Political Violence, Land Reform and Child Health: Results from Zimbabwe[±]

Olga N. Shemyakina[±±]
Georgia Institute of Technology
School of Economics

Draft: July 11, 2014

Abstract

The article examines the impact of politically-motivated violence in Zimbabwe following the 2000 referendum and the accompanying it controversial land reform on children's health, measured by height-for-age and weight-for-height z-scores. Empirical analysis employs the 1999 and 2005/06 Demographic and Health Surveys and information on the location and date of violent events from the Armed Conflict Location and Event dataset. To identify the impact of violence on children's stature, the empirical analysis exploits temporal and spatial variation across birth cohorts, assuming all children surveyed in 2005/2006 were exposed to conflict. Children born after the 2000 referendum had lower height-for-age and higher weight-for-height z-scores than children from the earlier cohort, suggesting that the long-term effect of conflict on child height was more important than the short term variations in weight. This long-term effect evidenced by height-for-age z-score declines is greater in areas more affected by violence for older children, older girls in urban areas, and children in rural locations. This study provides further empirical evidence on the effect of conflict on child health in the context of state-led violence using multiple indicators of health. The results of this study are largely consistent with the literature on countries that experienced full-fledged civil wars. The similarity of the results across these studies is important as it indicates that populations of countries that are not "officially" impacted by a civil war, but governed by repressive regimes suffer in similar ways, and may require similar forms of international assistance.

Keywords: human capital, child health, conflict, height-for-age, weight-for-height, sub-Saharan Africa
JEL classification: I12, J13, O12

[±] I would like to thank Georgia Institute of Technology for financial support. I am grateful for helpful comments and discussions to Harold Alderman, Charles Becker, Camelia Minoiu, Eik Swee and participants at the 8th Households in Conflict Network Workshop on Violent Conflict and Economic Development (Aix-en-Provence, 2012), the 13th Jan Tinbergen European Peace Science Conference (Milan, 2013), the Southern Economic Association (Tampa, 2013) and the Development seminar at the DiW (German Institute for Economic Research) (Berlin, 2014). The views expressed in this paper are those of the author and do not necessarily reflect those granting and funding agencies. All mistakes are mine.
Contact: Olga Shemyakina, School of Economics, Georgia Institute of Technology, Atlanta, GA, 30332–0615, USA, olga.shemyakina@econ.gatech.edu, (323) 229 3180.

I. Introduction

The severity and the length of armed conflict, such as civil war, has decreased in the past 30 years (World Bank 2011). Shorter term conflicts such as low-scale insurgencies, revolutions, and riots often triggered by rising prices or other unpopular government policies[1] replaced large-scale civil wars. The effects of these conflict events on population have been extensively researched by the economists and political scientists alike (World Bank 2011). However, one type of conflict, political and economic repression of the population, by own country's government and its effect on country's population has received far less attention. Political repression and persecution for political views and associations have been relatively common in a number of countries. These topics have been extensively researched by political scientists (see review by Davenport (2007)) with many studies focused on understanding determinants of political repression at a country level (e.g. Henderson 1991; Davenport 1995) and economists, focusing on modelling of the situation (Besley and Persson 2011). At the microeconomic, disaggregated level, this type of internal conflict has not been studied extensively by development economists because such conflicts typically happen in relatively closed economies with little measurable data on the internal state of affairs. The most widely-researched case of political repression is the Cultural Revolution in China and its effect on education and labor market outcomes (e.g. Giles et al. 2008; Meng and Gregory 2002). Other notable examples of state repressions are: 1) the 1976-1983 Argentina Dirty war, a period of state terrorism against left-wing guerillas and their sympathizers, during which 22,000 people were killed or disappeared[2]; 2) the 1936-1939 Great Purge by Joseph Stalin in the Soviet Union that killed millions of people or sent them to work camps or gulags; 3) the North Korean regime; 4) the Mao regime in China, and finally, the last but not the least, 5) the 2000-2005 violent repression of a popular opposition party, the Movement for Democratic Change (MDC), and its supporters by Robert Mugabe's government in Zimbabwe that was accompanied by farm invasions and land grabs to compensate regime supporters, disguised as a fair redistribution of property. This particular period of

[11] Some recent examples include riots in Brazil, Turkey, and Ukraine in 2013.
[2] Global Security, 2014. "Argentina Dirty War 1976-1983". http://www.globalsecurity.org/military/world/war/argentina.htm. Accessed: June 18, 2014.

widespread repression started in 2000 and was followed by a deep economic crisis, hyperinflation, and persistence of hunger and personal insecurity for many Zimbabweans. This paper focuses on the impact of these events in Zimbabwe on the health outcomes of young children who were less than 60 months old.

This study contributes to the following three strands of the development economics literature. First, it adds to a large literature that examines the impact of exogenous shocks, either due to nature or man-made events, on household behavior. A sub-set of this literature focuses on the impacts of armed conflict on human capital and, in particular, on education and health outcomes of young children (e.g. Akbulut-Yuksel 2014; Akresh et al. 2011, 2012; Bundervoet et al. 2009; Minoiu and Shemyakina 2012, 2014; Verwimp 2012). Second, it contributes to the literature on the impact of political repression on well-being of individuals in a developing country (e.g. Kim 2011; Giles et al. 2008; Neupert and Prum 2005). This paper is one of the first to address the impacts of state-sponsored violence on child health in an African country.

The Republic of Zimbabwe has had a turbulent history. This study focuses on the impact of events that took place between 2000 and 2005. While Zimbabwe has a long history of political violence, the events following the February 2000 referendum and the June 2000 elections were particularly violent, marking the start of a new period in the country's history. The 2000 referendum was followed by violent invasions of commercial farms sanctioned by the state. Violence was not limited to farm invasions in the rural areas. The state also severely clamped down on the supporters of a new opposition party, MDC, formed in September of 1999 and that gained significant momentum and support among the urban poor and in rural areas by 2000. Following the wave of violence, in a matter of months, Zimbabwe, a country that was once referred to as a "bread basket of Africa" spiraled into a downward growth path marked by hyperinflation and the population becoming dependent on food aid.

This severe decline in living standards and availability of food have undeniably affected health of young children. A growing literature on child health suggests that shocks in early childhood have long-term effects on the well-being of the surviving children, reflected in part in their educational attainment, their stature, health, labor market, and cognitive outcomes (Almond and Currie 2010). In the context of

Zimbabwe, a seminal study on resettlement farmers shows that children who received poor nutrition due to drought and a concurrent civil war had significantly lower stature (Alderman et al. 2006). Shorter children were considered younger and therefore were enrolled in school at a later age than taller kids, thus completing less schooling. The authors projected a substantial decrease on one's future life-time income that can be plausibly attributed to health shocks in early childhood.

There is a rapidly growing literature on the effects of armed conflicts on child health. These studies use cohort and region-specific exposure to armed conflict to identify the effect of the conflict and uniformly find that exposure to conflict at a young age has a detrimental effect on the long-term health-outcomes. The empirical analysis in this field typically limited to the sample of the surviving children that did not migrate outside country's borders. Therefore, the effects observed are conservative estimates of actual conflict impacts. In this context, several studies examined the effects of conflict on the height-for-age z-scores, a commonly used measure of long-term health status of young children. Akresh et al. (2011) compare the effects of the drought and the civil war crises in Rwanda and find gender differentiated outcomes. In the wake of the drought, girls' height to age z-scores declined to a greater extent than these of boys, while the conflict affected boys and girls in a similar negative way. Other related studies also document similar impacts for boys and girls during armed conflicts (e.g. Bundervoet et al. 2009; Akresh et al. 2012; Minoiu and Shemyakina 2012, 2014). Lower height can lead to poorer health and education outcomes in the future. Alderman et al. (2006) link malnourishment in early childhood to a loss in schooling in Zimbabwe, while Verwimp (2012) finds an increased mortality risk for children who were stunted due to conflict in Burundi.

Several studies link low birth weight, infant mortality and child development outcomes to political violence and crime. Camacho (2008) finds that in Colombia the conflict shocks measured by random landmine explosions during the first three months of pregnancy were significantly and negatively associated with a low birth-weight. Mansour and Rees (2012) study the effect of the al-Aqsa Intifada on birth weight for children in Palestine and observe a positive connection between higher fatalities during a woman's pregnancy and the birth weight falling below 2,500 grams. Brown (2013) finds that an increased

drug gang crime in Mexico had a negative impact on birth weights of infants, with a 75 gram reduction in birth weight and 1.7 higher than that effect for children from low socio-economic backgrounds. These studies argue that maternal stress is one of the factors affecting low birth weight.

This study contributes to the literature above and is one of the first to examine the effect of several violent periods in Zimbabwe between 2000 and 2005 on the children' nutritional status and their health, measured by height-for-age z-scores, a common measure of long-term health. The identification strategy exploits regional and cohort variation in the effects of political violence and insecurity during 2000-2005 on child's health, I combine data on household and child characteristics 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 study uses data from the 1999 and 2005/2006 Zimbabwe Demographic and Health Surveys (ZDHS) that bracket the period of violence under consideration. Similar analysis techniques were used by Akresh and de Walque (2012) and Minoiu and Shemyakina (2012). The 1999 data was collected before violence started and the 2005/2006 survey was conducted after violence subsided. This timing of data collection allows me to control for pre-conflict differentials in child health. All provinces of Zimbabwe were affected by violence to some extent over the 2000-2005, with a large variation in the number of conflict events. To reduce the influence of outliers, I use a natural logarithm of the number of events recorded in each province between 2000 and 2005.[3]

The findings indicate that children born after the 2000 wave of violence in the provinces with more instances of violence had significantly lower height-for-age z-scores (HAZ) than children surveyed in 1999. Specifically, the length of exposure to the crisis, both linear (months of exposure) and non-linear (with 1-24 months of exposure, and more than 24 months) combined with the province level intensity of violence had a significant and negative impact on child's HAZ, with older children experiencing larger set-backs in their health, a result that is consistent with the literature (e.g. Bundervoet et al. 2009). This impact is more pronounced for children in rural areas. The results are robust to the inclusion of multiple control variables, such as controls for the language of interview, age and education of the household head,

[3] The geographical distribution of events over time is presented in Appendix A.

and child's mother, household's assets and province and year of birth fixed effects. Examining the specific impacts of conflict for sub-groups, I find that in rural areas, both, boys and girls who were exposed to conflict for more than 24 months were negatively affected, while older urban girls in areas with more violence suffered from a greater loss in their stature than boys of a similar age. I further investigate the impact of conflict on child health using an alternative baseline cohort and the main results remain robust. I perform multiple checks for the sample composition by comparing the 1999 and the 2005/2006 DHS survey data and test for selective mortality by gender. As an additional robustness check, I compare the effects of conflict on the short-term measure of child health such weight-for-height (WHZ) z-scores and the long term measures of child health, such as height-for-age z-scores and the results support the hypothesis that exposure to violence early on had a greater impact on the long-term measures of well-being.

