductions in women's reproductive autonomy.

Sterilizations in Colombia and elsewhere have not always been well-informed or voluntary (Folch et al., 2017; Hollerbach, 1989; Jadhav & Vala-Haynes, 2018; Rizo & Roper, 1986). Although eugenic sterilization practices have largely ceased, forced and coerced sterilizations are still performed in many parts of the world, against ethnic minorities, the disabled, and HIV positive persons (Asdown Colombia, 2013; CDR, 2014; Kendall & Albert, 2015; Miranda & Yamin, 2004; Reilly, 2015; Zampas & Lamačková, 2011). In Colombia, female soldiers in the FARC ranks have reported forced sterilization as a measure of reproductive control in exchange for participating in the guerrilla (Herrera & Porch, 2008). Forced sterilization is one form of GBV that could increase in tandem with other forms of abuse against women.

Female sterilizations in Colombia

Sterilizations have played an important part in the development of family planning programs in Colombia. It was considered illegal and immoral in most countries until 1969, when Singapore and the US state Virginia introduced the first non-eugenic, non-restrictive laws. During the 1970s, sterilization programs were introduced worldwide through national family planning initiatives, often motivated by high levels of fertility and maternal mortality. Sterilization was portrayed as a good option in developing settings with low access to reversible contraception (Nortman, 1980). It was first introduced in Colombia in 1972 by the private non-profit family planning organization Profamilia, when two medical doctors were sent to train in the United States. The initiative followed the introduction of a vasectomy program two years earlier. Both were widely available but especially aimed at the poor as a cost-effective and permanent form of avoiding unwanted pregnancies. While religious, medical and target-group opposition hindered the success of the vasectomy program, the uptake of sterilization grew large (Hollerbach, 1989; T. Williams et al., 1990).

The Colombian government sponsored its first free-of-charge sterilization program in 1979, largely as a response to the high maternal mortality rate. The program explicitly targeted women at risk of high-risk pregnancies in terms of both morbidity and mortality. A point system was introduced through which factors such as a woman's age, number of children, pregnancy intervals, nutritional status, and number of people in the household would determine their risk level. Women had to be at least 25 years old and have at least three living children to be eligible. Women at lower or medium risk would instead be offered reversible methods. Colombia's then 1,200 rural health centers and 800 local hospitals would refer the women to one of the country's 108 regional hospitals, where obstetricians, surgeons and operating room nurses newly trained by Profamilia would perform outpatient laparoscopic sterilization (Guttmacher, 1979; Rizo & Roper, 1986).

The sterilization rate was estimated to be 16 percent among married, fecund women in 1982 (Trias et al., 1987) and 18.3 percent as of 1986, at that point the most frequently used method (Hollerbach, 1989). Profamilia provided 599,018 female sterilizations between 1972 and 1988, compared to only 19,590 vasectomies (T. Williams et al., 1990). In 1986, 19 percent of women were sterilized in Colombia, representing one-third of all contraceptive use (Rutenberg & Landry, 1993). Between 1977 and 1995, the share of women who were sterilized rose from 6 to 37 percent (Parrado, 2000). By the mid-90s, sterilization was the most common contraceptive method in all of Latin America. About 16 percent used

sterilization among married, fecund women aged 20–45 in Colombia, compared to 40 percent in Brazil and the Dominican Republic and 10 percent in Peru. All else equal, Colombian women aged 20–29 or above 40 had a lower propensity for undergoing sterilization compared to ages 30–34. The uptake increased with number of children and was highest for those who had been married 5–9 years compared to lower and higher durations. There was no statistical difference between urban and rural women (Leite et al., 2004). Leite and colleagues (2004) observed that women with higher levels of education were more prone to sterilization in the mid-1990s, while Folch et al. (2017) found that women of lower educational and wealth levels were more likely to undergo sterilization compared to using reversible long-acting methods in 2005 and 2010. This difference could be due to different sample selections of the population at risk and not necessarily a period change.

From the onset, the private and public sterilization programs in Colombia specifically targeted poor women (Guttmacher, 1979) and observed differences have led to allegations of coercive sterilizations, particularly among disadvantaged groups such as young, poor, rural, Afrocolombian and Indigenous women (Folch et al., 2017). Since those groups were also more affected by local conflict, it is probable that their uptake of sterilization differed from more affluent women with respect to conflict exposure as well as access to health care.

Conflict dynamics in Colombia

Colombia has had an unusually longstanding internal armed conflict since 1964 involving the government, paramilitary groups, organized crime groups, and left-wing guerrillas such as *las Fuerzas Armadas Revolucionarias de Colombia-Ejército del Pueblo* (FARC, The Revolutionary Armed Forces of Colombia) and *el Ejército de Liberación Nacional* (ELN, The National Liberation Army).

The conflict has its roots in a decade-long unofficial civil war that started in 1948 known as *La Violencia* over ownership, clientelism, corruption and socioeconomic inequality dating back to Colonial times. Responding to a governmental vacuum in remote geographic areas, clientelism, socioeconomic injustice, and exclusion of other political views, various left-wing guerrilla movements were born in the mid-1960s. During the 1970s drug trafficking emerged in Colombia as an economic alternative to rising poverty, political corruption, and insufficient public services. Left-wing guerrillas turned to drug trafficking, extortion and kidnapping for economic and political purposes. In the following, large landowners and drug traffickers created their own right-wing paramilitary groups in the 1980s. Most of these groups were part of *las Autodefensas Unidas de Colombia* (AUC, The United Self-Defence Forces of Colombia) until it disbanded in 2006. The conflict has grown more complex over time because of state corruption and illegitimacy, protracted sociopolitical instability and intolerance, widespread drug trafficking, and judicial impunity (Bergquist et al., 2001; de Roux, S.J., 1994; Jansson, 2008).

