Impact of armed conflicts on child welfare in Côte d'Ivoire

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***Abstract*:** Civilian populations, including children are often caught in the crossfire during armed conflicts. Children are also victims and often forced perpetrators of atrocities, which has lifelong consequences on their wellbeing as well as implications for intergenerational transmission of poverty and the achievement of Sustainable Development Goals. This study builds on previous work on the microeconomic effects of armed conflicts on children in line with the fetal origins hypothesis to investigate the effects of early life shocks on child health. Unlike past studies in Côte d'Ivoire, which addressed the 2002-2007 civil conflicts, this study examines the impact of armed conflicts on child welfare focusing on the 2010-2011 post-electoral violence. It uses the 2011/2012 DHS surveys and data from the Armed Conflict Location and Event Database (ACLED) on the exact location and timing of conflicts. The empirical evidence shows that conflict reduces significantly the height-for-age z-score of exposed children compared to their non-exposed counterparts. Both children born before and during the war are impacted. Moreover, the results suggest that child welfare is negatively affected by conflict intensity, while the presence of UN peacekeepers might mitigate the negative effects of conflict on child welfare.

Keywords: Child welfare; Conflict; Sub-Saharan Africa; Côte d'Ivoire

JEL Classification: I1, J1, O1

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1. Introduction

The quality of children's life and future economic outcomes as adults are critically influenced by early childhood development. Life events happening until age five such as civil war, rainfall variability and income shocks have an impact on children's cognitive ability, educational attainment, health, anthropometric measures and future contribution to society. Understanding the effects of such shocks on child welfare is crucial since one in 10 children across the globe, or more than 230 million children currently live in countries and areas affected by armed conflicts (UNICEF, 2015).

Recently, the availability of household surveys conducted in war-affected countries has led to a mushrooming of research on the microeconomic effects of wars (Pivovarova and Swee, 2015). Those studies not only found strong negative effects of armed conflicts on child health but also unravelled some important channels through which such effects occur (Minoiu and Shemyakina, 2012). For example, Akresh, Lucchetti and Thirumurthy (2012) suggest that war might affect children by preventing food aid from reaching war-affected areas or because households in those regions might lose their source of livelihood due to looting. In addition, children might be affected because of population displacement, which makes access to appropriate health care services or clean water difficult. In the same vein, Minoiu and Shemyakina (2012) conclude that children whose parents reported economic losses in terms of livestock or property (farm) experienced more health setbacks due to conflict. However, they admitted that their findings were to a certain extent limited because information about war-related victimization is self-reported by households and might not represent the actual destruction of their economic assets. This, therefore, could potentially bias the results from using victimization as war-impact mechanism. They also argue that other mechanisms such as the displacement of health workers and the destruction health care facilities are possible ways in which conflict could have affected Ivorian children.

The present study focuses on Côte d'Ivoire, where overall economic performance has deteriorated following the 1999 military coup and the civil war that broke out in 2002. Between 2000 and 2009, GDP per capita declined by 1.2% annually, and the poverty rate increased from 38.4% in 2002 to 48.9% in 2008 (IMF, 2009). After the conflict erupted in 2002, many attempts in 2003 and 2004 to reach a ceasefire and a negotiated peace agreement proved to be unsuccessful in bringing about sustainable peace. For example, the January 2003 Linas-Marcousis agreement brokered by the former colonial power, France, included the formation of a National Reconciliation Government, the disarming of all forces, the rebuilding of the army and the preparation of elections by dealing with the citizenship problem and the conditions of eligibility to the Presidency of the Republic. These later issues, in addition to the land tenure regime were considered to be at the root of the Ivorian conflict according to rebel forces[1]. However, the failure of the Linas-Marcousis peace agreement to reunify the country and organized elections led to a new peace agreement in March 2007 in Ouagadougou. This peace accord resulted in the appointment of the rebel leader Guillaume Soro, as new Prime Minister and included as mandate the completion of the disarmament process, the reunification of the country and the provision of identity cards in view of the national elections. Thus, since its beginning the Ivoirian crisis seems to have been inextricably linked to the electoral process. This study therefore adds to previous research on the impact of conflict on children, and attempts to unravel conflict-impact mechanisms by considering the 2010-2011 Ivorian post-electoral violence.

The consequences of the Ivorian civil conflict have been devastating for children. When the conflict was at its peak in 2002, severe chronic malnutrition was well above 10% in the northern and western parts of the country. In July 2008, the SMART survey showed that 17.5 % of children under five in the north suffered from acute malnutrition, and out of them 4 per cent (22,000 children) suffered from severe acute malnutrition compared to 6.9% at the

national level. A similar trend was observed by the Food Security Monitoring System (FSMS) survey conducted in August 2008, which revealed that 27% of rural households in the savane regions (northern region) were food insecure, while 12 % were severely food insecure (UNICEF, 2009).

The educational system and health sector were also affected by the civil war as over 80 per cent of health personnel and trained teachers working in rebel-controlled regions fled to more secure areas in the South. Even though under five mortality decreased from 176/1000 live births in 2002 to 127/1000 in 2005, this decline was not sufficient to reach the MDG target of reducing child mortality by two-thirds in 2015 (UNICEF, 2009). In the same vein, maternal mortality increased from 597/100,000 in 2000 to 810/100,000 live births in 2008. Furthermore, the politico-military upheaval that started in 2002 led to 3,000 children being forced to be involved with armed groups while out of 750,000 internally displaced people who fled to the relatively safer zones, 51,037 were children (UNICEF, 2009).

The objective of this study is to estimate the effects of conflicts on child welfare in Côte d'Ivoire focusing on the 2010-2011 period characterized by the violent post-electoral crisis. The study examines the effect of conflict on children born before and during the conflict in war-affected provinces compared to non-affected ones. The study also aims to examine whether there is any difference in the impact of conflict on children by gender. Its makes use of the temporal and spatial variation of conflict and its effect on children height-for-age z-score, an indicator of children's long-term nutritional status and health.

This study makes two contributions to the literature on the effects of armed conflicts on children. First, unlike previous studies on Côte d'Ivoire, this research is not limited to shocks occurring between 2002 and 2007, which resulted in the signing of the Ouagadougou Peace Accord in March 2007. The analysis in this paper builds on previous research in Côte d'Ivoire by focusing on the 2010 post-electoral violence using a survey conducted in 2011

and 2012 after the conflict. Second, this study investigates the role of the intensity of conflict on child welfare as well as the presence of UN peacekeepers as a conflict-mitigating instrument. The measure of conflict intensity is the number of casualties as a proportion of the pre-conflict population in the affected regions. The information on the presence of UN peacekeepers is obtained from the 2010 United Nations Operation in Côte d'Ivoire (ONUCI) deployment map.

The empirical results show that the post-electoral violence negatively affects children born before or during the conflict. More specifically, for children born during the conflict, height-for-age z-score is reduced by 0.5-0.6 standard deviations. The study did not find any robust difference across gender in the impact of the conflict on children. Finally, the evidence suggests that the intensity of the conflict has a negative impact on children while the presence of UN peacekeepers might play a mitigating role on the impact of conflicts on child health.

The negative impact of conflict on children welfare found in this study is consistent with the burgeoning literature on the association between conflict and child health. The results are in the same range of those of Akresh, Verwimp and Bundervoet (2011) who studied the effect of the Rwandan October 1990-December 1991 pre-genocide civil conflict (0.64-1.05 standard deviations). The estimates however, are larger than those of Minoiu and Shemyakina (2014) dealing with the effect of the September 2002-March 2007 Ivorian conflict on children height-for-age z-score (0.2-0.42 standard deviations).[2]

The rest of the paper is organized as follows. Section 2 gives an overview of the recent literature on children and conflict. Section 3 describes the data and provides summary statistics for the main variables. Section 4 discusses the model specification and the estimation methodology. Section 5 presents the results and robustness checks. Section 6 explores some conflict-impact mechanisms and section 7 concludes.

[2] See Table A1 for a summary of results from selected comparable studies.

2. Literature review

Studies related to the consequences of early-life events such as the occurrence of civil war, rainfall shocks, or income fluctuations are mostly grounded on the fetal origin hypothesis (Almond and Currie, 2011). The fetal origin hypothesis is closely related to epidemiologic studies showing that the in-utero environment, such as inadequate nutrition, predisposes an unborn baby to future health problems. Babies who are underweight at birth or during infancy or who faced undernutrition while in-utero run a high risk of developing coronary heart diseases, obesity and addiction-related behaviours in their lifetime.