2. Background: Political violence in Zimbabwe: 1997-2008

The history of Zimbabwe, formerly South Rhodesia, is marked by many violent events. In the post WWII period, the British government was giving up its colonial powers, and planned to establish majority rule in the united region of Northern Rhodesia (currently Zambia), Southern Rhodesia, and Nyasaland (currently Malawi). Around 1964, the majority black rule was established in Northern Rhodesia and Malawi, but the Southern Rhodesia's white-led government did not support it, and in 1970, it established a republic controlled by white minority with the government led by Ian Smith. Soon thereafter, two insurgent organizations, the Zimbabwe African People's Union (ZAPU) and the Zimbabwe African National Union – Patriotic Front (ZANU-PF) challenged the white-minority government and a vicious civil war ensued. The Rhodesian Bush war lasted between July 1964 and December 1979. On April 18, 1980, the first elections under the supervision of British and the Commonwealth were conducted and Robert Mugabe of ZANU-PF was elected as the first Prime Minister of Zimbabwe. The country gained an international recognition of its independence in the same year. After Zimbabwe's independence, the white population in the country declined from 250,000 to 100,000 due to immigration

(Embassy of Zimbabwe, 2013). At the same time, population of white, mostly commercial farmers remained relatively constant with 4,500 farmers remaining from the original 5,000.[4] In 1980, the majority black population was given full access to secondary education. This reform rapidly increased the number of individuals continuing their schooling past primary level. The increase amounted to 53 percentage points between 1979 and 1980 (Aguero and Bharadwaj 2014).

The two parties which fought side by side in the independence war did not entirely trust each other. The post-independence decade in Zimbabwe was characterized by internal instability with a Matabeleland uprising, led by Joshua Nkomo of Zimbabwe African People's Union (ZAPU), which was severely suppressed (Bratton 2011). 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). In 1987, the two parties, the ZAPU and ZANU-PF, signed a peace accord and ZAPU was absorbed into ZANU-PF. Post 1987, Zimbabwe experienced a continuous decline in economic and human rights, which led in 1999 to creation of a new popular opposition party, MDC. This paper focuses primarily on the period between 1999 and 2006 and employs for that ACLED data that reports conflict events on a daily basis. For the presentation purposes, Table 1 separates these events into three periods: pre-MDC repression: 1997-1999, severe repression: 2000-2005 and, a period of a slow-down in repression between 2006 and 2010. The first period had 197 events reported, mostly riots and protests, 77.16%, and some notes of violence against civilians – 18.27%. The main causes of riots were increases in food prices, student tuition, and tax hikes. More specifically, war vets, or veterans of the independence war, complained of being left out of the compensation schemes proposed by the government, famers protested low tobacco leaf prices, students rioted about handling of the student loans and tuition, female guerrilla supporters demanded compensation for their war effort, and so forth. From 1998 and on, the reports note an increased brutality of the police. Thus, the ACLED data indicate that a period of heightened political activity preceded the 2000 referendum.

[4] http://www.zimembassy.se/history.html (Accessed: July 18, 2013).

In 1999-2000, the ACLED data notes again a fair number of protests organized by war-vets and their supporters, who felt left of the compensation schemes for war effort proposed by the government. The government reportedly paid attention to these demands when it announced the "fast track" land reform as an item on the 2000 referendum. This land reform was defined by Human Rights Watch (2012) as follows: "the government has revised the constitution and amended legislation in order to allow it to acquire commercial farms compulsorily and without compensation."

During that time, the government also allegedly allowed land grabs by war vets (and also other much younger supporters of Mugabe's government who did not fight) to compensate them for their loyalty in the independence war and beyond (Godwin 2010). Among 2,402 events recorded in ACLED database between 2000 and 2006, 90.09% of events were coded as violence against civilians and only 4.95% events were coded as riots. Numerous farm seizures, attacks on commercial farmers and farm workers led to widespread displacement and disorder. Many grocery chains in Britain broke their contracts with commercial farms as deliveries were not possible to ensure and also to protest the violence (Rodgers 2012). In the third sub-period, between 2006 and 2010, 1,393 events were recorded in the ACLED dataset.

Figure 1 shows the distribution of events in ACLED database by year and event type over 1997-2010. We can see that the proportion of riots in the dataset has decreased from about 90% in 1997 to less than 3% in 2000 and remained low until 2005-2007, when the proportion of riots rose to about 20% of all events. Between 1997 and 2004, violence against civilians rose dramatically from 10% in 1997 to 85% in 2000 and then to over 90% of all events between 2001 and 2004. The proportion of violent actions towards civilians decreased in 2005-2007, and at the same time when the proportion of riots went up. Other types of events, such as non-violent activity, non-violent transfer of territory and headquarters/base established constituted a rather small proportion of the total number of events in ACLED database.

I 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 wide-spread violent invasions of commercial farms (HRW 2002, Bratton 2011).

While the ACLED count of the events in 2000 is substantial in comparison to the preceding years, the ACLED data may underestimate the actual number of events. For example, Kriger (2005) notes that only in first half of 2000 there were more than 200,000 violent events for the 12 million of the population. Alix-Garcia et al. (2012) notes that the data on damaged and burned villages in Darfur from the US Government Humanitarian Information Unit had a greater spatial variation than ACLED data, but ACLED data was more precise time-wise. Between February and June of 2000, about 1500 white-owned commercial farms were invaded (Kriger 2000). “By 2003, there were only 500 of the 4,000 large-scale farmers left“ (Orlet 2005). The invasions continued through the mid-2008 and by then almost 90 percent of “white owned commercial farms were occupied or appropriated for redistribution” (Hammar 2008: 427). The owners and commercial form workers were displaced as a result of the official FTLRP (Hammar 2008: 427). Between 150,000 and 250,000 farm workers were displaced and the full size of the displaced population is about 1,000,000 if we included family members in the estimates (Hammar 2008: p. 431, endnote 21).

Violence that followed the February referendum and the June 2000 election was the most severe in urban localities. The urban poor who largely voted for the MDC (Movement for the Democratic Change) were targeted by the ZANU(PF) affiliates, the army and the police. A large number of events reported in ACLED database are consistent with the definition of political repression as "disappearance, detention, torture, and political killings" conceptualized in study by Henderson (1991). Further, "political repression is the use of threat of coercion in varying degrees applied by government against opponents or potential opponents to weaken their resistance to the will of authorities (Stohl and Lopez 1984, p. 7)." (as quoted in Henderson 1991, p. 121).

Agricultural and industrial production during this period fell dramatically. While a large proportion of agricultural land was given to the poor affiliated with ZANU(PF), most of them did not

have sufficient means to invest in agricultural production and were not given clear property rights to the land (Hammar 2008: p. 425, also ft. 19). Further, the ZANU(PF) government officials claimed a sizeable proportion of the land but in most cases did not commit to commercial farming (Hammar 2008). Appendix B provides a timeline of important events between 1998 and 2008 in Zimbabwe's political history.

A report by Zimbabwe Institute (2007) describes the economic performance of Zimbabwe since 2000 as "disastrous". The production of major crops that were favored by communal farmers fell 1/3 to 1/2 against the target output over 2000-2006 with the sharpest decline between 2001 and 2002. Between 1998 and 2006 the cumulative decline in Zimbabwe's GDP was 37% compared to 40% gain for other African countries. Between 2001 and 2005, the country also experienced de-industrialization, there the manufacturing volume declined by 33%. The disinvestment in agriculture was also remarkable, as infrastructure crumbled due to stealing and destruction, and due to inability to secure loans by new farmers. New farmers did not have titles to land and could not secure loans without a collateral. The economic conditions were correlated with a decline in people's well-being as evidenced by a fall in Zimbabwe's life expectancy at birth to 43 years in 2000-2004 from the already low expectancy of 45 in 1999. During the same period, the average life expectancy in the world steadily rose to 70 years of age (Zimbabwe Institute 2007).

III. Data and Methods

The sharp increase in the state-led violence and political retributions, large-scale farm invasions and the ensuing collapse of agriculture, international embargoes and the economic crisis, - all predict a large fall in nutritional standards in Zimbabwe. However, aggregate data presented in Figures 2 and 3 show rather minor changes in the height-for-age z-scores of children between 1999 and 2005/06.

Therefore, a detailed analysis of individual child nutritional status is required to quantify the effects of political crisis in Zimbabwe on child health. For that, I use two datasets, the 1999 and 2005/2006 ZDHS. 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). These datasets are the part of the worldwide data collection effort by MEASURE Demographic and Health Surveys (DHS+). The surveys collect information on maternal and child health, fertility, mortality and HIV/AIDS.

Both surveys provide anthropometric information for children aged 6-60 months at the time of the survey. The descriptive statistics for main variables used in the analysis, such as height for age z-scores, characteristics of mother and head of the household are provided in Table A1.

Figure 4 provides a comparison between children's HAZ by age in months and survey. It suggests that HAZ rapidly declined in a similar fashion during the first 18 months of life for kids in both surveys, which is consistent with a growth faltering hypothesis (Victora et al. 2010) that is supported by data from over the world. However, we could see that HAZ declined at a slower rate and recovered at a much faster rate for children surveyed in 1999 than for these surveyed in 2005/2006.