Widespread violence in the forms of homicides, disappearances, forced displacements, use of antipersonnel mines, and kidnapping has gravely affected the Colombian people (Alzate, 2008; Franco et al., 2006). Colombia has long had the highest mortality level in the Western Hemisphere due to conflict (Garfield & Llantén Morales, 2004). More than 3,600,000 Colombians have been forcibly displaced during 1985–2005, half of which were younger than 18 years. 554,008 homicides were committed in Colombia 1975–2004, representing a mean of one homicide every half an hour and 10–15 percent of the total mortality rate. Homicide rates vary significantly across the regions of the country, reflecting the level of

regional state presence (Franco et al., 2006). The Colombian armed conflict has, in other words, been tremendously detrimental to the health of the population.

Mixed methods rationale

This study used a mixed methods rationale to generate a more comprehensive understanding of sterilization uptake in the Colombian armed conflict. Mixed methods provide strengths that offset the weaknesses of both qualitative and quantitative methods, offer a wider choice of data collection methods, help answer research questions that cannot be answered with only one method, and increase the validity of the study. In the case of contraception uptake, quantitative analyses of survey data are appropriate for identifying general patterns at the population level and statistical relationships net of confounding factors, while qualitative interview material is useful for creating a richer understanding of why these relationships exist. I used an explanatory sequential approach: the quantitative core models were developed first, after which supplementary interviews were conducted to contextualize and interpret the results as well as give insight to further statistical analyses (Curry & Nunez-Smith, 2015; Tashakkori & Teddlie, 2016; Tembo, 2014). This is also the order in which the methodological components are presented below.

Quantitative analyses

Two sets of data were combined in this study to quantitatively address the uptake of sterilization in the Colombian armed conflict.

First, six rounds of the Colombian Demographic and Health Surveys (DHS) conducted every fifth year 1990–2015 offer long-term information on women’s reproductive behavior and characteristics. The sample is nationally representative of Colombia’s female population aged 13–49, with response rates above 86 percent in all rounds¹. The DHS are primarily cross-sectional, but some indicators may be used as longitudinal. These are collected retrospectively through a calendar module of reproductive events, with detailed information about the monthly timing of events such as contraceptive method uptake. It relies on the recall of events by the respondent, but is aided by timing events in relation to one another (such as births) to increase reliability (DHS, 1991, 1995, 2000, 2005, 2011, 2017). Like in other studies of war-affected populations, there is likely a survivorship bias in the DHS sample, due to mortality, emigration and internal displacement. This could lead to an underestimation of effects since the worst-off women are not in the sample.

Second, the Uppsala Conflict Data Program Georeferenced Event Dataset (UCDP-GED) contains information 1989–2017 about events of violent conflict in which at least one person was killed, including when and where each event occurred and an estimation of how many casualties there were in each event. The information is based on news media, reports, books, etc. (Croicu & Sundberg, 2017; Sundberg & Melander, 2013). The conflict data underestimates the magnitude of violence since it does not account for all homicides, but it does include violence perpetrated by non-political actors such as narcotraffickers that is an

¹ The sampling included all regions and department of Colombia since 2005, but not the island department San Andrés y Provincia in the Caribbean or the regions Amazonía and Orinoquía (departments Amazonas, Arauca, Casanare, Guainía, Guaviare, Putumayo, Vaupes and Vichada) in the three first rounds. Women aged 15–49 were sampled for interview in all survey rounds, and since 2005 women aged 13–14 were also included.

important component in the Colombian context. Events that were unclear with regards to which month and in which administrative unit they happened were dropped from analysis. In total, 2,515 out of 4,578 observations remained.

The geography of violence in Colombia is illustrated in Figure 1 using UCDP-GED data.

The datasets were combined spatially by the lowest geographical level available in all survey rounds: the department where the respondent resided and the conflict events occurred. Respondents were only observed from when they moved to the residence at time of interview in order to correctly assign exposure.