The fetal origins hypothesis proposed by Barker (1990), which explains how early life exposure to shocks affects future outcomes, has generated a large body of literature spanning a significant number of economic disciplines including health, environment, development and family economics. A number of studies that examine the consequences of early life shocks on children have focused on civil war. These studies assess the microeconomic impact of civil conflict on non-combatants. Children who faced shocks such as civil war early in life have lower anthropometric scores (height-for-age z-scores) measures compared to those born in non-affected areas. The transmission mechanism of the negative effect of civil war on child health is mostly explored through the number of displaced people and victimization by combining household surveys and data on the occurrence of conflicts. Alderman, Hoddinot and Kinsey (2006) analyse the effect of 1982-1984 drought and the civil war on children in Zimbabwe and find that exposure to civil war leads to lower height-for-age z-score, late start of school, and fewer years of schooling. In addition, children who were shorter because of their exposure to civil war or drought are not able to catch up and tend to remain short in adolescence.

Moreover, Bundervoet, Verwimp and Akresh (2009) use household data (1998

priority survey) and the timing and location of civil war in Burundi (1994-1998) to assess its effect on children. They control for location (province) and cohort of birth, as well as individual and household characteristics in their regression of height-for-age z-score on months of war exposure. They find that children who were exposed to war have, on average, 0.515 standard deviations lower height-for-age z-scores compared to non-exposed children. However, their data did not allow them to tease out the transmission mechanisms through which the war impacted children. Similarly, Akresh, Bhalotra and Osili (2011) examine the effect of the Nigerian civil war of 1967-70 on stature. Using DHS data and variation across ethnicity and cohort they find that those exposed to the war at all ages between birth and adolescence show reduced adult stature with the largest impact occurring in adolescence. Furthermore, Akresh, Lucchetti and Thirumurthy (2012) use household data (DHS) from Eritrea and Ethiopia and GPS information on the distance between survey villages and conflict sites to increase the accuracy of child war exposure. They find that children who were exposed to war have 0.42 standard deviation lower height-for-age z-scores, with the worse impact occurring in the country that instigated and lost the war (Eritrea) compared to the one that won the war (Ethiopia). The effects are also similar for boys and girls born during the conflict and those alive at the time of the war.

Armed conflicts have been shown to increase child mortality. Scott, Hegre, Nygård and Strand (2012) estimate that the average infant mortality rate for war-torn countries is 10% higher compared to non-war affected countries. Verpoorten (2008) analyses 258 Rwandan rural household responses to income shock during the 1991-2001 civil war with a particular focus on the 1994 genocide. He argues that the probability of selling cattle as a buffer shock increases both in peacetime and wartime, whereby changes in household asset composition explain the former and the necessity to buy food motivates the later. However, the most severely affected households did not resort to cattle selling as coping mechanism

because of their very low prices and security concerns having to do with high risk of looting or cattle raiding on the road.

Many other studies have examined the effect of shocks on children in Côte d'Ivoire. Using household surveys, Thomas, Lavy and Strauss (1996) found that the structural adjustment programs of the 1980s, which resulted in the reduction of government social spending and the availability and quality of health services, had a detrimental impact to child health. Furthermore, stabilization programs aimed at aligning local food prices to world prices led to an increase in domestic food prices and lowered child weight-for-height and adult body mass index (BMI). In the same vein, using the difference-in-difference estimation method and pre-crisis (1985-1988) and post crisis (1993) data sets, Cogneau and Jewad (2012) investigate the impact of a 50% fall in administered cocoa prices on children's outcomes such as school enrolment, child labour, height-for-age z-scores, and incidence of illnesses comparing children in cocoa farming and non cocoa farming households. They find that a cocoa price shock has a negative impact on human capital investment of cocoa producing households. For instance, the height-for-age z-scores of children in the 2-4 years age bracket fall by between 0.25 to 0.62 standard deviations and girls (7-11 years of age) school enrolment by 9-10 percentage points on average. In addition, parents invest more in boys' education and health care compared to girls. They consider the reduction of income or the severe liquidity constraint of cocoa producing parents as the vehicle through which cocoa prices falling affect children.

Minoiu and Shemyakina (2014) used the Ivorian Household Living Standards Surveys (HLSS) (CIV 2002, 2008) and the Armed Conflict Location and Events Dataset (ACLED) to study the impact of the 2002–2007 armed conflict in Côte d'Ivoire on children's height-for-age z-scores. They found, as in previous studies, that children aged 6–60 months who lived in conflict-affected areas had a lower height-for-age z-score compared to those

living in the non-affected areas. The conflict led to between 0.2 and 0.4 standard deviations of health setbacks; but they could not find any gender differences in the impact of conflict. Using the same data, Dabalen and Saumik (2014) showed that households affected by the conflict had lower dietary diversity. They argue that household victimization or economic losses are important channels through which armed conflicts negatively affect child health. In their studies, they emphasized the possibility of many other channels through which armed conflict affected children and the importance of documenting those channels to help implement policies aimed at mitigating the adverse effects of conflicts on children.

The present study investigates two other potential channels, namely the presence of UN peacekeepers and conflict intensity and their aggravating or alleviating role on the impact of conflict on child health. UN peacekeepers play a crucial role in preventing conflicts, in carrying out disarmament, demobilization, reintegration, and rehabilitation (DDRR) programs, and in providing security to the population, and protecting humanitarian aid convoys. Furthermore, since its 1261 resolution of 1999 and through subsequent resolutions (1314 (2000), 1379 (2001), 1460 (2003), 1539 (2004), 1612 (2005), 1820 (2008)), the UN has reiterated its commitment to child protection during its peacekeeping missions (UN, 2009). It has appointed child protection advisers in peacekeeping operations and its New Resolution on Children and Armed Conflict of March 2014, SCR 2143 (2014) and has stressed the importance of peacekeepers' training in child protection. Despite the importance of UN peacekeepers during wars, there is limited literature dealing with the relationship between children in armed conflict and UN peacekeepers presence. In Côte d'Ivoire, the presence of UN peacekeepers has been associated with lower concerns about conflict resumption and less severe economic losses by households, with those living in largely affected localities close to the Liberian borders having a positive perception on the UN peacekeepers humanitarian role compared to those in less affected regions (Mvukiyehe and

Samii, 2008) .

The second channel that is considered is the intensity of the armed conflict, which is defined as the ratio of the number of casualties to the pre-conflict population in each affected region. Previous studies of the effect of war on children in Côte d'Ivoire used the 2002 and 2008 National Household Surveys as pre and post-conflict datasets, which assess the impact of the 2002 Ivorian armed conflict on children. They showed that children living in conflict-affected regions have a lower height-for-age z-score on average compared to the same age group living in non-conflict affected regions with no difference in the impact by gender.

The present study attempts to replicate these results using the 2011/2012 Demographic Health Surveys with a particular emphasis on another short but violent conflict stemming from the 2010-2011 post-electoral crisis in Côte d'Ivoire.

3. Data

This study uses the child sample of the 2011/2012 Demographic and Health Surveys (DHS) to estimate the effect of conflicts on children. The 2011/2012 survey was fielded by the National Institute of Statistics in collaboration with the Ministry of Health and international donors between December 2011 and May 2012. It is a countrywide survey that covered 10,413 households. The children sample contains information related to in-utero and postnatal care, immunization and health and consists of 7,766 observations. The dataset also includes information on the mother of each of the children born in the past 5 year and aged 0-59 months. The analysis is conducted at the province (administrative district) level. The information for the provinces is not available in the dataset. To circumvent this problem the study uses the geographical information (longitude and latitude) contained in the dataset for each cluster. This information is used to find the different regions (provinces) of the country

to which those clusters belong and are merged with the dataset[2]. In the end, 55 provinces (departments) are included in the dataset.

The study also uses the Armed Conflict Location and Event Database (ACLED) by Raleigh et al. (2010), which reports exact locations, dates, and other characteristics of individual battle events in states affected by civil conflict. The conflict data for Côte d'Ivoire are available for the period from 1997 to 2015 and are disaggregated at the administrative departments of the country. The intensity of war variable is constructed based on the 1998 General Population and Housing Census, which gives the pre-conflict population by regions. Finally, the study utilizes the 2010 map of UN mission's deployment across the country to examine the effect of their presence on child welfare.

4. Model specification and estimation methodology

Drawing on Akresh, Lucchetti and Thirumurthy (2012) and Minoiu and Shemyakina (2014), the following models are specified:

$$HAZ_{ijt} = \alpha_j + \delta_t + \beta_1(ConflictRegion_j * AliveDuringConflict_t) + \theta X_{ijt} + \lambda_{jt} + \varepsilon_{ijt} \qquad (1)$$

For a child i (aged 6-60 months), born in region or department j, at time t, HAZ_{ijt} is the child's height-for-age z-score, X_{ijt} a vector of child, mother and household characteristics, δ_t is the birth-cohort fixed effects. α_j stands for the districts or provinces fixed effects, λ_{jt} the province-year of birth effects to capture pre-existing province level trends in cohort health and ε_{ijt} represents the error terms.

AliveDuringConflict is a binary variable for children born before or during the conflict.

