Child Health and Conflict in Cote d'Ivoire[±]

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Abstract

Our paper focuses on the impact of the 2002–2007 civil conflict in Cote d'Ivoire (CIV) on child's health as measured by height-for-age for children born between 1997 and 2007. We use household survey data from the 2002 and 2008 cross-sectional Household Living Standards Surveys (HLSS). Our preliminary results indicate that children from the northern regions of CIV that were controlled by the rebels and that were more affected by the war suffered health set-backs compared to children from the lesser affected south. The effect is especially pronounced for children born soon after the start of the conflict (during 2003–2005) and who were exposed to the conflict for a longer period of time.

Keywords: Child health, economic shocks, stunting, sub-Saharan Africa

JEL classification: I12, J13, O12

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The views expressed in this paper are those of the authors and do not necessarily reflect those of the IMF or IMF policy, or those of granting and funding agencies.

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1. Introduction

The impact of civil wars and other shocks on population has been debated in the literature. Recent studies at the macro-level suggest that wars have no significant long-term effects on development, population growth rates, or poverty (Davis and Weinstein, 2002; Miguel and Roland, forthcoming). In contrast, micro-level studies offer mixed results, with the direction of the effect depending on the indicator being studied. For instance, the effect of civil wars on education, health, and labor market outcomes has been shown to be negative (Bundervoet, Verwimp, and Akresh, 2009; Kondylis, 2010; Akresh, Verwimp and Bundervoet, forthcoming; Shemyakina, forthcoming; Blattman and Annan, forthcoming). These negative effects persist even in the territories adjacent to the affected countries (Baez, 2010). At the same time, other studies document a positive association between being a victim of violence and an individual's post-war engagement in civic and political life (Bellows and Miguel, 2009; Blattman and Annan, forthcoming; Blattman, 2009).

Extending the literature briefly reviewed above and following the analysis framework employed by Bundervoet et al. (2009), our paper focuses on the impact of the 2002–2007 civil conflict in Cote d'Ivoire (henceforth, CIV) on child's health as measured by height-for-age for children born between 1997 and 2007. We use household survey data from the 2002 and 2008 cross-sectional Household Living Standards Surveys (HLSS) collected by the National Institute of Statistics.[1] To identify an individual's exposure to the conflict we use self-reported data on exposure to armed conflict from these surveys together with the event data on the civil war in Cote d'Ivoire from the reports by UNICEF (2003), UNOCI (2010), Global Security (2009), and McGovern (2010, 2011). We use the variation among birth cohorts to identify a child's exposure

[1] The most recent survey was employed for the poverty assessment published in the Cote d'Ivoire's Poverty Reduction Strategy Paper in March 2009, when the country qualified for debt relief under the Highly Indebted Poor Countries (HIPC) initiative (IMF, 2009).

to the shock of the civil war. A similar empirical strategy was used by Bundervoet, Verwimp, and Akresh (2009) and Akresh, Verwimp and Bundervoet (forthcoming), who studied the effect of exposure to genocide in Rwanda and civil war and crop failure in Burundi, respectively. We estimate the effect of exposure to the shock of civil war on child's health as measured by height-for-age while controlling for province of residence and year of birth.

The 2002–2007 conflict in CIV was a major shock to the economic well-being of the country, which had been on track to become one of the most prosperous countries in Africa (Figure 1). The civil war in CIV was characterized by the unusually high international involvement by the neighboring nations, the United Nations, and France. The number of casualties in the war was relatively small for a 5-year conflict, with the best estimates of annual battle fatalities reaching about 600 in 2002 and 2003. Nevertheless, the number of civilians affected by the conflict was about 3 million, including the internally displaced and 4 million if we add the foreign residents evacuated to Liberia and Sierra Leone and those who fled to Mali, Guinea, Burkina Faso and elsewhere (UNOCHA, 2003).

There is relatively little research in development economics on CIV relative to other African countries. Thomas, Lavy and Strauss (1995) used the 1987–1988 Living Standards Survey to examine the effect of the 1980s economic adjustment policies in CIV on child height, weight-for-height, and adult body mass index. They find that the health of Ivoirians was negatively affected by the onset of the economic adjustment policies, in particular, an increase in food prices and reduced availability and quality of health care. More recent work on CIV focuses on the recent conflict (Mvukiyehe and Samii, 2008; McGovern, 2010, 2011) and intrahousehold resource allocation (Duflo and Udry, 2003).

Malnourishment in early childhood has been linked to poor health in adulthood, poorer schooling performance, and negative socio-economic outcomes later in life (Barker, 1998; Glewwe, Jacoby, and King, 2001; Alderman, Hoddinott, and Kinsey, 2006). In low-income countries, an individual's height, which is used as a proxy for health, is positively correlated with employment, wages, and education (Strauss and Thomas, 1998). While the literature (discussed further below) broadly indicates that negative shocks to health in early childhood or in *utero* are irreversible, a recent study points towards a potential catch-up in health once the crisis is over (Mani, 2008).

Barker (1998) studied the effect of exposure to various shocks in *utero* on adult health. He hypothesized that shocks early in life are associated with poorer health as an adult and that these shocks are irreversible. In his seminal study, Barker shows that impaired fetal growth significantly raises the probability of cardio-vascular disease in adults. Thus, he suggests that there is no reversal of poor nutrition early in life and the damage to health is permanent. This process is referred to as *programming* where a fetus adjusts to short-term changes in his or her environment and while such changes are beneficial in the short run, they are detrimental to long-term health (Godfrey and Barker, 2000).

