Abstract for EPC 2020 Submission – Do Not Distribute

Exploring Violence's Effects on Fertility in Nigeria

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Abstract: This study explores the relationship between fertility and organized violent events. Much attention has been directed at this topic to describe and test the mechanisms of how fertility can be influenced by violence of various kinds. This work uses novel data, DHS Surveys and UCPD organized violent events which are related spatially and temporally, to test the effect of exposure to violence on DHS cluster level fertility. The richness of this data will allow for exploration of the effect of exposure, timing, distance, scale and duration of violence as well as exploring these conditions for different types of conflict such as religious, ethnic, and resource related conflicts.

Introduction and Aims

This study brings together two spatial datasets to assess the effect of exposure to violent events on subsequent fertility. Due to the novel combination of data, location of DHS interviews and location of violent events, I can address questions and test hypotheses about general exposure, and scale, distance and duration of violence, rather than just a general indicator of exposure to violence in country or in region. In additional to the spatial relationship between location and violence, I can also assess the temporal relationship and determine if there is a meaningful window of time during which violent events influence fertility. Additionally I aim to test to see if the effect of distance between home location and violence location changes over time and ascertain if there is a meaningful distance at which there is an effect, and if that changes as the connectedness of people expands. The richness of the data also allows for exploration into different types of conflict: religious and ethnic – farmer/herder. I can assess if the same relationships determined in the study of general violence hold over to these more specific types, and if the effect various by group membership.

Background

Fertility and Violence

There are various approaches to this topic. In the past the focus has been in the aggregate; conflict impact on aggregate measures of fertility. Most studies finding a decline in fertility during conflict and an increase in the post war period, then a gradual decline (Hill 2004). There is evidence of an increase in overall fertility associated with armed conflict (Urdal and Che 2013). More recent scholarship has been at the micro level. The empirical record related to the direction of effect is mixed (Islam et al. 2016; Agadjanian et al. 2008; Heuveline and Poch 2007) and for which subpopulations there is an effect (Rogall and Yanagizawa-Drott 2014). This study, aggregates individual DHS surveys just to the cluster level.

There are a number of mechanisms through which conflict may affect fertility. Again following aggregate and micro levels, the mechanisms are discussed at a macro scale or on an individual, micro scale. Conflict may deteriorate or disrupt conditions which may delay marriage or births (Lee 1990; Rindfuss et al 1978) or disrupt provision of health and reproductive services (Verwimp and Van Bavel 2005). Conflict and resulting mortality may increase desire for children (Agadjanian and Prata 2002), it may also increase fertility due to increased value of children as old age security (Cain 1983; Nugent 1985). This mortality concentrated in one group may be a particularly salient influence on that group's fertility, "a reproductive response of threatened families and communities" (Heuveline and Poch 2007). It has been noted that demand for children increases because education for women is disrupted by conflict (La Mattina 2017). In Iraq, the conflict increased fertility because marriage and fertility patterns were shifted to earlier ages for women (Cetorelli 2014).

Psychological literature suggests other mechanisms. In response to violent or tragic events, individuals may display proximity seeking behavior and thus be desirous of more sex and children (Nobles, Frankenberg, and Thomas 2015) or individuals/couples may stick more closely to traditional values and focus on having more children (Vail et al. 2012). The psychological literature also points to possible decreases in fertility due to conflict negatively effecting the physiological status of a women, a more withdrawn behavior and less coital frequency (Kidane 1989).

Fertility

Fertility in Africa and West Africa more specifically has been a topic of demographic research for decades. National levels of fertility are, as Bongaarts (2017) describes, exceptional. These high levels, relative to other populations in the world, reflect that the fertility transition in this region began later, and has had a slower pace. Research in this domain has identified a number of exceptional cultural and institutional barriers to fertility decline in Africa generally or West Africa in particular (Caldwell and Caldwell 1987).

At the subnational level, women and men of reproductive age have differential exposure to modern ideas of family limitation, education for women, contraception, violence, cultural or religion ideals on family size. These different exposures may influence the fertility of women/couples, via various mechanisms, leading to different levels of fertility within country.

Fertility change and ideals have been long linked to exposure to new ideas and information (Bongaarts and Watkins 1996). It is conceivable that changes to spread of information or news of violence in general or that has happened to co-ethnics or fellow religious group members will have an effect on fertility even in the absence of a close geographic link.