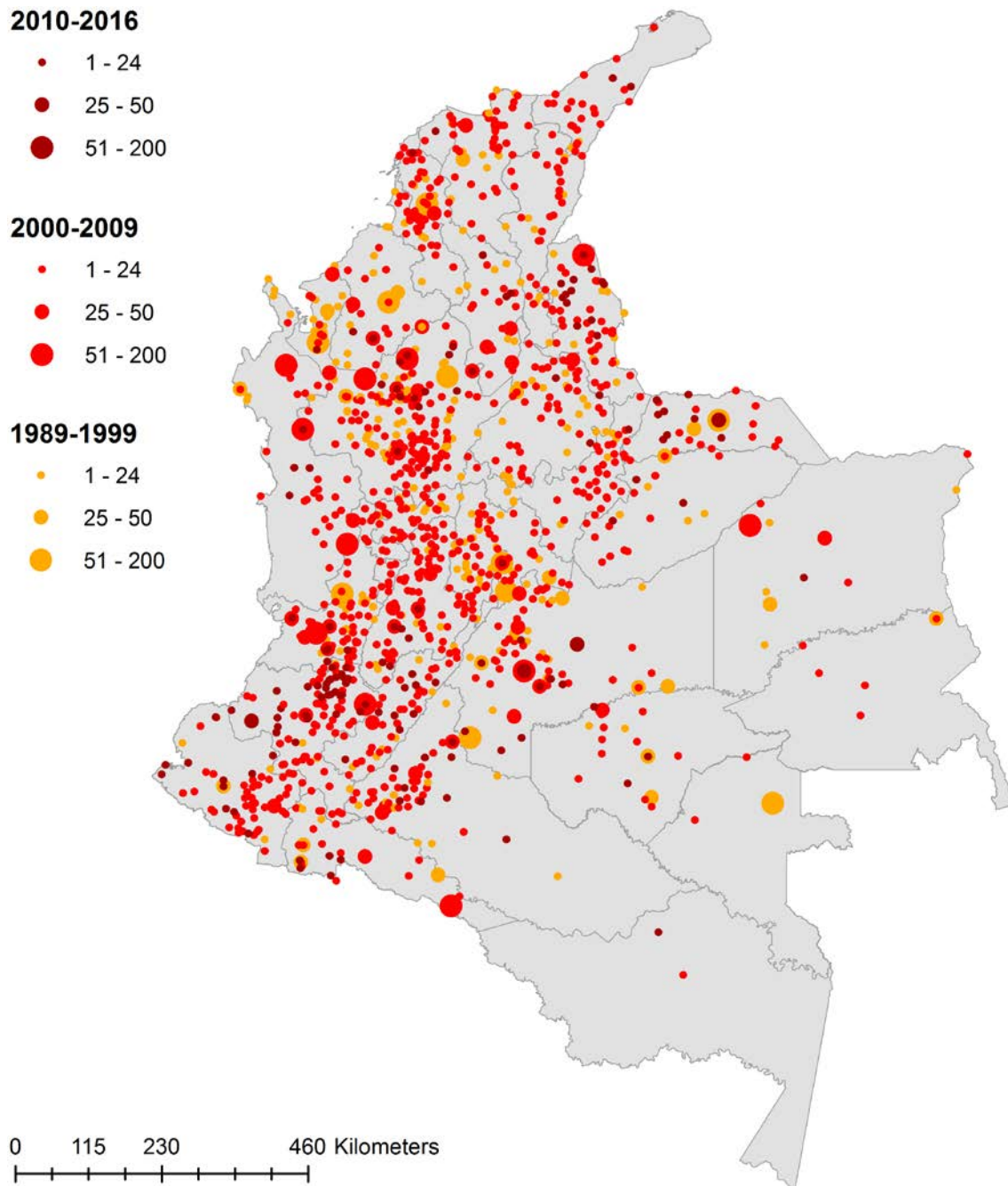


Figure 1. Prevalence of conflict events across Colombia 1989–2016. Darker colors indicate later events, and bigger size of the bubbles indicate more casualties. Source: Author's analysis of UCDP-GED data.

Independent variables

The independent variables of this study captured department-level violence related to armed conflict. Departments were the finest geographical level available in the DHS across all waves of data. Since there is no a priori standard to guide how conflict is measured, a data-driven approach was used. Numerous specifications were tested to explore the relationships to sterilization uptake: functional form (linear, categorical or dummy measures), counting deaths or events, and temporality (three-, six-, twelve- or 24-month lags before the event). Coefficients, p-values and Akaike's Information Criterion (AIC) tests were used to assess indicator performance.

Dependent variable

The outcome variable was women's month of sterilization at any time between age 13 and the age at interview. Women were asked to recall the month and year of when the procedure happened in relation to other reproductive events such as childbirth, using the retrospective calendar module in the DHS.

The share of the sample population that used sterilization as their contraceptive method at each year during the observation period is illustrated in Figure 2 with a solid line on the left Y-axis. It shows that the sterilization prevalence hovers around one fifth or one sixth throughout the observation period, with a slight increase after the turn of the millennium. The number of conflict events annually in Colombia is shown with a dashed line on the right Y-axis. It displays that conflict was most intense in the early 21st century.