Our preliminary results indicate that children from the northern regions of CIV that were controlled by the rebels and that were more affected by the war suffered health set-backs compared to children from the lesser affected south. The effect is especially pronounced for children born soon after the start of the conflict (in 2003–2005) and who were exposed to the conflict for a longer period of time, which is consistent with previous studies (Bundervoet et al., 2009).

The remainder of the paper is organized as follows. Section 2 provides an overview of the history of violence in CIV and sketches the spatial and temporal event data for the recent conflict. Section 3 describes the survey data used in the analysis and explains the key variables. Section 4 describes the empirical identification strategy and Section 5 presents the preliminary results as well as robustness tests. Section 6 outlines plans for future work.

2. Conflict in Cote d'Ivore

2.1 Political History and 2002–2007 Conflict

The world's leading exporter of cocoa and an economic powerhouse in West Africa, CIV enjoyed a long period of political stability and economic development following its declaration of independence in 1960. With an average GDP growth rate of 4.4 percent per year over 1965–1990,[2] it became an attractive destination of foreign investment and migrant workers from neighboring countries.[3] Political unrest followed the death of long-standing President Felix Houphouet-Boigny in 1993, with a number of coups d'état taking place during the 1990s. The power struggle that ensued that decade was not uncommon to a number of African countries transitioning to a multi-party elections-based system. In CIV, it was rooted in controversies over nationality laws and eligibility conditions for national elections.[4]

Violent conflict erupted on September 19, 2002 with multiple attacks in several cities (Abidjan in the south, Bouake in the center, and Khorogo in the north) by military forces protesting against plans towards demobilization. The crisis ended officially with the March 2007

[2] Source: World Development Indicators (2006). Note that the average for 1965–1990 includes the major cocoa price decline in 1980 which led to a GDP contraction of 10 percent.
[3] By end-1998, more than a quarter of the population consisted of foreign workers, more than a half of which were of Burkinabe origin.
[4] In particular, the origins of the conflict can be traced back to a law drafted in 2000 which required that both parents of a presidential candidate to be born within Cote d'Ivoire, which led the idea of "*Ivoirian-ness*" to enter the political discourse.

Ouagadougou Political Accord, although fighting had ceased about three years back (Sany, 2010), with the interim period being marked by isolated bouts of violence and a tense atmosphere. After the initial attacks, the conflict evolved with the rebel forces retreating to the northern and western parts of the country, while the south was under government control. The conflict ignited widespread harassment of foreigners in CIV, including migrant workers from the region and refugees from Liberia and Sierra Leone living on the outskirts of cities. By late-2002, the number of war-affected people reached 2.7 million (including the internally displaced), and 4 million when including the foreign residents evacuated to Liberia and Sierra Leone and those who fled to Mali, Guinea, Burkina Faso and elsewhere (UNOCHA, 2003).[5]

The timeline of events extracted from the reports of the United Nations Mission in CIV (Figure 2) shows that the period between September 2002 and December 2007[6] was marked by multiple peace talks and negotiations, while the country was effectively split into two, with the rebels occupying and controlling the northern states, while the government controlled the southern territories (Figure 3). Through the period, there have been a "parallel administration, economy, treasury, judicial system, and security structures in the north" (UNOCI, 2010).[7]

The Ivorian conflict was far less intense than other conflicts as it did not produce casualties in the tens or hundreds of thousands as civil wars elsewhere in the world. The best estimate of annual battle fatalities is about 600 in 2002 and 2003, which is ten times lower than

[5] Source: *Africa Renewal*, Vol. 16(4), Feb. 2003 (http://www.un.org/ecosocdev/geninfo/afrec/vol16no4/164food1.htm) Accessed: November 10, 2010. Other sources indicate that in the first ten months of armed conflict in Cote d'Ivoire displaced more than 500,000 people (UNICEF, 2003), with 350,000 Burkinabes returning to Burkina Faso by July 2003 (Sakurai and Savadogo, 2009).
[6] "On 29 November 2007, the government and rebels in Côte d'Ivoire agreed to begin disarming their troops by 22 December 2007." http://www.globalsecurity.org/military/world/war/ivory-coast-2007.htm. Accessed: November 5, 2010.
[7] UN Security Council, "Twenty-fourth report of the Secretary-General on the United Nations Operation in Côte d'Ivoire," May 20, 2010, U.N. Doc. S/2010/245, paras. 24 and 26. http://www.hrw.org/en/node/93700/section/7#_ftn22. Accessed: November 15, 2010.

the average for the civil wars included in the Battle Deaths Dataset (UCDP/PRIO, 2009). The figure falls to 50 for the year 2004, the last year for which an estimate is available.

2.2 Spatial and Temporal Intensity of the Conflict

Over 2002–2007 many peace talks and negotiations took place with the aim of reunifying the country and restoring peace. After the initial more violent phase of the war (2002–2004) followed three years of "no war, no peace" (2005–2007) marked by isolated violent incidents and a tense atmosphere. As seen in Figure 3, rebel organizations controlled the northern part of the country while the government controlled the southern region, with a "buffer zone" separating the two. In the preliminary analysis below, we define the Center-North, Center-West, West and North-West regions of the country as 'war-affected', while the rest of the country comprises the lesser affected regions.