Violence

Conflict and violence can take many different forms and definitions. The scale and location of conflict can also vary. Generalized all-out war will have different effects on demographics than episodic or short term violent events and different still than protracted sectarian conflict. With this variation in form, scale and spread there will be variation in its effect, in size, location, and for whom. Exposure to violence varies considerably across time and space, the geospatial data used here also allow for exploration of these variations (Sundberg and Melander 2013). The parties in involved in the violence will also factor into whether and which direction the fertility effect might take (Heuveline and Poch 2007). The data used herein are suited to assess differences in effect by conflict type and groups involved.

In recent times the spread of information and news has rapidly increased thanks to increase in use, spread and availability/cost of mobile phones and the internet. News of violence may spread more quickly and over a larger area. With this increase in access to information there may be an effect on fertility such that the distance at which there is an effect may get ever larger as time goes on and the spread of mobile phones becomes more ubiquitous.

Region of Study: Nigeria

Nigeria has a history of high fertility rates and conflict. In recent years there have been episodes of religious violence, between Christians and Muslims, and herder-farmer violence (which also crosses ethnic and religious lines) (Adelakun et al 2015). The conditions of the country are well suited for examining the relationship between violence and fertility and within that relationship, examining religious and ethnic resource conflict.

Data

The data for this study come from two sources. The demographic data come from the Demographic and Health Surveys for Nigeria. I use three phases: Phase IV in 2003, Phase V in 2008 and Phase VI in 2013. The woman's questionnaire focuses on women of reproductive age (15-49) and I use the

various questions about her, her family, health, and reproduction/birth, religion and ethnicity. The DHS also provides the geographic coordinate data of the cluster (representative point where interviews for that neighborhood/village in which the respondent lives). I use the cluster location to connect the individuals to a violent event. The distance between cluster and violent event was calculated in ArcGIS 10.6 using the Generate Near Table tool. This results in a table with the cluster identifier, the violent event identifier, and distance between points. There can be many violent events per cluster. The detailed data related to the individuals, clusters, and violent events were joined to that Near Table in Stata (Stata 15).

The violent events data come from the Uppsala University Conflict Data Program. The UPCD compiles violence data from around the world from myriad sources going back to 1989. I downloaded all available violent events for the Nigeria and West African countries nearby. The data includes location, as well as names of groups involved in the event, death counts and dates. Using the date information I was able to exclude violent events that were outside a window of possible fertility effect. I limited my sample to violent events in the 5 previous years to the DHS interview month. The time-window was lagged 21 months, because the outcome of interest is number of births in the last year/ pregnancies at interview, this lag allows for time for the pregnancy and conception.
The joining of individuals in clusters linked by time and distance to violent events yields a sample of 79,427 individuals in 2,130 clusters (over three waves) and 606 individual violent events. Below see Figures 1 and 2 for maps of all the clusters in total and broken down by DHS Phase and the violent events in total and those in the relevant window of time for each Phase.
In the future, climate data from the Climatic Research Unit of University of East Anglia will enrich this study further by including temperature and precipitation data for the cluster area and violence areas matching the timing window of interest of the exposure to violence preceding the DHS interview month. And this data will be added to analyses of the ethnic and resource related conflict between herders and farmers.

[Figures 1 & 2 about here]
[Tables 1 & 2 about here]

Methods and Planned Future Analysis

The data was collapsed to the cluster level and will be analyzed using Poisson count models. A series of models will be undertaken to assess a general effect of exposure to violence on fertility. These models will analyze the cluster level count of births in the last year and pregnancies at time of interview. The models will include, at the cluster level, exposures to, and count of, violent events in preceding years of interview (I have created cluster level data for time windows of five, three and two year lags), deaths, duration of event, and distance to events. Separate models will examine religious and ethnic conflict and will include the same measures broken down for religious and non-religious conflict, and ethnic and non-ethnic conflict. Next steps also include comparison across phases of the DHS to see how the conditions of the violent events change over time. Future models will also incorporate cluster level data related to climate and agriculture to assess to analyses on the ethnic farmer-herder conflicts. In addition all analyses will be run using, negative bionomial regression as a sensitivity to compare results to the Poisson models and access possible over-dispersion.