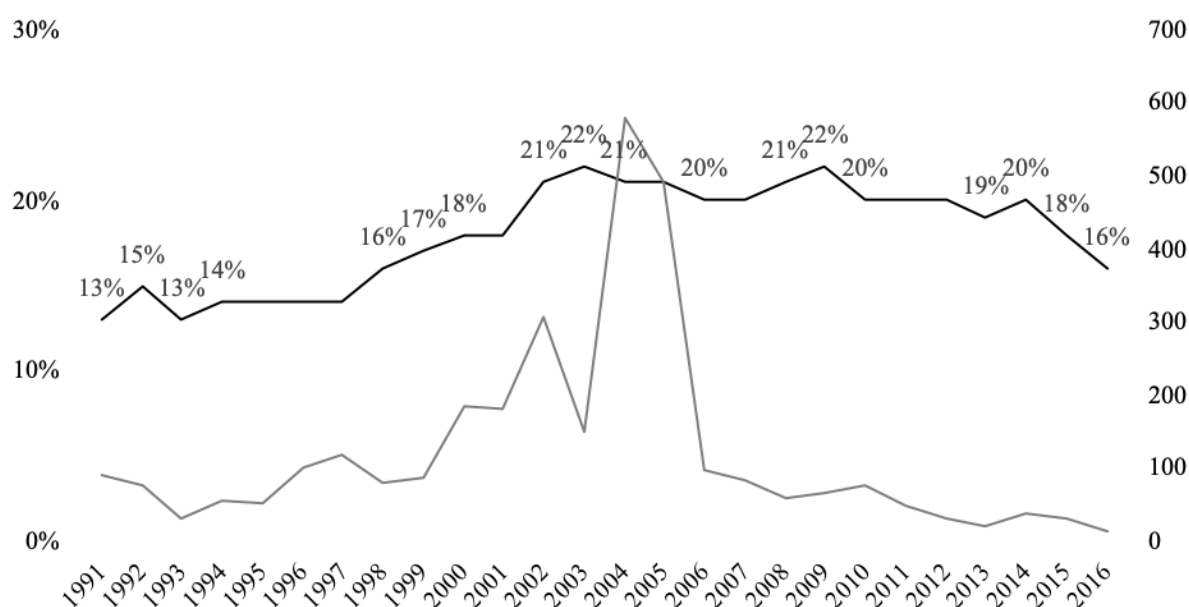


Figure 2. Share of sample population that is sterilized (left Y-axis, solid line) and number of conflict events in Colombia (right Y-axis, dashed line) by year (X-axis). Source: Author's analysis of DHS and UCDP-GED data (see 'Quantitative analyses' section).

Model and sample

A discrete-time model is useful to estimate the time-specific risk of an event (sterilization) in relation to a social phenomenon (conflict) when these occur grouped in time, in this case at month level. Since the dependent variable is measured dichotomously (either a woman is

sterilized, or she is not) linear probability regression models were used. The unit of analysis was woman-month.

The observation starts in January 1991 to enable observing conflict exposure in the preceding 24 months, at age 13, or when a woman who changed place of residence moved to the current location. Women sterilized before observation were excluded from the analysis. The observation ends at the event, age 49 or the age at interview; women sterilized after this time point were right-censored. This data structure created 11,648,913 woman-month observations from 113,403 women during the period 1991–2016.

The model estimated, for each month, whether a woman will ‘survive’ without being sterilized. Unlike other contraceptive methods, a (successful) female sterilization can generally not be reversed and after method uptake in most cases there can be no discontinuation. Transition into sterilization is an absorbing state; uptake can only happen once in the life course.

Single-level regressions assume that women behave independently from one another, but this is not the case when observations of women within the same area are likely mutually dependent. I used a fixed effects linear regression and clustered standard errors to account for regional heterogeneity, using variation within clusters to generate estimates. The cluster variable *department* measured in which of Colombia’s 33 departments the respondent resided. The department-specific error term represented the effects of omitted department characteristics. This approach compensated for contextual omitted factors that could co-determine women’s uptake of sterilization as well as the magnitude of local violence (Angrist & Pischke, 2009; Rabe-Hesketh & Skrondal, 2011, pp. 71–216; Stock & Watson, 2008).

Covariates

The models included relevant control variables that could be constructed as time-varying retrospectively. *Year* accounted for period changes. *Age*, *educational level* and whether respondent is *in education* (approximated from the age at which women would typically start and finish school in Colombia and the highest level at interview), *parity*, and *sex composition of children* represented respondent’s characteristics. Respondent’s *type of place of residence* (urban or rural) at the time of interview was included since women were only observed during the time they live in their current residence.

Descriptive statistics

Descriptive statistics of the sample population are displayed in Table 2. It shows that both the prevalence of sterilizations among women under risk, as well as the incidence of the number of sterilizations per woman-month. Chocó and Cauca have been two of the most conflict-affected departments but have among the lowest shares of sterilizations per woman-month (0.13 and 0.14 percent respectively). Bogotá is among the departments with fewer (0.14 percent) sterilizations per woman-month and has been less affected by conflict. The share of woman-months when sterilization occurred depending on department strengthens the case for a multi-level model, since patterns according to conflict are inconclusive. Summary statistics of conflict events across departments can be found in Table A in the appendix.

TABLE 2 Descriptive statistics of sample population.

	Frequency	Percent
Prevalence of sterilization		
No	92,414	81.49
Yes	20,989	18.51
Total women	113,403	100.00
Incidence of sterilization		
No	11,627,924	99.82
Yes	20,989	0.18
Total woman-months	11,648,913	100.00
	Share of women-months under risk	Share of those who experienced the event per woman-month
Age		
13–19	24.99	0.01
20–24	22.87	0.12
25–29	20.15	0.27
30–34	15.27	0.35
35–39	9.84	0.33
40–44	5.27	0.17
45–49	1.60	0.05
Urban		
No	24.99	0.18
Yes	75.01	0.18
Parity		
0	38.02	0.00
1	24.51	0.03
2	18.56	0.31
3	9.13	0.65
4	4.52	0.62
5+	5.26	0.55
Sex composition of children		
No children	38.02	0.00
All boys	19.10	0.14
All girls	17.91	0.14
Mixed	24.97	0.51
Education		
Primary	46.26	0.15
Secondary	39.64	0.21
Tertiary	14.10	0.20
In education		
No	77.86	0.23
Yes	22.14	0.01
Total woman-months	100.00	0.18

TABLE 3 Department-fixed effects linear probability model of women's uptake of sterilization in relation to armed conflict in Colombia