One of the potential concerns with cross-sectional survey data covering multiple periods is data comparability over time. Thus, to examine the sample composition over time, I regress the main control variables on the dummy for an observation coming from the 2005/2006 survey, a measure of conflict and their interaction, with and without province fixed effects (Table A2). The regression coefficients on the interaction terms suggest that in 2005/2006 in more affected regions, household heads were older, more likely to be male. Mothers of young children were older, less likely to be Christian, and more likely to report no religious affiliation. We control for these characteristics in our estimations.

To identify regional exposure to conflict these surveys are combined with the ACLED province-specific data on conflict events that are aggregated by year and province. Between 2000 and 2005, there were reported between 43 and 935 events 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, a country's capital (935 events).[5] Thus, to reduce the relative weight of the outliers, I use a natural logarithm of the number of violent events in a province/year as a measure of conflict.

Baseline Specification

Figure 4 suggests that it is not necessarily the mere exposure to conflict (observed in 2005/2006 survey) that had an impact on child's health but the length of exposure, with a greater impact observed for older children. Therefore, the baseline regressions include months of life exposed to conflict (age in months for kids in 2005/06 survey) as a linear measure of conflict exposure and two non-linear measures – exposed between 0 and 24 months, and exposed longer than 24 months. These measures are consistent with the ones used in the literature. Similar to Bundervoet et al. (2009) and Minoiu and Shemyakina (2014), the baseline estimation equation is given by:

$$(1) \qquad HAZ_{ijt} = \alpha_j + \delta_t + \beta_1 \, Affected\ region_j * Exposed\ cohort_{ijt} + \beta_2 * Exposed\ cohort_{ijt} + \varepsilon_{ijt}$$

where HAZ_{ijt} is the height-for-age z-score of child *i* (aged 6-60 months) residing in province *j* and born in year *t*; α_j are province fixed effects, δ_t are year of birth fixed effects, and ε_{ijt} is a random, idiosyncratic error term. All regressions include indicator variables for child's gender and rural residence.

The "Exposed Cohort" variable is equal to age in months for children measured in 2005/06 survey and is zero for children observed in 1999. This linear measure stands for exposure of children at a young age to the drastic increase in violence that followed the 2000 referendum. Next, I replace "age in months" with two dummy variables that account for child being exposed for conflict events for 0-24 months and for over 24 months. I expect to see a greater impact of violence on the health of the older

[5] 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.

cohort that was born soon after the start of the fast track land reform and increase in violence.[6] "Affected region" is the province/year measure of exposure to conflict based on ACLED data (ln (count of events)).

In Eq. 1, the main coefficient of interest β_1 captures the average impact of residing in a region more exposed to the conflict on the health of children in the conflict-affected cohort. The inclusion of province fixed effects allows me to account for unobserved time-invariant factors that are constant across individuals within a province and that may systematically be 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.

It is likely that the effects of violent farm invasions has a greater impact on households in rural areas, therefore we estimate all regressions for the full sample and rural sub-sample.

Next, I examine the potentially differential effect that the conflict may have had on male and female children. For that, I estimate a triple difference regression where I add to the specification in Equation 2 a set of interactions of the "Female" dummy variable, the "Affected region" and the "Exposed cohort" variables (Appendix Tables A3 and A4).

4. Empirical Results

4.1 The effect of conflict on child health: baseline regressions

Table 2, Panel A reports the baseline results where we explore the effect of the duration of exposure to conflict measured by age in months in 2005/2006 survey on child health. The estimated coefficient of interest is negative at -0.003, statistically significant at least at 5% level in all specifications and is robust to the introduction of various control variables. The value of the coefficient suggests that a child from the exposed cohort who experienced an average level of violence at 28.82 months, and who lived in a province with a median level of violence during that period (202 events) had a HAZ that was

[6] Note that some researchers suggest that the land reform eventually had a positive impact on well-being of small land-holders (Scoones et al. 2010). However, this study focuses on the impacts of violence in the early years of the land reform.

lower by 0.459 (= 0.003*28.82* 5.31) standard deviations compared to a child from a non-exposed cohort. This estimate is comparable to Bundervoet et al. (2009) and Minoiu and Shemyakina (2014). For the rural sub-sample, the estimates on the coefficient of interest are slightly higher in absolute value at -0.005, but only statistically significantly different from zero at the 10 percent level.

The estimated coefficient on "Female" dummy variable is positive and statistically significant in all of the estimations, which is consistent with other studies. The coefficient on "Rural" dummy variable is negative in most of the regressions, except of these that include household assets controls, suggesting that children from wealthier households in rural areas were protected from the effects of the crisis. In Table 3, a linear measure of cohort level conflict exposure is replaced with two dummy variables for "exposed for 1-24 months" and "exposed for at least 25 months". This analysis tests for the effect of the timing of exposure, as the severity of events was the highest in the early years of conflict, in 2000-2002. Therefore, the older cohort of children born after 1999 should have accumulated a greater loss in their stature than the younger cohort. Table 3 results support this hypothesis. The regression coefficients estimated on the interaction between "exposed for 25 months and above" and ln(events) are negative and are almost twice as large as the coefficient estimates on the interaction between "exposed for 1-24 months and above" and ln(events) (Panel A: Col. 1-5). However, none of the estimated coefficients is statistically significant from zero. Since the effects of land reform, commercial farm invasions and displacement of agricultural workers should have been felt more in the rural areas, the regressions are also estimated for the rural sub-sample. The results presented in Col. 6-10 suggest that indeed, children who were exposed to the conflict for at least 25 months and above in the more affected provinces in rural locations experienced the greatest loss in their stature. The estimated coefficient ranges between -0.250 and -0.242 depending on the set of controls considered and is statistically significantly different from zero at least at the 5% 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 lower by about 0.242*5.31*1 = -1.285 standard deviations.

A potential threat to the validity of our estimates is selective migration. It is possible that poorer households are more likely to migrate during conflict (e.g. Pivovarova and Swee 2012). In this case, the full sample results may underestimate the effects of conflict as poorer households may also have less healthy children. On another side, if households that place a higher preference on the health of their children are more likely to migrate out of conflict areas, our results may be overestimating the impact of conflict. To control for migration, I use information on mother's migration and re-estimate our two baseline models for the sample of mothers who did not migrate during child's life (Tables 2 and 3, Panel B). The results on the main coefficients of interest are very similar for the full sample results in Tables 2 and 3 (Panel A) suggesting that health of migrant and non-migrant children was affected in a similar way, and that migration was not one of the confounding factors.

I further explore the gender-specific differentials in Tables A3 and A4 by adding to the baseline equation an interaction between "Female" dummy variable, "Exposed cohort" and "ln(events)" while controlling for other relevant interaction terms. The results show that it is female children from the affected cohort and more affected provinces who lost the most in their stature: the estimated coefficient on the triple interaction term is negative (-0.003), statistically significant at least at the 5% level, and is robust to various controls (Col. 6-10). The estimated coefficient on the "Months exposed to the conflict events" is also negative (-0.03) and statistically significant at least at the 1% level.

Table A4 tests for the non-linear effects of exposure to the conflict. The full sample estimates presented in Panel A confirm that it is the older female children who suffered a greater loss in their stature during the conflict time. The estimated coefficient on the triple interaction term between "female", "exposed for at least 25 months" and "ln(events)" is negative, statistically significant at least at the 10% level, and is largely robust to the introduction various control variables. The coefficient estimate varies between -0.111 and -0.131 depending on the set of controls. The comparison of estimated coefficients on the triple interaction term in the full and rural samples suggests that the effects of conflict events were felt the most by female children in the urban areas (coefficient on the interaction between "Female" * "Exposed 0-25 plus months"*ln(events)). Panel B suggests that negative impacts of the conflict were

strongly felt by boys and girls, who experienced conflict for at least 25 months of their life and who lived in provinces with more violent events.

The regression results performed for the urban sample (not shown) suggest that health of older female children was particularly impacted in urban areas. Taken together, these results suggest that households in rural areas were not able to protect both, boys and girls, from the violent shocks that started in early 2000, as these events appear to have uniformly affected all young children aged 0-60 months at that time, while households in urban locations appear to have prioritized investments in the health of boys.

4.2 Robustness Checks

4.2.1 Short Term Measures of Health

My main hypothesis is that the onset of the conflict affected older children to a greater extent. It was supported by the results in Tables 2 and 3. Since the HAZ are systematically lower for older children surveyed in 2005/2006, it is likely that the measures of short-term health, such as weight-for-height (WHZ) (a measure of wasting) and weight for age (WAZ) (a measure of being underweight, WAZ is a composite of WHZ and HAZ and thus, its interpretation is difficult), will be of smaller magnitude for older children. Weight-for-height is an indicator for the current nutritional status. Since the height of the conflict was closer to 2000, I assume that exposure to conflict did not have a large negative impact on WHZ, and I expect that WHZ will be higher for older children from conflict affected areas, as height of these children has suffered due to conflict. Specifically, if older children are shorter, their lower height will inflate the WHZ measures. Since the data was collected in 2005/2006 I expect that the children affected by the 2000 events were able to recover their weight. The results in Tables 8 and 9 suggest that children born after 2000 in more affected areas have indeed higher WHZ which could also be a consequence of these children being stunted due to conflict. The positive effect of being born after 2000 and living in conflict-prone area dissipates when controls for household assets are added to regressions, suggesting that a household's wealth is largely responsible for individual gains in weight.

These results confirm the importance of the substantial violent shock experienced by the cohort born soon after shifts in local politics starting with the 2000 referendum and the 2000 land reform in Zimbabwe. The number and proportion of violence against civilians substantially increased between 1999 and 2000 (Figure 1) and Appendix Figures A1-A10. It is possible that decline in access to food contributed to poorer child's health, as ACLED reports are heavier in farm attacks and invasions between 2000 and 2002, and these attacks led to a decline in food supply for all.

4.2.2 Results for Different Sub-Samples

This section explores the differential effect of this conflict on various population subgroups. We divide the sample into sub-samples: girls vs. boys; urban vs. rural; mothers with and without education and by poverty status. 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 Panel A suggest that the health of the following groups was particularly negatively impacted: girls in areas exposed to more violence, children from rural households, poor households and children of mothers without education. 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 25 months. The regression coefficients on the interaction terms with conflict exposure are mostly negative, except of one. Children who were exposed to conflict events for longer more than 25 months of their lives and who also lived in rural areas, experienced more substantial health set-backs amounting to 0.250 standard deviations. This coefficient is statistically significant at the 5% level.