Hypotheses

There are a number of possible hypotheses I intend to test related to effect on fertility on exposure, distance, duration, and death toll of violent events, particular effects of religious and ethnic conflict and being a member of a group involved, year of interview following are some of the hypotheses I plan to test:

- *exposure to violence in previous 5 (or 3, or 2) years will have a positive effect on fertility in the cluster*
- *increasing levels of exposure will have a positive effect on fertility in the cluster*
- *living closer to violence will have a positive effect on fertility in the cluster*
- *more death per event will have a positive effect on fertility in the cluster*
- *fertility will increase when exposed to violence involving group members*
- *the distance of violence having an effect on fertility will increase in later Phases of the DHS*

Preliminary Results and Discussion

Results are listed in Tables 3 and 4. Table 3 shows the results of the Poisson regression and Table 4 shows the Negative Binomial regression results. Results are nearly identical, pointing to an absence of overdispersion. LR test for the Negative Binomial models did not have significant chibar2(01) values. The Base Model (Model 1) includes some of the standard predictors of fertility for the cluster level; count of women per cluster, and averages of educational attainment, marital status, employment for individual respondents and partners, current children in cluster households, households with electricity, and wealth/assets level of households. The direction of effect for these predictors are as expected. In Model 2, I add an indicator for exposure to violent events, within the 5 year lagged period. Clusters with exposure to violent events increases the count of, *births in the last year / pregnancies at interview,* by 1.06 (significant at 0.10 level). This result shows that, in line with some of the stated hypotheses that five years of exposure is a significant window of time for exposure, and that exposure has a positive and significant effect on fertility. Further analysis is needed to account for other conditions to account for what mechanisms may be at play to illicit this fertility response to violence exposure. Figure 3 displays this result graphically. With no exposure the count of *births in the last year / pregnancies at interview* is predicted to fall at approximately 9.2, with violence exposure the predicted count increases to approximately 9.75, holding all other variables at their means.

The variable of interest in Model 3 is a count of the violent exposures per cluster. As the number of violent events a cluster is exposed to increases by 1 there is an increase in the county of *births in the last year / pregnancies at interview* of 1.027. This result is significant at the $p < .05$ level. Figure 4 displays the predicted count of *births in the last year / pregnancies at interview* by count of violent events. There is an interesting pattern. Lack of exposure predicts a count of *births in the last year / pregnancies at interview* at approximately 9. There is an initial decrease in fertility with exposure is under 20, at 20 exposures the predicted count increases to a level past the zero exposure level and then follows a compressed curvilinear pattern with much variation reaching a peak at 30 violent events and then decreases. At approximately 55 events the decrease steepens dropping to lowest levels as the event count reaches approximately 6 at the tail end. This suggests that the higher event counts, the effect of violence is dulled and individuals are inured to violence's effects.

[Tables 3 & 4 about here]

[Figures 3 & 4 about here]

The above results are promising and with further development will lead to possible answers to open questions on the topic and a well developed understanding of the fertility influence from various types of violence, the conditions of violence and the change in these conditions over time.

