Political Violence and Child Health: Results from Zimbabwe

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Abstract

This paper examines how the health of Zimbabwean children was affected by election-related violence and land reform in Zimbabwe during the period from 2000 to 2005. These events impacted Zimbabwean livelihoods and increased food insecurity in the country. Our study combines individual child data from the Demographic and Health Surveys that bracket these violent events with information on the location and date of violence from the Armed Conflict Location and Event dataset. To understand how the spike in violence impacted children's health, the empirical analysis exploits temporal and spatial variation in height across birth cohorts. Children born after the spike in violence in 2000 had lower height-for-age z-scores than children from earlier cohorts. The long-term effect was larger in magnitude and significance for older children and children living in rural areas. The results are robust to a placebo test for parallel trends, alternative control groups, selective mortality, and migration. The paper adds to the literature on election-related violence, armed conflict, and land reform. Additionally, it provides guidance on differentiating between timing of violence during multiple political and electoral events, and estimating the impact on rural communities, who likely felt a greater impact from land reform transitions.

Keywords: human capital, child health, conflict, height-for-age, sub-Saharan Africa

JEL classification: I12, J13, O12

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1. Introduction

Over the past 30 years, armed conflicts (e.g., civil wars) have declined in both severity and length. Such conflicts have largely been replaced by shorter-term conflicts, such as low-scale insurgencies, uprisings, and riots. These lower-intensity conflicts have received less attention than armed conflicts and civil wars, the effects of which economists have researched extensively (World Bank 2011). The research on armed conflict points toward negative and lasting impacts for populations of affected countries. This is particularly true with respect to human capital accumulation, such as education and health. Recent studies have found that stunting and malnourishment in early childhood may lead to lasting cognitive impairments, even after children recover (e.g. Casale et al. 2020).

This study examines how several violent periods in Zimbabwe affected the nutritional status and health of the nation's young children. We study this impact primarily using height-for-age z-scores, a common measure of long-term health. The study focuses on the 2000-2005 period, which was marked by a spike in election-related violence against civilians and displacements due to land reform. During this violent period, Zimbabwe also introduced a fast track land reform that displaced large numbers of farm owners and workers. In a matter of months, Zimbabwe, once known as a "bread basket of Africa," spiraled into a downward growth path characterized by hyperinflation and dependence on food aid. We would expect the significant drop in living standards and poor access to food to have negatively affected the health of young children across the country, particularly in the areas most affected by the violence. The main goal of this paper is to first quantify this impact, then identify the most impacted populations and suggest policy conclusions.

The identification strategy exploits regional and cohort variations in the effects on Zimbabwean children's health as a result of the 2000-2005 period of political and election-related violence. The study combines data on household and child characteristics from a household survey with information on the exact dates and locations of conflict events from the Armed Conflict Locations and Event Dataset (ACLED) (Raleigh et al. 2010). The 1999 and 2005/2006 Zimbabwe Demographic and Health Surveys

(ZDHS) bracket the period of violence under consideration.[1] The timing of the data collection allows us to control for pre-conflict differentials in children's health. The review of ACLED data indicates that all provinces of Zimbabwe were affected by violence to some extent during the relevant period, with a large variation in the number of conflict events across provinces. To reduce the influence of outliers, we use as our main measure of violence the natural logarithm of the number of events recorded in each province from 2000-2005.[2]

We find that children who were born in Zimbabwe after the 2000 wave of violence, and who lived in one of the more significantly affected locations, had significantly smaller height-for-age z-scores (HAZ) than children surveyed in 1999. This finding is in line with the literature studying the impact of civil wars on children's health. We further find that the length of exposure to the crisis (measured in linear and non-linear terms combined with the province level intensity of violence) had a significant and negative impact on a child's HAZ, with older children experiencing greater setbacks to their health. Children in rural areas experienced the greatest impact. These results are consistent with the literature (e.g., Bundervoet et al. 2009, Minoiu and Shemyakina 2014). The evidence presented is consistent when we also add controls for the language of interview; age and education of the household head; the child's mother; household's assets; the child's age in months; the child's province; and the child's year of birth fixed effects.

Our results are also robust to a variety of tests, such as using an alternative definition for treatment and control groups; comparing sample composition between survey waves; and performing placebo tests to probe for pre-existing trends between regions.

This paper's contributions are twofold: first, the paper evaluates the impact of election-related violence on children's health and contributes to the related literature in the study of armed conflict (e.g., Akbulut-Yuksel 2014; Akresh et al. 2011, 2012; Bundervoet et al. 2009; Giles et al. 2008; Kim 2011;

[1] Akresh and de Walque (2012) for Rwanda and Minoiu and Shemyakina (2012) for Cote d'Ivoire used similar analysis techniques to those proposed in this study. The authors were able to bracket the period of violence using data collected before and after a conflict.
[2] The geographical distribution of events over time is presented in Appendix A.

Minoiu and Shemyakina 2012, 2014; Verwimp 2012). Second, the paper shows that children's well-being is affected by exposure to several cycles of election violence, in much the same way it is affected by larger-scale armed conflicts. Thus, the results suggest that populations of countries impacted by persistent low-scale conflict and accompanying it food deprivation may suffer in similar ways to populations affected by civil wars. As a result, they may require similar forms of international assistance.

A large literature on children's health suggests that shocks in early childhood have long-term effects on the well-being of the surviving children. These effects can be seen in outcomes related to educational attainment, stature, health, labor market, and cognition (e.g. Almond and Currie 2010). In the context of armed conflict, researchers have been able to identify the effects of the conflict using data on cohort- and region-specific exposure. Studies have found that exposure to conflict at a young age has a detrimental effect on long-term health outcomes. The empirical analysis in this field is typically limited to the sample of surviving children who did not migrate outside the country's borders. Therefore, the effects observed are conservative estimates of actual conflict impacts. In this context, several studies have examined the effects of conflict on height-for-age z-scores, a commonly used measure of long-term health status of young children. Akresh et al. (2011) compared the effects of the drought and the civil war crises in Rwanda and found gender-differentiated outcomes. In the wake of the drought, girls' height-to-age z-scores declined more than boys' did. The conflict, however, had similar negative effects on both boys and girls. Other related studies also document similar negative impacts for boys and girls during armed conflicts (e.g., Bundervoet et al. 2009; Akresh et al. 2012; Minoiu and Shemyakina 2012, 2014). Shorter stature can lead to poorer health and education outcomes in the long-term. In the context of Zimbabwe, a seminal study on resettlement farmers showed that children who received poor nutrition due to drought and a concurrent civil war had significantly shorter stature (Alderman et al. 2006). Shorter children were considered younger, and therefore were enrolled in school at a later age than taller kids; as a result, they completed less schooling. Likewise, in Burundi, Verwimp (2012) observed an increased mortality risk for children whose growth was stunted by armed conflict.

This paper also contributes to the study of food insecurity levels in countries affected by conflict. It links hunger and sub-standard nutrition to children's height-for-age z-score, a long-term measure of child health. The usual challenge in development literature is that for many sub-Saharan countries, data on different food groups in the country are not readily available. The availability and affordability of food and food groups at the country level does not guarantee the same access across all regions of the country. Therefore, anthropometric measures like height-for-age z-scores could be a good proxy for the actual food intake by populations across the country. Additionally, given that we have data on the regional effects of violence against civilians, we can link children height-for-age z-scores to both the conflict they experienced while growing up and the number of months they were exposed to instability, as measured by local conflict activity. Thus, given that violent conflict and political repression are often associated with lack of foodstuffs, we can use children's height-for-age scores to measure a partial effect of conflict on food security.

The remainder of the paper is organized as follows. Section 2 describes the historical context of the conflict in Zimbabwe. Section 3 presents the data and the estimation strategy. Section 4 discusses the baseline results, robustness checks, and mechanisms through which political violence may have affected children's health. Section 5 further discusses the results and concludes.

2. Background

This section describes the setting around the conflict in Zimbabwe. We begin with a discussion of the events leading to the conflict that peaked in 2000.

On April 18, 1980, Zimbabwe gained its independence. Formerly known as Southern Rhodesia, Zimbabwe had also been a former colony of the British Empire. The country conducted its first multiparty elections under the supervision of the British and the Commonwealth. Robert Mugabe of the Zimbabwe African National Union – Patriotic Front (ZANU-PF) was elected as the first Prime Minister of Zimbabwe (The US Department of State, 2009/2017). The country gained international recognition of its independence in the same year.

The post-independence decade in Zimbabwe was characterized by internal instability and the suppression of non-ruling parties and ethnic groups.[3] In 1987, the two major parties, Patriotic Front (ZANU-PF) and Zimbabwe African People's Union (ZAPU), merged. Still Zimbabwe continued to experience some instability, accompanied by a decline in economic conditions and human rights. These circumstances created an opportunity for a rise in 1999 of a new opposition party, Movement for Democratic Change (MDC). MDC quickly became very popular.

This paper's analysis focuses primarily on the period between 1999 and 2006, a period of several important elections and significant voter suppression campaigns.

In 2000, the government launched a referendum on the proposed draft constitution. The referendum had two major goals. The first was to extend the powers of the existing government. The second was to redistribute the land held by white commercial farmers to black Zimbabweans.[4,5] Various parties questioned the motives behind the proposed land reform. First, the government did not plan to compensate white farmers for the loss of land. Further, the motivations to distribute land to black Zimbabweans were not entirely driven by considerations of economic efficiency and equality. Rather, the ZANU-PF government was rumored to compensate its supporters and cronies, and, in particular, groups known as war-vets.[6] By committing to land reform and engaging in land redistribution, ZANU-PF aimed to deliver on the promises made during the Zimbabwe's independence struggle.

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[3] For example, a Matabeleland uprising, led by Joshua Nkomo of Zimbabwe African People's Union (ZAPU), was severely suppressed (Bratton 2011). Some sources indicate that the government, ruled by ZANU-PF, was responsible for execution style deaths of about 20,000 civilians in Ndebele-speaking regions in the west in the province of Matabeleland (Catholic Commission for Justice and Peace in Zimbabwe, 1997; The US Department of State, 2009/2017). In 1987, the two parties, the ZAPU and ZANU-PF, signed a peace accord and ZAPU was absorbed into ZANU-PF.

[4] After the transition to majority black rule, the white population in the country gradually declined from 250,000 to 100,000 due to emigration (Embassy of Zimbabwe, 2013). At the same time, the population of white, mostly commercial farmers remained relatively constant, with 4,500 farmers remaining from the original 5,000.(http://www.zimembassy.se/history.html (Accessed: July 18, 2013)).

[5] The Lancaster House Agreement, signed on December 21, 1979, originally recognized the creation of the Republic of Zimbabwe and established provisions to set aside funds to buy out land from white farmers and redistribute it. However, the British government refused to abide by it.

[6] In 1997, war veterans, who were tied to the land movement in Zimbabwe, forced Mugabe to the negotiation table. Mugabe and the war veterans agreed that the white-owned commercial farms would be seized and distributed to those in need of land, with 20 percent being allocated to war veterans. The Government designated 1,471

In a February 2000 referendum, the proposed draft constitution was rejected by 54% of voters. This defeat was due in part to efforts by the opposition party, MDC, which was successful in mobilizing the voters for the referendum. Despite this defeat, the Fast Track Land Reform program (FTLRP) was unrolled. Between February and June, about 1,500 white-owned commercial farms were invaded, with commercial farmers and farm workers attacked. This campaign led to widespread displacement and disorder.

Farm invasions continued through mid-2008. By that point, almost 90 percent of "white owned commercial farms were occupied or appropriated for redistribution" (Hammar 2008: 427). Hammar (2008: p. 431, endnote 21) estimates that anywhere from 150,000 to 250,000 farm workers could have been displaced by the official FTLRP. During the same time, the opposition supporters were suppressed, often violently, and especially in the periods leading to elections in 2000 and 2002.

Beginning in 2000, agricultural and industrial production fell dramatically. Many grocery chains in Britain broke their contracts with commercial farms, both to protest the violence and because they could not ensure delivery as promised (Rodgers 2012). Within a very short period, many large commercial farms ceased to exist, and large amounts of land were given out to smallholder farms. However, most of these smallholder farms did not have sufficient means to invest in agricultural production. Moreover, they were not given clear property rights to the land (Hammar 2008: p. 425, also ft. 19). As a result, they were prohibited from borrowing from banks or using the land as collateral. Further, some ZANU(PF) government officials claimed a sizeable proportion of seized land, but often did not commit to commercial farming (Hammar 2008). Appendix B provides a timeline of important events in Zimbabwe's political history between 1998 and 2008.