3. Data

3.1 Data Overview

The data are drawn from the nationally representative, cross-sectional 2002 and 2008 Household Living Standards Surveys (HLSS), which sampled 10,800 and 12,600 households organized in 540 and 630 sampling units, respectively. The interviews were conducted by trained interviewers through face-to-face interviews based on (semi-)structured questionnaires. Filled-out questionnaires were reviewed by team leaders and sent back to the household if information was incomplete, thus ensuring that survey design was respected and the survey attained a 100 percent response rate.[8] The 2002 survey interviews were conducted over a period of 45 days between

[8] In the 2002 survey, 4 percent of the initially drawn households that were unavailable for interviewing were replaced with new ones. In the 2008 survey, 100 percent of the originally selected households were interviewed.

May and July 2002, while the 2008 interviews took place over two months between June and August 2008.

3.2 Health and Civil War Variables

In this study, we focus on height-for-age as a long-term measure of health for young children and compute the conventional height-for-age z-scores (henceforth, HAZ). The z-score is defined as a difference between the height of a child from the dataset and the average height of an average child from the WHO reference dataset, divided by the standard deviation of the reference population. On average, an average child from the 2002 HLSS in CIV was two standard deviations below the average height-for-age of children from the reference dataset, with the gap diminishing to 1.53 standard deviations for children from the 2008 HLSS (Table 1).

To construct an individual's exposure to the conflict, we mark all observations from the 2008 dataset as children affected by the conflict, and we multiply this cohort-level variable by a dummy variable that is equal to one if a household was located in one of the war-affected northern regions. The 2002 and 2008 datasets have information on height for children who were between 6 months and 5 years of age at the time of the survey. Thus, we define all children who were born between 2003 and 2007 (i.e., all children aged 6 months to 5 years from the 2008 survey) as children affected by the conflict.

3.3 Long-term Trends in Child Health

Before describing our empirical findings, we provide a longer term perspective on child health in CIV to better place our analysis in historical context. Figures 4–5 show the percentage of children with HAZ lower than two and three standard deviations compared to the mean for

reference children, over 1994–2008. These represent malnutrition and severe malnutrition rates, respectively. The data for 1994, 1998 and 2006 come from separate surveys and are taken from WHO (2008), while the estimates for 2002 and 2008 are drawn from our surveys. Prior to the conflict, the malnutrition rates were around 30 percent for both males and females, whereas severe malnutrition rates were around 10–15 percent. As a result of the gradual worsening of the economic situation during the 1990s, the nutritional status of all children markedly deteriorated by 2002. Estimates for 2006 and 2008 suggest worsening child health compared to the 1990s, but an improvement compared to 2002. Nevertheless, this improvement conceals important gender differences (as discussed further below). Against the backdrop of this long-term deterioration in child health in CIV, our study exploits children's differential exposure to the war (depending on birth cohort and/or residence) to assess the contribution to this trend of the conflict that started in 2002.

3.4 Preliminary Observations

Table 1 shows the differences across regions by nutritional status and the incidence of malnutrition. About 52 percent and 42 percent of children in 2002 and 2008 respectively are malnourished, with 30 and 25 percent being severely malnourished. There is a disparity in nutritional status across regions, with the North and West regions having the highest rates of severe malnourishment in 2002 and North and Center-West having the highest rates in 2008. The average height-for-age was 2 (in 2002) and 1.53 (in 2008) standard deviations lower than that of an average reference child. Figures 6 and 7 show the gender-specific rates of malnourishment and severe malnourishment for the rebel-held Northern regions (war regions) and government-controlled Southern regions (non-war regions). The figures suggest that on average between

2002 and 2008 the percentage of malnourished children in CIV has declined for both afflicted and lesser afflicted regions. However, the results by gender indicate that the rates of severe (Fig. 7) and less severe (Fig. 6) malnourishment among girls in the conflict regions actually increased, and the same rates among boys in the affected regions failed to decline to the same extent as the rates of malnourishment among boys in the lesser affected regions. These results are suggestive of the negative association between living in the conflict-affected regions and child's health.

4. Identification and Econometric Specification

4.1 Econometric Specification

Following Bundervolt et al. (2009), we model our econometric specification as

(1) $HAZ_{ijt} = \alpha_j + \delta_t + \beta_1(Conflict\,\mathrm{Re}\,gion_j * Exposure_t) + \varepsilon_{ijt}$

where HAZ_{ijt} is the height for age z-score for child i in region j who was born in year t; α_j are the region of birth fixed effects, δ_t are birth-cohort fixed effects given by the year when the child was born, and ε_{ijt} is a random, idiosyncratic error term. We create the $Conflict\mathrm{Re}gion_j * Exposure_t$ variable at first as an interaction between a child living in one of the war-affected regions in the North and an observation coming from the 2008 dataset. Later on, we will add household and individual specific conflict-related shocks to capture a child's exposure to the war. In the regressions with the binary conflict variable, β_1 measures the impact of the war on the children who were born between 2003 and 2007 and who lived in the regions more affected by the conflict. Including all regions in the regressions and also including the data from the 2002 survey allows us to exploit the variation in the temporal and regional exposure to the conflict. The 2002 data serves here as a control group, against which we check for trends in

children's health over time and across regions. In the robustness check, where we will use only the data from the Northern regions, we will exploit the variation in the timing of the conflict, where we compare children who were born during the period of the conflict (2008 survey) to children who were born before the start of the war (2002 survey).