	Model 1.a.			Model 1.b.			Model 1.c.			Model 1.d.		
	Probability	T-value		Probability	T-value		Probability	T-value		Probability	T-value	
Age (ref. 20-24)												
13-19	0.000734***	(10.31)		0.000734***	(10.31)		0.000734***	(10.31)		0.000734***	(10.31)	
25-29	0.000048	(0.88)		0.000048	(0.88)		0.000048	(0.88)		0.000048	(0.88)	
30-34	-0.000113	(-1.45)		-0.000113	(-1.45)		-0.000113	(-1.45)		-0.000113	(-1.45)	
35-39	-0.001022***	(-9.26)		-0.001022***	(-9.26)		-0.001023***	(-9.27)		-0.001024***	(-9.28)	
40-44	-0.002969***	(-16.53)		-0.002969***	(-16.53)		-0.002969***	(-16.53)		-0.002969***	(-16.53)	
45-49	-0.004492***	(-22.05)		-0.004491***	(-22.03)		-0.004490***	(-21.99)		-0.004488***	(-21.97)	
Year	0.000058***	(11.35)		0.000058***	(11.33)		0.000058***	(11.31)		0.000058***	(11.21)	
Parity (ref. 2)												
0	-0.003404***	(-14.61)		-0.003404***	(-14.61)		-0.003403***	(-14.61)		-0.003403***	(-14.61)	
1	-0.003031***	(-14.66)		-0.003031***	(-14.66)		-0.003031***	(-14.66)		-0.003031***	(-14.66)	
3	0.003870***	(11.50)		0.003870***	(11.50)		0.003870***	(11.50)		0.003870***	(11.50)	
4	0.004028***	(11.94)		0.004028***	(11.94)		0.004028***	(11.94)		0.004028***	(11.94)	
5+	0.004035***	(11.92)		0.004035***	(11.93)		0.004035***	(11.93)		0.004035***	(11.93)	
Sex composition (ref. all boys)												
All girls	-0.000002	(-0.05)		-0.000002	(-0.05)		-0.000002	(-0.05)		-0.000002	(-0.05)	
Mixed	0.000501***	(6.07)		0.000501***	(6.07)		0.000501***	(6.07)		0.000501***	(6.07)	
Urban (ref. rural)	0.000761***	(10.22)		0.000761***	(10.22)		0.000761***	(10.22)		0.000761***	(10.21)	
Education (ref. primary or less)												
Secondary	0.001004***	(12.41)		0.001004***	(12.41)		0.001004***	(12.41)		0.001004***	(12.41)	
Tertiary	0.001619***	(12.43)		0.001619***	(12.43)		0.001619***	(12.43)		0.001619***	(12.43)	
In education (ref. not)	-0.000106*	(-2.45)		-0.000106*	(-2.46)		-0.000106*	(-2.46)		-0.000106*	(-2.46)	
Conflict events past three months	0.000012*	(2.11)										
Conflict events past six months												
Conflict events past 12 months												
Conflict events past 24 months												
Constant	-0.114315***	(-11.16)		-0.114218***	(-11.14)		-0.114025***	(-11.13)		-0.113371***	(-11.02)	
Rho	0.000080			0.000080			0.000080			0.000080		
R-square overall	0.0005			0.0005			0.0005			0.0005		

□ Significant at $p < 0.05$; □□ $p < 0.01$; □□□ $p < 0.001$; ref.—reference; $n=11,648,900$ woman-months

Results from linear probability models

Table 3 displays the results from multiple department-fixed effects models, to evaluate the effect and model contribution of various indicators of armed conflict at the department level on the uptake of sterilization.

Only the specifications measuring number of conflict events are statistically significant and are presented here. Those indicators also contribute most to model fit according to AIC. The linear estimates of conflict events on uptake of sterilization are consistently positive and statistically significant, ranging from a higher probability of sterilization by 0.000012 percentage points in the past month to 0.000003 points in the past 24 months per conflict event for each woman-month. In other words, the effects are stronger when the extent of conflict is measured in the most recent period. This suggests that conflict indeed alters women's fertility choices and/or autonomy. It is possible that the negative mechanisms are still operative, but they are not stronger than the positive effect of conflict on sterilization.

Additional measurements of conflict defined dichotomously, categorically or continuously as number of deaths (as opposed to events) are consistently insignificant as the confidence intervals overlapped with zero. Those models are available upon request. This suggests that neither the intensity of conflict in terms of fatalities, whether or not there were any deaths in the department, nor whether there was no, low or high levels of conflict are statistically related to variation in women's sterilization uptake within a region. It could reflect that the intrinsic fear of violence rather than intense violence itself is more important.

Covariates will be discussed for all models together since the differences were infinitesimal.

The uptake of sterilization is, surprisingly, higher at the youngest ages and lowest at the oldest. Since this covariate is estimated net of parity and year, it should capture life-course differences that are not related to childbearing or generational differences. There is no statistical difference between the reference group — women aged 24–29 — and those aged 25–34. The uptake of sterilization has increased over time.

Sterilization uptake is largest at second parity with mixed composition of children, confirming the hegemonic status of the one-of-each two-child norm in Colombia. There seems to be no son preference in Colombia, but rather women tend to have one child of each sex before sterilization. Further, uptake is biggest among urban residents, the highly educated, and those currently in education², suggesting that women in higher socioeconomic positions are more prone to sterilize. These are arguably the most empowered groups of women, pointing towards an increase in the demand for sterilization after the goal of two children is met, and not a reduction in women's reproductive autonomy.

To contextualize the relationship between sterilization and conflict, Figure 3 shows the predicted probabilities of sterilization at each woman-month by exposure to different levels of violence intensity in the past three months. Women-months with no exposure to conflict have a 0.18 percentage points' probability of sterilization, while the probability is 0.24 percentage points for women-months with the highest exposure observed in the sample (at 50 events)³.