The changes in land ownership that occurred alongside political struggles between the ruling party and the MDC were accompanied by substantial costs. A report by Zimbabwe Institute (2007) describes the economic performance of Zimbabwe since 2000 as "disastrous." The production of major

commercial farms for a compulsory acquisition. This decision was contested by white farmers and no resettlement happened at the time (Moyo, 2000; Sadomba, 2008).

crops favored by communal farmers fell 1/3 to 1/2 against the target output over 2000-2006, with the sharpest decline occurring between 2001 and 2002. Between 1998 and 2006, the cumulative decline in Zimbabwe's GDP was 37%, compared to a 40% gain for other African countries. During the period under consideration in this paper, 2001-2005, the country also experienced de-industrialization, wherein manufacturing volume declined by 33%. The disinvestment in agriculture was also remarkable, as infrastructure crumbled due to theft, destruction, and the inability of new, title-less farmers to secure loans against their land.

This political and economic crisis led to food insecurity in Zimbabwe. The insecurity was aggravated for rural residents, many of whom were displaced from the farms where they used to work. Further, some accounts note that the government discriminated against opposition supporters in the distribution of food at controlled prices and access to public works during the crisis (e.g. Beaumont 2002; HRW, 2003; US Department of State 2009/2017). These disruptions affected households' access to resources, such as food and work. In turn, they made living conditions worse for affected children. In this study, we are unable to identify opposition supporters versus non-supporters; as a result, the findings presented below constitute an average estimate of the effect of the political and economic disruption on children in the sample.

3. Data and Estimation Approach

Zimbabwe presents us with a setting where waves of violent incidents may have led to a drop in nutritional standards. In the context of Zimbabwe, these incidents included state-sponsored violence, political retributions, violence against MDC supporters, large-scale farm invasions, and displacement of agricultural workers, all followed by a collapse of agriculture and the prolonged economic crisis.

One way to analyze whether these incidents impacted nutritional and health outcomes is to examine children's height-for-age z-scores. Based on the World Health Organization (WHO) aggregate data for Zimbabwe, children's height-for-age z-scores suffered only minor negative changes between 1999 and 2006 (WHO Global Database on Child Growth and Malnutrition. July 15, 2012). Thus, to

understand the effects of the political crisis in Zimbabwe on the well-being of Zimbabwean children of all ages and locations, we need to perform a further analysis. To that end, this paper uses the 1999 and 2005/2006 ZDHS and the data on local conflict exposure from ACLED. The datasets are discussed below.

Height-for-age z-scores and other children's and household characteristics come from the 1999 and 2005/2006 ZDHS. Both datasets were collected by the USAID, as a part of worldwide effort of the Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys (MEASURE DHS)[7]. The 1999 data were collected between August and November 1999 and the 2005/2006 ZDHS was fielded between August 2005 and March 2006 (Central Statistical Office and Macro International Inc. 2000, 2007). The surveys collected information on the health of women and children, mortality and HIV/AIDS. Both surveys provide anthropometric information for children aged 0-59 months at the time of the survey. Height-for-age z-scores (HAZ) is our main measure of child health. HAZs are calculated following the WHO procedure, where the z-score is defined as the difference between the child's height and the median height of the same-aged international reference population, divided by the standard deviation of the reference population.[8]

We also use "stunting" as an additional health and nutritional outcome to understand whether a reduction in HAZ scores corresponds to malnourishment. A child is considered to be stunted if his/her height-for-age z-score falls below -2 standard deviations from the WHO Child Growth Standards median (WHO 2010). The percentage of children who are stunted reflects the cumulative effects of undernutrition and infections they experienced since and even before birth. As a result, stunting can be "interpreted as an indication of poor environmental conditions or long-term restriction of a child's growth potential" (WHO 2010: 1).

[7] "MEASURE DHS: Demographic and Health Surveys" http://microdata.worldbank.org/index.php/catalog/dhs/about (accessed 05/13/2020).
[8] Height-for-age z-scores for children are calculated using WHO Multicenter Growth reference datasets and the WHO Anthro (version 3.2.2 January 2011) STATA routines (http://www.who.int/childgrowth/software/en/). We drop the observations with biologically implausible z-scores (that is, more than 6 standard deviations away from the international reference population) from the analysis.

Appendix Table A.1 shows the descriptive statistics for the main variables used in the analysis, such as height-for-age z-scores, characteristics of mother, and head of the household. Summary statistics indicate that, during the period of analysis, Zimbabwean children were behind the international reference population, with average height-for-age z-scores being lower by 1.26 standard deviations in the 1999 survey, and by 1.38 standard deviations in the 2005 survey. Average child age was close to 28 months and did not differ significantly across surveys. In both surveys, over 60 percent of the household heads were male. In the 2005 survey, households were 11 percentage points more likely to be interviewed in Shona, and nine percentage points less likely to be interviewed in Ndebele. Household heads were, on average, 42 years old. Mothers, were, on average, about 28 years old. 43 and 55 (47 and 39) percent of percent of mothers had secondary (primary) education in 1999 and 2005 surveys respectively.

Surprisingly, fewer mothers reported having migrated during their children's lifetime (including during pregnancy) in 2005 compared to 1999. There are some differences in religion profile. Mothers in the 2005 survey were more likely to report being Christian (85% vs. 80% in 1999) and less likely to report not having a religion (10% vs 13% in 1999). Based on all combined assets, but not the individual assets alone, households in the 2005 survey were more likely to be relatively poor, with 53 percent having combined assets below the district and survey averages, compared to 48 percent in 1999. We include most of these variables as controls in our regressions and perform robustness checks to ensure that our results are not driven by these differences.

Figure 1 provides a comparison between children's HAZ by age in months and the survey year. It shows that for both surveys, HAZ rapidly declined during the first 18 months of life, a pattern consistent with growth faltering hypothesis (Victora et al. 2010). HAZ scores declined at a slower rate and recovered at a much faster rate for children surveyed in 1999 than for those surveyed in 2005/2006, i.e., the children who were affected by the increase in violence since the 2000 referendum.

We continue with discussing ACLED data on violent outcomes. This dataset contains information on dates, actors, types and locations of political violence and protests around the world, focusing on less

developed regions.[9] Table 1 shows the distribution of events by year and event type over 1997-2010 for Zimbabwe. The two categories with the highest frequency of events are riots/protests and violence against civilians. The data indicate that the importance of categories switched over time, and that violence against civilians increased, both as a proportion of all events and in absolute value. This switch could be related to the more repressive government policies that took effect in 2000. Note that the proportion of riots in all violent events decreased from about 90 percent in 1997 to less than three percent in 2000. During the same period, violence against civilians rose ninefold to 83 percent, and then increased even further between 2001 and 2004. Riots spiked again in 2005-2007, reaching about 20 percent of all events. Other types of events constituted a rather small proportion of the total number of events in the ACLED database.[10,11] Between 2000 and 2005, there were between 43 and 935 events recorded per province, with an average of 444 and a standard deviation of 394 events. The largest number of events was recorded for Mashonaland Central Bulawayo (307) and Harare, the country's capital (935 events).[12] To reduce the relative weight of the outliers, we use as a measure of conflict the natural logarithm of the number of violent events in a province/year. In the regression analysis that follows, we aggregate ACLED data by year and province and combine it with the ZDHS survey data.

One of the potential concerns with cross-sectional survey data covering multiple periods, like the data used in this paper, ZDHS, is survey comparability over time. Thus, following the literature, we check for such comparability and regress the main control variables on the indicator variable for an observation

[9] About ACLED. https://www.acleddata.com/about-acled/ Accessed: 11/20/2018.
[10] We also mapped the ACLED events at the year-province level for the period under observation: 1997-2006, generating 10 maps, one per year (See Appendix A: Figures A1-A10). Zimbabwe is divided into 10 provinces, including the cities of Harare and Bulawayo. The maps visually suggest that the number of conflict events across the country sharply increased after the year 2000, the year of the referendum that also marked the start of the controversial land reform, the Fast Track Land Reform Programme (FTLRP) that involved widespread violent invasions of commercial farms (HRW 2002, Bratton 2011).
[11] While the ACLED count of the events in 2000 is substantial in comparison to the preceding years, the ACLED data may yet underestimate the actual number of events. For example, Kriger (2005) notes that in just the first half of 2000, there were more than 200,000 violent events for the 12 million of the population. Between February and June of 2000, about 1500 white-owned commercial farms were invaded (Kriger 2000). By 2003, the number of large-scale farms declined by 8-fold from 4,000 to 500 (Orlet 2005).
[12] Omitting Harare, the capital of Zimbabwe, from the sample of 10 provinces reduces the province/year average to 135.53, with a standard deviation of 76.76 (ACLED version 1: 1997-2009/2010).

coming from the 2005/2006 survey, a variable measuring conflict based on ACLED data and their interaction, and estimate regressions with and without province fixed effects. The results are reported in Appendix Table A2. The regression coefficients on the interaction terms suggest that in 2005/2006, in the most affected regions, household heads were older, and more likely to be male. Mothers of young children were older, less likely to be Christian, and more likely to report having no religious affiliation. To decrease concerns of selective targeting of individual populations and thus, the impact of these characteristics on child health, we control for these characteristics in the main analysis.

3.2 Methodology

To estimate the impact of political violence on children's height-for-age scores, we use the Ordinary Least Square (OLS) regression shown in Equation (1) below. Similar to Bundervoet et al. (2009) and Minoiu and Shemyakina (2014), the baseline estimation equation is given by:

(1) $$HAZ_{ijtm} = \alpha_j + \delta_t + \mu_m + \beta_1 \, Affected\ region_j * Exposed\ cohort_{ijtm} + \beta_2 * Exposed\ cohort_{ijtm} + + \beta_3 * Z_{ijtm} + \varepsilon_{ijtm}$$

where HAZ_{ijt} is the height-for-age z-score of child i (aged 0-59 months) residing in province j and born in year t; α_j are province (department); δ_t are year of birth and μ_m is age in months fixed effects. ε_{ijt} is a random, idiosyncratic error term. All regressions include a vector of child characteristics, such as sex and rural residence (Z_{ijtm}).

Our dependent variable, height-for-age z-score of child i (aged 0-59 months), is regressed on the length of a child's exposure to conflict, interacted with the province level exposure to conflict. Following the literature, we use two proxies for the length of a child's conflict exposure. The first is the number of months a child was exposed to conflict during their life. The date of the first referendum is the date of the child's first exposure to the 2000 spike in violence (February 2000 referendum in Zimbabwe). Thus, the child's date of birth and the date of survey determine the number of months a child was exposed to violence during their lifetime. For example, a child born in March of 2001 and surveyed in November of

2005 was exposed to political violence for 53 months, i.e., their entire life. Thus, the "*Exposed Cohort*" variable is equal to age in months for children in the 2005/2006 survey and is zero for children observed in 1999.

For the second measure of exposure to violence and instability, we use a combination of two mutually exclusive indicator variables. The first variable is equal to one if the child was exposed to conflict for less than 25 months. The second variable is equal to one if the child was exposed over 24 months; otherwise, it is zero. We would expect to see a greater impact of violence on the health of the older cohort that was born soon after the implementation of the FTLR and the increase in violence.

"Affected region" is the province level of exposure to conflict based on ACLED data (natural logarithm of number of events in a province/ department during the period from 2000-2005). We interact the child level exposures to violence with the level of violence at the child's current residence. The resulting regression estimates constitute our baseline regressions.

In Eq. 1, the main coefficient of interest, β_1, captures the average impact of residing in a region that was more exposed to the conflict on the health of children in the conflict-affected cohort. In the robustness section of the paper, we perform a placebo test to verify that the estimated β_1 is not capturing residual differential health trends.

The inclusion of province fixed effects allows us to account for unobserved time-invariant factors that are constant across individuals within a province. These factors may be systematically related to exposure to the conflict, and hence bias the coefficient of interest. Year of birth fixed effects control for underlying trends that affect health of each cohort in a similar manner. Age-in-months fixed effects control for age-specific developments in child health.

It is possible that the effect of political violence varied for urban and rural locations, as urban residents, and, in particular, MDC supporters, were targeted for violence. Rural households suffered from political violence as well. They also experienced disruptions in their access to land and changes in work

arrangements caused by the agricultural reform. Therefore, we estimate all regressions for the full sample and rural sub-sample.