ConflictRegion is a dummy variable for regions with at least one event of conflict between November 2010 and May 2011, the duration of the post-electoral violence[3]

The impact of the post-electoral violence on children born before and during conflict is determined by the following equation:

$$HAZ_{ijt} = \alpha_j + \delta_t + \beta_2(ConflictRegion_j * BornBeforeConflict_t) + \beta_3(ConflictRegion_j * BornDuringConflict_t) + \theta X_{ijt} + \lambda_{jt} + \varepsilon_{ijt} \quad (2)$$

BornDuringConflict is an indicator for children born between November 2010 and May 2011 the period coinciding with the post-electoral violence. *BornbeforeConflict* is a dummy variable for children born before November 2010 while *BornAferConflict* is an indicator variable for the children born after May 2011.

A continuous measure of violence exposure is also used as presented in the next equation:

$$HAZ_{ijt} = \alpha_j + \delta_t + \beta_4(MonthsofConflictExposure_{jt}) + \theta X_{ijt} + \lambda_{jt} + \varepsilon_{ijt} \quad (3)$$

MonthsofConflictExposure measures the months of exposure to the conflict for a child living in conflict-affected provinces (=0 if the child lives in non-conflict provinces or is born after the conflict has ended).

To check for the robustness of the effect of conflict on children, conflict intensity is added yielding the following equation:

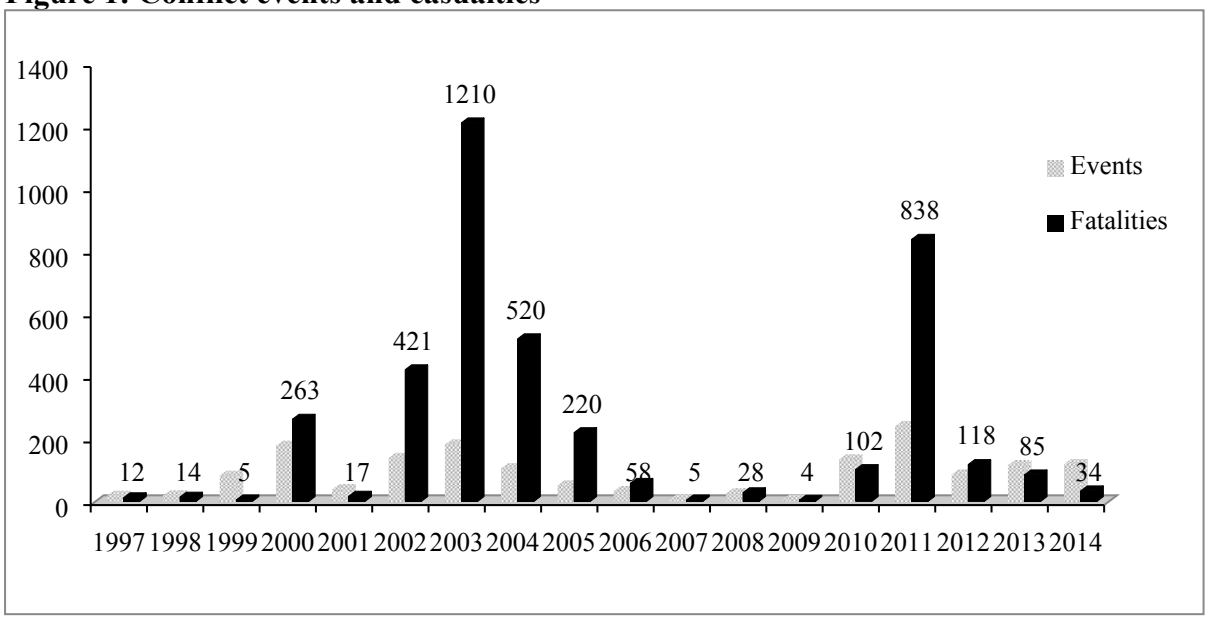
$$HAZ_{ijt} = \alpha_j + \delta_t + \beta_5(ConflictIntensity_j * BornBeforeConflict_t) + \beta_6(ConflictIntensity_j * BornDuringConflict_t) + \theta X_{ijt} + \lambda_{jt} + \varepsilon_{ijt}$$

Where *ConflictIntensity* is the ratio of casualties and pre-conflict population per 100,000 inhabitants.

In all the equations, the vector of exogenous control variables **X** includes the gender of the child, ethnicity, religion, area of residence, the age and gender of the household head, the mother's age, her education, her height and marital status. The models are estimated using the difference-in-difference method. The coefficients of interest measuring the impact of the conflict on children, the β_s are expected to be negative. The list of the variables used in the analysis, the definitions and sources are provided in Table A2 in the Appendix.

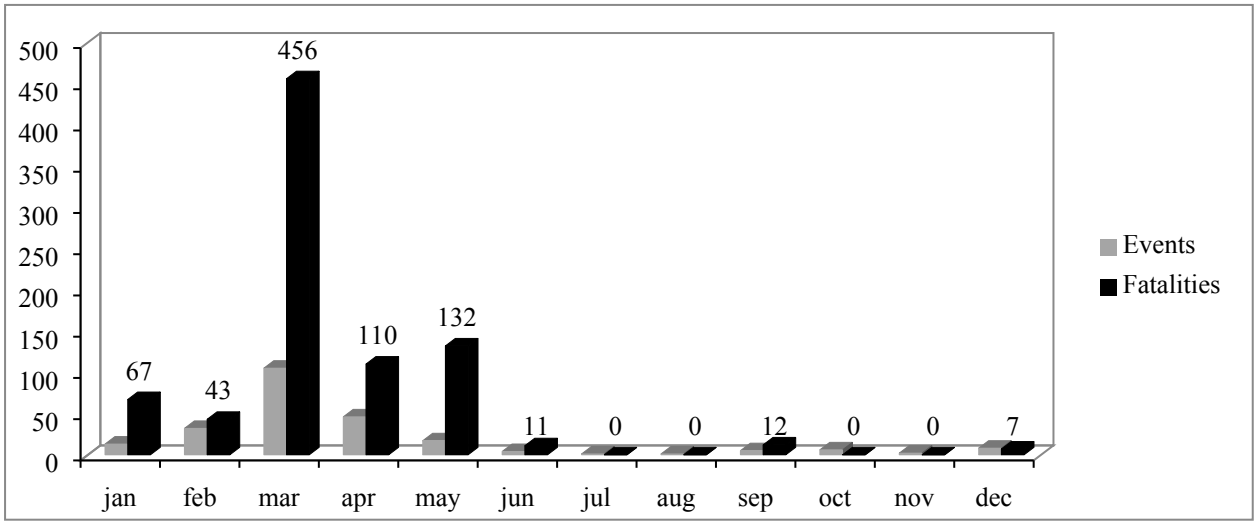
The Ivorian conflict can be divided in two periods. The first one spans from September 2002 to March 2007 with the signing of the Ouagadougou peace accord. The second period covers to the post-electoral violence from November 2010 to May 2011. As shown in Figures 1 and 2, there is a high level of casualties relative to the number of conflict events during the period 2002-2004 and in 2011, which corresponds to the post-electoral violence. Figure 3 presents the spatial distribution of the conflict across the country, which affected mostly the western and central regions as well as some regions in the North-east (Bondoukou) and in the South (Abidjan).