The findings are largely robust to excluding women who had ever changed residence and only observing a subset of never-movers, except a loss of significance for conflict within the

² When parity is excluded from the model, the effect of whether respondent is in education at that month changes direction, possibly because women in education have fewer children.

³ The predicted probabilities span similar ranges from the minimum to the maximum of the other time frames of conflict events measured linearly.

past three months ($p=0.08$; the coefficient remained the same). The results are also robust to using logistic instead of linear regression.

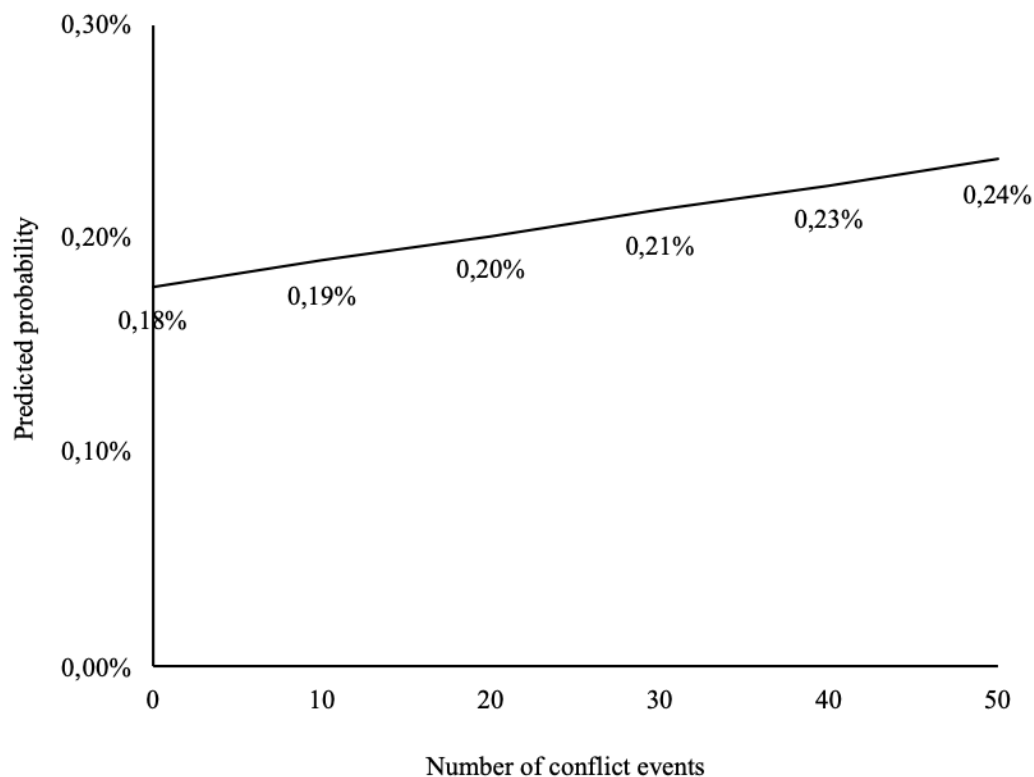


Figure 3. Predicted probabilities of sterilization (Y-axis) according to conflict violence intensity in the past three months (X-axis) in Colombia 1991–2016. Source: Author’s analysis of DHS and UCDP-GED data (see ‘Quantitative analyses’ section).

Qualitative analyses

The qualitative segment of this study built on expert interviews with 15 representatives of civil society, peace process and international development organizations specialized in women’s rights, sexual and reproductive health and rights and/or the peace process from a gender perspective in Colombia. A purposeful sample of experts was based on mutual contacts, word-of-mouth recommendations, and chain referral. Experts were chosen on their knowledge of the field and willingness to participate (Bogner & Menz, 2009).

Semi-structured interviews were conducted November 2019–February 2020, two of which on video call and the rest face-to-face in Bogotá. The interviews lasted between 30 minutes and two hours.

Participants were informed both at initial contact and the start of the interview about their full confidentiality and right to cancel the interview or not answer certain questions at any point without any consequences. Participants gave verbal consent to participate and for the interviews to be recorded. Names or descriptions of participants and organizations were not disclosed in the manuscript to safeguard their anonymity. Because there is no specific procedure in Colombia (Rivillas & Ingabire, 2018) and Swedish legislation does not regulate data collection abroad, no ethical approval was sought for the data collection.

The interviews were analyzed thematically using NVivo. I began the analysis by taking notes during data collection and transcription, listening to and transcribing the interviews in full in the original language (English and/or Spanish) to familiarize myself with the data. Next, I coded the material inductively by categorizing sentences with shorthand labels to describe their content and condense the information. Codes were either originated from key domains from the interview guide, or *in vivo* from the transcripts. Codes were then either aggregated into broader themes or discarded as irrelevant. The themes identified as pertinent for this study related to women's reproductive health in relation to violent conflict in Colombia. I checked the quality and accuracy of the codes and themes with the transcriptions, while also exploring the range and interrelationships of the codes. Finally, I chose representative quotations from the material to illustrate the material (Ayres, 2012).

Results from expert interviews

Several of the experts report that they consider the Colombian health care system to be in a state of crisis. The areas that have been most affected by conflict also suffer from a chronic absence of state services, including health care. Even though the coverage has increased over time, quality of care is often very poor, especially in remote areas. Access to care is restrictive and stratified; the most vulnerable and marginalized groups face barriers that more affluent groups do not. The role that conflict has played is that it has exacerbated the lack of access to health care for women who are already underserved.