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Figure 1

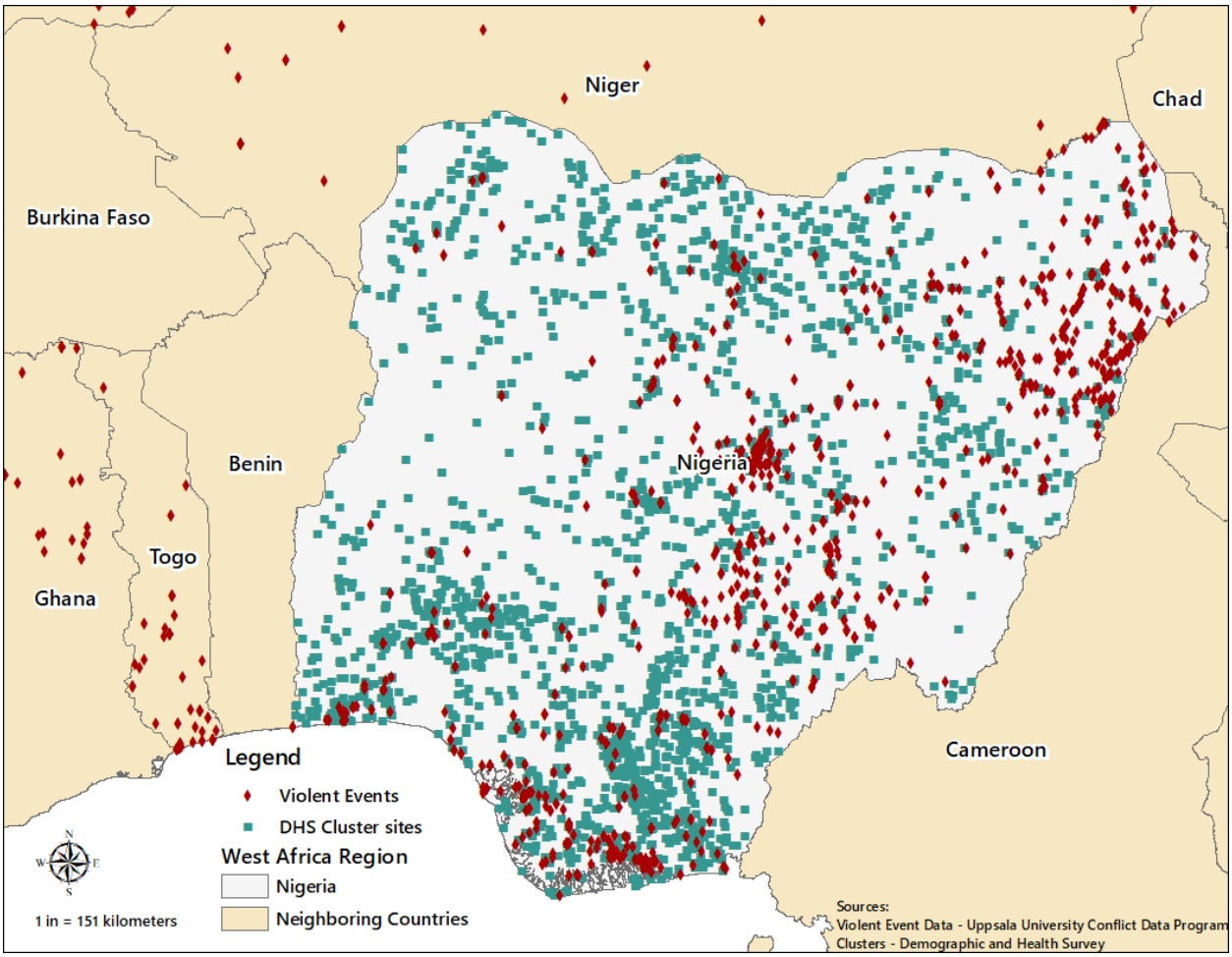
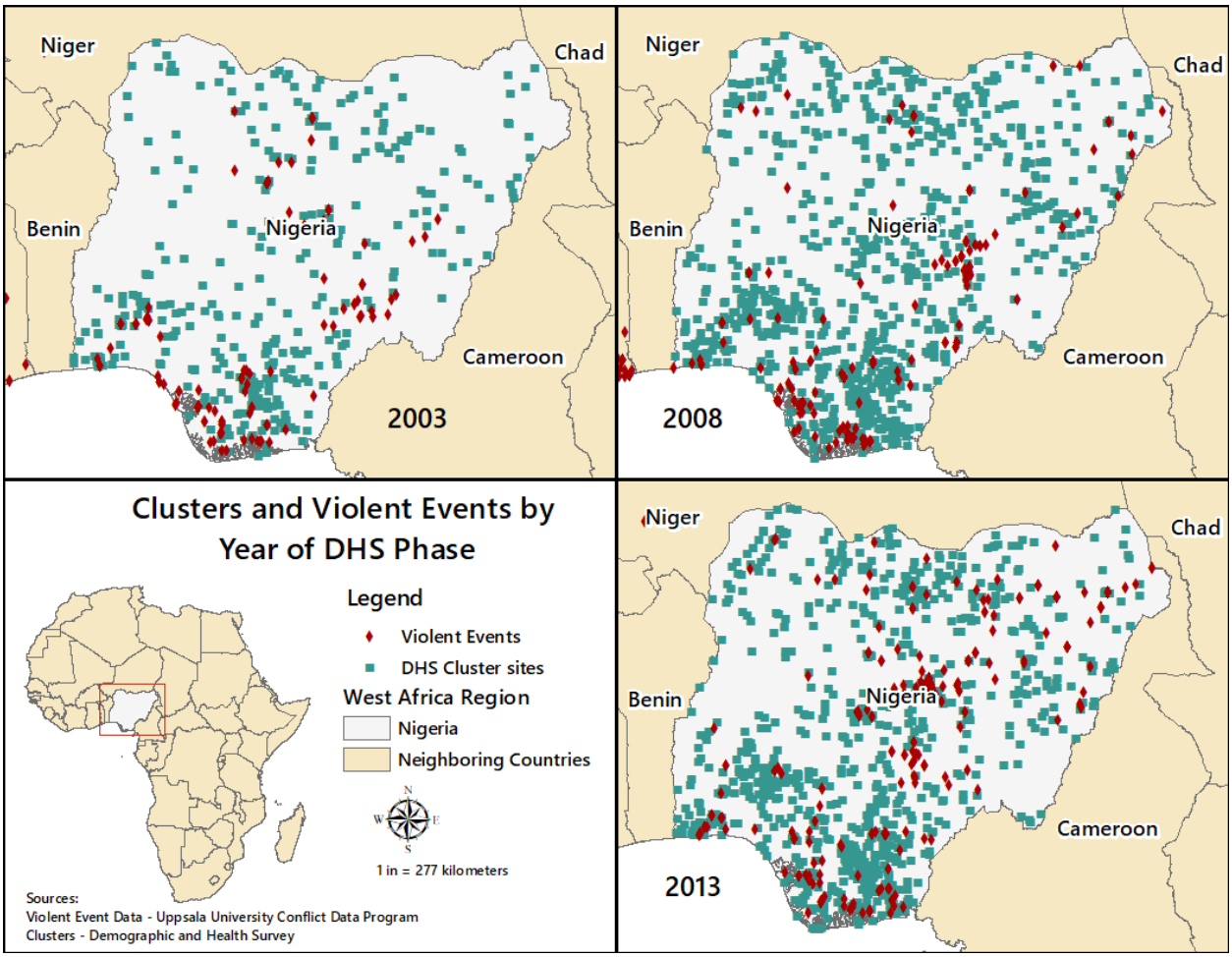