Figure 1: Conflict events and casualties



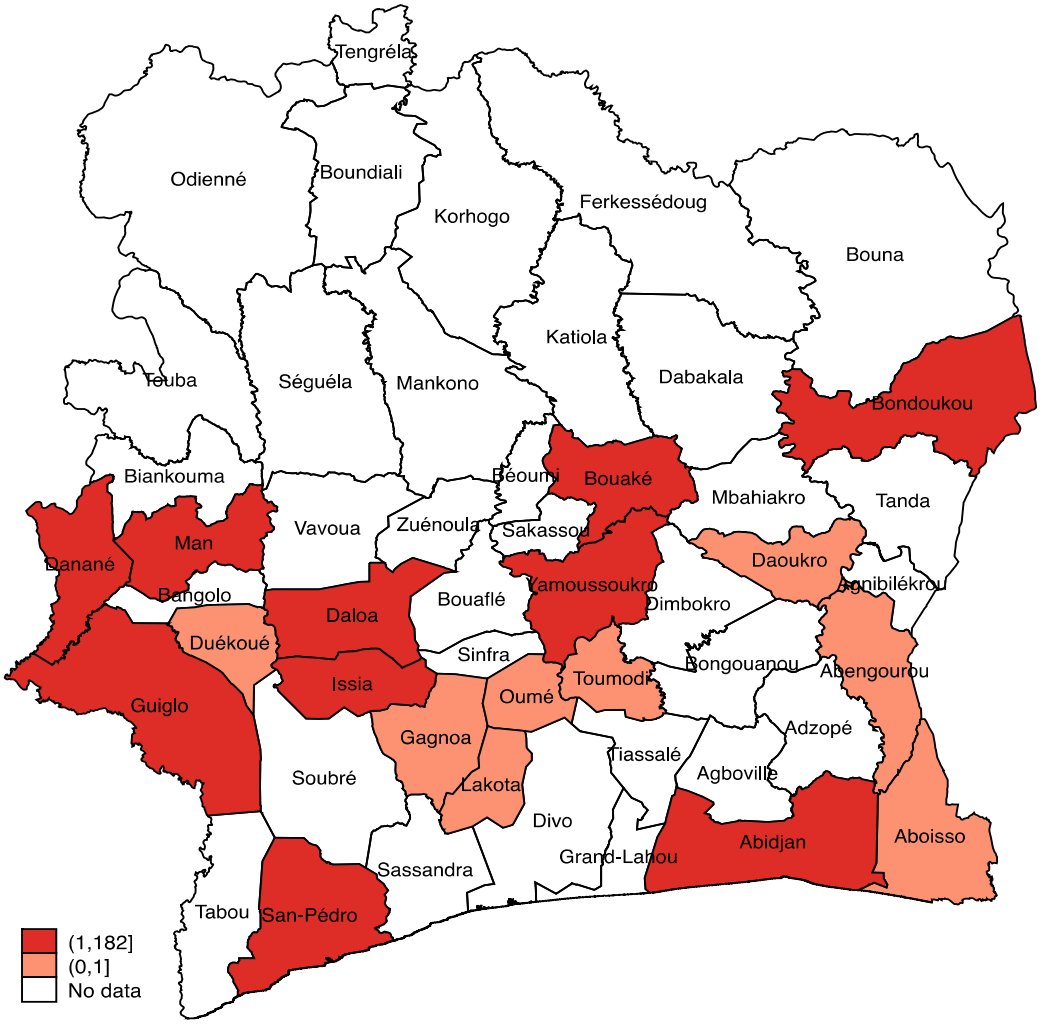
Source: Author's calculation based on data from ACLED (2010)

Figure 2: Conflict events and fatalities per month in Côte d'Ivoire (2011)



Source: Author's calculation based on data from ACLED (2010)

Figure 3: Location of conflict events between November 2010 and May 2011



Source: ACLED (2010). Regions marked as "No data" are those that were not exposed to any conflict between November 2010 and May 2011.

As described in Table 1, the average height-for-age z-score across war-affected and non war-affected regions is -1.221 showing that children across Côte d'Ivoire are 1.221 standard deviations below the average height-for-age z-score of the international reference child. Also 51.7% and 64 % of women are married in conflict and non-conflict regions, respectively. Finally, children from conflict areas are 44.1 percentage points more likely to originate from poor households. The evidence in Table 1 also shows significant difference across regions in terms of ethnicity, religions and mother characteristics such as age and education. All these variables will be used as controls in the estimations.

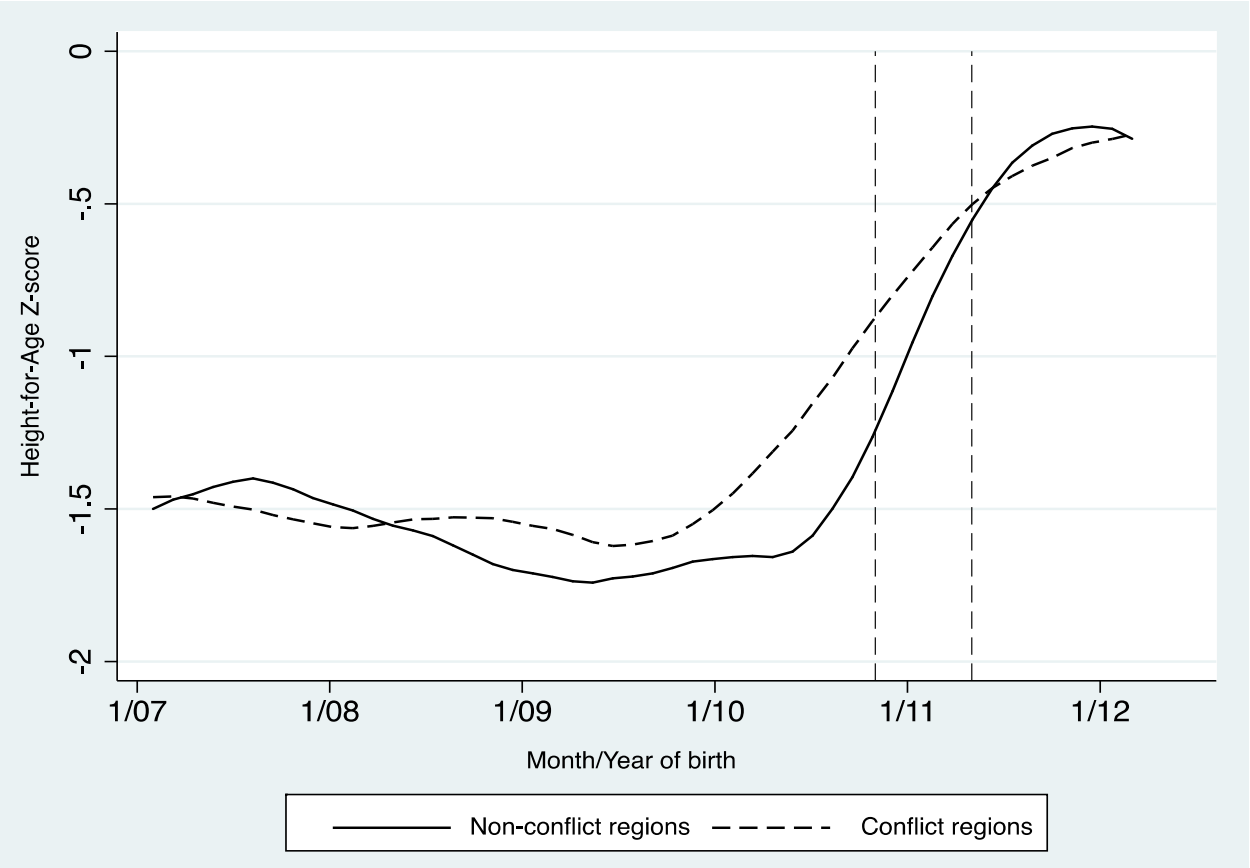
Table 1: Summary statistics

Variables	[1] Obs	[2] Non-Conflict Regions	[3] Conflict Regions	[4] Difference in Mean [2]-[3]
Child characteristics				
Child Haz z-score	3148	-1.283	-1.160	-0.123**
Child age in months	3390	27.477	26.417	1.061*
Child is female	7555	0.494	0.498	-0.003
Child lives in rural household	7555	0.746	0.562	0.184***
Child lives in a poor Household	7555	0.444	0.441	0.003
Ethnicity				
Akan	7547	0.201	0.337	-0.136***
Krou	7547	0.030	0.117	-0.087***
Northern Mandé	7547	0.226	0.096	0.130***
Southern Mandé	7547	0.106	0.084	0.022***
Voltaiques	7547	0.254	0.111	0.143***
Others	7547	0.183	0.255	-0.073***
Religion				
Christian	7535	0.275	0.466	-0.191***
Muslim	7535	0.516	0.402	0.114***
Others	7535	0.209	0.132	0.077***
Months of conflict exposure	2561	28.575	31.814	-3.239***
Conflict intensity	7555	0	14.803	-14.803***
Head of the household characteristics				
Household head age	7555	44.146	44.346	-0.199
Household head is male	7555	0.885	0.824	0.061***
Mother's characteristics				
Mother's height	3754	158.574	158.892	-0.318
Mother's age	7555	29.028	28.411	0.617***
Mother is educated	7555	0.243	0.418	-0.174***
Mother's is married	7555	0.640	0.517	0.123***

Notes: Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)
* significant at 10% , ** significant at 5% , *** significant at 1%

In addition, Figure 4 shows that older cohorts have a lower height-for-age z-scores compared to younger cohort. Furthermore, for those born before 2008, children born in conflict regions have lower height-for-age z-scores compared to children born in non-conflict regions. The graph also suggests that during the conflict, children in conflict regions have better health. However, compared to the pre-conflict period (especially from the year 2009 onward) the deprivation gap seems to shrink during the conflict. One may argue that the effect of the conflict on the child's deprivation builds up overtime.