To account for potential effects of migration, we estimate the set of regressions for migrants and non-migrants using a measure of mother's migration. A mother is considered not to have migrated if she resided in the area prior to becoming pregnant with her child. The estimation results are very similar to those in the baseline results reported in Table 2.

4. Empirical Results

This section presents the results of the OLS estimations of our main regression model (Equation 1) presented in Section 3. We begin by discussing our baseline model estimated for two different dependent variables, height-for-age z-score and stunting. We then proceed with presenting regression results where we modify the baseline model by replacing the linear exposure to conflict with two non-linear age-specific variables measuring timing of exposure to conflict. We conclude this section by presenting regression results for different sub-samples of children, segregated by gender and household characteristics.

4.1 The effect of conflict on child health: baseline regressions

Table 2 reports our baseline results, where the main coefficient of interest is the one estimated on the interaction between the duration of exposure to conflict measured by age in months in 2005/2006 survey and the natural logarithm of the conflict events in a province of current residence. The table presents regression results for four sample categories. Panel A in Columns 1-6 presents results for the full sample and Columns 6-10 report them for the rural sub-sample. Panel B repeats these specifications for the sample of children who did not migrate during their life. All regressions include child's age in months, year of birth, and department of residence fixed effects.

In the full sample results presented in Panel A, Columns 1-5, the estimated coefficient of interest is -0.003, which is statistically significant at the ten percent level. This value suggests that a child from

the exposed cohort who experienced an average level of violence of 27.97 months, and who lived in a province with a median level of violence during that period (202 events) had a HAZ that was lower by 0.4456 (= 0.003*27.97* ln(202))[13] standard deviations, as compared to a child from a non-exposed cohort. This estimate is comparable to those of Bundervoet et al. (2009) and Minoiu and Shemyakina (2014), who analyzed the impacts of a civil war in Burundi and Cote d'Ivoire, respectively.

In the specifications for the full sample and the non-migrant sub-sample presented in Columns 1-5, we have controlled for household's rural residency. The regression coefficient estimated on the rural indicator variable is negative in all regressions; however, it fails to be statistically significant when we also control for household assets. This result suggests that there is a strong negative correlation between rural residence and household assets. This could indicate that wealthier households in rural locations may have been able to protect their children from the effect of the crisis.

Given that the effects of land reform, commercial farm invasions and displacement of agricultural workers were more likely to be felt in rural areas, we separately estimate models for the rural sub-sample only. We show results in Panel A, Columns 6-10. We find that the estimated coefficient of interest is higher in absolute value at -0.005 and is statistically significant at the ten percent level in all specifications. In the non-migrant and rural sub-sample results in Panel B, Columns 6-10, the estimated coefficient of interest is not statistically significantly different from zero.

The estimated coefficient on the stand-alone variable for the number of months exposed to violence is positive, but not statistically significantly different from zero in most of the models. In all specifications, the estimated coefficient on the "Female" dummy variable (not reported) is positive and statistically significant, which is consistent with some other studies.

[13] 0.003 is the estimated coefficient on the interaction term between variables "Number of months child was exposed to a violent events during his/her lifetime" and the "natural logarithm of the total number of conflict events between 2000 and 2005" in a province of child's residence (Table 2 Column 1). 27.97 is the average number of months a child was exposed to the conflict. 202 is the median number of conflict events a province experienced between 2002 and 2005.

Thus, the above results suggest that exposure to conflict during children's early years had an important negative effect on their health. The comparison between full and non-migrant sub-samples suggests that in rural areas, the majority of the negative health impacts were felt by children who migrated during their lifetimes.

[TABLE 2 HERE]

[TABLE 3 HERE]

Table 3 follows the layout of Table 2. Here, we use as our dependent variable "stunting," an alternative measure of child health. We find that the estimated coefficient of interest is positive in all specifications, but statistically significantly different from zero only for the rural sub-samples. Results are reported in Columns 6-10. Although the effect of conflict on stunting is statistically significant, it is worth noting that it is rather small in magnitude for the full sample results in Panel A. In Column 6, the estimated coefficient is 0.000949. This coefficient suggests that for an average level of exposure to conflict at 27 months, and with median number of conflict events at 202, a child in a rural location would be 14.09 percentage points (0.000949*27.97*ln(202)) more likely to be stunted than a child in the same location with zero months of exposure to conflict events. For the rural sub-sample the coefficient is 1.1 times larger at 0.001044. Using the same numbers as above, it suggests that non-migrant children in rural areas are 15.50 percentage points more likely to be stunted, as compared to non-exposed to violence children. Using this alternative measure of child health allows us to test for the robustness of the main results and to find an additional implication of conflict exposure for rural residents in particular.

[TABLE 4 HERE]

Next, we test for the robustness of our main results presented in Table 2. To do so, we use a non-linear measure of a child's lifetime exposure to conflict. In Table 4, the linear measure of child's conflict exposure, which we have used thus far, is replaced with two dummy variables, one for "exposed for 1-24 months," and one for "exposed for at least 25 months." By adding these two measures of conflict exposure, we seek to test for the effect of the timing of exposure. The reason is that the severity of events was higher in the early years of conflict, in 2000-2002. Thus, we would expect the older cohort of

children born after 1999 to have experienced a greater loss in stature compared to the younger cohort. Estimation results in Table 4 support this hypothesis, but only for the rural sub-sample.[14] Results in Panel A Columns 6-10 for rural locations suggest that children who were exposed to the conflict for 25 months or more in the most affected provinces experienced the greatest loss in stature. The estimated coefficient ranges between -0.235 and -0.250. depending on the set of controls considered. It is statistically significantly different from zero at the five percent level. The value of the coefficient suggests that children exposed to conflict for at least 25 months in rural provinces with the median exposure conflict level have a HAZ that is comparatively lower, by about 0.242*5.31*1 = -1.285 standard deviations.

One potential threat to the validity of the estimates presented thus far is selective migration, i.e., it is possible that poorer households were more likely to have migrated during political conflict, as they had nothing to lose. If this assumption is accurate, then our full sample estimates may underestimate the effects of conflict, as poorer households may also have less healthy children. However, if households that place a higher priority on the health of their children are more likely to migrate out of conflict areas, our results may overestimate the impact of conflict. Thus, to control for migration, we use information on whether the mother migrated when her child was very young, i.e., less than 5 years old, and re-estimate our two baseline models for the sample of mothers who did and did not migrate during their child's life (Tables 2 and 4, Panel B). The estimated main coefficients of interest are very similar to the full sample results in Tables 2 and 4 (Panel A). This suggests that the health of non-migrant children was affected similarly to the health of the full sample, and that migration was not one of the confounding factors.[15]

We further explore growth differentials between girls and boys in Tables A3 and A4. In these specifications, we add to the baseline equation an interaction among children's "Female" dummy

[14] It is possible that this effect only holds for the rural sub-sample, as rural areas experienced greater setbacks than urban households. These setbacks stemmed from the combined exposure to political violence and to various other disruptions associated with the land reform, including forced changes in ownership, farm invasions, and displacement of rural workers.

[15] We also estimate the set of regressions using an alternative measure of mother's migration: a mother is considered not to have migrated if she resided in the area prior to becoming pregnant with this child. The estimation results are very similar to these in the main regression Table 2.1.

variable, the variable for "months of exposure" and the variable "ln(events)." The rest of our controls remain the same. In Table A3, the estimated coefficient on the triple interaction term defined above is negative and statistically significantly different from zero at the 5 percent level, suggesting that female children from the affected cohort and in more affected communities fared worse. In the rural subsample, the estimated coefficient on the double interaction term "ln(events) * months of exposure" is negative and statistically different from zero at the 10 percent level, supporting the results in Table 2.

We now move to test whether there are any non-linear effects of exposure to conflict, e.g., with older children experiencing greater declines in stature. As shown in Table A4, the full sample estimates suggest that older female children suffered a greater loss in stature post-reform. In Columns 1-5, the estimated coefficient on the triple interaction term between "female," "exposed for at least 25 months" and "ln(events)" is negative and statistically significant at least at the five percent level. For the rural sub-sample, the results reported in Columns 6-10 suggest that negative impacts of the conflict were felt most strongly felt by older children, both boys and girls, who experienced conflict for at least 25 months of their life and who lived in rural provinces with more violent events. This is similar to the findings in Table 4. Thus, the results support the hypothesis that conflict exposure had a non-linear impact on child health; however, the impact for a particular group differs by sample analyzed.

Taken together, these results suggest that households in rural areas were unable to protect children of either sex from the violent shocks that began in early 2000. These events appear to have uniformly affected all young children aged 0-59 months at that time. The full sample results suggest that older girls in more affected locations (in urban areas, results not shown) experienced greater setbacks to their health as compared to younger girls, and to boys from both age groups.

The findings discussed above confirm the importance of the substantial violent shock experienced by the cohort born soon after the shifts in local politics, starting with the 2000 referendum in Zimbabwe. As previously mentioned, the levels and extent of violence against civilians substantially increased between 1999 and 2000, post-February 2000 referendum (Table 1 and Appendix Figures A1-A10). The violent events that followed the referendum affected farms, agriculture workers and transport networks.

The ACLED reports are heavy in farm attacks and invasions between 2000 and 2002. These attacks wrecked communities and livelihoods, and were coupled with a subsequent decline in commercial agriculture, leading to a decrease in food supply for everyone, particularly the poor.

4.2. Results for Different Sub-Samples

This section explores the differential effect of exposure to conflict for various subgroups. We divide the sample into four sub-samples: girls and boys; urban and rural; children of mothers with and without education; and children from poor and non-poor households. Households are defined as "poor" if they have less than the province-specific average amount of assets. Table 5 presents these baseline models with linear (Panel A) and non-linear measures (Panel B) of the duration of exposure to conflict. The results in Table 5, Panel A suggest that the health of female children living in rural and poor households who lived in regions more affected by violence was particularly negatively impacted by conflict. Specifically, girls in areas exposed to more violence experienced greater setbacks in their health than girls in areas exposed to fewer violent events or not exposed to it. Children from rural households living in communities exposed to violence suffered more compared to children from similar communities with lesser exposure to violence. Furthermore, children from poor households in the more affected communities and children of mothers with some education suffered greater setbacks in their health (Panel A). A greater regional exposure to conflict did not have a significant impact on health of children from urban areas, boys, and children from non-poor households.

Table 5, Panel B presents the baseline results with non-linear measures of duration of exposure: dummy variables for being-exposed for less than 24 months and for more than 24 months. The regression results are consistent with those presented in Panel A. Children who experienced conflict for more than 24 months, and who lived in provinces with higher violence levels, experienced greater absolute value negative shocks on their health as suggested by the estimated coefficient on the double interaction term between these two variables.

[TABLE 5 HERE]

4.3 Robustness Checks

4.3.1 Selective Mortality

A potential threat to the validity of our baseline estimates is selective mortality of boys, who tend to be biologically weaker in early years, or girls, due to gender bias, as documented in studies on South and East Asia (e.g. Das Gupta 1987, Duflo 2012). To explore potential selective mortality by gender, we construct a set of province and year-of-birth specific sex ratios and regress them on the interaction between a dummy for an observation coming from the 2005 survey (conflict cohort) and ln(events), a 2005 survey dummy and the ln(events). The estimated coefficient on the interaction term is negative in some regressions, but not statistically significantly different from zero in the four specifications considered (Table 6). The estimated coefficients on the conflict cohort dummy (survey 2005) or the province level measure of conflict are likewise not statistically significant in any of the models. These results suggest that selective mortality among boys or girls did not play a significant role.[16]

[TABLE 6 HERE]

4.3.1 Alternative Baseline Cohort: pre-conflict instability

From Table 1, we can see that many more violent events were recorded for 1998, compared to 1997 and 1999. More specifically, in 1998, there were multiple riots motivated by the increase in food and fuel prices (January and November, respectively) and tax reforms.[17] There were also some first instances of farm occupations during that time (Sadomba, 2008). Therefore, to account for that initial increase in violence, we exclude from the initial control group children born in 1998 and 1999, who were exposed to this early period of instability. During this period, there were food and fuel price hikes that could have

[16] Another way to compare selection mortality of the cohort born before 1999 to that born after 1999 would be to use Census data or birth history data from the ZDHS data. However, Zimbabwe Census data are not publicly available, and ZDHS-based birth history data are likely to be of a limited use, due to migration of populations out of their communities and the country.