4.2.3 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, I 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 but not statistically significantly different from zero in the four specifications considered (Table 6). The negative sign suggests that sex ratios of boys to girls appear to be lower for the conflict cohort from the regions with more ACLED reported violence. The estimated coefficients on the conflict cohort dummy (survey 2005) or the province level measure of conflict are not statistically significant as well in any of the models. These results suggest that selective mortality among boys or girls did not play a significant role.

4.2.4 Alternative Baseline Cohort

Further, I test for the robustness of the results to the alternative control group following approach in Minoiu and Shemyakina (2014). From Figure 1, we can see that there were many more violent events recorded for the year 1998 compared to 1997 and 1999. More specifically, in 1998, there were multiple riots motivated by the increase in food (January) and fuel (November) prices, and tax reforms. Therefore, I exclude from the control group children born after January 1998 as they were exposed to food and fuel price hikes that may have negatively affected their outcomes and made them a less desirable control group, biasing our results towards zero. Table 4 confirms our baseline results, with a slight increase in the coefficient estimated on the interaction between "age in months" and severity of conflict (Panel A). The estimated coefficient on the non-linear exposure (exposed for 25 months and above) and the severity term is higher than the one in Table 3 and is statistically significant at the 1% level for older kids (Panel B). The interaction coefficient is negative and statistically significant at the 10% level for children aged 0-24 months, suggesting that younger children from the control cohort used for the baseline estimations (born after 1998) were negatively affected by the onset of the 1998 crisis.

5. Discussion and Conclusion

The results of this study are largely consistent with the literature on countries that experienced full-fledged civil wars (e.g. Bundervoet 2009; Akresh 2011, 2012; Minoiu and Shemyakina 2014). An

average civil war lasts between 5-7 years (Collier et al. 2003), which is similar in length to the five-to six year period of conflict in Zimbabwe that this study is focused on. The similarity of the results across these studies is important as it indicates that populations of countries that are not "officially" impacted by a civil war, but governed by repressive regimes suffer in similar ways, and may require similar forms of international assistance. According to the WHO (1997), "growth assessment serves as an indirect measure of the quality of life of an entire population". Thus, child health as measured by height for age z-scores is an indirect measure of household's well-being. 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 are better protected than adults from food insecurity, with the exception of female orphans. Since, anthropometric measures show that older children in regions more affected by violent events are stunted it is likely that the health of adults in the affected areas was also distressed.

Moreover, shocks to child's early health are likely to profoundly affect children through their whole life unless mitigated by improved circumstances. For a long time, it has been believed that once a shock to child health occurs in early childhood, the impact of the shock is irreversible, with the body adjusting its growth path in a certain way. However, a recent literature on the "catch-up growth" suggests that early childhood deprivations can be remedied (Mani 2010) but also note that this "window of opportunity" for catch-up in health and cognition appears to close early on and most likely by age five (Lopez Boo and Canon 2013; Outes and Porter 2013). This study shows that for Zimbabwe, children from the affected cohort were able to catch up at least in their weight for height z-scores, indicating that the conflict had a negative effect on child height early in her life. The effect though disappears once we control for household assets, suggesting that wealthier households were able to better protect their children from shortfalls, a result consistent with Minoiu and Shemyakina (2014) who show that economic victimization of households during the conflict in Cote d'Ivoire was an important channel of conflict transmission mechanism.

From a policy perspective, it is important to identify at what age children are the most vulnerable to the short-fall in their growth and how to address this shortfall with timely policy interventions. Further

it is important to understand which factors or circumstances mitigate one's exposure to violent shocks, be it education, family income or location; and to identify the pathways through which conflict may impact one's health. This study shows that older children from rural households, older female children in urban areas, children of lesser educated mothers and from households with fewer assets experienced poorer outcomes. With respect to the conflict mechanisms, we were able to explore one that frequently affects households in conflict affected countries, namely migration, and we find very little difference in the magnitude of estimated coefficients between the full and non-migrant sub-samples, indicating that health of migrant children was affected in a similar way to the full sample. As usual with studies of conflict, we would like to qualify that our results are contingent on an individual surviving the conflict and remaining within the country borders.

References:

Aguero, J. M. and P. Bharadwaj. 2014. "Do the More Educated Know More about Health? Evidence from Schooling and HIV Knowledge in Zimbabwe." *Economic Development and Cultural Change* 62(3): 489-517.

Akresh, R. and D. de Walque. 2010. "Armed Conflict and Schooling: Evidence from the 1994 Rwandan Genocide," IZA Discussion Paper.

Akresh, R., Verwimp, P. and T. Bundervoet, 2011, "Civil War, Crop Failure, and Child Stunting in Rwanda," *Economic Development and Cultural Change*, 59(4), pp. 777-810.

Akresh, R., Lucchetti, L., and H. Thirumurthy, 2012, "Wars and child health: Evidence from the Eritrean-Ethiopian conflict," *Journal of Development Economics*, Vol. 99, pp. 330-40.

Akbulut-Yuksel, M., 2014, "Children of war: The long-run effects of large-scale physical destruction and warfare on children," *The Journal of Human Resources*, 49 (3): 634-662.

Alderman, H., J. Hoddinott and B. Kinsey, 2006, "Long Term Consequences of Early Childhood Malnutrition," *Oxford Economic Papers*, 58 (3), pp. 450-474.

Alix-Garcia, J.; A. Bartlett and D. Saah. 2012. "The Landscape of Conflict: IDPs, aid, and land use change in Darfur." *Journal of Economic Geography.*

Almond, D. and J. Currie, 2011, "Human capital development before age five," *Handbook of Labor Economics*, Vol. 4, Part B, pp. 1315-1486.

Besley, T. and T. Persson. 2011. "The logic of political violence." *Quarterly Journal of Economics* 126(3): 1411-1445.

Bird, K. and M. Prowse. 2008. "Vulnerability, Poverty and Coping in Zimbabwe," *UNU-WIDER, Research Paper No. 2008/41*. Helsinki, Finland: UNU-WIDER.

Bratton, M.. 2011. "Violence, partisanship and transitional justice in Zimbabwe." *The Journal of Modern African Studies, 49*(03): 353-380.

Brown, R. 2014. "The Mexican Drug War and Early-Life Health: The Impact of Violent Crime on Birth Outcomes", Duke University. Working Paper. http://sites.duke.edu/ryanbrown/files/2013/09/Conflict_BW.pdf (Accessed: June 12, 2014).

Bundervoet, T., Verwimp, P. and R. Akresh, 2009, "Health and Civil War in Rural Burundi," *Journal of Human Resources*, 44 (2), pp. 536-563.

Camacho, A. 2008. "Stress and Birth Weight: Evidence from Terrorist Attacks." *American Economic Review: Papers & Proceedings, 98*(2), pp. 511–15.

Central Statistical Office and Macro International Inc. 2000. Zimbabwe Demographic and Health Survey 1999.

Central Statistical Office and Macro International Inc. 2007. Zimbabwe Demographic and Health Survey 2005-06. Calverton, Maryland: CSO and Macro International Inc.

Collier, P.; Elliott, V. L.; Hegre, H.; Hoeffler, A.; Reynal-Querol, M.; Sambanis, N.. 2003. "*Breaking the conflict trap: civil war and development policy*", Washington, DC: World Bank; [New York]: Oxford University Press.

Das Gupta, M. 1987. "Selective Discrimination against Female Children in Rural Punjab, India." *Population and Development Review*, 13(1), pp. 77-100.

Davenport, C. 1995. "Multi-dimensional threat perception and state repression: An inquiry into why states apply." *American Journal of Political Science 39(3):* 683.

Davenport, C. 2007. "State repression and political order." *Annual Review of Political Science 10*: 1-23.

Duflo, E. 2012. "Women Empowerment and Economic Development." *Journal of Economic Literature*, 50(4), pp. 1051-79.

Giles, J., A. Park, and M. Wang. 2008. "The Great Proletarian Cultural Revolution, Disruptions to Education, and Returns to Schooling in Urban China." World Bank Policy Research Working Paper 4729.

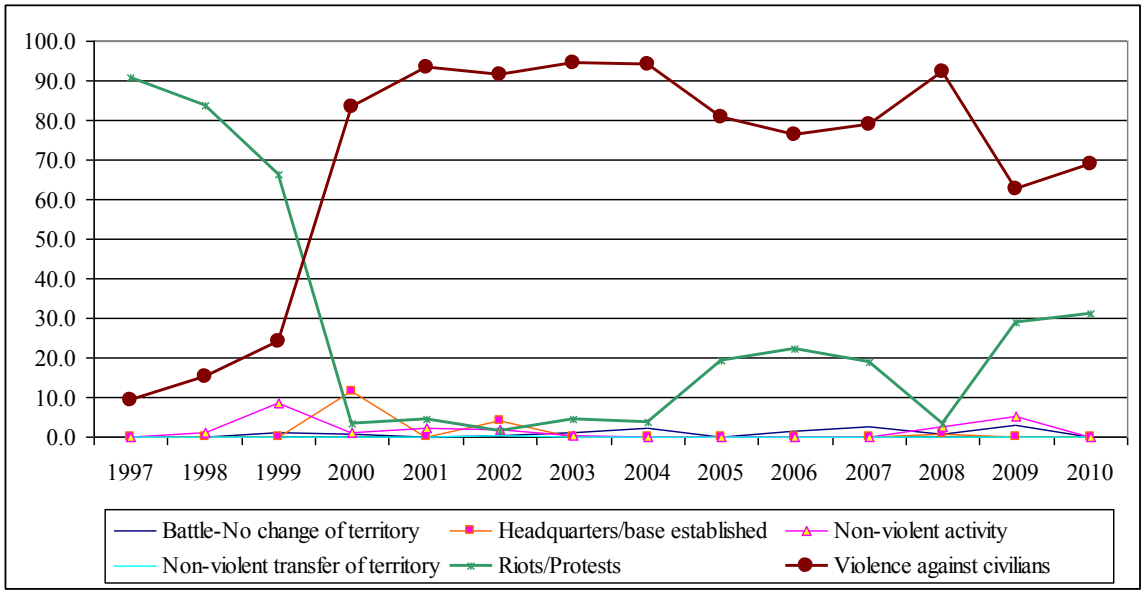
Godwin, R. 2011. The Fear: Robert Mugabe and the Martyrdom of Zimbabwe New York: Little, Brown and Company.