4.2 Potential Threats to the Identification Strategy

In future analysis, we plan to empirically address the following threats to our identification strategy. First, there is a non-linearity in the accumulation of the negative effects of the war, where older children are likely to suffer a stronger negative impact as they were exposed to the conflict for a longer period of time. For that, we will divide the sample into children who were 24 months or younger and children who were 2–5 years old at the time of the survey. The second strategy would be to compare HAZ scores for children from poor and non-poor provinces. The third challenge is the wide-spread displacement during the war and migration to other countries in the region, in particular, Mali and Burkina Faso. We will use information from the survey on whether a child was ever displaced during the conflict, compare health attainment among children who were displaced and who were never displaced at the time of the war, and also match children to the province where they were born to identify the impact of the conflict on their health.

5. Preliminary Empirical Results

Tables 2 and 3 present our preliminary empirical results from the OLS regressions of Equation 1. All regressions include region dummies, cohort-of-birth dummies (at the month-year level), child's gender and the interaction of child's gender and child's residence in the war-affected

region. All regressions are estimated with survey sampling weights. The variables of interest in Table 2 are the dummy for a child residing in one of the conflict-affected regions and the interaction of child's gender and child's residence in the war-affected region. The variables of interest in Table 3 are the interactions between a child being born after September 2002 (the start of the conflict) and a child's residence in the war-affected region, and the triple interaction between a child being born after September 2002 (the start of the conflict), her residence in the war affected region, and her gender.

The results in Table 2 that are based on the 2008 data show that the binary war variable (residence in the rebel-controlled regions) has a negative impact on child's health. The children from the rebel-held regions have HAZ that are 0.534 to 0.804 lower on average than those from the government-controlled regions, a reduction that is statistically significant at the one percent level for all age groups considered.

Table 3 presents results from the OLS regressions where we include data from the 2002 and 2008 surveys and estimate the effect of the temporal and regional exposure to the conflict (the effect of being born after September 2002 and living in one of the rebel-controlled regions) on child's health relative to children who were born before the start of the conflict in 2002. The results show that the conflict had the largest negative effect on children born in 2003,[9] with their HAZ being 0.863 standard deviations lower than those of children born before the start of the conflict in September 2002. The effect decreases to 0.599 standard deviations when we add data for children born in 2004, and it decreases even further to 0.423 standard deviations when we add observations for these born in 2005. The estimated coefficient on the interaction term is statistically significant at least at the 5 percent level in the first three sets of regressions (columns

[9] Due to the design and timing of the 2008 survey, children who were born after September of 2002 are not included in our sample of interest: age six months to five years.

1–6). The coefficient significantly declines and is not statistically different from zero in the last two sets of regressions (columns 7–10) where we add data for children born in 2006 and 2007, respectively. These results indicate that the negative effect of the conflict was concentrated among older children (born between 2003–2005) which is consistent with an argument that older children are shorter because they had been exposed to the conflict for a longer period of time (Duflo, 2003). Further, Sany (2010) notes that most of the fighting ended by the end of 2004 and thus, children who were born after 2004 would not have experienced the most severe consequences of the conflict. The negative effect of the conflict on children born in 2005, though, suggests that these children were exposed to the conflict *in utero*, and thus, suffered as well.

6. Discussion and Future Work

In this extended abstract we outlined the framework to be employed in the analysis of the effect of the 2002–2007 armed conflict in CIV on child's anthropometric outcomes. Our preliminary results suggest that the conflict had a sizable negative impact on child's height-for-age z-scores.

In the revised version of the paper we will also add household and child characteristics to the empirical specification and test the robustness of our results to the use of alternative conflict exposure measures for the affected cohorts, such as age and household-specific conflict exposure measures. For the latter, we use a rich set of household level variables on the exposure to the conflict, such as "have you been a victim of war-related violence?", "have your properties been damaged by the conflict?", "have you been displaced because of the conflict?" and other questions as listed in Appendix A.