[17] The increase in food prices and tax hikes should have affected the real incomes of the population, effectively reducing them. The riots associated with these events in 1997 occurred before the increase in violence that began in 2000, and, which is the main interest in this paper. Thus, the decrease in income due to steeper prices and higher taxes would have especially impacted children born in 1997 and 1998. We assume that these events applied uniformly across the country.

negatively affected these children's outcomes, thereby biasing our baseline results towards zero. This modified alternative control group includes only those children born between 1994 and 1997 and surveyed in 1999. Results in Table 7 confirm our baseline results with respect to the sign and size of coefficients. We also observe that removing from the control group all children born after January 1998 (up to the date of the 1999 survey) increases the effect size. The absolute value of the coefficient estimated on the interaction between "months of exposure" and severity of conflict (Panel A) is higher (-0.004) as compared to full sample results (-0.003) in Table 2, Panel A. This coefficient is statistically significant at the one percent level in all specifications, compared to the 10% significance level in Table 2, Panel A.

In other specifications in Panel B, the estimated coefficient on the interaction between a dummy for "exposed for 25 months or more" and the regional conflict exposure is higher than the one in Table 4 (full sample results) and is statistically significant at the one percent level for older kids. The interaction term is also negative and statistically significant at the ten percent level for children exposed for 24 months or less. For the rural sub-sample, the coefficient for older children * ln(events) is statistically significant from zero at the one percent level in all models but one. It is also comparable in size to the results in Table 4, Panel A.

The results above suggest that the pre-2000 conflict turbulence and increase in food prices (proxied by the increase in riots) put children born in 1998 at a substantial disadvantage. This disadvantage is comparable to the impact of the following years of crisis caused by a rise in political violence, combined with land reform. These findings highlight how understanding the history of conflict and other insecurities in a country is important for attributing changes in child health to specific periods of political disturbances.

[TABLE 7 HERE]

4.3.2 Operation Murambatsvina: alternative treatment group

In May 2005, the government carried out "Operation Murambatsvina" (translated as "Drive out the Rubbish"), officially termed "Operation Restore Order." The official goal of the operation was to clean up urban slums in Harare and generate urban renewal; however, in practice, the government used the operation to bulldoze illegal settlements in the cities and push out rural migrants. About 2.4 million individuals were affected by the Operation (Tibaijuka 2005). Many residents were forced to destroy their own homes. Some accounts suggest that young children, elderly and the disabled were killed in the process (Hammar, 2008: p. 427). Between 120,000 (police accounts) and 323,385 (Zimbabwe Human Rights NGO Forum, 2005) people become displaced. Almost 700,000 thousand people became unemployed or lost their livelihoods, as destroyed housing included many informal sector production sites and workshops containing tools and other means of production. This large displacement of population and loss of livelihoods could have affected child health negatively, leading to an overestimate of the effect of the overall period of political violence during the 2000-2005 period. To address this concern, we trim the exposed cohort by removing from the analysis children born after May 2005.

[TABLE 8 HERE]

The estimated results are reported in Table 8. They suggest that the impact of exposure to political violence on children' health outcomes was significantly different from zero for children residing in rural areas. The main coefficient of interest is stable for the full sample results and is similar to Table 2; however, it is no longer statistically significantly different from zero. These results suggest that the political violence over the whole period from 2000-2005 had a substantial effect on the health of children in rural areas. The alternative treatment group estimations suggest that the effects of Operation Murambatsvina had a stronger impact on urban locations, as the full sample results become not statistically significant once we drop the group affected by the Operation.

4.3.3 Potential Threats to Validity

There are three other potential threats to the validity of results presented thus far. The first is sample selection due to migration. If political violence led to significant displacement of the population—particularly, migration outside of a country's borders—this could affect our results. Specifically, migrants are generally poorer, and are thus more likely to have poorer health outcomes. This could lead us to underestimate the impact of conflict exposure. If, instead, the migrants were wealthier and from urban locations, we could expect the results to overestimate the impact of political violence on child health.

The second potential threat to the validity of our results is the impact of political violence on children, which is likely significant and nationwide. We would expect all children in the affected cohort to have been impacted by the health shock, and, as a result, the local impact of violence could be underestimated. From Table 2, we can see that the number of months child was exposed to political violence interacted with amount of localized violence on child health is statistically significantly different from zero in most of the estimations, regardless of whether the samples are rural or full samples. We see some age-specific impacts in Table 4, where the affected cohort is split into two sub-samples, but only when the "exposed over 25 months" dummy variable is interacted with ln(events) in the child's province of residence. Thus, we can argue that the impact of political turbulence was indeed more prominent for older kids and in the areas that experienced greater amount of political violence.

The third potential threat to validity is the fact that the conflict variable is measured at the province level – a rather aggregate measure. As a result, our conflict exposure estimation could lead to a measurement error, where some parts of the region that are geographically far away from the actual location of the conflict are included in the "conflict area" on par with the areas adjacent to this particular event. This inclusion may bias the regression slope towards zero. Although this might indeed be the case, we assume, similar to the earlier literature, that regional food security is threatened during conflict due to its impact on food supply and trading networks that were shut down during conflict. Hence, our estimates help us to understand the extent of the regional shocks to food security.

Most of the threats to validity discussed above suggest that it is more likely than not that our results present a rather conservative measure of the actual impact of political violence on population.

4.3.4 Placebo Test

Our analysis may be vulnerable to two additional concerns. The first concern is that the estimated impact of the conflict could capture pre-existing differences in child health between conflict and non-conflict regions. The second concern is that political violence in the country and displacement of agricultural workers may have led to out-migration of the population that was affected by the violence in 2000-2005. As a result, this wave of migration could have affected our sample composition. To alleviate these concerns, we perform a placebo test using household- and individual-level data from the 1994 and the 1999 Demographic and Health Surveys (ZDHS) for Zimbabwe. We note that children surveyed in 1994 and most children surveyed in 1999 were not affected by the pre-conflict turbulence and or the post-2000 conflict events. Given that the 1994 ZDHS only collected data on the anthropometric indicators of children who were less than 36 months old (ZDHS Program 1995), our placebo test combines data for 1994 (assumed control group) and 1999 (assumed treatment group) ZDHS. Specifically, we estimate two sets of regressions. In the first, we use only the sample of children ages 35 months and below from ZDHS 1994 and 1999 (Panel A). Second, we estimate the same set of regressions for a sample of children under 35 months using the combined 1999 and 2005/2006 DHS data. The results show that children in the placebo-conflict regions and the placebo war cohort did not have different height-for-age z-scores compared to children of similar age outside placebo-conflict regions (Table 9: Panel A). In Panel B, we see that children aged 35 months or less in rural locations experienced significant health set-backs in provinces with more conflict events. Thus, the placebo test results suggest that pre-existing differences in child health across provinces differentially affected by political violence in 2000-2005 are unlikely to drive our baseline results.

[TABLE 9 HERE]

4.3.5 Discussion

This section discusses our main results and their potential drivers. It is important to understand the mechanisms through which exposure to political violence and conflict affect child health. The reason is that it may help us to develop policy responses to address these negative effects. As is often the case, for the conflict-affected countries (e.g. Akresh et al. 2011), we are unable to explore these mechanisms empirically; therefore, we use anecdotal and contextual evidence from the field to speculate on the mechanisms through which political violence affected child health.

One of the potential mechanisms through which political violence could affect children's health is by influencing their families' access to resources. Several reports have argued that opposition supporters were discriminated against in their access to food at controlled prices and food for work programs during the crisis (e.g. Beaumont 2002; HRW, 2003; US Department of State 2009/2017).

Our results suggest that children in rural areas who were exposed to conflict for more than 25 months of their life were negatively affected. As we are unable to identify the political affiliation of children's families, our results could be interpreted as a lower bound estimate for children who may have come from families that supported the opposition. It is possible that the discriminatory policies of the Mugabe regime had a spillover effect on everyone in the country, and that what we are seeing is the average impact. Furthermore, Operation Murambatsvina led to displacement of large numbers of urban and rural residents and to a loss of livelihoods, as dwellings, and businesses were demolished (Sadomba 2008; US Department of State 2009/2017).

As previously discussed, we expect that political violence in Zimbabwe would have affected food security, thereby affecting children's height. We have two reasons for this hypothesis. First, state-sponsored violence towards opposition supporters (Sadomba 2008) and farm owners due to FTLR displaced many people and agricultural workers in particular. Involuntary migration and longer displacement is likely to expose children to water and vector borne diseases (Akresh et al. 2011). This exposure may explain why children affected by political violence have a shorter stature than non-affected

children in our sample. Second, this disruption affected all households, and rural households in particular, through a reduced access to work and food supply.

As shown in Table 4, we find that conflict exposure is greater among children in rural areas, and in those exposed to conflict for longer durations. These findings are in line with Akresh et al. (2011)'s findings on Rwanda's civil war shock and crop failure.

Our results show that height-for-age z-scores of girls, rural children, and children in poorer households were most affected by the cycle of political violence following the 2000 Zimbabwe referendum. As previously noted, it is possible that urban households and wealthier households across the country had access to more diverse resources to draw on in the face of the crisis.

Further research should focus more on the specific mechanisms impacting children's health in these situations of prolonged deprivation, when government assistance is poor and disruptions to market systems abound.

5. Discussion and Conclusion

Our objective was to analyze the impact of election-related instability and civilian waves of violence on the health of Zimbabwean children. The wave of violence intensified around the time of the 2000 referendum. One of the aims of the referendum was a land reform policy seeking to redistribute land away from commercial farmers. The land reform affected food supply and food security by decimating commercial farms in Zimbabwe. A large body of literature has previously found that children's height-for-age can be affected by full-fledged civil wars (e.g. Bundervoet et al. 2009; Akresh et al. 2011, 2012; Minoiu and Shemyakina 2014). The contribution of this paper is to test whether violence during a smaller scale conflict, such as the one in Zimbabwe, could also have impacted children's height-for-age.

Our study used DHS data for Zimbabwe, in combination with ACLED based measures of conflict related violence. We performed differences in differences analysis, through which we compared the health of children not exposed to the increase in violence to children who experienced the height of it. We find that children who lived in areas with high levels of violence during their early childhood suffered

setbacks in their height-for-age z-scores. These results are consistent with studies on the impact of major wars on the populations of impacted countries.

With respect to conflict mechanisms, we were able to explore migration, which frequently affects households in conflict-affected countries. We find very little difference in the magnitude of estimated coefficients between the full and non-migrant sub-samples for full sample results, while rural migrant children experienced poorer health outcomes in the locations where they migrated (results not reported). This suggests that the health of migrant children was affected similarly to the full sample. Furthermore, we would like to qualify that our results are contingent on an individual surviving the conflict and remaining within the country's borders.

Our study also helped to understand which factors or circumstances mitigate one's exposure to violent shocks. We noted that parents' education, family income, and location are all relevant to identifying the most vulnerable households and children that could be affected. We find that those who experienced poorer health outcomes were older children from rural households; female children in areas more affected by conflict; children of more educated mothers; and children from households with fewer assets.

We focused on the impact on children's height-for-age. The reason is that, according to the WHO (1997), "growth assessment serves as an indirect measure of the quality of life of an entire population." A study by Kuku et al. (2011) that uses self-reported food security measures by children and adults in Zimbabwe suggests that young children, ages 6-9, in poorer households were better protected than adults from food insecurity, with the exception of female orphans. In our study, anthropometric measures show that older children in regions more affected by violent events have lower height-for-age z-scores in the full sample in more affected locations and are more stunted in rural locations. Therefore, it is likely that the health of adults in the affected areas is also distressed.

In sum, this paper shows that the effect of conflict exposure to children's early health is profound and likely to be of long-term consequence, affecting children throughout their life unless mitigated by improved circumstances. Our results are relevant from a policy perspective, as we have shed light on the

effects of state-sponsored violence, a common phenomenon in Zimbabwe, and more generally in the region. We showed that children are among the most vulnerable, and can suffer long-term consequences affecting their stature, and presumably their overall quality of life. Thus, adequate and timely policy interventions are needed to prevent stunting during conflict.