Figure 4: Height-for-age Z-scores and conflict exposure in Côte d'Ivoire (conflict vs. post-conflict periods)



Notes: Kernel weighted local polynomial of Height-for-age Z-scores by month and year of birth. Vertical dashed lines indicates when the post-electoral violence started (November, 2010) and ended (May, 2011)

Data sources: 2011-2012 Côte d'Ivoire DHS and ACLED (2010)

5. Empirical Results

5-1 Effect of conflict on children

Table 2 presents the results from the estimation of the impact of the conflict on children as described in equations (1) to (3). When the pooled sample of children born before and during the conflict (alive during the conflict) is considered, the results show that children who lived in conflict-stricken regions had a height-for-age z-score that is 0.813 to 0.831 standard deviations lower than those in non-conflict regions and the coefficients are statistically significant at 1% level (columns 3 and 4). The negative effect of conflict persists even after controlling for household and mother characteristics.

Next the differential impact of the conflict on children is analysed by considering the older cohort (born before the conflict) and the younger cohort (born during the conflict) as well as the duration of exposure to the conflict. As shown in columns 1 and 2 in Table 2, children born during the conflict in conflict regions have 0.626 to 0.657 standard deviations lower height-for-age z-score and the coefficients are statistically significant at 1%. As for those born before the conflict, the height-for-age z-score is lowered by 1.164 to 1.173 standard deviations and the coefficients are also statistically significant at 1%. The magnitudes increase, however when mother and households characteristics are controlled for.

To further evaluate the differential impact of conflict between children born before and those born during the conflict, a test of equality of the coefficients β_2 and β_3 in equation (2) is performed. The test shows that the hypothesis of equality of the coefficients can be rejected (columns 1 and 2). The results suggest that, although both younger and older cohorts are affected by the conflict, the impact is more pronounced for the older cohort. This is also in line with the non-parametric estimation presented in Figure 4.

Moving on to the effect of the duration of exposure to the conflict, columns 5 and 6 show that an additional month of exposure to conflict reduces the height-for-age z-score by

0.151 to 0.147 standard deviations, on average and the coefficients are statistically significant at 1%.

The results so far have shown that conflict has a negative effect on children. However, it would be insightful to see whether the effects are similar for both boys and girls. The results in Table 2 show that the coefficients on the triple interaction of conflict, time of birth and gender are statistically significant for only children born during the conflict and also when using conflict exposure. In the first case (column 2) the coefficient is positive suggesting that girls were affected by the conflict less than boys of similar age. In the second case (columns 5 and 6) the coefficients are negative suggesting that girls are more affected by the conflict relative to boys. These results show that there is no gender difference consistency in the effect of conflict. Therefore, evidence from this study does not support the gender bias against girls presented in the literature on early life development. This is also consistent with the results found by Akresh et al. (2012) in the case of Ethiopia and Minoiu and Shemyakina (2014) in Côte d'Ivoire.

Table 2: Impact of conflict on child health: Difference-in-difference results

	(1)	(2)	(3)	(4)	(5)	(6)
Conflict Region*Alive During Conflict			-0.813***	-0.831***		
			(0.109)	(0.112)		
Conflict Region*Born Before Conflict	-1.164***	-1.173***				
	(0.136)	(0.140)				
Conflict Region*Born During Conflict	-0.626***	-0.657***				
	(0.176)	(0.189)				
Months of conflict exposure					-0.151***	-0.147***
					(0.039)	(0.041)
Conflict Region*Alive During Conflict*Female			0.085	0.095		
			(0.105)	(0.105)		
Conflict Region*Born Before Conflict*Female	0.001	0.008				
	(0.103)	(0.104)				
Conflict Region*Born During Conflict*Female	0.451	0.477*				
	(0.272)	(0.271)				
Months of conflict exposure*Female					-0.011***	-0.012***
					(0.003)	(0.003)
Female	0.154*	0.157*	0.156**	0.158**	0.548***	0.578***
	(0.077)	(0.079)	(0.077)	(0.078)	(0.137)	(0.136)
Rural	-0.378***	-0.333***	-0.382***	-0.334***	-0.368***	-0.329***
	(0.091)	(0.099)	(0.093)	(0.101)	(0.099)	(0.102)
Mother's height	0.048***	0.046***	0.048***	0.046***	0.045***	0.043***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
P-value testing equality between born during and born before conflict	0.003	0.008				
Child's controls	No	Yes	No	Yes	No	Yes
Mother's controls	No	Yes	No	Yes	No	Yes
Household head's controls	No	Yes	No	Yes	No	Yes
Province-specifics trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3086	3086	3086	3086	2346	2346
R-squared	0.203	0.210	0.195	0.202	0.178	0.185

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, province fixed effects, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status.

Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%

5-2 Robustness checks

To explore the robustness of the results, another variable capturing the conflict is used, namely, the intensity of the conflict defined as the ratio of casualties to the pre-conflict population per 100,000 inhabitants as described in equation 4. The results in Table 3 show that children who were alive during the conflict in higher conflict intensity regions have a lower height-for-age z-score and the coefficients are statistically significant at 1%. An increase in the number of casualties per 100,000 inhabitants by one percentage point reduces child height-for-age z-score by 0.008 standard deviations and the coefficients are statistically significant at 1% (columns 3 and 4). Table 3 also shows that both children born before and during the conflict are significantly affected by the intensity and the coefficients are statistically significant at 1%. When the effect of the conflict on younger and older cohort are considered, an increase in the number of casualties per 100,000 people in conflict affected-provinces by one percentage point leads to a reduction in child health by 0.013 to 0.010 standard deviations standard deviations for children born before and during the conflict, respectively (columns 1 and 2). In addition, the p-value of test of equality between those coefficients are between 0.204 and 0.250 showing no difference in the effect of conflict between the two cohorts.

Table 3: Impact of conflict on child health using war intensity.

	(1)	(2)	(3)	(4)
Conflict Intensity*Alive During Conflict			-0.008***	-0.008***
			(0.003)	(0.003)
Conflict Intensity*Born Before Conflict	-0.013***	-0.013***		
	(0.004)	(0.004)		
Conflict Intensity*Born During Conflict	-0.010***	-0.010***		
	(0.002)	(0.002)		
Conflict Intensity*Alive During Conflict*Female			0.005***	0.005***
			(0.001)	(0.001)
Conflict Intensity*Born Before Conflict*Female	0.002	0.002		
	(0.001)	(0.001)		
Conflict Intensity*Born During Conflict*Female	0.014***	0.015***		
	(0.002)	(0.002)		
Female	0.166***	0.172***	0.164***	0.170***
	(0.051)	(0.052)	(0.051)	(0.052)
Rural	-0.391***	-0.343***	-0.390***	-0.343***
	(0.092)	(0.100)	(0.092)	(0.101)
Mother's height	0.047***	0.045***	0.047***	0.045***
	(0.006)	(0.006)	(0.006)	(0.006)
P-value testing equality between born during and born before conflict	0.250	0.204		
Child's controls	No	Yes	No	Yes
Mother's controls	No	Yes	No	Yes
Household head's controls	No	Yes	No	Yes
Province-specifics trends	Yes	Yes	Yes	Yes
Observations	3086	3086	3086	3086
R-squared	0.191	0.198	0.188	0.195

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, province fixed effects, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status. Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%

A second robustness check consists of assessing the effect of conflict on children taking into consideration within-household variations. The aim is to control for the characteristics of the child's mother using the sibling sample. The regressions are performed with and without mother fixed effects. These regressions allow taking into consideration differences with mother characteristics for those who have multiple children under five and those who have only child. The results in Table 4 indicate that conflict has had a negative impact on children regardless of their period of birth. The negative effects hold also when using months of exposure to conflict. Looking at the specification including mother fixed effects, the magnitude of the effect is larger for children born before the conflict compared to those born during the conflict. For children born during the conflict, the height-for-age z score fall by 0.542 standard deviations.

Table 4: Impact of conflict on child health using the siblings' sample and mother fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
Conflict Region*Alive During Conflict			-0.727***	-0.837***		
			(0.119)	(0.112)		
Conflict Region*Born Before Conflict	-1.068***	-1.175***				
	(0.147)	(0.139)				
Conflict Region*Born During Conflict	-0.542***	-0.667***				
	(0.198)	(0.188)				
Months of conflict exposure					-0.153***	-0.145***
					(0.043)	(0.041)
Conflict Region*Alive During Conflict*Female			0.068	0.094		
			(0.112)	(0.104)		
Conflict Region*Born Before Conflict*Female	-0.008	0.009				
	(0.109)	(0.102)				
Conflict Region*Born During Conflict*Female	0.411	0.478*				
	(0.279)	(0.272)				
Months of conflict exposure*Female					-0.012***	-0.012***
					(0.004)	(0.003)
Female	0.132*	0.152*	0.133*	0.154*	0.551***	0.575***
	(0.075)	(0.078)	(0.074)	(0.078)	(0.142)	(0.136)
Mother's height		0.046***		0.046***		0.043***
		(0.006)		(0.006)		(0.007)
Rural	-0.459***	-0.333***	-0.462***	-0.334***	-0.448***	-0.333***
	(0.099)	(0.101)	(0.100)	(0.103)	(0.111)	(0.104)
P-value testing equality between born during and born before conflict	0.009	0.008				
Mother fixed effects	Yes	No	Yes	No	Yes	No
Province fixed-effects	No	Yes	No	Yes	No	Yes
Province-specifics trends	Yes	Yes	Yes	Yes	Yes	Yes
Child's controls	No	Yes	No	Yes	No	Yes
Mother's controls	No	Yes	No	Yes	No	Yes
Household head's controls	No	Yes	No	Yes	No	Yes
Observations	3074	3074	3074	3074	2336	2336
R-squared	0.182	0.210	0.174	0.202	0.159	0.185

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status. Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%.