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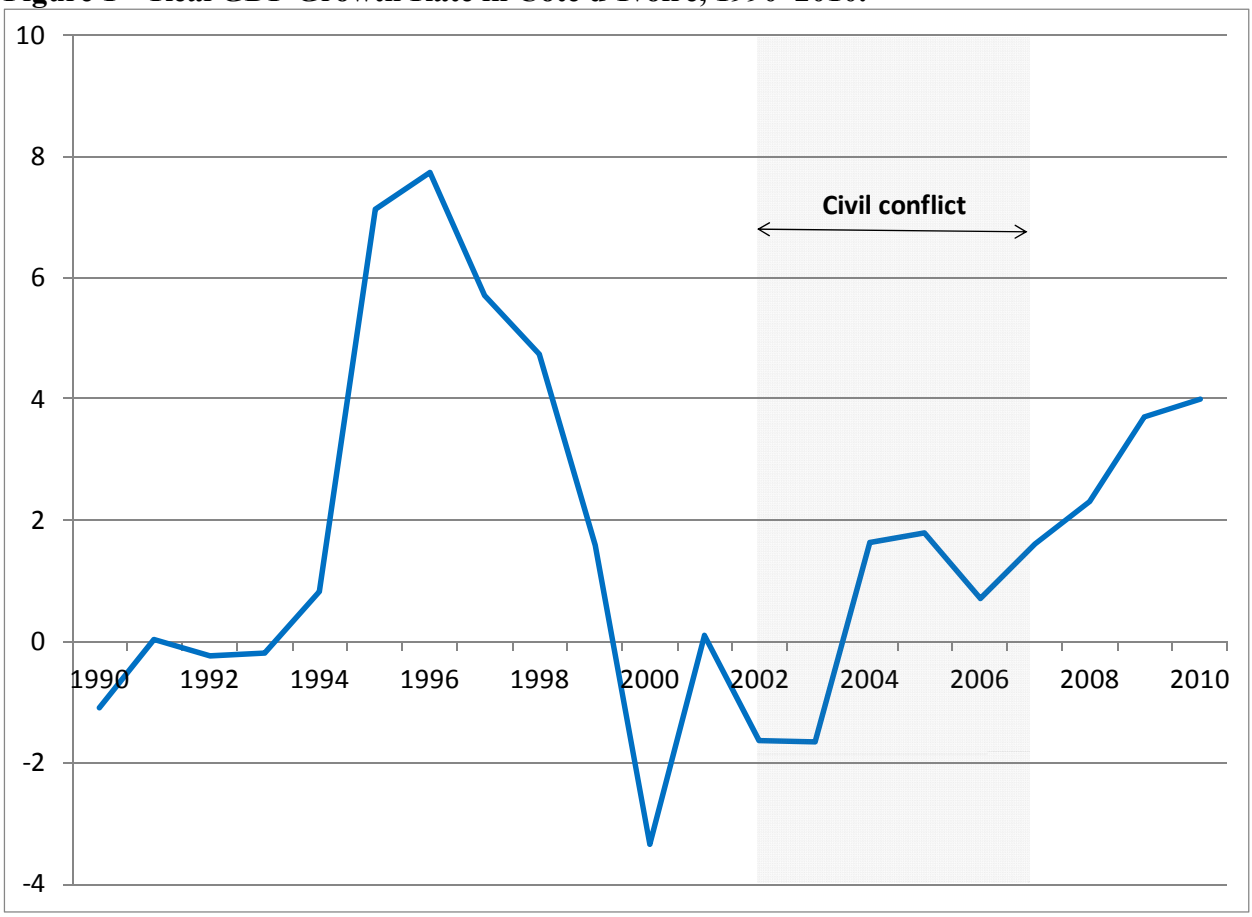
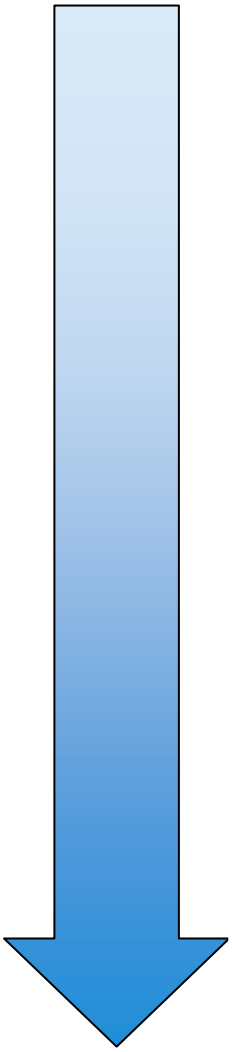
Figure 1 – Real GDP Growth Rate in Cote d'Ivoire, 1990–2010.



Source: World Economic Outlook (October 2010). The figure for 2010 is a projection.

Figure 2 - Chronology of the 2002–2007 conflict and its aftermath



Sept 2002 - Conflict erupts in Abidjan, Bouake and Khorogo. Rebels consolidate position in the NW, while the South is under government control. The country's partition is delineated by the "buffer zone" (Figure 2).

Jan 2003 - The Linas-Marcousis Agreements are signed to permit restoration of peace; situation remains precarious

May 2003 – A complete cease fire is achieved on the entire territory. The United Nations Mission in Cote d'Ivoire (MINUCI) is established.

Sept-Oct 2003 – The *Forces Nouvelles*, representing the rebel-held North, walk out of the government of national reconciliation

Dec 2003 – Prisoners of war are released by the *Forces Nouvelles*

April 2004 – The MINUCI is replaced by UNOCI (United Nations Operation in Cote d'Ivoire)

July 2004 – The goals of the Linas-Marcousis Agreements are re-stated in the Accra Agreement, which aims to get the peace process back on track

Late-2004 – Most fighting ends

April 2005 – Pretoria Agreement declares immediate and final cessation of all hostilities and the end of the war throughout the national territory

March-2007 – Ouagadougou Political Agreement is signed to end the conflict, disarm armed factions, reunite the country, and hold elections before end-2008

Nov 2007 – The government and rebels agree to begin disarming their troops by end-2007.

Oct-2010 – After several delays, Ivorian elections are held.

Sources: Globalsecurity.org (http://www.globalsecurity.org/military/world/war/ivory-coast-2002.htm) and the site of the UN mission in Cote d'Ivoire (http://www.un.org/en/peacekeeping/missions/past/minuci/background.html), both accessed November 9, 2010.

Figure 3 - The « buffer zone » separating the rebel-held north and the government-controlled south in Cote d'Ivoire, 2002–2007

Source: http://en.wikipedia.org/wiki/File:C%C3%B4te_d%27Ivoire_ZDC.png

Figure 4 – Long-term perspective on child health in CIV: Percentage of children with HAZ < 2 s.d. Years: 1994, 1998, 2002, 2006, and 2008.