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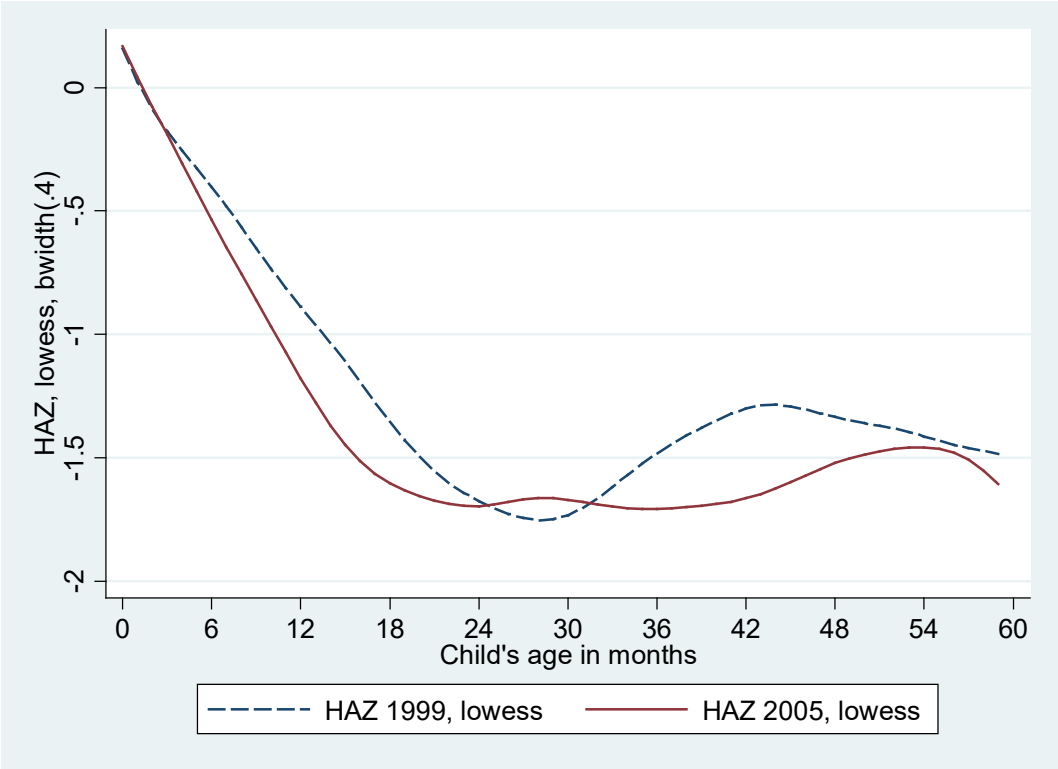
Figure 1 – HAZ by child's age in months and survey date



Source: ZDHS 1999 and 2005/06. Author's calculations

Table 1 – Violent Events in Zimbabwe by Year and Type of Event: 1997-2010

Type of Event	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	total
Battle-No change of territory	0.0	0.0	1.2	0.6	0.0	0.4	1.1	2.2	0.0	1.6	2.9	0.6	3.1	1.8	1.0
Headquarters or base established	0.0	0.0	0.0	10.4	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.6	0.0	15.9	2.6
Non-violent transfer of territory	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Remote violence	0.0	0.0	0.0	1.5	0.3	0.1	0.0	0.0	0.0	0.0	0.5	0.1	0.0	0.4	0.2
Riots/Protests	90.9	84.6	66.3	3.3	4.4	1.5	4.2	3.7	19.9	17.2	19.5	3.3	28.9	10.6	10.7
Strategic development	0.0	1.1	9.6	1.5	2.2	2.0	0.3	0.0	0.0	0.0	0.0	2.8	7.1	16.4	2.7
Violence against civilians	9.1	14.3	22.9	82.8	93.1	91.3	94.4	94.1	80.2	81.2	77.1	92.6	60.9	54.9	82.7
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
N-events year	22	91	83	337	318	784	354	324	272	122	210	800	225	226	4,168
Fatalities per year	2	11	6	46	37	54	6	2	7	1	9	108	27	8	324

Source: ACLED data, version 7 (1997-2016), accessed 10/27/2017. ACLED data (Raleigh et al. 2010).

Table 2 - The effect of exposure to political violence on height-for-age z-score (HAZ), difference in differences regressions.

Panel A: Full sample	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.005*	-0.005*	-0.005*	-0.005*	-0.005*
events	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Months exposed to political violence	0.017*	0.016*	0.016*	0.014	0.011	0.024	0.023	0.023	0.021	0.02
	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)	(0.016)	(0.016)	(0.016)	(0.015)	(0.017)
rural	-0.287**	-0.273**	-0.273**	-0.254**	-0.04					
	(0.091)	(0.088)	(0.085)	(0.096)	(0.082)					
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R squared	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.13	0.13
F-values (joint test of controls)										
Interview language	na	0.030	0.049	0.067	0.188	na	0.057	0.051	0.012	0.034
Head controls	na	na	0.589	na	na	na	na	0.734	na	na
Mother controls	na	na	na	0.000	na	na	na	na	0.000	na
HH assets controls	na	na	na	na	0.032	na	na	na	na	0.013
Panel B: Non-migrant sub-sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln	-0.003*	-0.003*	-0.003	-0.003*	-0.003	-0.005	-0.005	-0.005	-0.005	-0.005
events	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Months exposed to political violence	0.014	0.012	0.013	0.012	0.008	0.016	0.015	0.015	0.013	0.012
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.018)	(0.018)	(0.019)	(0.018)	(0.020)
rural	-0.318**	-0.303**	-0.304**	-0.282**	-0.095					
	(0.104)	(0.101)	(0.104)	(0.099)	(0.133)					
N	5735	5735	5707	5729	5706	4405	4405	4381	4400	4387
R squared	0.12	0.12	0.12	0.13	0.12	0.14	0.14	0.14	0.14	0.14
F-values (joint test of controls)										
Interview language	na	0.082	0.137	0.136	0.268	na	0.087	0.108	0.028	0.064
Head controls	na	na	0.892	na	na	na	na	0.427	na	na
Mother controls	na	na	na	0.010	na	na	na	na	0.002	na
HH assets controls	na	na	na	na	0.046	na	na	na	na	0.081
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes

Notes: Sample: children age 0-59 months in 1999 and 2005/2006 DHS. Robust standard errors in parentheses, clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is a child's height-for-age z-score (HAZ). All regressions include a dummy variable for "female" child, year of birth, age in months and province of residence fixed effects. The interview language dummies includes: Ndebele, other (English and other) with

Shona being a reference category. Mother's characteristics include: mother's age, a set of controls for mother completing: primary, secondary, higher education, and other ("no education" is a reference category), and controls for mother's religion (traditional, other, no religion, "Christian" is a reference category). Household head characteristics include: household's head age, gender (=1 if male) and an indicator for household head being literate (completed some education). Household's assets include a set of dummy variables for: having access to a toilet facility, have cement floor in a household, for cooking hhd used electricity, natural gas, or coal; household has access to electricity, phone, and a dummy for household owning a car. Data sources: DHS 1999 and 2005/2006 and ACLED v1 (Raleigh et al. 2010).

Table 3 - The effect of exposure to political violence on stunting, difference in differences regressions.

	Full sample					Rural sample				
Panel A: full sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to conflict * ln	0.000051	0.000038	0.000027	0.000045	0.000034	0.000949*	0.000920*	0.000897*	0.000899*	0.000873*
events	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N months exposed to conflict	0.002034	0.0022	0.001926	0.002582	0.002889	-0.001415	-0.001282	-0.001282	-0.000901	-0.000401
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
rural	0.066763**	0.064335**	0.067861**	0.056933**	0.009087					
	(0.022)	(0.022)	(0.023)	(0.025)	(0.032)					
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes
N	6560	6560	6520	6550	6520	5020	5020	4990	5020	5000
R squared	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08
Panel B: non-migrants	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to conflict * ln	0.000121	0.000109	0.000088	0.000114	0.000077	0.001044*	0.001010*	0.000968	0.000985*	0.000942
events	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
N months exposed to conflict	0.00453	0.004779	0.004433	0.004863	0.005486*	0.001305	0.00152	0.001553	0.001859	0.002486
	(0.0029)	(0.0030)	(0.0029)	(0.0029)	(0.0027)	(0.0028)	(0.0028)	(0.0029)	(0.0027)	(0.0029)
rural	0.072916**	0.070389**	0.073288*	0.062730*	0.022727					
	(0.031)	(0.031)	(0.033)	(0.034)	(0.054)					
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes
N	5740	5740	5710	5730	5710	4410	4410	4380	4400	4390
R squared	0.07	0.07	0.07	0.08	0.07	0.08	0.08	0.08	0.08	0.08

Notes and data sources: see “notes and “data sources” to Table 2.The dependent variable is a dummy variable denoting a child being stunted based on WHO standards.

Table 4 – The effect of exposure to state violence on height-for-age z-score (HAZ), difference in differences regressions. Non-linear conflict exposure.

Panel A: Full sample	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	-0.052	-0.05	-0.054	-0.053	-0.041	-0.147	-0.144	-0.144	-0.147	-0.13
	(0.062)	(0.063)	(0.062)	(0.062)	(0.066)	(0.108)	(0.108)	(0.107)	(0.109)	(0.108)
Exposed 25 plus months * ln events	-0.111	-0.108	-0.112	-0.109	-0.099	-0.250**	-0.246**	-0.245**	-0.244**	-0.235**
	(0.070)	(0.069)	(0.070)	(0.069)	(0.071)	(0.097)	(0.096)	(0.097)	(0.096)	(0.096)
Exposed for 0-24 months	-0.435	-0.444	-0.438	-0.427	-0.494	-0.071	-0.092	-0.106	-0.073	-0.169
	(0.462)	(0.467)	(0.474)	(0.459)	(0.486)	(0.617)	(0.626)	(0.628)	(0.624)	(0.621)
Exposed for at least 25 months	-0.368	-0.386	-0.374	-0.396	-0.455	0.138	0.116	0.098	0.104	0.033
	(0.453)	(0.448)	(0.463)	(0.448)	(0.455)	(0.640)	(0.637)	(0.643)	(0.615)	(0.635)
rural	-0.256**	-0.241**	-0.244**	-0.226*	-0.005					
	(0.097)	(0.092)	(0.090)	(0.102)	(0.094)					
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R squared	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Panel B: Non-migrant sub-sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	-0.043	-0.042	-0.042	-0.045	-0.027	-0.152	-0.145	-0.144	-0.145	-0.13
	(0.070)	(0.068)	(0.069)	(0.066)	(0.072)	(0.093)	(0.092)	(0.090)	(0.095)	(0.086)
Exposed 25 plus months * ln events	-0.11	-0.108	-0.108	-0.109	-0.092	-0.263**	-0.256*	-0.254*	-0.252*	-0.243*
	(0.082)	(0.080)	(0.081)	(0.079)	(0.083)	(0.110)	(0.109)	(0.110)	(0.109)	(0.110)
Exposed for 0-24 months	-0.474	-0.48	-0.483	-0.461	-0.558	-0.044	-0.079	-0.098	-0.076	-0.166
	(0.452)	(0.451)	(0.455)	(0.439)	(0.467)	(0.462)	(0.467)	(0.454)	(0.479)	(0.440)
Exposed for at least 25 months	-0.308	-0.322	-0.318	-0.327	-0.414	0.236	0.199	0.18	0.177	0.101
	(0.480)	(0.471)	(0.485)	(0.470)	(0.492)	(0.704)	(0.701)	(0.706)	(0.687)	(0.704)
rural	-0.279**	-0.262**	-0.267**	-0.248**	-0.057					
	(0.111)	(0.107)	(0.110)	(0.108)	(0.150)					
N	5735	5735	5707	5729	5706	4405	4405	4381	4400	4387
R squared	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes

Notes: as for Table 2. Exposed for "1-24" months and "exposed for more than 25 months" are dummy variables indicating months of exposure to political violence.