Hammar, A. 2008. "In the Name of Sovereignty: Displacement and State Making in Post-Independence Zimbabwe." *Journal of Contemporary African Studies, 26*(4), pp. 417-34.
Henderson, C. W. 1991. "Conditions Affecting the Use of Political Repression." *The Journal of Conflict Resolution. 35(1):* 120.
Human Rights Watch, 2002. *Fast Track Land Reform in Zimbabwe*, 8 March, A1401, available at: http://www.refworld.org/docid/3c8c82df4.html [accessed 7 December 2013]
Kim, Y. J. 2011. A study on the mental health of North Korean refugee youth in South Korea, Daegu University, South Korea: http://isci.chapinhall.org/?page_id=536. Accessed: November 8, 2013.
Kriger, N. 2005. "Zanu(Pf) Strategies in General Elections, 1980-2000: Discourse and Coercion." *African Affairs, 104*(414), pp. 1-34.
Kuku, O.; C. Gundersen; S. Garasky. 2011. "Differences in food insecurity between adults and children in Zimbabwe." *Food Policy* 36: 311-317.
Lahiff, E. and Cousins, B. 2001. "The Land Crisis in Zimbabwe Viewed from South of the Limpopo." *Journal of Agrarian Change*, *1*(4), pp. 652-66.
Orlet, C. 2005. "From Breadbasket to Dustbowl," *The American Spectator.* April 13.
Outes, I. and C. Porter. 2013. "Catching up from early nutritional deficits? Evidence from rural Ethiopia," *Economics and Human Biology*, Vol. 11, pp. 148–163.
Mani, S. 2012. "Is there Complete, Partial, or No Recovery from Childhood Malnutrition? - Empirical Evidence from Indonesia." *Oxford Bulletin of Economics and Statistics 74(5*): 691-715.
Mansour, H. and D.I. Rees. 2012."Armed Conflict and Birth Weight: Evidence from the Al-Aqsa Intifada," *Journal of Development Economics*. Vol. 99, No. 1, pp. 190-199
Meng, Xin, and R. G. Gregory. 2002. "The Impact of Interrupted Education on Subsequent Educational Attainment: A Cost of the Chinese Cultural Revolution." *Economic Development and Cultural Change. 50(4):* 935-959.
Minoiu, C. and O. Shemyakina, 2012, "Child Health and Conflict in Côte d'Ivoire," *American Economic Review Papers and Proceedings*, Vol. 102, Issue 3, pp. 294-299.
Minoiu, C. and O. N. Shemyakina. 2014. "Armed Conflict, Household Victimization and Child Health in Côte d'Ivoire". *Journal of Development Economics.* 108, pp. 237-255.
Neupert, R. F. and V. Prum. 2005. "Cambodia: Reconstructing the demographic stab of the past and forecasting the demographic scar of the future," *European Journal of Population*, 21: 217-246.
Pivovarova, M. and E. L. Swee. 2012. Quantifying The Microeconomic Effects of War: How Much Can Panel Data Help? Households in Conflict Network. Working Paper 116.
Raleigh, C.; Linke, A.; Hegre, H. and Karlsen, J.. 2010. "Introducing ACLED: An Armed Conflict Location and Event Dataset." *Journal of Peace Research, 47*(5), pp. 651-60.
Rodgers, D. 2009. The Last Resort: A Memoir of Zimbabwe, Random House LLC. Kindle Edition.
Shemyakina, O., 2011, "The Effect of Armed Conflict on Accumulation of Schooling: Results from Tajikistan," *Journal of Development Economics*, 95(2), pp. 186-200.
Scoones, I.; N. Marongwe; B. Mavedzenge, J. Mahenehene, F. Murimbarimba and C. Sukume. 2010. Zimbabwe's Land Reform: Myths and Realities (African Issues), Zimbabwe: Weaver Press.
Stohl, M., and G.A. Lopez. 1984. Introduction. In *The state as terrorist*, edited by M. Stohl and G.A. Lopez, 3-10. Westport, CT: Greenwood.
Tibaijuka, A., 2005. Report of the Fact-Finding Mission to Zimbabwe to assess the Scope and Impact of Operation Murambatsvina by UN Special Envoy on Human Settlements Issues in Zimbabwe, New York: United Nations. 18 July 2005.
Victora, C. G., M. de Onis, P. Curi Hallal, M. Blössner and R. Shrimpton. 2010. "Worldwide Timing of Growth Faltering: Revisiting Implications for Interventions". *Pediatrics*, 125, e. 473.
Verwimp, P., 2012, "Undernutrition, Subsequent Risk of Mortality and Civil War in Burundi." *Economics and Human Biology*. 10(3), pp. 221-328.
World Bank. 2011. *World Development Report 2011: Conflict, Security and Development*. Washington DC: The World Bank.

Zimbabwe Human Rights NGO Forum. 2005. Order out of Chaos, or Chaos out of Order?: A Preliminary Report on Operation "Murambatsvina".

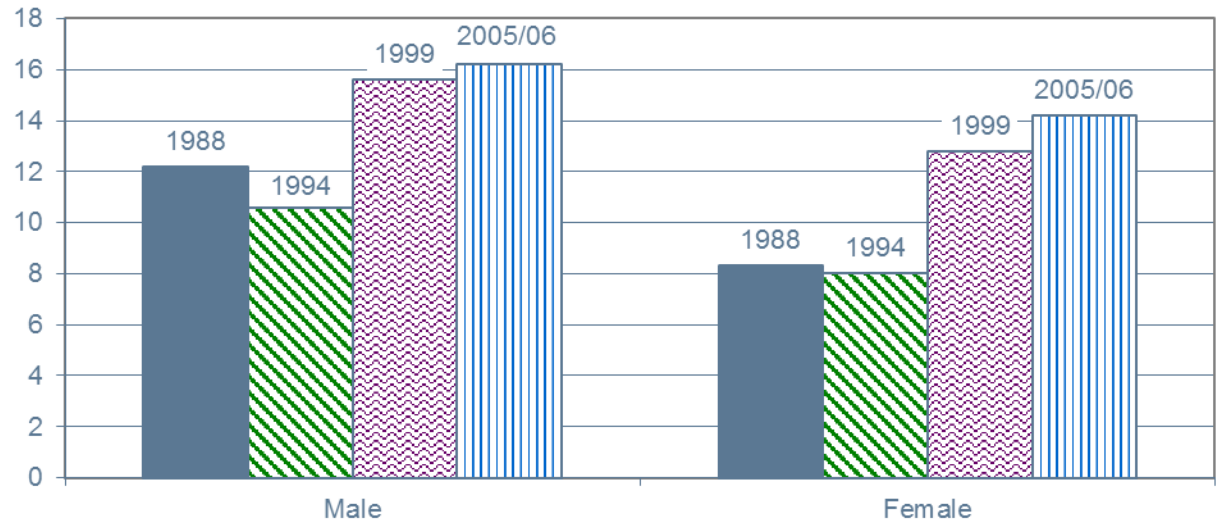
Zimbabwe Institute. 2007. Progressive Zimbabwe - Sustainable Growth and Transformation. Macro-economic Paper for Zimbabwe Institute. Accessed: March 15, 2014. http://www.zimbabweinstitute.net/File_Uploads/docs/Progressive%20Zimbabwe%20Final.pdf

Figure 1 – Violent Events in Zimbabwe by Year and Event Type



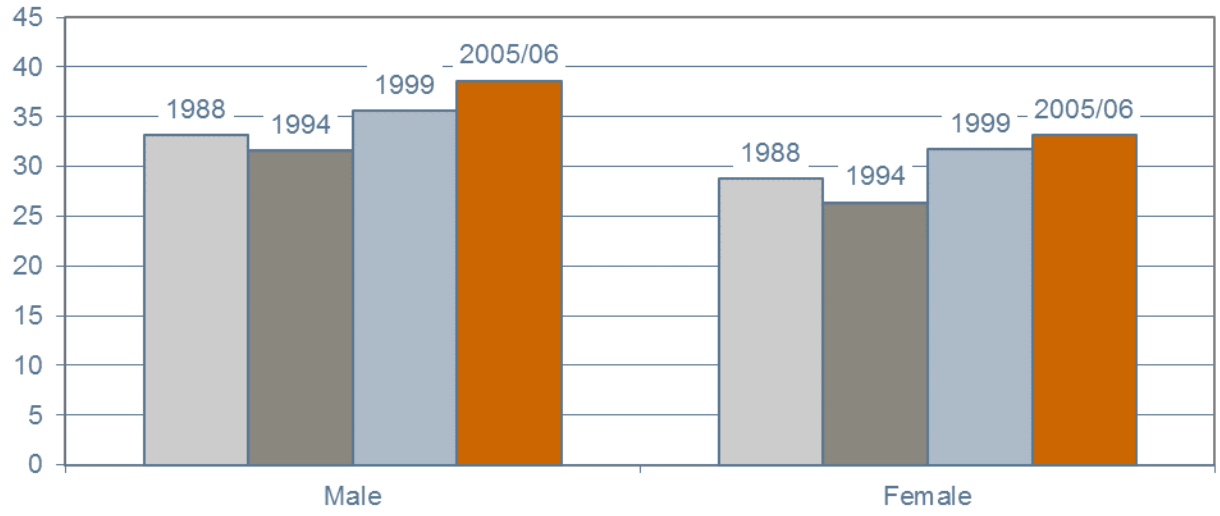
Source: Author's calculations. ACLED data for Zimbabwe (Raleigh et al. 2010).

Figure 2 – Percentage of children with HAZ below -3 SD by survey year.