Niger
Chad
Burkina Faso
Benin
Nigeria
Togo
Ghana
Cameroon
Legend
Violent Events
DHS Cluster sites
West Africa Region
Nigeria
Neighboring Countries
1 in = 151 kilometers
Sources:
Violent Event Data - Uppsala University Conflict Data Program
Clusters - Demographic and Health Survey

Figure 2


Niger
Chad
Benin
Nigeria
Cameroon
2003
Niger
Chad
Benin
Nigeria
Cameroon
2008
Clusters and Violent Events by Year of DHS Phase
Legend
Violent Events
DHS Cluster sites
West Africa Region
Nigeria
Neighboring Countries
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1 in = 277 kilometers
Sources:
Violent Event Data - Uppsala University Conflict Data Program
Clusters - Demographic and Health Survey
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Chad
Benin
Nigeria
Cameroon
2013

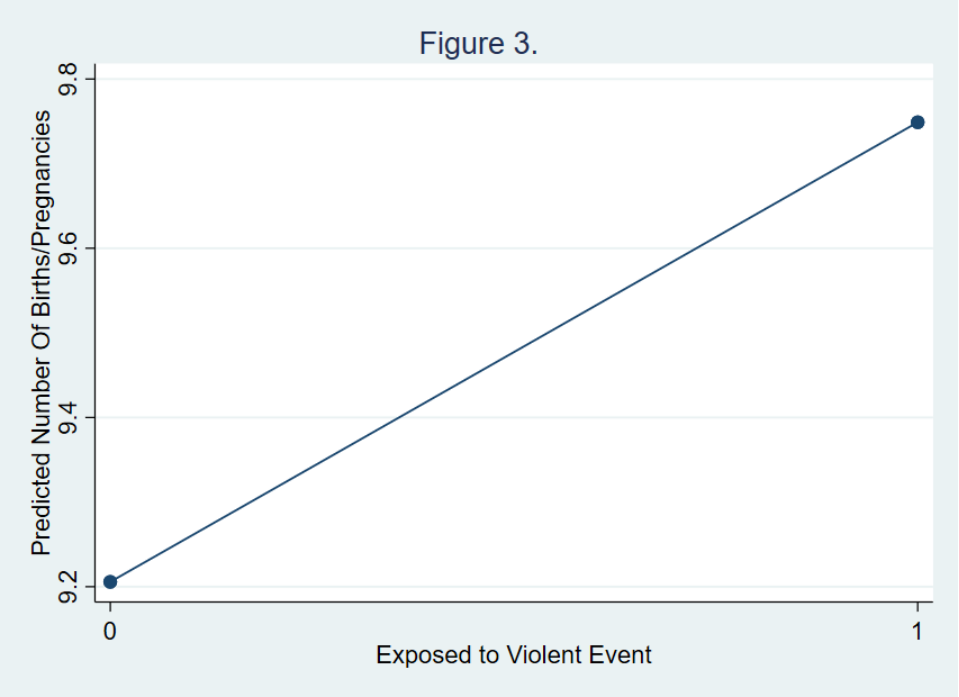
Figure 3.
Predicted Number Of Births/Pregnancies
9.2
9.4
9.6
9.8
0
1
Exposed to Violent Event