Table 5 - Impact of political violence on child health, analysis by sub-group

Panel A: linear exposure to political violence	female	male	rural	urban	mother no education	mother some education	poor	non poor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
N months exposed to political violence * ln events	-0.005**	-0.002	-0.005*	-0.003	-0.003	-0.003*	-0.004**	-0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.005)	(0.001)	(0.002)	(0.001)
N months exposed to political violence	0.002	-0.045***	-0.024	0.000	-0.097**	-0.019**	-0.021	-0.026**
	(0.012)	(0.007)	(0.015)	(0.017)	(0.038)	(0.006)	(0.015)	(0.011)
Female			0.207***	0.086	-0.002	0.181***	0.167***	0.183**
			(0.034)	(0.069)	(0.105)	(0.045)	(0.032)	(0.078)
rural	-0.263**	-0.280**			0.595	-0.278**	0.004	-0.228*
	(0.108)	(0.120)			(0.397)	(0.098)	(0.095)	(0.120)
N	3284	3271	5023	1532	402	6153	3390	3134
R squared	0.09	0.10	0.10	0.08	0.11	0.10	0.11	0.08
Panel B: Non-linear exposure to political violence	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposed 1-24 months * ln events	-0.026	-0.071	-0.147	-0.051	-0.197	-0.034	0.022	-0.062
	(0.025)	(0.109)	(0.108)	(0.039)	(0.333)	(0.065)	(0.059)	(0.145)
Exposed 25 plus months * ln events	-0.165	-0.056	-0.250**	-0.075	-0.044	-0.105	-0.147	-0.057
	(0.092)	(0.059)	(0.097)	(0.084)	(0.273)	(0.078)	(0.088)	(0.073)
Exposed for 0-24 months	0.690*	-1.293	-0.071	0.892***	2.829	-0.593	-1.385*	0.265
	(0.310)	(0.766)	(0.617)	(0.216)	(1.938)	(0.453)	(0.686)	(0.975)
Exposed for at least 25 months	1.304	-1.739**	0.138	0.942	-0.227	-0.300	-0.799	-0.037
	(0.812)	(0.681)	(0.640)	(0.600)	(1.764)	(0.415)	(1.065)	(0.471)
Female			0.214***	0.089	0.023	0.186***	0.173***	0.190**
			(0.034)	(0.069)	(0.117)	(0.045)	(0.035)	(0.080)
rural	-0.249**	-0.253*			0.61	-0.257**	0.003	-0.211
	(0.109)	(0.116)			(0.406)	(0.093)	(0.100)	(0.121)
N	3284	3271	5023	1532	402	6153	3390	3134
R squared	0.09	0.10	0.10	0.07	0.14	0.09	0.11	0.07

Notes: as for Table 2.1. “Poor” household is defined as the one with less than the province-specific average amount of assets (Household's assets include a set of dummy variables for: having access to a toilet facility, have cement floor in a household, used for cooking oil, household has access to electricity, phone, and a dummy for household owning a car). “Mother no education” – is a mother with zero years of education. “Mother some education” – mother has some years of education above zero.

Table 6 – Variations in Sex Ratios Across Regions and Over Time

	(1)	(2)	(3)	(4)
Survey 2005 * ln(events)	0.01	-0.008	0.008	-0.011
	(0.140)	(0.126)	(0.144)	(0.127)
Survey 2005	-0.043	-1.109	-0.037	-1.266
	(0.779)	(0.930)	(0.803)	(0.914)
ln(events)	0.01	0.019		
	(0.083)	(0.083)		
N	122	122	122	122
R squared	0.00	0.18	0.04	0.24
Year of birth FE		X		X
Province of Residence FE			X	X

Notes: Robust standard errors in parentheses, clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is the sex ratio (by province and year of birth). Sex ratios are computed from data for 6,558 children with non-missing information on gender and location of current residence from two pooled surveys. The year of birth ranges between 1994 and 2006. "War cohort" is an indicator for an observation coming from the 2005/2006 DHS. Data sources: as for Table 2.

Table 7 – Alternative baseline cohort, full sample, the effect of exposure to political violence on height-for-age z-scores (HAZ), difference in differences regressions.

Panel A: Linear exposure	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004*	-0.004*	-0.004*	-0.004*	-0.004*
* ln events	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Months exposed to political violence	-0.017	-0.018*	-0.018	-0.018*	-0.020*	-0.027*	-0.027*	-0.027*	-0.028**	-0.029*
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.013)	(0.013)	(0.013)	(0.012)	(0.014)
rural	-0.382**	-0.364***	-0.363***	-0.353**	-0.150					
	(0.118)	(0.111)	(0.105)	(0.127)	(0.117)					
N	5516	5516	5488	5512	5492	4229	4229	4204	4225	4213
R squared	0.08	0.08	0.08	0.09	0.09	0.08	0.09	0.08	0.09	0.09
Panel B: Non-linear exposure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	-0.103*	-0.104*	-0.102*	-0.109*	-0.096*	-0.127	-0.125	-0.124	-0.123	-0.113
	(0.048)	(0.051)	(0.051)	(0.049)	(0.052)	(0.105)	(0.110)	(0.110)	(0.114)	(0.105)
Exposed 25 plus months * ln events	-0.165***	-0.164***	-0.161***	-0.168***	-0.155***	-0.228***	-0.225***	-0.222***	-0.223***	-0.216**
	(0.039)	(0.037)	(0.039)	(0.038)	(0.036)	(0.062)	(0.059)	(0.060)	(0.056)	(0.062)
Exposed for 0-24 months	-0.185	-0.185	-0.199	-0.158	-0.229	-0.173	-0.186	-0.202	-0.204	-0.258
	(0.434)	(0.447)	(0.459)	(0.433)	(0.454)	(0.635)	(0.659)	(0.676)	(0.669)	(0.647)
Exposed for at least 25 months	-0.095	-0.109	-0.121	-0.097	-0.168	0.037	0.023	0.0000	0.004	-0.053
	(0.402)	(0.396)	(0.413)	(0.394)	(0.399)	(0.498)	(0.483)	(0.498)	(0.446)	(0.506)
rural	-0.355**	-0.338**	-0.338**	-0.334**	-0.139					
	(0.119)	(0.112)	(0.106)	(0.129)	(0.121)					
N	5516	5516	5488	5512	5492	4229	4229	4204	4225	4213
R squared	0.08	0.08	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.08
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes

Notes: as for Table 2.1. The baseline cohort (DHS 1999 observations) excludes children born after Jan 1998 (1998 and 1999 born) as they were exposed to pre-crisis events soon right after their birth.

Table 8 – Alternative treatment (affected) cohort, full sample, the effect of exposure to political violence on height-for-age z-scores (HAZ), difference in differences regressions.

Panel A: Full sample	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln	-0.003	-0.003	-0.003	-0.003	-0.003	-0.005*	-0.005*	-0.005*	-0.005*	-0.005*
events	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Months exposed to political violence	0.017*	0.016*	0.017*	0.015	0.012	0.029*	0.028*	0.028*	0.026*	0.025
	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.013)	(0.013)	(0.013)	(0.013)	(0.015)
rural	-0.271**	-0.258**	-0.256**	-0.238**	-0.022					
	(0.086)	(0.083)	(0.079)	(0.094)	(0.085)					
N	6137	6137	6105	6130	6106	4660	4660	4633	4654	4640
R squared	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11
Panel B: Non-migrant sub-sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln	-0.003	-0.003	-0.003	-0.003	-0.003	-0.005	-0.005	-0.005	-0.005	-0.005
events	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Months exposed to political violence	0.014	0.013	0.013	0.012	0.008	0.023	0.021	0.022	0.02	0.018
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.016)	(0.016)	(0.016)	(0.015)	(0.018)
rural	-0.300**	-0.286**	-0.286**	-0.264**	-0.076					
	(0.097)	(0.095)	(0.097)	(0.093)	(0.121)					
N	5321	5321	5297	5315	5292	4045	4045	4025	4040	4027
R squared	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.12	0.12
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes

Notes: as for Table 2. The alternative treatment cohort excludes children born in or after May 2005 as they were exposed to Operation Murambatsvina in infancy.

Table 9 – Placebo Test: testing the parallel trends assumption.

Panel A: 1994 and 1999 ZDHS: children under 36 months old	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence (placebo) * ln events	0.001	0.001	0.001	0.001	0.000	0.002	0.002	0.002	0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
N months exposed to political violence (placebo)	-0.001	-0.001	0.002	0.000	0.007	-0.004	-0.004	0.000	0.001	0.007
	(0.021)	(0.021)	(0.021)	(0.020)	(0.022)	(0.039)	(0.039)	(0.041)	(0.040)	(0.041)
rural	-0.142	-0.144	-0.139	-0.054	0.144					
	(0.106)	(0.105)	(0.094)	(0.127)	(0.113)					
N	3769	3769	3723	3769	3746	2912	2912	2871	2912	2897
R squared	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18
Panel B: 1999 and 2005/2006 ZDHS: children under 36 months old	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln events	-0.003	-0.003	-0.003	-0.003	-0.002	-0.008*	-0.009*	-0.009*	-0.009*	-0.008*
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
N months exposed to political violence	0.017	0.017	0.017	0.015	0.006	0.036	0.037	0.037	0.037	0.031
	(0.025)	(0.025)	(0.026)	(0.025)	(0.027)	(0.028)	(0.028)	(0.029)	(0.027)	(0.030)
rural	-0.294**	-0.293**	-0.299**	-0.263*	-0.042					
	(0.117)	(0.116)	(0.114)	(0.120)	(0.121)					
N	4073	4073	4050	4068	4053	3133	3133	3113	3129	3118
R squared	0.13	0.13	0.13	0.13	0.13	0.15	0.15	0.15	0.15	0.15
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes

Notes: Sample: Panel A: children age 0-35 months in 1994 and 1999 ZDHS. Panel B: children age 0-35 months in 1999 and 2005/2006 ZDHS.
In Panel A: Children surveyed in 1999 are assumed to belong to "exposed cohort"; In Panle B: children surveyed in 2005/2006 are the "exposed cohort".Robust standard errors in parentheses, clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is a child's height-for-age z-score (HAZ). All regressions include a dummy variable for "female" child, year of birth, age in months and province of residence fixed effects. The interview language dummies includes: "Ndebel", reference category is "Shona + other language" (the last two categories are bundled together b/se there was no "other" category reported in ZDHS 1994 sample. Mother's characteristics include: mother's age, a set of controls for mother completing: primary, secondary, higher education, and other ("no education" is a reference category), and controls for mother's religion (traditional, other, no religion, "Christian" is a reference category). Household head characteristics include: household's head age, gender (=1 if male) and an indicator for household head being literate (completed some education). Household's assets include a set of dummy variables for: having access to a toilet facility, have cement floor in a household, household has access to electricity, and a dummy for household owning a car. Data sources: Zimbabwe DHS: 1994, 1999 and 2005/2006 and ACLED v1. (Raleigh et al. 2010).

APPENDIX

Table A1 – Sample statistics

Variable	N obs, 1999	Survey=1999 (non-exposed)	N obs, 2005	Survey=2005 (Exposed group)
Child's height-for-age z-score (HAZ)	3194	-1.26	4973	-1.38
Child's weight-for-height z-score (WHZ)	3194	0.11	4973	0.09
Child's age in months	3078	27.86	4535	27.97
Child months exposed to political violence	3078	0.00	4535	27.97
Child's exposure for 0-24 months (dummy)	3078	0.00	4535	0.45
Child's exposure for 25 months and more (dummy)	3078	0.00	4535	0.54
Female child	3078	0.50	4537	0.50
Months exposed to political violence * events	3078	0.00	4535	7377.14
Months exposed to political violence * ln(events)	3078	0.00	4535	145.48
Interview language is Shona	3892	0.68	5944	0.77
Interview language is Ndebele	3892	0.30	5944	0.21
Interview language is English	3892	0.02	5944	0.00
Interview language is "other"	3892	0.03	5944	0.01
Rural resident	3892	0.77	5944	0.75
Mother's age	3077	28.11	4537	27.78
Mother has no education	3077	0.08	4537	0.04
Mother has primary education	3077	0.47	4537	0.39
Mother has secondary education	3077	0.43	4537	0.55
Mother has higher education	3077	0.02	4537	0.02
Mother practices traditional religion	3067	0.04	4537	0.04
Mother is Christian	3067	0.80	4537	0.85
Mother did not report religion	3067	0.13	4537	0.10
Mother belongs to other religion	3067	0.04	4537	0.01
Mother migrated during child's life	3077	0.20	4535	0.07
Mother migrated during child's life and her pregnancy	3077	0.27	4535	0.11
HH head age	3892	42.24	5942	42.34
HH head is male	3892	0.63	5942	0.65
HH head is literate	3860	0.86	5908	0.89
HH has an improved toilet facility	3887	0.63	5935	0.60
HH has cement floor	3889	0.56	5943	0.55
HH uses for cooking: coal, gas, electricity	3891	0.19	5943	0.24
HH has electricity	3884	0.26	5940	0.27
HH has phone	3884	0.04	5943	0.05
HH owns a car	3884	0.05	5939	0.05
HH is poor (asset sum below province and survey level average)	3862	0.48	5927	0.53

Notes: please note that on an average a child under age 60 months surveyed in 2005 was exposed to violence for the whole duration of his/her life. Therefore, child's average age in months = child's average number of months of exposure to conflict (for 27.97 months).