Source: WHO Global Database on Child Growth and Malnutrition. July 15, 2012. Zimbabwe.
http://www.who.int/nutgrowthdb/database/countries/who_standards/zwe.pdf?ua=1
Note: All bars show the percentage of children in the relevant age group with HAZ less than -3SD. Age categories: 1988 - 0.25-5.00; 1994 - 0-2.99 and 1999 and 2005/06 – 0-5 years.

Figure 3 – Percentage of children with HAZ below -2 SD by survey year.



Source: as for Figure 2. Notes: as for Figure 2.

Figure 4 – 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
Battle-No change of territory	0.0	0.0	1.2	0.6	0.0	0.3	1.1	2.2	0.0	1.6	2.4	0.8	3.1	0.0
Headquarters/base established	0.0	0.0	0.0	11.6	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
Non-violent activity	0.0	1.1	8.4	1.2	2.2	2.0	0.3	0.0	0.0	0.0	0.0	2.8	5.3	0.0
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
Riots/Protests	90.9	83.7	66.3	3.5	4.4	1.7	4.3	3.7	19.4	22.1	18.8	3.5	28.9	31.0
Violence against civilians	9.1	15.2	24.1	83.2	93.4	91.5	94.3	94.1	80.6	76.2	78.7	92.4	62.7	69.1
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100
N events/ year	22	92	83	346	319	788	352	324	273	122	207	797	225	42

Source: ACLED data (Raleigh et al. 2010).

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

Panel A: Full sample	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to referendum * ln events	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.005*	-0.005*	-0.005*	-0.005*	-0.004*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Months exposed to the Feb 2000 referendum	-0.022**	-0.023**	-0.022**	-0.024***	-0.025***	-0.024	-0.025	-0.025	-0.027*	-0.027
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)
Rural	-0.279**	-0.264**	-0.265**	-0.243**	-0.015					
	(0.101)	(0.097)	(0.094)	(0.106)	(0.096)					
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R sq	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.11	0.11
Panel B: non-migrants	Full sample					Rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to referendum * ln events	-0.003*	-0.003*	-0.003*	-0.003*	-0.003*	-0.005*	-0.005*	-0.005	-0.005*	-0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Months exposed to the Feb 2000 referendum	-0.027**	-0.027**	-0.027**	-0.028**	-0.030**	-0.03	-0.031	-0.031	-0.033*	-0.033*
	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
Rural	-0.312**	-0.295**	-0.297**	-0.272**	-0.072					
	(0.116)	(0.113)	(0.115)	(0.111)	(0.151)					
N	5735	5735	5707	5729	5706	4405	4405	4381	4400	4387
R sq	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11
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 6-60 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 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, used for cooking oil, household has access to electricity, phone, and a dummy for household owning a car. Data sources: DHS 1999 and 2005/2006 and ACLED (Raleigh et al. 2010).

Table 3 – The effect of exposure to state violence on height-for-age z-score (HAZ), difference in differences regressions. Cohort level exposure: a dummy for being exposed to the conflict for 1-24 months and 25 months and above.

Panel A: Full sample	Panel A: full sample					Panel B: rural sub-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 25 months and more	-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 sq	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10
Panel B: non-migrants	Full sample					Rural 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	-0.480	-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 25 months and more	-0.308	-0.322	-0.318	-0.327	-0.414	0.236	0.199	0.180	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 sq	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.

Table 4 – The effect of exposure to state violence on weight-for-height z-score (WHZ), difference in differences regressions, linear months.

Panel A: Full sample	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to referendum * ln events	0.002**	0.002**	0.002*	0.002**	0.002	0.002*	0.002*	0.002	0.002*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Months exposed to the Feb 2000 referendum	-0.004	-0.004	-0.005	-0.007	-0.005	0.000	0.001	0.000	-0.002	-0.001
	(0.010)	(0.010)	(0.011)	(0.011)	(0.009)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
Rural	-0.258***	-0.257***	-0.252***	-0.187***	0.077					
	(0.055)	(0.055)	(0.054)	(0.057)	(0.085)					
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R sq	0.02	0.02	0.02	0.03	0.03	0.01	0.02	0.02	0.02	0.03
Panel B: non-migrants	Full sample					Rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to referendum * ln events	0.002*	0.002*	0.002	0.001*	0.001	0.002	0.002	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Months exposed to the Feb 2000 referendum	-0.004	-0.004	-0.005	-0.008	-0.004	0.003	0.004	0.002	0.001	0.003
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.015)	(0.014)	(0.015)	(0.015)	(0.014)
Rural	-0.251***	-0.248***	-0.242**	-0.160*	0.181					
	(0.070)	(0.069)	(0.079)	(0.083)	(0.116)					
N	5735	5735	5707	5729	5706	4405	4405	4381	4400	4387
R sq	0.02	0.02	0.03	0.03	0.03	0.01	0.01	0.02	0.02	0.03
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.

Table 5 – The effect of exposure to state violence on weight for height-for-age z-score (WHZ), difference in differences regressions, non-linear months measure.

Panel A: Full sample	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	0.148	0.146	0.146	0.141	0.14	0.259	0.252	0.243	0.239	0.245
	(0.114)	(0.114)	(0.113)	(0.107)	(0.116)	(0.212)	(0.217)	(0.214)	(0.207)	(0.212)
Exposed 25 plus months * ln events	0.088*	0.086*	0.088*	0.083**	0.074	0.100	0.093	0.087	0.081	0.083
	(0.039)	(0.040)	(0.044)	(0.036)	(0.047)	(0.059)	(0.062)	(0.064)	(0.057)	(0.061)
Exposed for 0-24 months	-0.414	-0.407	-0.433	-0.379	-0.377	-0.797	-0.762	-0.742	-0.703	-0.725
	(0.814)	(0.813)	(0.805)	(0.788)	(0.794)	(1.301)	(1.316)	(1.295)	(1.275)	(1.282)
Exposed for 25 months and more	0.084	0.089	0.06	0.076	0.118	0.158	0.195	0.195	0.206	0.206
	(0.552)	(0.553)	(0.558)	(0.549)	(0.523)	(0.618)	(0.610)	(0.615)	(0.616)	(0.592)
Rural	-0.260***	-0.259***	-0.253***	-0.186***	0.074					
	(0.055)	(0.055)	(0.054)	(0.057)	(0.086)					
N	6555	6555	6519	6548	6524	5023	5023	4992	5017	5003
R sq	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03
Panel B: non-migrants	Full sample					Rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	0.147	0.146	0.145	0.14	0.133	0.238	0.234	0.222	0.219	0.215
	(0.105)	(0.105)	(0.105)	(0.097)	(0.106)	(0.195)	(0.200)	(0.198)	(0.189)	(0.193)
Exposed 25 plus months * ln events	0.072*	0.072	0.074	0.066*	0.05	0.069	0.065	0.057	0.051	0.049
	(0.039)	(0.040)	(0.044)	(0.035)	(0.049)	(0.056)	(0.057)	(0.060)	(0.051)	(0.055)
Exposed for 0-24 months	-0.42	-0.416	-0.443	-0.383	-0.357	-0.703	-0.68	-0.651	-0.614	-0.587
	(0.786)	(0.784)	(0.780)	(0.751)	(0.762)	(1.231)	(1.247)	(1.230)	(1.201)	(1.208)
Exposed for 25 months and more	0.088	0.089	0.058	0.084	0.159	0.309	0.333	0.337	0.352	0.37
	(0.543)	(0.544)	(0.552)	(0.535)	(0.531)	(0.616)	(0.604)	(0.613)	(0.604)	(0.586)
Rural	-0.252***	-0.249***	-0.243**	-0.158*	0.178					
	(0.071)	(0.070)	(0.079)	(0.084)	(0.115)					
N	5735	5735	5707	5729	5706	4405	4405	4381	4400	4387
R sq	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03
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.

Table 6– Impact of conflict on child health, analysis by sub-group

Panel A: months of exposure: linear	girls	boys	rural	urban	mother has primary or no education	mother has more than primary education	poor	non-poor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
N months exposed to referendum * ln events	-0.005**	-0.002	-0.005*	-0.003	-0.004*	-0.003	-0.004**	-0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Months exposed to the Feb 2000 referendum	0.002	-0.045***	-0.024	0.0000	-0.018	-0.023**	-0.021	-0.026**
	(0.012)	(0.007)	(0.015)	(0.017)	(0.014)	(0.008)	(0.015)	(0.011)
Female			0.207***	0.086	0.189***	0.150*	0.167***	0.183**
			(0.034)	(0.069)	(0.051)	(0.067)	(0.032)	(0.078)
Rural	-0.263**	-0.280**			-0.413**	-0.225	0.004	-0.228*
	(0.108)	(0.120)			(0.171)	(0.151)	(0.095)	(0.120)
N	3284	3271	5023	1532	3176	3379	3390	3134
R squared	0.09	0.10	0.10	0.08	0.08	0.11	0.11	0.08
Panel B: non-linear exposure measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposed 1-24 months * ln events	-0.026	-0.071	-0.147	-0.051	-0.109	0.022	0.022	-0.062
	(0.025)	(0.109)	(0.108)	(0.039)	(0.085)	(0.090)	(0.059)	(0.145)
Exposed 25 plus months * ln events	-0.165	-0.056	-0.250**	-0.075	-0.184*	-0.058	-0.147	-0.057
	(0.092)	(0.059)	(0.097)	(0.084)	(0.090)	(0.087)	(0.088)	(0.073)
Exposed for 0-24 months	0.690*	-1.293	-0.071	0.892***	0.460	-1.095	-1.385*	0.265
	(0.310)	(0.766)	(0.617)	(0.216)	(1.135)	(0.661)	(0.686)	(0.975)
Exposed for at least 25 months	1.304	-1.739**	0.138	0.942	0.473	-0.781	-0.799	-0.037
	(0.812)	(0.681)	(0.640)	(0.600)	(0.843)	(0.477)	(1.065)	(0.471)
Female			0.214***	0.089	0.189***	0.157**	0.173***	0.190**
			(0.034)	(0.069)	(0.051)	(0.068)	(0.035)	(0.080)
Rural	-0.249**	-0.253*			-0.409**	-0.205	0.003	-0.211
	(0.109)	(0.116)			(0.168)	(0.148)	(0.100)	(0.121)
N	3284	3271	5023	1532	3176	3379	3390	3134
R squared	0.09	0.10	0.10	0.07	0.08	0.10	0.11	0.07

Notes: as for Table 2. “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).