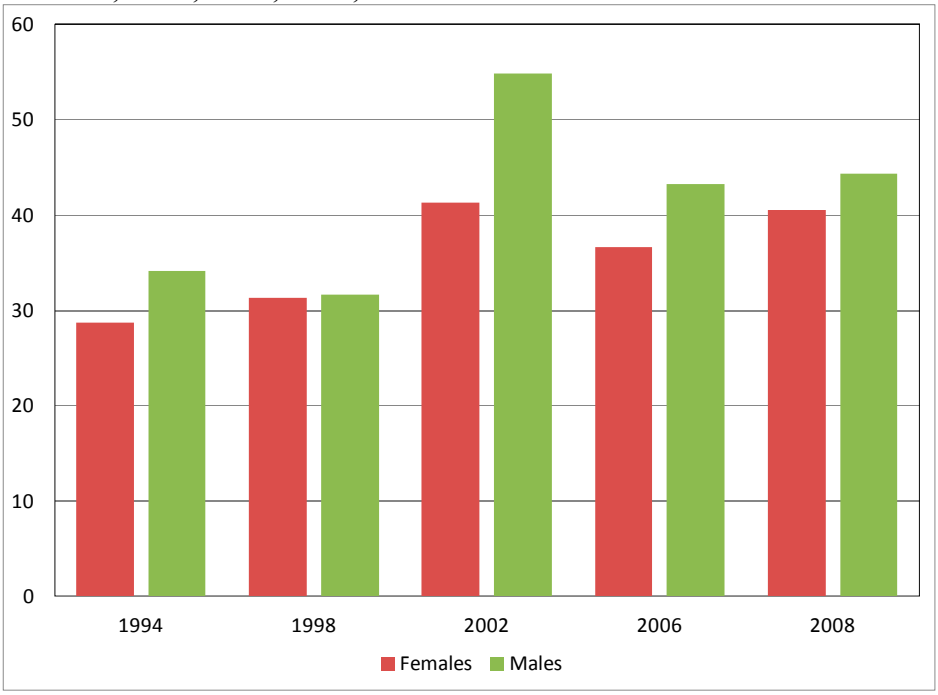
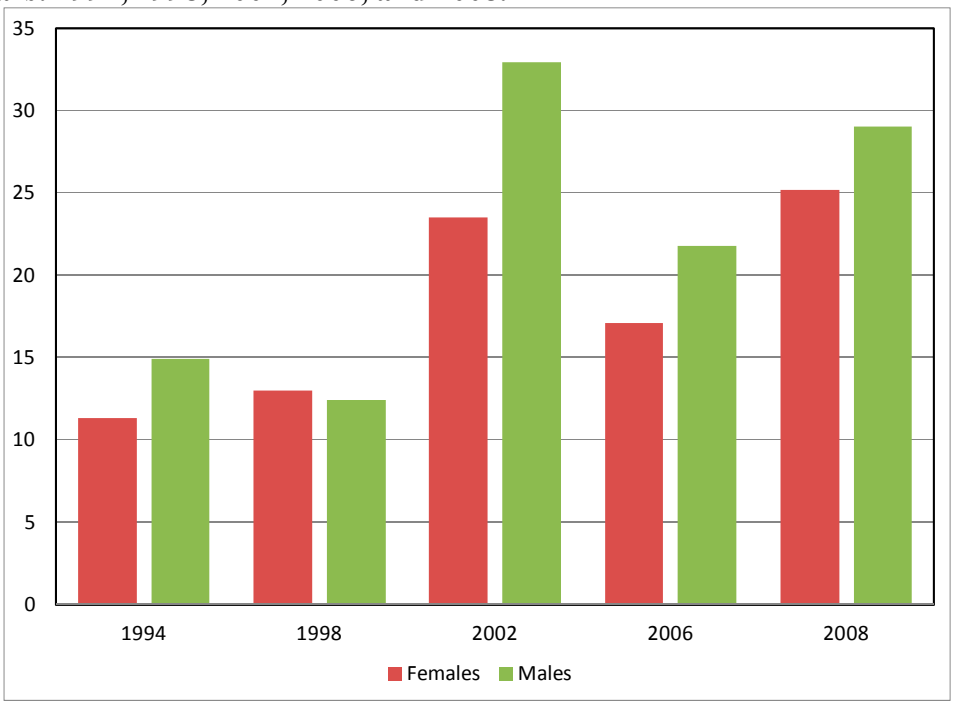


Figure 5 – Long-term perspective on child health in CIV: Percentage of children with HAZ < 3 s.d. Years: 1994, 1998, 2002, 2006, and 2008.



Sources for Fig. 4-5: 1994, 1998, 2006 figures are from Child malnutrition estimates by WHO Child Growth Standards, August 15, 2008, (http://www.who.int/nutgrowthdb/database/countries/civ/en/). The 2002 and 2008 estimates are based on the data are from the 2002 and 2008 Household Living Standards Surveys for Cote d'Ivoire (Authors' calculations).

Figure 6 - War vs. non-war affected areas: Percentage of children with HAZ < 2 s.d.