Table A2 – Survey comparability, 1999 ZDHS vs. 2005/2006 ZDHS

	Panel A: No province fixed effects							Panel B: Included province level fixed effects						
Variables	ln events* Survey 2005		Survey 2005		ln events, 2000-2005		R-sq	N	ln events* Survey 2005		Survey 2005		R-sq	N
	(1)		(2)		(3)		(4)	(5)	(1)		(2)		(3)	(4)
Rural	0.018		-0.063		-0.226		0.16	7614	0.005		-0.023		0.56	7614
Poor hhd	-0.091		0.533		-0.043		0.03	7576	-0.098	*	0.564		0.05	7576
Household Head														
Age	1.999	***	-10.122	**	-3.327	***	0.02	7612	2.027	***	-10.263	**	0.03	7612
Male	0.027	***	-0.148	***	0.054	**	0.02	7612	0.029	***	-0.157	***	0.04	7612
Literate (some school)	-0.002		0.028		0.035		0.01	7570	-0.004		0.046		0.03	7570
Mother's characteristics														
Age	0.262		-1.646	*	-0.700	***	0.01	7614	0.245		-1.563	*	0.01	7614
Literate (some school)	-0.010		0.083		0.020		0.01	7614	-0.010		0.085		0.03	7614
No education	0.010		-0.083		-0.020		0.01	7614	0.010		-0.085		0.03	7614
Has primary education	-0.016		-0.004		-0.092	*	0.04	7614	-0.015		-0.015		0.08	7614
Secondary education	0.002		0.107		0.108	*	0.04	7614	0.002		0.118		0.10	7614
Higher education	0.004		-0.020		0.004		0.00	7614	0.004		-0.018		0.01	7614
Mother's religion														
Christian	-0.033	*	0.224	**	0.038		0.01	7604	-0.028		0.198	*	0.03	7604
Traditional	0.007		-0.048		0.000		0.00	7604	0.004		-0.033		0.03	7604
No religion	0.024	**	-0.131	**	-0.038	**	0.01	7604	0.022	*	-0.122	*	0.03	7604
Religion is other or Muslim	0.002		-0.045		0.000		0.01	7604	0.001		-0.042		0.04	7604
Interview Language														
Shona	0.016		-0.050		0.276	*	0.40	7614	0.018	**	0.883		0.89	7614
Ndebele	-0.010		0.030		-0.272	**	0.41	7614	-0.013		0.870		0.87	7614
other (other and English)	-0.006		0.020		-0.004		0.01	7614	-0.006		0.022		0.02	7614

Notes: each row/Panel combination is a separate regression. Each column reports a coefficient estimate from an OLS regression. Regressions in Panel A are estimated without province fixed effects and Panel B regressions account for them. Robust standard errors in parentheses, clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. Data sources: 1999 and 2005/2006 DHS for Zimbabwe and Raleigh et al. (2010).

Table A3 – Triple Differences Regressions: controlling for gender specific effects. Months of exposure.

	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to political violence * ln events	-0.002	-0.001	-0.001	-0.001	-0.001	-0.004*	-0.004*	-0.004*	-0.003*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Female* N months exposed to political violence * ln events	-0.003**	-0.004**	-0.004**	-0.003**	-0.004**	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Female*N months exposed to political violence	0.016*	0.016*	0.017*	0.016*	0.017**	0.008	0.008	0.007	0.008	0.008
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
N months exposed to political violence	-0.030***	-0.031***	-0.031***	-0.032***	-0.034***	-0.028**	-0.029**	-0.029**	-0.031**	-0.031**
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)	(0.011)	(0.011)	(0.011)	(0.010)	(0.011)
Female* ln events	0.038	0.042	0.05	0.033	0.053	0.130	0.130	0.126	0.131	0.126
	(0.071)	(0.070)	(0.066)	(0.071)	(0.065)	(0.082)	(0.082)	(0.083)	(0.085)	(0.084)
Female	0.013	-0.005	-0.04	0.038	-0.055	-0.389	-0.393	-0.368	-0.395	-0.374
	(0.371)	(0.369)	(0.347)	(0.371)	(0.343)	(0.404)	(0.407)	(0.412)	(0.426)	(0.417)
rural	-0.279**	-0.263**	-0.265**	-0.242**	-0.016					
	(0.101)	(0.097)	(0.094)	(0.106)	(0.097)					
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R squared	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.11	0.11

Notes: Sample: children age 0-59 months in 1999 and 2005/2006 DHS. Robust standard errors in parentheses, clustered at the province level. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable is a child's height-for-age z-score (HAZ). All regressions include year of birth, age in months and province of residence fixed effects. The interview language dummies include: Ndebele, other (English and other) with Shona being a reference category. Mother's characteristics: mother's age, and a set of controls for mother completing one of the following education levels: primary, secondary, higher education, and other ("no education" is a reference category). Household head characteristics: household's head age, gender (=1 if male) and an indicator for household head being literate (completed some education). Household's assets include a set of dummy variables for: having access to a toilet facility, have cement floor in a household, for cooking hhd used electricity, natural gas, or coal; household has access to electricity, phone, and a dummy for household owning a car. Data sources: ZDHS 1999, ZDHS 2005/2006, and ACLED (Raleigh et al. 2010).

Table A4 – Triple Differences Regressions: controlling for gender specific effects. Non-linear measures of exposure.

	Full sample					Rural sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Female*Exposed 1-24m* ln events	0.037	0.031	0.018	0.036	0.01	0.069	0.070	0.072	0.069	0.082
	(0.109)	(0.109)	(0.114)	(0.111)	(0.123)	(0.080)	(0.081)	(0.081)	(0.090)	(0.088)
Female*Exposed 25plus m * ln_events	-0.111*	-0.120**	-0.131**	-0.115*	-0.132**	-0.032	-0.032	-0.030	-0.032	-0.025
	(0.051)	(0.050)	(0.052)	(0.053)	(0.052)	(0.124)	(0.125)	(0.130)	(0.130)	(0.128)
Exposed 1-24 months * ln events	-0.071	-0.066	-0.064	-0.072	-0.046	-0.177	-0.174	-0.176	-0.177	-0.165
	(0.113)	(0.114)	(0.116)	(0.114)	(0.124)	(0.121)	(0.122)	(0.120)	(0.124)	(0.128)
Exposed 25 plus months * ln events	-0.056	-0.048	-0.047	-0.052	-0.033	-0.231**	-0.227**	-0.228**	-0.226**	-0.220**
	(0.060)	(0.059)	(0.063)	(0.060)	(0.066)	(0.069)	(0.067)	(0.069)	(0.070)	(0.065)
Exposed for 0-24 months	-0.331	-0.355	-0.379	-0.321	-0.454	0.066	0.048	0.04	0.072	0.002
	(0.698)	(0.704)	(0.714)	(0.704)	(0.747)	(0.673)	(0.683)	(0.681)	(0.690)	(0.708)
Exposed for at least 25 months	-0.610	-0.650	-0.661	-0.648	-0.744	0.103	0.080	0.071	0.070	0.016
	(0.391)	(0.390)	(0.412)	(0.390)	(0.409)	(0.559)	(0.555)	(0.569)	(0.538)	(0.552)
Female*Exposed 1-24m	-0.212	-0.184	-0.124	-0.217	-0.085	-0.349	-0.354	-0.365	-0.365	-0.419
	(0.560)	(0.561)	(0.582)	(0.576)	(0.623)	(0.306)	(0.308)	(0.303)	(0.347)	(0.349)
Female*Exposed 25plus m	0.480	0.523	0.567*	0.500	0.571*	0.015	0.018	-0.001	0.011	-0.018
	(0.307)	(0.298)	(0.304)	(0.320)	(0.308)	(0.637)	(0.638)	(0.664)	(0.671)	(0.654)
Female* ln events	0.014	0.02	0.031	0.01	0.037	0.102	0.103	0.100	0.103	0.094
	(0.057)	(0.056)	(0.051)	(0.059)	(0.050)	(0.075)	(0.075)	(0.075)	(0.081)	(0.079)
Female	0.142	0.115	0.067	0.170	0.040	-0.253	-0.256	-0.233	-0.249	-0.211
	(0.312)	(0.308)	(0.278)	(0.324)	(0.283)	(0.360)	(0.361)	(0.362)	(0.395)	(0.389)
rural	-0.256**	-0.241**	-0.244**	-0.226*	-0.006					
	(0.097)	(0.093)	(0.090)	(0.103)	(0.094)					
Interview language	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Head controls	No	No	Yes	No	No	No	No	Yes	No	No
Mother controls	No	No	No	Yes	No	No	No	No	Yes	No
HH assets controls	No	No	No	No	Yes	No	No	No	No	Yes
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R squared	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10

Notes: as for Table A3.

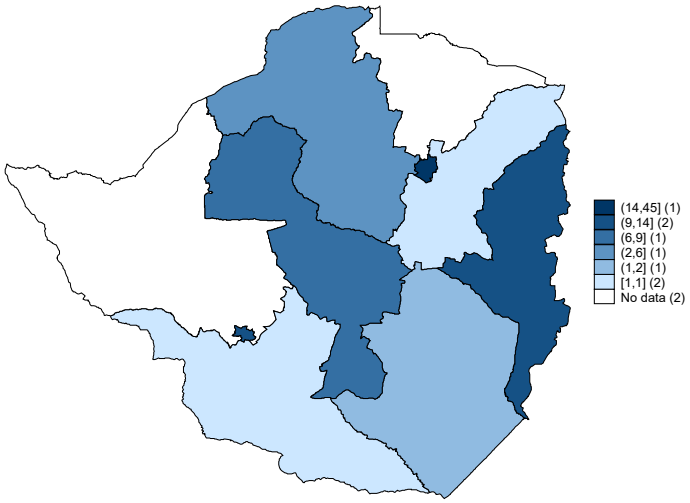
APPENDIX – NOT FOR PUBLICATION

Appendix A: Spatial depiction of conflict-related events in Zimbabwe, 1997-2006

Figure A1 - Conflict-related events in Zimbabwe, 1997

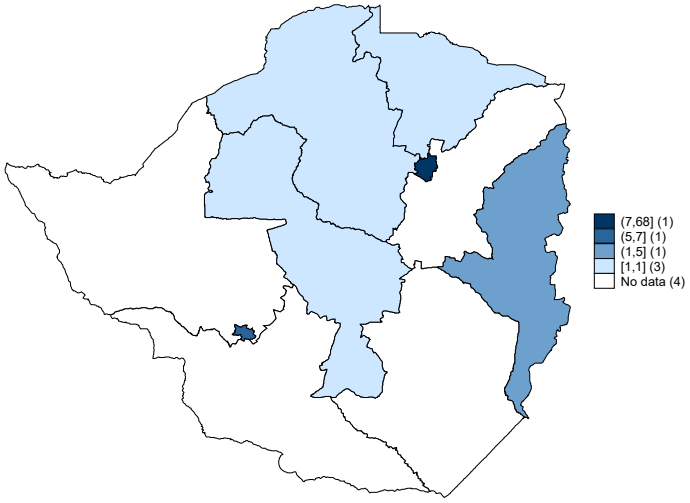
Data Source: ACLED dataset (Raleigh et al., 2010). The two largest cities that are also separate provinces in Zimbabwe are marked on the map.

Figure A2 - Conflict-related events in Zimbabwe, 1998



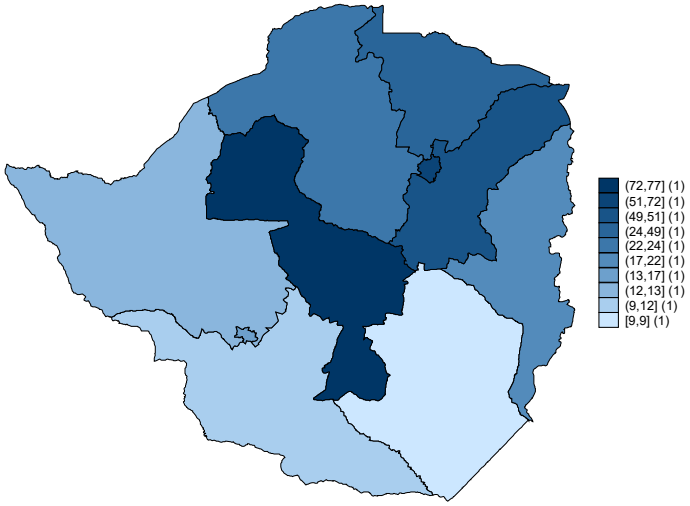
Data Source: as for Figure A1.