Table 7 – Variations in Sex Ratios Across Regions and Over Time

	(1)	(2)	(3)	(4)
Survey 2005 * ln(events)	-0.006	-0.012	-0.004	-0.010
	(0.124)	(0.126)	(0.129)	(0.131)
Survey 2005	0.072	-0.759	0.065	-0.88
	(0.676)	(0.880)	(0.700)	(0.889)
ln (events)	0.011	0.02	-0.028	-0.025
	(0.083)	(0.083)	(0.064)	(0.066)
Year of birth FE		X		X
Province of residence FE			X	X
N	120	120	120	120
R - squared	0.00	0.14	0.07	0.20

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 8 – Alternative baseline cohort, full sample, the effect of exposure to state violence on height-for-age z-score (HAZ), difference in differences regressions.

Panel A: Linear exposure	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
N months exposed to referendum * ln events	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004*	-0.004*	-0.004*	-0.004*	-0.004*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Months exposed to the Feb 2000 referendum	-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***	-0.359**	-0.150					
	(0.118)	(0.111)	(0.105)	(0.127)	(0.117)					
N	5516	5516	5488	5516	5492	4229	4229	4204	4229	4213
R sq	0.08	0.08	0.08	0.09	0.09	0.08	0.09	0.08	0.09	0.09
Panel B: non-linear	Full sample					Rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	-0.103*	-0.104*	-0.102*	-0.110*	-0.096*	-0.127	-0.125	-0.124	-0.125	-0.113
	(0.048)	(0.051)	(0.051)	(0.049)	(0.052)	(0.105)	(0.110)	(0.110)	(0.112)	(0.105)
Exposed 25 plus months * ln events	-0.165***	-0.164***	-0.161***	-0.168***	-0.155***	-0.228***	-0.225***	-0.222***	-0.222***	-0.216**
	(0.039)	(0.037)	(0.039)	(0.039)	(0.036)	(0.062)	(0.059)	(0.060)	(0.057)	(0.062)
Exposed for 0-24 months	-0.185	-0.185	-0.199	-0.152	-0.229	-0.173	-0.186	-0.202	-0.188	-0.258
	(0.434)	(0.447)	(0.459)	(0.436)	(0.454)	(0.635)	(0.659)	(0.676)	(0.677)	(0.647)
Exposed for 25 months and more	-0.095	-0.109	-0.121	-0.099	-0.168	0.037	0.023	0.0000	-0.005	-0.053
	(0.402)	(0.396)	(0.413)	(0.395)	(0.399)	(0.498)	(0.483)	(0.498)	(0.468)	(0.506)
Rural	-0.355**	-0.338**	-0.338**	-0.341**	-0.139					
	(0.119)	(0.112)	(0.106)	(0.129)	(0.121)					
N	5516	5516	5488	5516	5492	4229	4229	4204	4229	4213
R sq	0.08	0.08	0.08	0.08	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. 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.

APPENDIX – NOT FOR PUBLICATION

Table A1 – Sample statistics

Variable	Obs, 1999	Survey=1999	Obs, 2005	Survey=2005
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 referendum	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 referendum * events	3078	0.00	4535	7377.14
Months exposed to referendum * ln(events)	3078	0.00	4535	145.48
Interview langiage is Shona	3892	0.68	5944	0.77
Interview langiage is Ndebele	3892	0.30	5944	0.21
Interview langiage is English	3892	0.02	5944	0.00
Interview langiage 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

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.

	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Months exposed to the Feb 2000 referendum	-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)
N months exposed to referendum * 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 referendum	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)
Female*N months exposed to referendum * 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* ln events	0.038	0.042	0.050	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)
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	6555	6182	5023	5023	4992	5023	4733
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 6-60 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 and province of residence fixed effects. All regressions include "female" dummy. Col. 1-5 include "rural" dummy variable. 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, used for cooking oil, 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.

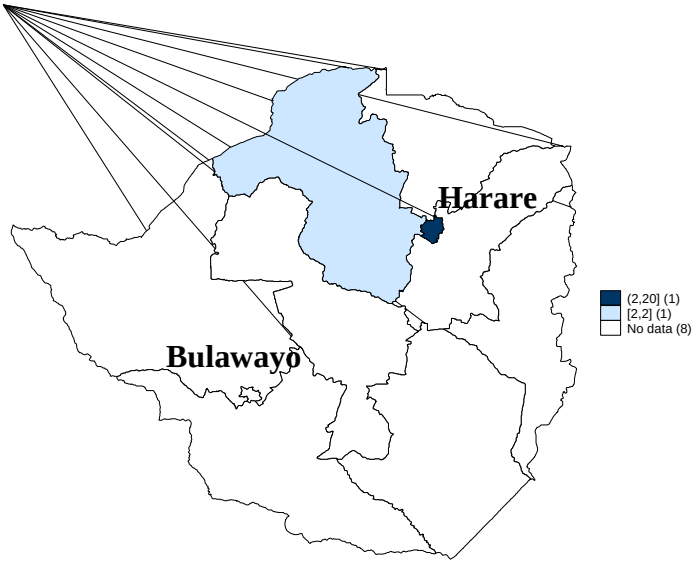
	Panel A: full sample					Panel B: rural sub-sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed 1-24 months * ln events	-0.071	-0.066	-0.064	-0.072	-0.046	-0.177	-0.174	-0.176	-0.177	-0.165
	(0.113)	(0.114)	(0.116)	(0.114)	(0.124)	(0.121)	(0.122)	(0.120)	(0.124)	(0.128)
Exposed 25 plus months * 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	0.040	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	0.08	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*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	-0.03	-0.032	-0.025
	(0.051)	(0.050)	(0.052)	(0.053)	(0.052)	(0.124)	(0.125)	(0.130)	(0.130)	(0.128)
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	0.48	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	0.020	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)
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

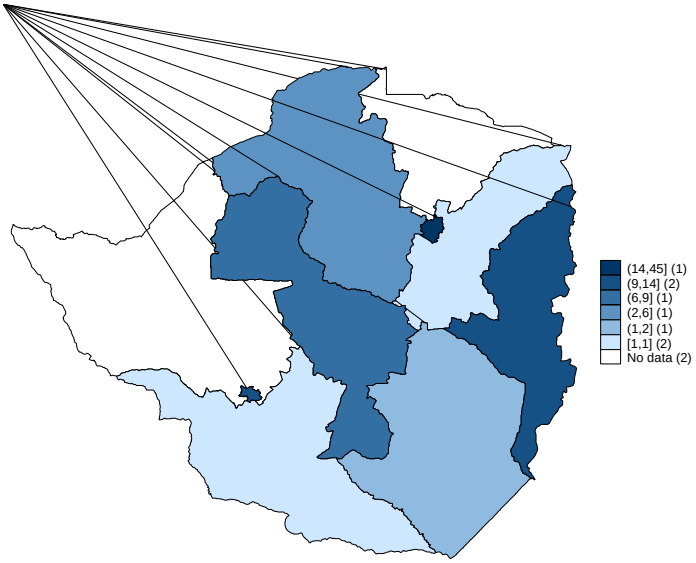
Appendix A: Spatial depiction of conflict-related events in Zimbabwe, 1997-2006

Figure A1 - Conflict-related events in Zimbabwe, 1997



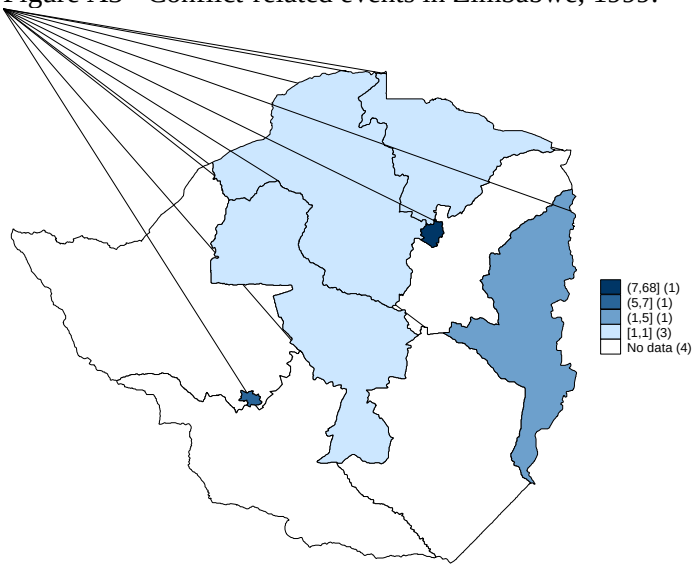
Data Source: ACLED dataset (Raleigh et al., 2010). The two largest cities that are also separate provinces in Zimbabwe are marked on the map.

Figure A2 - Conflict-related events in Zimbabwe, 1998



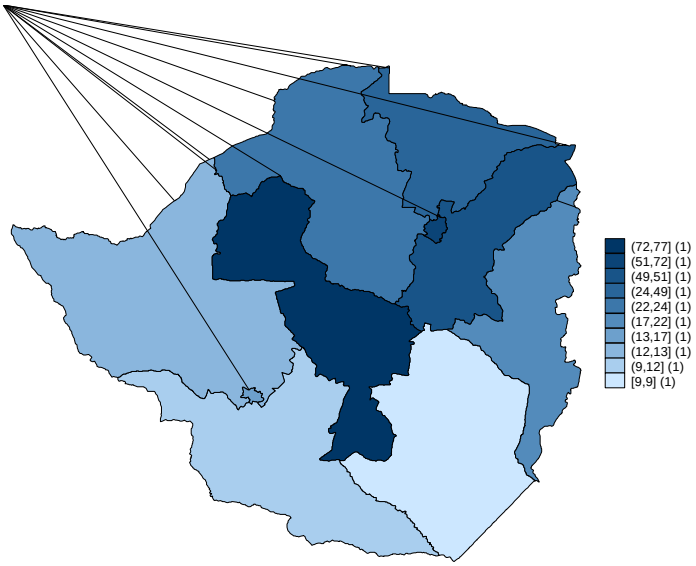
Data Source: as for Figure A1.