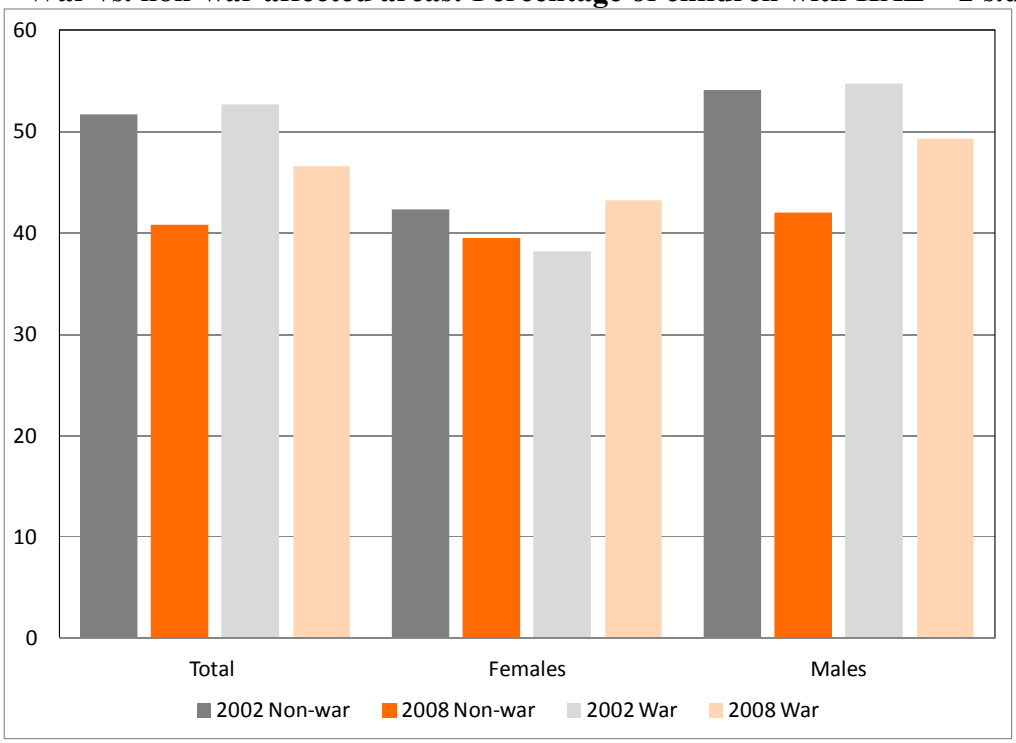
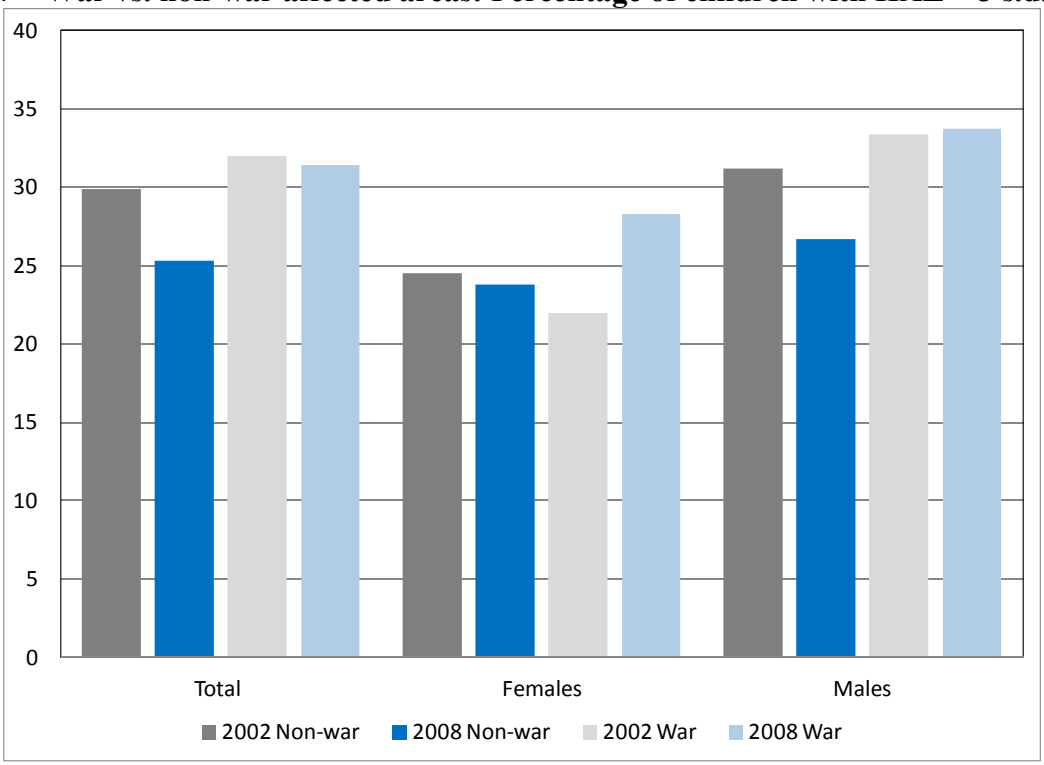


Figure 7 – War vs. non-war affected areas: Percentage of children with HAZ < 3 s.d.



Sources for Fig. 6-7: Authors' calculations using data from the 2002 and 2008 Household Living Standards Surveys of Cote d'Ivoire.