For example, a woman living in a rural area who requests an abortion on one of the legal grounds (the life or health of the woman is threatened; fetal malformations; the pregnancy resulted from rape or incest) may have to wait months for a decision, even though the process is legally required to take a maximum of five days [Interview 5]. Sometimes the closest clinic may not even have a pregnancy test in stock [Interview 11]. Additionally, women in rural areas may have to spend hours or even days to travel to the nearest health clinic. When conflict violence intensifies or obstructs economic prospects, women may not be able to access care whatsoever. One expert describes how poverty and remoteness makes sterilization the preferred contraceptive method for many women:

[I]n Colombia in the very poor regions, like near to the Pacific Coast for instance, most of the women decide their favorite method is sterilization [...] because it's cheap, because you only do it once. You don't have to pay constantly. You don't have access to nearby health care so you go to a hospital to sterilize yourself and it's okay. [Interview 11]

Lack of reliable access to reproductive health goods and services may then make women turn to sterilization as a dependable option of family planning.

Activities of armed groups have impeded women's reproductive autonomy. The armed groups controlling certain areas have often imposed their own view of sexual and reproductive health and rights, and limited women's access to contraception and abortion as a part of a broader control of the population's everyday life [Interview 3; Interview 11]. Health care workers in those areas have been forced to perform services, prevented from going to certain areas, and attacked by armed groups [Interview 5]. Among female FARC recruits and perhaps some women in relationships with FARC members, forced contraception and sterilization have been reported, but the experts do not believe this reproductive control has largely spread to the civilian population since those policies were instated to ensure the military capacity of their recruits.

One expert describes that the conflict has obstructed development in every form in the most violently affected communities, not least when it comes to health care. The protracted lack of

security makes medical doctors not want to do a residency there and there are no educational or labor market opportunities, which creates a perpetual cycle of barriers to access services. In terms of commodities, road blocks and closed drug stores have limited women's access to contraceptive goods. Pharmaceutical shipments have been obstructed and unreliable, resulting in difficulties for women to know whether or not their contraceptive method will be available the next time they need it [Interview 1].

When asked if it is likely that forced sterilizations have increased in light of conflict, another expert describes:

If you understand economic constraint as an element in consent, you could say that they were forced. [...] I mean, definitely there's a failure by the state to guarantee all of the contraceptive methods that are available and accessible and not only five-hours-train-accessible but really accessible. I would say that there is definitely a failure by the state, but I'm not sure if I would qualify them as forced because they are willingly going, even if it's in the lack of other options. As opposed to forced sterilization when you think about women with disabilities for instance, that is clearly forced. Like against your will. [...] If it's [a woman who] is just poor and she doesn't want any more children but she doesn't see any more options or it's too expensive to buy another type of contraception, I would say that it's not so clear. [Interview 11]

The expert reports that sterilization uptake is likely not coerced in Colombia, but women may opt for sterilization in lack of other contraceptive options. Economic constraint as a result of conflict may push women towards permanent methods when they are certain they do not want any more children, but cannot readily access reversible contraception goods and services. Several of the experts reflect that the most conflict-affected women are often the poorest and most vulnerable in other aspects as well. Reproductive choices may then be based on survival needs, and when deciding which contraceptive method to use or whether to complete or terminate an unplanned pregnancy, women may have to weigh in that they also need to afford to buy food and other life-essential goods for themselves and their children. In those decisions, contraception may not be of highest priority.

The multiple barriers conflict-affected women may face to access sexual and reproductive health care in Colombia — especially if they also live in poor, rural areas — points towards the increased sterilization uptake as a result of lack of other options, rather than a result of coercion. There may be exceptions in some subgroups of the population, but those are most likely not represented in the survey data.

Discussion

Results from linear probability regressions showed that local conflict generally increased women's uptake of sterilization in Colombia. The effects of recent conflict were stronger than long-term conflict, which could reflect that women opt for permanent contraception when access to reversible methods becomes more unstable. Since uptake was largest among more affluent women, it is unlikely that coerced sterilization drove the results. The results are corroborated by Colombian experts in sexual and reproductive health, who report that since the health care system has been so heavily affected by conflict, women may opt for sterilization in lack of other options. This evidence suggests support for Hypothesis 2; conflict is linked to an increase in the voluntary uptake of sterilization. This adds to previous research reporting a reduction in the use of reversible contraceptive methods in relation to local violence in Colombia (Svallfors & Billingsley, 2019) and provides novel insight into women's fertility decisions in response to crises and violence.

Without reports of individual women's perceptions, it is not possible to establish what the increased uptake of sterilizations in relation to conflict truly represents; a want to permanently reduce births, a grasp for control in an inherently unstable and dangerous situation, or a reduction in access to reversible contraception. The available survey data did not allow to evaluate these mechanisms, but the expert interviews provide some initial guidance.

The expert reports pointed towards the most socioeconomically deprived women having the least contraceptive autonomy. The only (quasi) time-varying quantitative measure of socioeconomic status available in the DHS is whether the respondent lived in a rural or urban area. An interaction term between conflict and residence showed no statistically significant pattern (available upon request), which may be reflective of too low variation and statistical power rather than a true null-effect. Additionally, the DHS offer no data on availability of contraceptive goods and services. It was therefore not possible to confirm or reject the expert reports statistically.