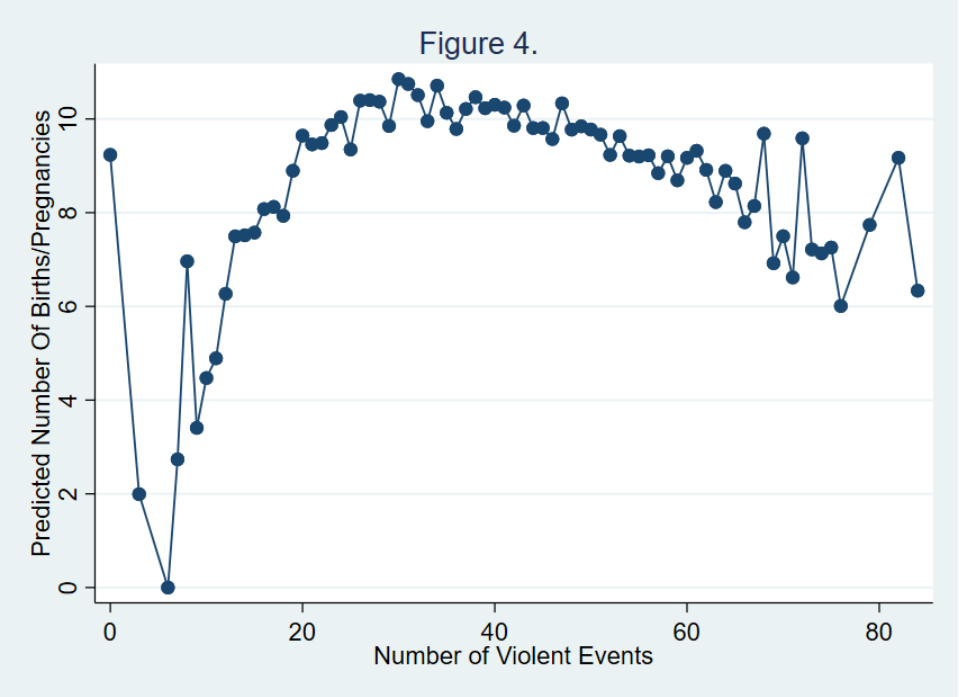
Figure 4.
Predicted Number Of Births/Pregnancies
0
2
4
6
8
10
0
20
40
60
80
Number of Violent Events

Table 1. Violent Events - Description - By Cluster

	Min	Mean	Max
Violent Events Per Cluster	3	37.3	84
Religious Group Violent Events Per Cluster	0	10.3	82
Ethnic/Herder Violent Events Per Cluster	0	5.9	84
Number of Deaths Exposed to Per Cluster	0	920	71862
Duration (in Days) of Violent Event Per Cluster	1	8	365
Median Distance (km) to Violent Event Per Cluster	6.97		7727

Table 2. Demographic Description - By Cluster

	Min	Mean	Max
Women Per Cluster	3	27.3	84
Number of Births (in last year) or Pregnancies (at Interview) Per Cluster	0	11.1	38
Births in Last Year Per Cluster	0	7.3	27
Pregnancies at Interview Per Cluster	0	4.1	25
Number of Women using Contraception Per Cluster		5.4	
Number of Women using Modern Contraception Per Cluster		3.4	
Number of Women Employed Per Cluster		22	
Number of Partners Employed Per Cluster		27.6	
	Percent		
Percent of Women Completing Primary Education Per Cluster	19.2		
Percent of Women Completing Secondary Education Per Cluster	43.3		
Percent of Women Who are Married Per Cluster	70.5		
Percent of Women Who are Divorced/Widowed/Not Together Per Cluster	4.5		
Percent of Women that are Catholic Per Cluster	12.6		
Percent of Women that are Christian Per Cluster	39.1		
Percent of Women that are Muslim Per Cluster	39.6		
Percent of Women that are Traditionalist Per Cluster	8		
Percent of Women that are Fulani Per Cluster	6		
Percent of Women that are Hausa Per Cluster	19		
Percent of Women that are Tiv Per Cluster	2		
Percent of Women that are Igbo/Ibo Per Cluster	16		
Percent of Women that are Yoruba Per Cluster	17		