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



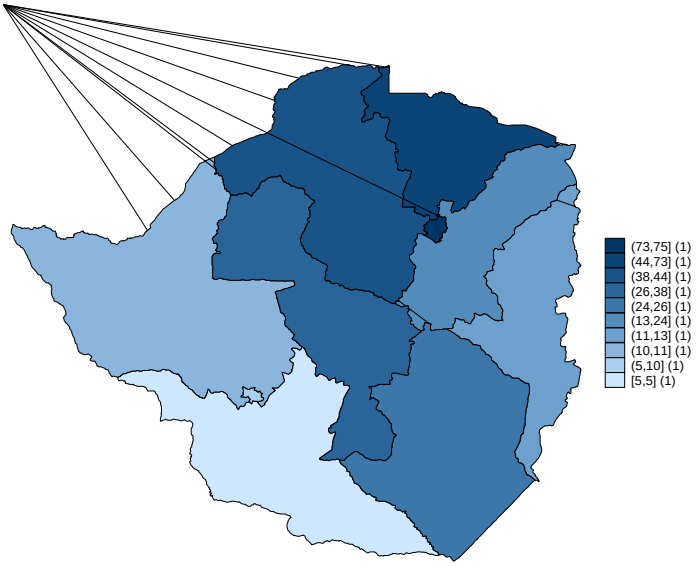
Data Source: as for Figure A1.

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



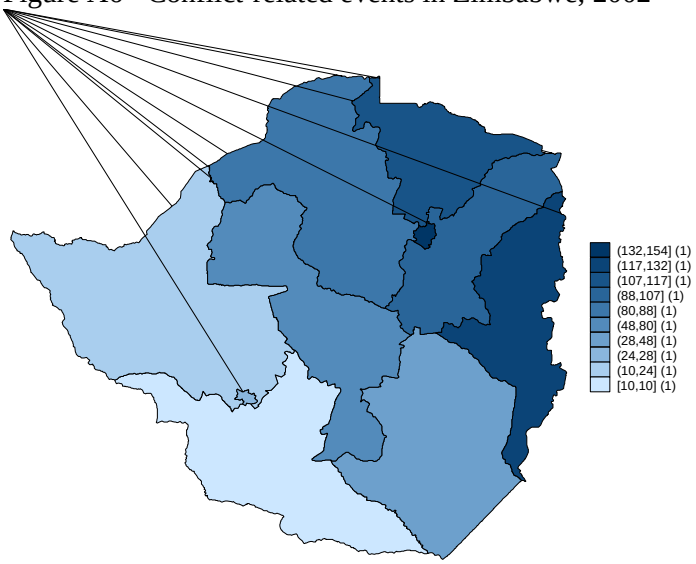
Data Source: as for Figure A1.

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



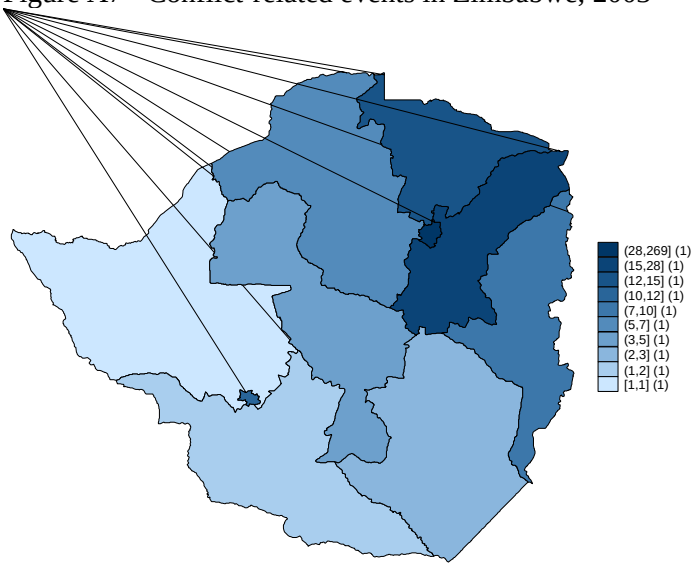
Data Source: as for Figure A1.

Figure A6 - Conflict-related events in Zimbabwe, 2002



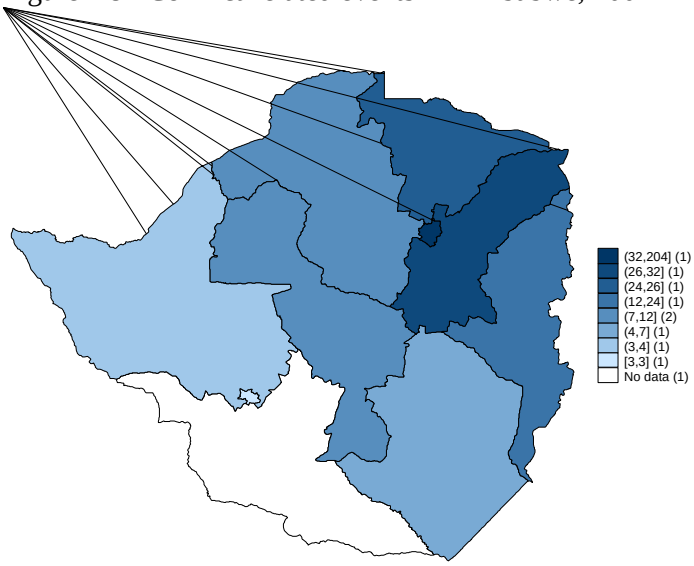
Data Source: as for Figure A1.

Figure A7 - Conflict-related events in Zimbabwe, 2003



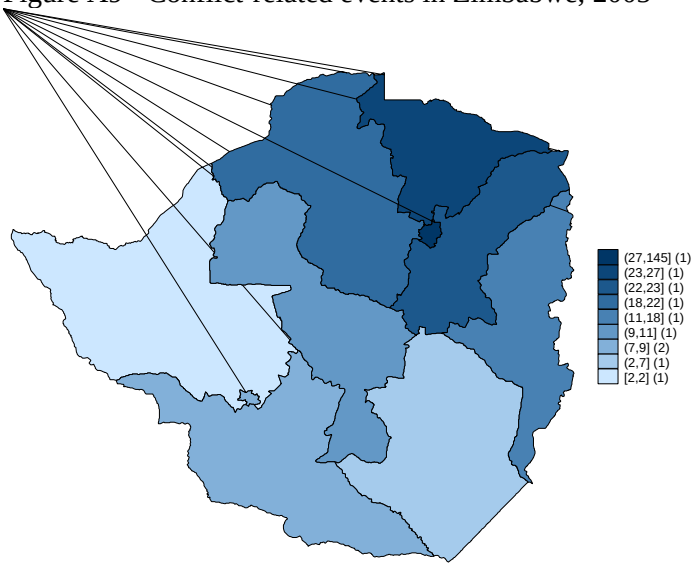
Data Source: as for Figure A1.

Figure A8 - Conflict-related events in Zimbabwe, 2004



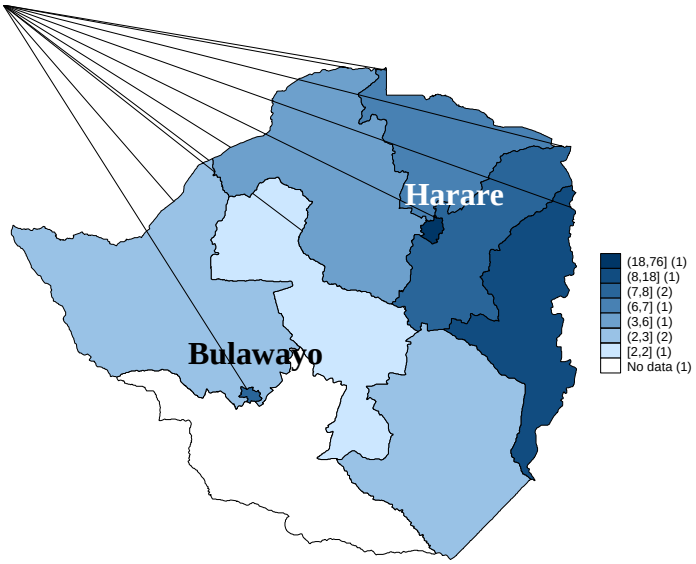
Data Source: as for Figure A1.

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

1998 – involvement in the war in the Democratic Republic of Congo
September 1999 – Formation of the Movement for Democratic Change (MDC) (Kriger, 2005: p. 26).
February 2000 – the referendum by the ruling party on the proposed draft constitution that included a provision that allowed Mugabe to seek two extra terms in office, "granted government officials immunity from prosecution"[7] and included the amendment by Mugabe to confiscate the land owned by whites (Kriger, 2005: p. 26). The proposed draft of the constitution was rejected by 54% of the voters, with only one fourth of the registered voters participating (Kriger, 2005).

2000 – Fast track land reform program (FTLRP): between February and June, about 1500 white-owned commercial farms were invaded.

June 2000 – parliamentary elections, 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 has a culture 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, and the ruling party also executed widespread purges of government officials. 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, subversion of the electoral process, intimidation of the opposition and the voters ensured Mugabe's victory.
2002-2005 – troubles within the opposition party.

2005 – Operation Murambatsvina: "Drive out the Rubbish" or officially "Operation Restore Order": the government bulldozed and de-legalized settlements in the cities and resettled large numbers of rural residents. Many residents were 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).

09/2005 - Constitutional amendments that reinstituted a national senate (abolished in 1987) and that nationalized all land. This converted all ownership rights into leases."

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

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. 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.

2008 – defeat of ZANY(PF) in the presidential elections and retaliation by the ruling party against the political opposition (MDC).

Data Appendix

Maps:
Downloaded maps from http://www.maplibrary.org/stacks/africa/Zimbabwe/index.php

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

ACLED routine:
Manually matched ACLED identified locations to provinces in Zimbabwe. Performed multiple Google using locations names and also used maplandia.com.