The Ivoirian conflict led to thousands of internally displaced people and the displacement of households from conflict to non-conflict regions can bias the results. For instance, if children in affluent households move from conflict to non-conflict areas, the impact of the conflict will be overestimated. However, if poor children move from conflict to non-conflict areas, the impact of the conflict will be underestimated. The 2011-2012 Côte d'Ivoire DHS survey does not provide direct information on migration status during the conflict. However, the mothers were asked how many times they spent a night or more outside of their home in the 12 months preceding the survey. Since the survey was conducted between December 2011 and May 2012, and the conflict under consideration occurred between November 2010 and May 2011, non-migrant households would fall pretty much within the conflict time frame.

Equations 1 to 3 are estimated using the subsample of non-migrants. The results in Table 5 indicate that the negative impact of conflict on children still persists. The coefficients showing the effect on conflict on children height-for-age z score are statistically significant at 5% and 1%, respectively. Children exposure to conflict translates into a reduction of their height-for-age z-score by 0.993 standard deviations when they are alive during the conflict (column 2). A similar result is obtained for those born during or before the conflict. Child height in conflict-affected regions is lowered by 0.572 standard deviations when they are born during the conflict and 1.412 when they are before the conflict (column 1). In addition, the effect of months of exposure to conflict remains negative in the non-migrants subsample. Overall, population displacement did not alleviate the negative effects of conflict on child health. This is similar to the results obtained for the whole sample as presented in Table 2.

Table 5: Impact of conflict on child health controlling for migration.

	Non-Migrants			Migrants		
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict Region*Alive During Conflict		-0.993***			-0.503**	
		(0.116)			(0.205)	
Conflict Region*Born Before Conflict	-1.412***			-0.786**		
	(0.164)			(0.310)		
Conflict Region*Born During Conflict	-0.572**			-0.547**		
	(0.260)			(0.209)		
Months of conflict exposure			-0.178***			-0.047
			(0.054)			(0.073)
Conflict Region*Alive During Conflict*Female		0.041			0.158	
		(0.128)			(0.167)	
Conflict Region*Born Before Conflict*Female	-0.001			-0.004		
	(0.124)			(0.180)		
Conflict Region*Born During Conflict*Female	0.194			0.823**		
	(0.376)			(0.376)		
Months of conflict exposure*Female			-0.009*			-0.021**
			(0.004)			(0.009)
Female	0.199**	0.203**	0.509***	0.075	0.077	0.867**
	(0.092)	(0.091)	(0.165)	(0.143)	(0.143)	(0.290)
Rural	-0.347***	-0.340***	-0.331***	-0.261*	-0.275*	-0.357**
	(0.108)	(0.114)	(0.120)	(0.145)	(0.145)	(0.160)
Mother's height	0.056***	0.056***	0.056***	0.028**	0.028**	0.016**
	(0.007)	(0.007)	(0.011)	(0.008)	(0.008)	(0.006)
Province specific trends, child, mother and household head controls	Yes	Yes	Yes	Yes	Yes	Yes
P-Value of t-test of equality between born during conflict and born before conflict	0.014			0.536		
P-Value of $\chi 2$ test of equality of coefficients of migrants versus non-migrants	0.000 [(1)-(4)]	0.000 [(2)-(5)]	0.000 [(3)-(6)]			
Observations	2035	2035	1530	1051	1051	816
R-squared	0.241	0.232	0.223	0.282	0.272	0.280

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, province fixed effects, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status.

Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%

Another robustness test consists of checking whether the negative impact of conflict is driven by household or child characteristics. To that end, the sample is split into poor versus non-poor households, girls versus boys, rural versus urban and male versus female-headed households. According to the results in Table 6, both poor and non-poor children exposed to conflict were negatively impacted. The same is observed for both those living in rural and urban areas, and boys and girls.

The absolute value of the coefficients estimated for the interaction term *Conflict Region*Alive during conflict* for those living in poor households, male headed households, and boys and those living in rural areas is bigger than those for counterpart groups, suggesting that children in those categories suffer from higher health deprivation as a result of violence compared to those in provinces that are not affected by the conflict.

Table 6: Impact of conflict on child health by gender, households' characteristics and location

	Poor Households	Non-poor Households	Male headed Households	Female Headed Households	Rural	Urban	Girls	Boys
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Conflict Region*Alive During Conflict	-1.156***	-0.580***	-0.914***	-0.487	-1.093***	-0.455**	-0.472**	-1.117***
	(0.208)	(0.194)	(0.160)	(0.329)	(0.184)	(0.226)	(0.186)	(0.186)
Conflict Region*Alive During Conflict*Female	0.269*	0.016	0.100	0.135	0.167	0.023		
	(0.163)	(0.152)	(0.121)	(0.286)	(0.139)	(0.189)		
Female	0.049	0.213**	0.141*	0.191	0.121	0.196		
	(0.105)	(0.097)	(0.076)	(0.205)	(0.082)	(0.137)		
Rural	-0.155	-0.273***	-0.239***	-0.876***			-0.413***	-0.198*
	(0.338)	(0.098)	(0.078)	(0.185)			(0.100)	(0.102)
Mother's height	0.043***	0.047***	0.042***	0.082***	0.040***	0.056***	0.049***	0.043***
	(0.006)	(0.006)	(0.005)	(0.013)	(0.005)	(0.008)	(0.006)	(0.006)
P-Value of t-test of equality of coefficients across sub-samples on "Conflict Region*Alive during conflict"								
	0.020		0.175		0.020		0.024	
Child's controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mother's controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household head's controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province-specifics trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1400	1686	2607	479	2030	1056	1572	1514
R-squared	0.280	0.189	0.194	0.453	0.246	0.200	0.233	0.247

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, province fixed effects, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status.

Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%

6. Impact of the presence UN Peacekeepers

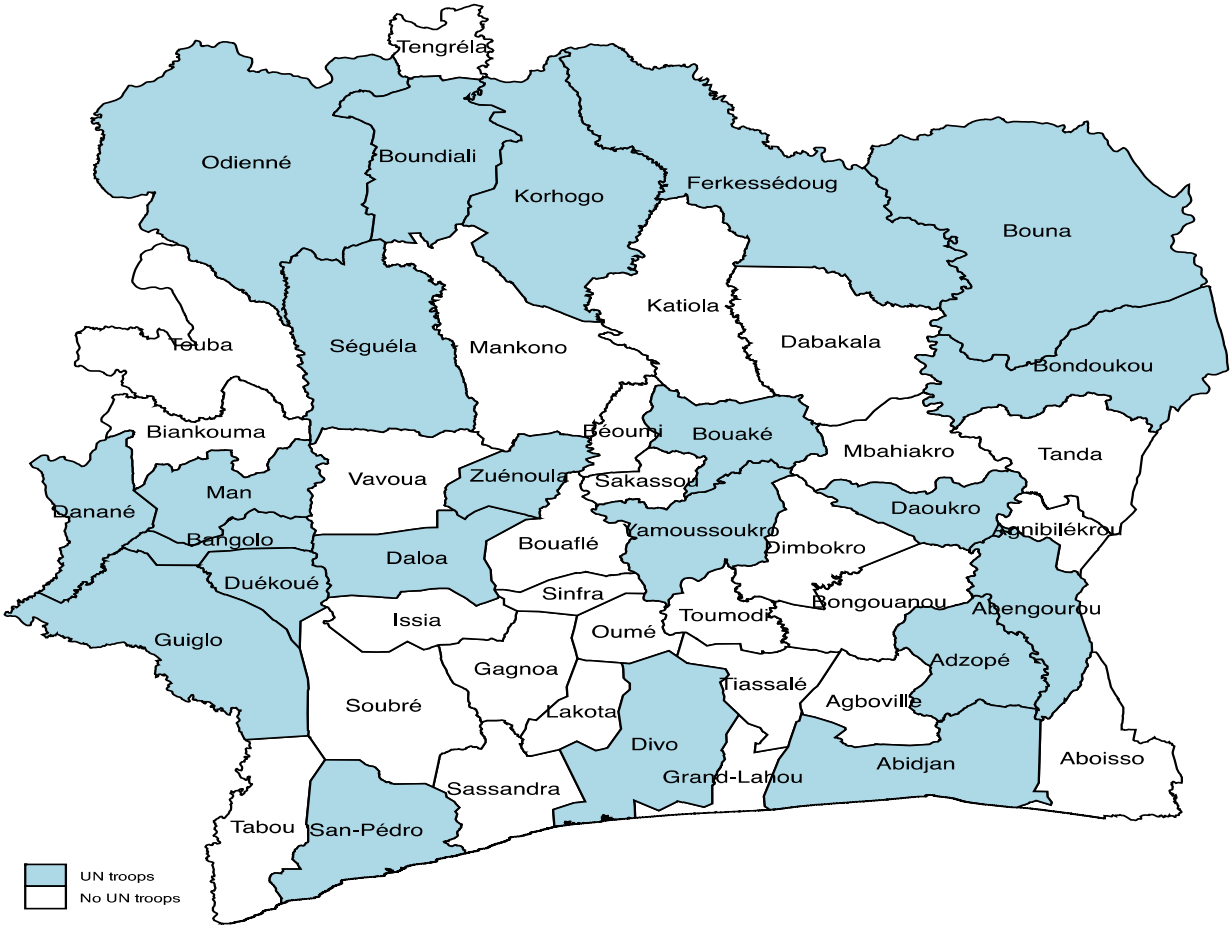
The regression results presented in the previous sections show that conflict negatively affects child health. However, understanding how this happens has important policy implications, especially in order to design possible interventions to attenuate the negative effects of conflict on children health. Akresh et al. (2011), in the case of Burundian war and Bundervoet et al. (2009) for Rwanda argue that the destruction of economic assets, the theft of livestock or burning of crop can be possible mechanisms through which conflict affects child health. Akresh et al. (2011) also suggest that conflict might prevent access to food aid provided by the international community, although this did not happen in the case of Burundi. Furthermore, they also claim that population displacement might be viewed as the key mechanism through which conflict impacted children, although they did not provide a thorough analysis of this factor because the 2002 Burundi DHS did not contain household level information on conflict-induced displacement. Minoiu and Shemyakina (2014) used the 2008 Côte d'Ivoire household survey in their study of the effect of the 2002-2007 Ivorian conflict on child health. A major advantage of this post-conflict household survey is that it contained information about war-related victimization such as loss of economic assets, health impairment, displacement and violence. They showed that conflict-induced victimization in the form of economic losses has a statistically significant effect on child health and therefore can be an important mechanism through which the conflict impacted child health. Unfortunately, the 2012 DHS survey used to assess the impact of the Ivorian post-electoral violence on child height did not contain household level information on conflict-induced victimization.

Drawing on the peacekeeping and humanitarian aid literature (Simmons, 2000), this study presents a possible mechanism through which conflict affects children. There is a possibility for synergic relationship between UN peacekeepers presence and other UN

agencies, as the former foster safe conditions for the latter to operate, enabling food relief delivery to the most vulnerable populations. Starting from the 1528 (2004) resolution, the UN Security Council included the protection of civilians and the assistance in the delivery of humanitarian assistance in conflict-affected areas as part of the mandate of the peacekeepers in Côte d'Ivoire. The effect of UN presence on child health in Côte d'Ivoire is therefore explored using the November 2010 UN peacekeepers deployment map as depicted in Figure 5. In comparison with Figure 3, most of the conflict-affected regions have a UN peacekeepers presence. Even more important, their presence can be seen in regions with more than one conflict events. Since the deployment occurred at the regional or province levels, equations 1-3 are estimated without region fixed effects. The results are presented in Table 7.

In both regions with and without UN presence, conflict negatively affects child health. The results in Table 7 show that on average both children living in regions with the presence of UN peacekeepers during the conflict and in regions without UN peacekeepers exhibit a significantly low height-for height z-score regardless of the birth period. However, the magnitude of the coefficients is lower where UN peacekeepers are present. These results support the idea that UN presence can play a role in mitigating the effect of conflict on children. The conflict-impact alleviating role of UN peacekeepers in Côte d'Ivoire is also in line with the evidence presented by Mvukiyehe and Samii (2009).

Figure 5: UN troops deployment in Côte d'Ivoire as of November 2010



Source: ONUCI
"No UN troops" stands for no UN Peacekeepers presence.

Table 7: Impact of conflict on child health controlling for the presence of UN Peacekeepers

	No UN Peacekeepers			With UN Peacekeepers		
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict Region*Alive During conflict		-1.242***			-0.852***	
		(0.346)			(0.105)	
Conflict Region*Born Before Conflict	-1.635***			-1.189***		
	(0.452)			(0.133)		
Conflict Region*Born During Conflict	-1.119*			-0.680***		
	(0.627)			(0.179)		
Conflict Region*Alive During Conflict*Female		-0.028			0.167	
		(0.233)			(0.120)	
Conflict Region*Born Before Conflict*Female	-0.137			0.079		
	(0.317)			(0.117)		
Conflict Region*Born During Conflict*Female	0.491			0.559*		
	(0.832)			(0.291)		
Months of conflict exposure			-0.194			-0.139***
			(0.128)			(0.032)
Months of conflict exposure*Female			-0.017*			-0.010***
			(0.009)			(0.004)
Female	0.247*	0.247*	0.743**	0.084	0.087	0.534***
	(0.135)	(0.134)	(0.316)	(0.086)	(0.086)	(0.145)
Rural	-0.375***	-0.388***	-0.310**	-0.300*	-0.297*	-0.310**
	(0.127)	(0.132)	(0.140)	(0.151)	(0.153)	(0.145)
Mother's height	0.052***	0.052***	0.040***	0.044***	0.044***	0.046***
	(0.011)	(0.011)	(0.014)	(0.008)	(0.008)	(0.007)
P-Value of t-test of equality between born during conflict and born before conflict	0.430			0.102		
P-Value of $\chi 2$ test of equality of coefficients of regions with UN peacekeeping versus no UN peacekeeping	0.000[(1)-(4)]	0.000[(2)-(5)]	0.000[(3)-(6)]			
Regions fixed effects	No	No	No	No	No	No
Province specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Child, Mother, households controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1135	1135	827	1951	1951	1519
R-squared	0.210	0.207	0.175	0.227	0.216	0.210

Notes: Robust standards errors are in parentheses, clustered at the province level. The dependent variable is the height-for-age z-score. All regressions include province specific trends, and month of birth fixed effects. Child's controls include ethnicity (Krou, Northern Mandé, Southern Mandé, Voltaiques and Akan, the reference category) and religion (Muslim, Christians and others, the reference category). Household head's controls include age and sex of the head of the household. Mother's controls include age, education (a dummy for having some education) and marital status. Data sources: 2011-2012 Côte d'Ivoire DHS, and ACLED (2010)

* significant at 10%, ** significant at 5%, *** significant at 1%

7. Conclusion

This study has examined the impact of the 2010-2011 post-electoral violence in Côte d'Ivoire on child welfare using 2011-2012 DHS surveys as well as information on the timing and location of conflict events. The evidence shows strong negative effects of conflict on children aged 6-60 months. The height-for-age z-score decreases on average by 0.8 for children alive during the conflict (born before or during the conflict) and by 0.6 for those born during the conflict. The main result is that children born during the conflict loose 0.5 standard deviations when using the mother fixed effects estimation. These results are close to those of Akresh et al. (2012) for Ethiopia and Minoiu and Shemyakina (2014) for Côte d'Ivoire. The results of this study are robust even after accounting for the effect of migration. No consistent differential impact of conflict was found between boys and girls. The results also suggest that presence of the UN peacekeepers might mitigate child health deprivation resulting from the conflict.

This study contributes to the growing literature on the impact of early life shocks on children wellbeing. Previous studies pointed out many channels through which conflict negatively affects child welfare including household idiosyncratic shocks such as illness of the parents, a sudden loss of household income, displacement, looting, loss of assets and the death of the breadwinner. Others have considered the impact of non-conflict related shocks on child welfare such as drought or climate change. Still others have documented the prevalence of disease, poor infrastructure or the destruction of health infrastructure as some of the vehicles of the impact of conflict on the health of children (see Minoiu and Shemyakina (2014)). This study has shown that the intensity of conflict and the presence of UN peacekeepers are potential channels through which conflict affects child welfare.

This study, however, presents some limitations that need to be emphasized. For example, it would have been interesting to compare conflict and non-conflict related shocks

and analyse households coping mechanisms. In addition, since previous research has shown that children often experience poverty or health deprivation more than adults (Kurukulasuriya and Engilbertsdóttir, 2011), it would have also been insightful to examine how early life shocks such as conflict relate to long-term economic outcomes. The lack of data makes it impossible to investigate these issues at the moment.

References

Akresh, Richard, Sonia Bhalotra, Marinella Leone, and Una Osili. 2011. “War and Stature: Growing Up during the Nigerian Civil War.” IZA Discussion Paper No. 6194.