Table 3. **Poisson, clustered standard errors** **Births in Last Year /Pregnancies at Interview Count**	**Base – Model 1**			**Violent Event Exposure – Model 2**			**Count of Violent Event Exposures – Model 3**		
	e^(B)	**e^(SE)**	**sig**	**e^(B)**	**e^(SE)**	**sig**	**e^(B)**	**e^(SE)**	**sig**
Cluster Controls									
Count of Women per Cluster	1.02681	0.00059	***	1.02673	0.00059	***	-	-	
Avg Educational Attainment (1= Primary level)	1.14437	0.02835	***	1.14366	0.02834	***	1.16486	0.02948	***
Marital Status (2= Married)	2.55855	0.10113	***	2.56001	0.10117	***	2.59472	0.10468	***
Employed Women (avg)	1.06433	0.03990	+	1.06761	0.04004	+	1.08082	0.04100	*
Employed Partners (avg)	1.80628	0.53747	*	1.88179	0.56291	*	1.89948	0.58055	*
Living Kids (avg)	1.01883	0.01476		1.01861	0.01471		1.02576	0.01516	+
Percent of Contraceptive Users per Cluster	0.58034	0.04404	***	0.58842	0.04497	***	0.55988	0.04490	***
Households with Electricity (mean)	0.99732	0.02184		0.99948	0.02185		0.99488	0.02220	
Assets Scale (avg) 1 (lowest) - 6 (highest)	0.96701	0.01287	*	0.96600	0.01287	**	0.96489	0.01309	**
Violence Exposure									
Exposed to Violent Event				1.05901	0.03269	+			
Number of Violent Events Exposed to							1.02662	0.00060	***
Constant	0.48282	0.15278	*	0.43970	0.14071	*	0.43942	0.14221	*
Observations	2,130			2,130			1,980		

*** p < .001 ** p<.01 *p<.05 + p<.10

Table 4. **Negative Binomial Regression, clustered standard errors** **Births in Last Year /Pregnancies at Interview Count**	**Base – Model 1**			**Violent Event Exposure – Model 2**			**Count of Violent Event Exposures – Model 3**		
	e^(B)	**e^(SE)**	**sig**	**e^(B)**	**e^(SE)**	**sig**	**e^(B)**	**e^(SE)**	**sig**
Cluster Controls									
Count of Women per Cluster	1.02683	0.00059	***	1.02674	0.00060	***	-	-	
Avg Educational Attainment (1= Primary level)	1.14450	0.02837	***	1.14372	0.02837	***	1.16486	0.02948	***
Marital Status (2= Married)	2.55931	0.10089	***	2.56038	0.10091	***	2.59472	0.10468	***
Employed Women (avg)	1.06404	0.03997	+	1.06747	0.04012	+	1.08082	0.04100	*
Employed Partners (avg)	1.80644	0.53753	*	1.88187	0.56293	*	1.89948	0.58055	*
Living Kids (avg)	1.01872	0.01474		1.01856	0.01468		1.02576	0.01516	+
Percent of Contraceptive Users per Cluster	0.58041	0.04404	***	0.58844	0.04496	***	0.55988	0.04490	***
Households with Electricity (mean)	0.99728	0.02185		0.99946	0.02186		0.99488	0.02220	
Assets Scale (avg) 1 (lowest) - 6 (highest)	0.96694	0.01289	*	0.96596	0.01289	**	0.96489	0.01309	**
Violence Exposure									
Exposed to Violent Event				1.05895	0.03268	+			
Number of Violent Events Exposed to							1.02662	0.00060	***
Constant	0.48246	0.15264	*	0.43957	0.14065	*	0.43942	0.14221	*
Observations	2130			2130			1980		
Pseudo R squared	0.21400			0.21400			0.21800		
Chibar2(01)	0.428			0.466			0.500		

*** p < .001 ** p<.01 *p<.05 + p<.10