Table 1 – Overview of nutritional status and poverty in CIV, by region

	N	Average HAZ score	% HAZ > -2 (not malnourished)	% HAZ ∈ [-3,-2] (moderately malnourished)	% HAZ < -3 (severely malnourished)	Poverty headcount ratio
Panel A: 2002						
Center North	507	-1.86	51.5	19.1	29.4	35.5
Center West	659	-2.19	45.7	23.7	30.7	54.8
North East	385	-1.86	51.4	22.6	26.0	51.9
North	512	-2.24	39.5	22.3	38.3	49.4
West	575	-2.13	44.0	18.4	37.6	65.9
South	371	-1.99	50.4	15.9	33.7	27.8
South West	177	-1.96	41.2	27.7	31.1	36.2
Center	454	-1.75	55.7	20.3	24.0	38.8
Center East	97	-1.81	58.8	15.5	25.8	36.1
North West	405	-1.86	49.4	21.0	29.6	55.8
Abidjan	568	-1.96	47.4	25.2	27.5	27.5
Conflict regions	2,146	-2.04	47.3	20.7	32.0	53.4
Non-conflict regions	2,564	-1.96	48.3	21.8	29.9	38.5
Total	4,710	-2.00	47.9	21.3	30.8	45.3
Panel B: 2008						
Center North	94	-1.22	62.8	13.8	23.4	38.3
Center West	283	-1.50	52.3	12.4	35.3	66.4
North East	133	-1.39	60.2	14.3	25.6	44.4
North	177	-2.13	44.1	16.9	39.0	70.6
West	201	-2.05	51.2	20.4	28.4	57.7
South	310	-1.50	58.4	19.4	22.3	45.2
South West	209	-1.52	65.1	12.0	23.0	40.7
Center	209	-1.69	60.8	14.8	24.4	57.4
Center East	193	-1.41	56.5	15.5	28.0	56.0
North West	162	-1.91	52.5	14.8	32.7	59.9
Abidjan	367	-1.14	64.0	14.2	21.8	15.5
Conflict regions	740	-1.68	53.4	15.3	31.4	59.1
Non-conflict regions	1,598	-1.46	59.2	15.5	25.3	43.4
Total	2,338	-1.53	57.4	15.4	27.2	48.4

Source: Authors' calculations using data from 2002 and 2008 Household Living Standards Surveys of Cote d'Ivoire.

Table 2 – Determinants of anthropometric outcomes in Cote d'Ivoire.
OLS Regressions. Dependent Variable: Children's Height for Age Z-Score.

	Children born b/w 2003-2004		Children born b/w 2003-2005		Children born b/w 2003-2006		Children born b/w 2003-2007	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1=Conflict-area	-0.535***	-0.614***	-0.804***	-0.836***	-0.714***	-0.753***	-0.747***	-0.732***
	(0.118)	(0.189)	(0.060)	(0.114)	(0.053)	(0.093)	(0.063)	(0.078)
1=Female x Conflict-area		0.188		0.068		0.088		-0.035
		(0.278)		(0.225)		(0.210)		(0.191)
1=Female	0.127	0.071	0.136	0.114	0.175*	0.148	0.218**	0.228**
	(0.158)	(0.219)	(0.095)	(0.098)	(0.085)	(0.086)	(0.080)	(0.084)
Region FE	yes	yes	yes	yes	yes	yes	yes	yes
Cohort FE	yes	yes	yes	yes	yes	yes	yes	yes
Observations	912	912	1524	1524	2010	2010	2326	2326
R-squared	0.054	0.054	0.043	0.043	0.044	0.044	0.048	0.048

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the province level.
Source: Authors' calculations using data from the 2008 Household Living Standards Survey of Cote d'Ivoire.

Table 3 - Determinants of anthropometric outcomes in Cote d'Ivoire.
OLS Regressions. Dependent Variable: Children's Height for Age Z-Score.

	Children born in 1997-2003		Children born in 1997-2004		Children born in 1997-2005		Children born in 1997-2006		Children born in 1997-2007	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1=Born>09/2002 x Conflict-area	-0.863**	-0.745*	-0.599***	-0.471**	-0.423**	-0.289	-0.256	-0.160	-0.176	-0.055
	(0.324)	(0.377)	(0.183)	(0.194)	(0.197)	(0.225)	(0.186)	(0.222)	(0.212)	(0.223)
1=Female x Born>09/2002 x Conflict-area		-0.223		-0.283		-0.299		-0.216		-0.273
		(0.407)		(0.236)		(0.277)		(0.234)		(0.222)
1=Female	0.459***	0.459***	0.459***	0.459***	0.458***	0.458***	0.458***	0.458***	0.458***	0.458***
	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)
Region FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Cohort FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	5015	5015	5622	5622	6234	6234	6720	6720	7036	7036
R-squared	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051

*** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the province level.
Source: Authors' calculations using data from the 2002 and 2008 Household Living Standards Surveys of Cote d'Ivoire.

Appendix A

The cross-sectional 2008 Cote d'Ivoire Household Living Standards Survey (HLSS) was collected by the Cote d'Ivoire's National Institute of Statistics. The 2008 survey has information on war-related disabilities (physical and mental). The section *Impact of the Conflict on the Population* also includes a variety of questions on the household and individual war-related experiences, including:

- How did individual/household revenues evolve during conflict? I.2
- Have you had to go into hiding during the conflict? I.1
- Have your properties been damaged by the conflict? I.3
    - What damage have they suffered? I.4
- Have you been displaced because of the conflict? I.5
- Where did you live prior to the conflict? I.6
    - (if displaced) Are you inclined to return to the original place of residence? I.7. If not, why not? I.8
- Have you lost your 1/ job; 2/ farm/plantation; 3/ livestock; 4/ other productive assets because of the conflict? I.9
- Are you currently displaced by the crisis? I.10
- Do you have difficulty sleeping or do you have nightmares because of the war? I.11
- Do you experience fear for no reason, anxiety, stress? I.12
- Has the crisis affected your life? I.13
- Have you been a victim of war-related violence?
    - I.14 (options: No/robbing/ rape/sexual violence/beating/harassment/other)
- Have you had to beg or go into prostitution because of the crisis? I.15
- Have you consulted a psychologist? I.16
- What was the cost of the consultation w/ the psychologist? I.17