Akresh, Richard, Leonardo Lucchetti, and Harsha Thirumurthy. 2012. "Wars and Child Health: Evidence from the Eritrean-Ethiopian Conflict." *Journal of Development Economics* 99 (2): 330-340.

Akresh, Richard, Philip Verwimp, and Tom Bundervoet. 2011. "Civil War, Crop Failure, and Child Stunting in Rwanda." *Economic Development and Cultural Change* 59 (4): 777-810.

Babo, Alfred. 2010. "Conflits Fonciers, Ethnicité Politique et Guerre en Côte d’Ivoire." *Alternatives Sud* 17: 95-118.

Barker, David James. 1990. "The Fetal and Infant Origins of Adult Disease." *British Medical Journal* 301 (6761): 1111.

Bundervoet, Tom, Philip Verwimp, and Richard Akresh. 2009. "Health and Civil War in Rural Burundi." *Journal of Human Resources* 44 (2): 536-563.

Cogneau, Denis and Remi Jedwab. 2012. "Commodity Price Shocks and Child Outcomes: The 1990 Cocoa Crisis in Côte D'Ivoire." *Economic Development and Cultural Change* 60 (3): 507-534.

Dabalen, Andrew L. and Saumik Paul. 2014. "Effect of Conflict on Dietary Diversity: Evidence from Côte d'Ivoire." *World Development* 58 (June): 143-158.

Douglas, Almond and Janet Currie. 2011. "Killing Me Softly: The Fetal Origins Hypothesis." *The Journal of Economic Perspectives* 25 (3): 153-172.

Gates, Scott, Havard Hegre, Havard Mokleiv Nygard, and Havard Strand. 2012. "Development Consequences of Armed Conflict." *World Development* 40 (9): 1713-1722.

Harold, Alderman, John Hoddinott, and Bill Kinsey. 2006. "Long Term Consequences of Early Childhood Malnutrition." *Oxford Economic Papers* 58 (3): 450-474.

IMF. 2009. Côte d'Ivoire : Poverty Reduction Strategy Paper. IMF Staff Country Reports. International Monetary Fund.

Kurukulasuriya, Sharmila and Engilbertsdottir Solrun. 2011. A Multidimensional Approach to Measuring Child Poverty. http://www.unicef.org/socialpolicy/filesA_Multidimensional_Approach_to_Measuring_Child_Poverty(2).pdf.

Minoiu, Camelia and Olga N. Shemyakina. 2014. "Armed Conflict, Household Victimization, and Child Health in Côte D'Ivoire." *Journal of Development Economics* 108: 237-255.

Mvukiyehe, Eric and Samii Cyrus. 2008. Laying a Foundation for Peace? A Quantitative Impact Evaluation of the United Nations Operation in Côte d'Ivoire. http://www.columbia.edu/~enm2105/docs/onuci/ics2008_report081218.pdf.

Mvukiyehe, Eric and Samii Cyrus. 2009. "Laying a Foundation for Peace? Micro-Effects of Peacekeeping in Côte d'Ivoire.
." Paper presented at the 2009 Meeting of the American Political Science Association, Toronto.

Pivovarova, Margarita and Eik Leong Swee. 2015. "Quantifying the Microeconomic Effects of War using Panel Data." *World Development* 66 (February): 308-321.

Raleigh, Clionadh, Andrew Linke, Håvard Hegre, and Joakim Karlsen. 2010. "Introducing ACLED: An Armed Conflict Location and Event Dataset." *Journal of Peace Research* 47 (5): 651-660.

Simons, Penelope C. 2000. "Humanitarian Intervention: A Review of Literature." *Ploughshares Monitor* 21 (4): 2.

Thomas, Duncan, Victor Lavy, and John Strauss. 1996. "Public Policy and Anthropometric Outcomes in the Côte D'Ivoire." *Journal of Public Economics* 61 (2): 155-192..

UN. 2009. Mainstraming the Protection, Rights and Well-being of Children Affected by Armed Conflict within UN Peacekeeping Operations. http://www.un.org/en/peacekeeping/.../dpkodfs_child_protection_policy.pdf.

UNICEF. 2009. UNICEF Côte d'Ivoire 2009-2013. http://www.unicef.org/cotedivoire/UNICEF_Briefing_Pack_2009_2013_En.pdf.

UNICEF. 2015. UNICEF's Humanitarian Action for Children 2015. http://www.unicefusa.org/press/releases/unicef...living.../2155.

Verpoorten, Marijke. 2009. "Household Coping in War- and Peacetime: Cattle Sales in Rwanda, 1991–2001." *Journal of Development Economics* 88 (1): 67-86.

Notes

[1]Babo (2010) gives a detailed and historical analysis of the root causes of the Ivorian crisis.

[2] http://stevemorse.org/jcal/latlonbatch.html?direction=reverse is an open software that helps find a location or address based on the GPS information.

[3]The conflict under consideration started on November 28, 2010 with the run-off of the presidential elections. The May, 2010 cutoff coincides with the end of the hostilities and the arrest of the former president Laurent Gbagbo on April 11, 2011. Figure 1 shows a decrease in conflict events and fatalities from June 2011 onward.

Data sources

Conflict data

Raleigh, Clionadh, Andrew Linke, Havard Hegre and Joakim Karlsen. 2010. Introducing ACLED-Armed Conflict Location and Event Data. *Journal of Peace Research* 47(5), 1-10. https://www.strausscenter.org/strauss-articles/acled-3.html

Surveys: DHS 1998/1999 and 2011/2012

http://dhsprogram.com/data/dataset/Cote-d-Ivoire_Standard-DHS_1998.cfm?flag=0

http://dhsprogram.com/data/dataset/Cote-d-Ivoire_Standard-DHS_2012.cfm?flag=0

Pre-conflict population:

General Population and Housing Census - Côte d'Ivoire 1998

http://www.ins.ci/nada1/?page=catalog

UN deployment map in 2010

http://reliefweb.int/map/c%C3%B4te-divoire/c%C3%B4te-divoire-unoci-deployment-nov-2010

Table A1: Results from studies of the effect of conflicts on child health in African countries

Study and estimation Methodology	Countries	Conflict duration	Effect of conflict on child health (height-for-age z-score)
Bundervoet Tom, Philip Verwimp, and Richard Akresh. (2009) Difference-in-difference	Burundi	January 1994-August 2000	0.35-0.53
Akresh Richard, Philip Verwimp Tom Bundervoet (2011) Difference-in-difference	Rwanda	October 1990-December 1991	0.64-1.05
Akresh Richard, Leonardo Lucchetti, Harsha Thirumurthy (2012) Difference-in-difference	Ethiopia-Eritrea	May1998-December 2000	0.42
Minoiu and Shemyakina (2014) Difference-in-difference	Côte d'Ivoire	September 2002-March 2007	0.2-0.42
Didier Wayoro (2017) Difference-in-difference	Côte d'Ivoire	November 2010-May 2011	0.5-0.6

Table A2: Definition of variables

Variable	Definition
HAZ_{ijt}	Height-for-age z-score
$ConflictRegion_j$	Regions with at least one event of conflict during the post-electoral violence (1/0)
$ConflictIntensity_j$	Conflict intensity in individual i's pre-conflict district of residence. Conflict intensity is the ratio of casualties over the pre-conflict population per 100,000 in the affected regions.
UN peacekeepers	UN peacekeepers presence (=1 if yes or 0 if not)
$AliveDuringConflict_t$	(=1 if born during before or during conflict or born between January 2007 and Mai 2011)
$BornBeforeConflict_t$	(=1 if child is born between January 2007 and October 2010)
$BornDuringConflict_t$	(=1 if child is born between November 2010 and Mai 2011)
$BornAfterConflict_t$	(=1 if child born after Mai 2011)
$MonthsofConflictExposure_{jt}$	Months of exposure to the conflict for a child living in conflict region (=0 if the child lives in non conflict or born after the conflict has ended).
Child Age	Age of the child in months
Female	Sex of the child (=1 if female and 0 if not)
Mother's age	Mother's age in years
Mother's education	Mother have some education (1= if primary, secondary or higher and 0 if no education)
Mother's marital status	Mother's marital status (=1 if yes and 0 if not)
Mother's height	Mother's height in cm
Male headed household	Sex of the head of the Household (=1 if male or 0 if female)
Household head age	Age of the head of the household in years
Rural	Place of residence (= 1 if Rural or 0 if Urban)
Child lives in a poor Household	poor (=1 if belong to the lowest 2 quintiles and 0 if not)
Ethnicity	Ethnic group of the head of the household (Akan, Krou, North Mandé, South Mandé, Voltaiques, Others recorded with dummy 0/1 for each ethnic group)
Religion	Religion of the head of the household (Christian=1, Muslim=2, Other=3)