The increase in sterilization uptake speaks to a relative resilience of family planning programs in Colombia. Despite multiple decades of conflict, women are still able to access some methods, although not all and not necessarily their preferred one. Part of the explanation likely lies in Colombia's programs being developed alongside conflict, but it also echoes findings from other settings where uptake — in particular of long-lasting methods — increased after emergencies (Bietsch et al., 2020; N. E. Williams et al., 2012). Other studies have reported lower uptake of contraception and changes to the method mix post-crisis (Behrman & Weitzman, 2016; Hapsari et al., 2009; Kissinger et al., 2007; Leyser-Whalen et al., 2011). The disparities may reflect the varying robustness of different health care systems, which emphasizes the need for family planning programs and research efforts to distinguish between different forms of contraceptive autonomy. While women faced with conflict may be able to make an *informed* contraceptive choice based on accurate knowledge about different methods, they may be restricted from making a *free* contraceptive choice of their preferred method (Senderowicz, 2020).

Women living in conflict-affected settings often face a routinized state of uncertainty characterized by livelihood insecurity and household instability, calling for reproductive choices that reduce the risk of unwanted pregnancy (Schwarz et al., 2019). Even the most marginalized women still maneuver with whatever means they have at hand (Enloe, 2000), and health-seeking behaviors can be a way to create order in the face of uncertainty (Steffen et al., 2005). Wanting or not wanting children is not an isolated event, but connects to the perception of oneself and others, present conditions, and future outcomes. Women's fertility control may be the only form of agency they can exert in a situation with extremely limited choices; a pivotal strategy to manage risk (Dalsgaard, 2005).

This study shows that women choose sterilization more often when exposed to more conflict events. The tentative interpretation is that since sterilization is a low-cost, socially accepted, and highly effective alternative of family planning in Colombia, it may be the preferred option for women who have completed their fertility goals. Given how conflict disrupts everyday life, it is not unreasonable to believe that women will opt for more secure and reliable contraceptive choices. This represents an embodiment of war; whatever their circumstances, women will make choices on reproductive matters based on what they perceive will be most beneficial to them. Sterilizations may represent a risk-aversion strategy of fertility regulation when other aspects of life turn more uncertain during armed conflict.

In light of these results, it is imperative that private and public health care initiatives in Colombia ensure that women have access to any contraceptive method of their choosing, not only sterilization. Such efforts should particularly focus on rural areas with poor access to health care and high intensity of conflict. Further, the Colombian government must take all necessary steps to decisively end violence in Colombia, including fully implementing the Havana Peace accords and assuming peace negotiations with remaining armed actors.

Data availability

The material collected for this study is not publicly available to protect the confidentiality of participants, but some information could be available upon reasonable request. The quantitative datasets are available online and Stata do-files can be requested from the author.

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Appendix

Table A presents descriptive summary statistics of the number of conflict events across Colombian departments. Conflict violence intensity varies substantially between departments. In most departments, there are women-months without exposure to conflict violence, except for Caquetá, Cauca, Meta, and Norte de Santander. Antioquia, Meta and Cundinamarca are the departments with highest levels of conflict violence in the sample. The sparsely populated remote rural areas Amazonas, Guainía, Guaviare, Vaupés and Vichada have the lowest levels of conflict intensity, together with the urban-dominated department Atlántico.

Table A Descriptive statistics of conflict across departments in Colombia.

	No of woman-months	Mean	Std. Dev.	Min.	Max.
Antioquia	869,473	69.05	53.16	0	223
Atlántico	550,790	1.25	1.57	0	7
Bogotá	1,024,557	7.29	3.58	0	27
Bolívar	381,924	14.42	13.97	0	61
Boyacá	348,044	7.35	6.87	0	44
Caldas	351,664	7.55	9.75	0	92
Caquetá	234,040	22.45	22.52	1	87
Cauca	365,054	21.52	16.82	1	64
Cesar	278,240	10.73	9.28	0	37
Córdoba	345,781	4.59	5.04	0	52
Cundinamarca	327,295	14.46	14.78	0	170
Chocó	272,715	8.46	7.08	0	34
Huila	333,981	12.56	10.84	0	61
La Guajira	293,374	5.93	6.36	0	20
Magdalena	324,421	14.56	19.27	0	81
Meta	242,811	23.01	19.02	2	182
Nariño	415,189	12.83	11.25	0	42
Norte de Santander	346,026	20.18	16.44	2	69
Quindío	337,416	1.35	2.41	0	29
Risaralda	304,112	4.93	7.07	0	75
Santander	411,823	15.14	11.16	0	38
Sucre	357,073	7.35	8.81	0	39
Tolima	327,402	17.67	17.92	0	81
Valle del Cauca	828,841	16.34	13.73	0	50
Arauca	177,754	16.20	14.32	0	59
Casanare	179,394	5.86	4.39	0	16
Putumayo	211,776	11.18	9.17	0	33
San Andrés y Provincia	260,533	0.16	2.26	0	43
Amazonas	251,358	0.15	0.36	0	1
Guainía	154,461	1.01	1.36	0	5
Guaviare	195,076	4.44	3.47	0	11
Vaupés	204,456	0.56	1.01	0	3
Vichada	142,059	1.42	1.25	0	5
Total	11,648,913	14.60	24.53	0	223

Source: Analysis of author's combined dataset based on DHS and UCDP-GED (see 'Quantitative analyses' section).

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