Figure A3 - Conflict-related events in Zimbabwe, 1999.



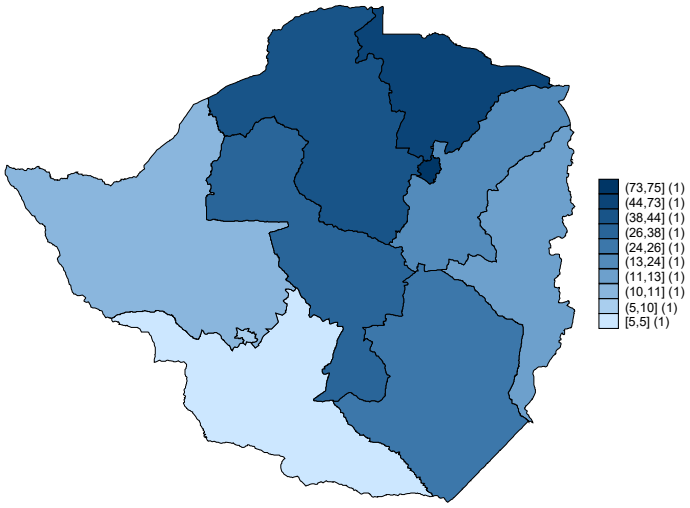
Data Source: as for Figure A1.

Figure A4 - Conflict-related events in Zimbabwe, 2000.



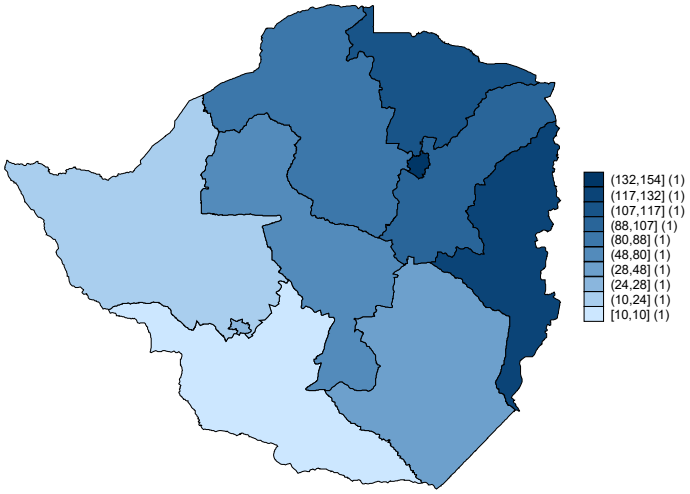
Data Source: as for Figure A1.

Figure A5 - Conflict-related events in Zimbabwe, 2001.



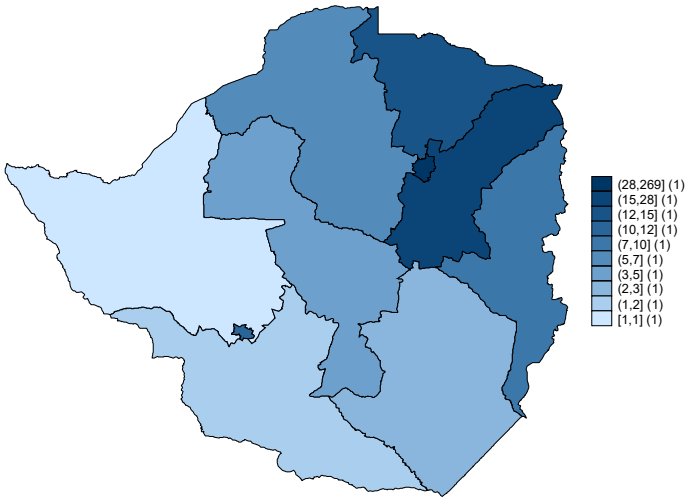
Data Source: as for Figure A1.

Figure A6 - Conflict-related events in Zimbabwe, 2002



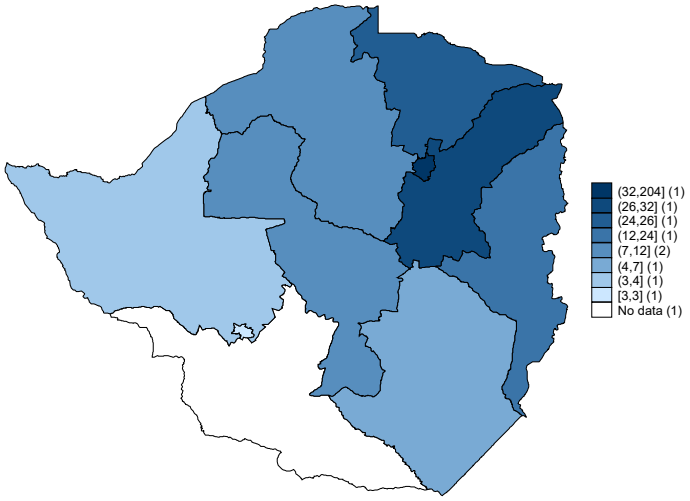
Data Source: as for Figure A1.

Figure A7 - Conflict-related events in Zimbabwe, 2003



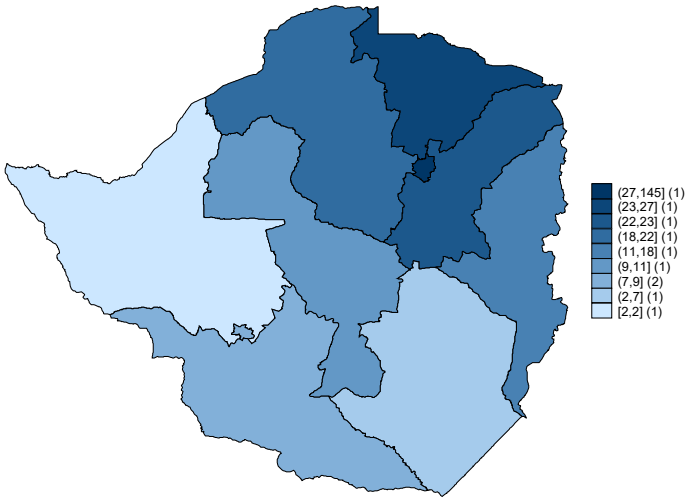
Data Source: as for Figure A1.

Figure A8 - Conflict-related events in Zimbabwe, 2004



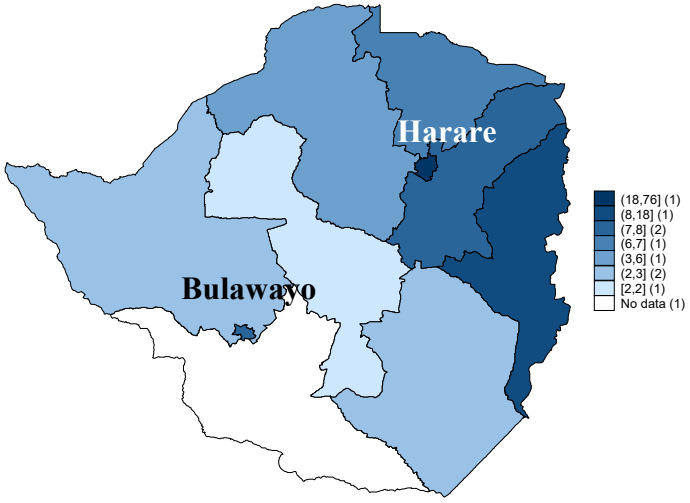
Data Source: as for Figure A1.

Figure A9 - Conflict-related events in Zimbabwe, 2005



Data Source: as for Figure A1.

Figure A10 - Conflict-related events in Zimbabwe, 2006



Data Source: as for Figure A1.

Appendix B

Timeline of Important Events in Zimbabwe: 1998-2008

1997 – In 1997, war veterans, that were tied to the land movement in Zimbabwe, forced Mugabe to the negotiation table. They both agreed that the white commercial farms will be ceased and distributed to these in need of land, with 20 percent being allocated to war veterans. The Government designated 1,471 commercial farms for a compulsory acquisition. White farmers contested this agreement and no resettlement happened at the time (Moyo, 2000; Sadomba, 2008).
1998 – Some of the early war-veteran led farm occupations happened in Zimbabwe (Cliffe et al. 2011; Sadomba, 2008).
1998 – Zimbabwe gets involved in the war in the Democratic Republic of Congo.
September 1999 –The Movement for Democratic Change (MDC) party is formed (Kriger, 2005: p. 26).
February 2000 – Zimbabwe conducted a referendum proposed by the ruling party on the proposed draft constitution. The draft included a provision that allowed Mugabe to seek two extra terms in office, "granted government officials immunity from prosecution"[18] and included the amendment by Mugabe to confiscate the land owned by whites (Kriger, 2005: p. 26). 54% of the voters rejected the proposed draft with only one fourth of the registered voters participating (Kriger, 2005).
2000 – The Fast track land reform program (FTLRP) started in 2000. Between February and June, about 1,500 white-owned commercial farms were ceased and invaded.
June 2000 – New set of parliamentary elections conducted. The ruling party won 62 out of 120 contested seats, MDC won 57 seats, and ZANU (Ndonga) kept their seats. While the ruling party had the majority in the parliament, the MDC had a large minority and a sufficient number of seats to preclude the ruling party from single-handedly making changes to the constitution (Krieger, 2005: p. 26).

Post 2000 election period:
The ruling party leaders repeatedly intimidated the MDC party supporters by issuing threats and physically attacking these who were affiliated with the MDC and these who display their party affiliation.

The increase in the intense violence in the post-referendum period was unprecedented even for Zimbabwe that experienced cycles of violence and intimidation occurring during the election years as described by Krieger (2005) who covered the ZANU (PF) strategies in general elections in 1980-2000.

About 200,000 cases of violence occurred in the first half of 2000 (Kriger, 2005, p. 29 - related to footnote 172). This sharp rise in targeted violence forced the MDC to stop it's campaign in many rural constituencies.

ZANU (PF) targeted these affiliated with the MDC. The army and the police continued to terrorize civilians into the first months of 2001 (Krieger, 2005: p. 30, also ft. 177).

March 2002 - Presidential elections were conducted, during which there was subversion of the electoral process, and intimidation of the opposition, which eventually ensured Mugabe's victory.

2002-2005 – The disagreements arise within the opposition party (MDC).

2005 – In 2005, the government conducted an Operation Murambatsvina: "Drive out the Rubbish", officially titled "Operation Restore Order." During the Operation, the government bulldozed and de-legalized settlements in the cities and resettled large numbers of rural residents. Many residents were

[18] http://en.wikipedia.org/wiki/History_of_Zimbabwe#The_economy_during_the_1980s_and_1990s. Accessed: September 4, 2012.

forced to destroy their own houses. Some accounts suggest that young children, elderly and the disabled were killed in the process (Hammar, 2008: p. 427). Multiple properties, especially those in urban locations, were destroyed (Sadomba, 2008).

The numbers of displaced during the Operation Murambatsvina range from 120,000 (police accounts) to 323,385 (Zimbabwe Human Rights NGO Forum, 2005). About 2.4 million individuals were affected by the campaign (Tibaijuka 2005). The campaign also led to 700,000 million unemployed. As housing included a lot of informal sector production sites and workshops containing tools and other means of production, people living in these areas were also deprived of their livelihoods. The police, the youth movement that supported the government and the army participated in the destructions of housing stock.

Hammar (2008) reports that the relocated families were forcibly resettled, often miles from their prior places of residence into camps that lacked access to water, sanitation or means to earn a living. The Washington Post (2008) reports that some residents had to walk to their workplaces for 18 miles per day as they could not afford the bus fare to the city.

09/2005 - Constitutional amendments were accepted that reinstituted a national senate (abolished in 1987) and that nationalized all land that was acquired through the Fast Track Land Reform. The nationalization converted all ownership rights into leases.

2008 – The ZANY(PF) was defeated by MDC in the presidential elections. This led to retaliation by the ruling party against the political opposition (MDC).

Data Appendix

Maps:
Downloaded maps from http://www.maplibrary.org/library/stacks/Africa/Zimbabwe/index.htm

Stata map routine:
http://www.stata.com/support/faqs/graphics/spmap.html

ACLED routine:
I manually matched conflict locations from ACLED data to provinces in Zimbabwe. I performed multiple Google searches using locations names and also used maplandia.com.