

## **Armed Conflict, Household Victimization, and Child Health in Côte d'Ivoire<sup>1</sup>**

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**Abstract:** We examine the effect of the 2002-2007 civil conflict in Côte d'Ivoire on children's health status using household surveys collected before, during, and after the conflict, and information on the exact location and date of conflict events. Our identification strategy relies on exploiting both temporal and spatial variation across birth cohorts to measure children's exposure to the conflict. We find that children from regions more affected by the conflict suffered significant health setbacks compared with children from less affected regions. We further examine possible war impact mechanisms using rich data on households' experience of war from the post-conflict survey. Our results suggest that conflict-induced economic losses, health impairment, displacement, and other forms of victimization are important channels through which conflict negatively impacts child health.

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

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## **I. Introduction**

Poor child health is a major problem facing policymakers in developing countries. Access to adequate nutrition and health services is especially problematic in countries affected by armed conflict. Recent studies show that armed conflict often triggers declines in household incomes, wealth, adult health, employment and security, and through these channels can have an adverse impact on child health (Stein et al. 2004; Bundervoet et al., 2009; Kondylis, 2010; Akresh et al., 2011a; Akresh et al., 2011b; Mansour and Rees, 2011). In this paper, we further explore the link between armed conflict and child health by studying the impact of the 2002-2007 conflict in Côte d'Ivoire on children's height-for-age, a widely recognized measure of long-term health. Using rich post-conflict survey data on war-related experiences, we also analyze several mechanisms by which armed conflict can hamper child health. Our identification strategy relies on exploiting both temporal and spatial variation across birth cohorts to measure children's exposure to the conflict.

Our results indicate that the height for age z-scores of children who were surveyed during and shortly after the conflict and who lived in conflict-affected regions was on average 0.414 standard deviations lower than that of children who were less exposed to the conflict. The health of young children was also negatively affected by the conflict-induced victimization reported by heads of households, for instance economic losses, health impairment, and displacement. This effect is stronger in conflict-affected regions and for young boys. The negative impact is also stronger for children exposed to the conflict for longer periods. Our findings are robust to including child controls, household controls, province-of-residence fixed effects, month-of-birth fixed effects, and province-specific time effects that allow for differential trends in cohort health.

The analysis is based on data from three cross-sectional household surveys collected before, during, and after the conflict. These are the 2002 and 2008 Household Living Standards Surveys (HLSS) ENV-2002 and ENV-2008 and the 2006 Multiple Indicator Cluster Survey (MICS3). The surveys were undertaken by the National Institute of Statistics in Côte d'Ivoire in collaboration with UNICEF. The ENV-2008 was designed as a post-conflict survey and provides a unique set of variables on the experience of war, including questions about loss of productive economic assets, effects of the conflict on adult health, displacement, and on other forms of

victimization. We use these data to obtain measures of household-level exposure to the war and examine the added impact of conflict-related victimization on child health. To identify conflict-affected areas, we use data on the exact locations of battles, violence against civilians, riots, and transfer of power between parties from the recently released Armed Conflict Location and Events Dataset (ACLED) (Raleigh et al., 2010).

Our analysis is most closely related to studies of the link between armed conflict and child health in sub-Saharan countries, which document a strong detrimental impact (see, e.g., Bundervoet et al., 2009; Akresh et al., 2011a, 2011b). We contribute to this literature in two ways. First, we employ both pre- *and* post-conflict data on child health, which enables us to control for the baseline (pre-conflict) level of child health. While post-conflict data and outcomes have been extensively studied in the literature, pre-war data are rarely available for conflict-affected regions. Second, rich information on conflict-related victimization in the post-war survey allows us to analyze the joint impact on child health of being in the conflict zone during the war *and* suffering from conflict-induced victimization during the same period. Thus, we are able to examine and quantify the impact of several mechanisms which may explain the negative health impact of armed conflict identified in the literature.

Our study also contributes to a relatively scarce literature on economic development in West African economies (World Bank, 2012, pp. 136). There are few recent studies on Côte d'Ivoire and these do not focus on health.<sup>4</sup> One exception is the comparative study of Strauss (1990) who shows that in the mid-1980s Ivorian children in rural areas fared well relative to other African nations in terms of nutritional status. In 1985 stunting rates in rural Côte d'Ivoire were half the African average, but twenty times larger than in the United States. In a related study, Thomas et al. (1996) examine the effects of the 1980s macroeconomic adjustment policies in Côte d'Ivoire on child and adult health. Focusing on height-for-age, weight-for-height, and body mass index and using the 1987-1988 HLSS, they find that the health of children (up to 12 years old) and adults alike was negatively impacted by macroeconomic adjustment, in particular due to an increase in relative food prices and reduced availability and quality of health infrastructure. Larger negative effects are documented for males, children and adults, a result that is echoed in our study.

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<sup>4</sup> See Duflo and Udry (2003) for a study of intrahousehold resource allocation in Côte d'Ivoire.

Our paper relates to the large literature that examines the causal impact of negative shocks experienced in early childhood on adult health, education, and labor market outcomes (for a review, see Almond and Currie, 2011). In developing countries, individual height is positively correlated with education, employment, and wages (Strauss and Thomas, 1998). Similarly, malnourishment during childhood contributes to poor schooling performance and negative adult socio-economic outcomes (Glewwe et al., 2001; Alderman et al., 2006). Impaired fetal growth is associated with significantly higher chances of cardio-vascular disease in adults, which suggests that poor nutrition early in life is difficult to reverse and may permanently damage health (Barker, 1998). The process whereby the fetus adjusts to short-term changes in their environment (referred to as *programming*), may be beneficial in the short run but is detrimental to long-term health (Godfrey and Barker, 2000).<sup>5</sup> Since we are able to identify a strong, negative and potentially causal impact of the Ivorian conflict on cohorts of young children in conflict-affected regions, our findings suggest that policy interventions should aim to mitigate the unfavorable socio-economic outcomes that can be expected for these cohorts during adulthood.

The remainder of the paper is organized as follows. In Section II we describe the historical context of the Ivorian conflict. Section III presents the data, the estimation strategy, our baseline results, and robustness checks. In Section IV we discuss and provide evidence of the channels through which armed conflict impacts child health. In Section V we conclude.<sup>6</sup>

## **II. Spatial and Temporal Intensity of the 2002-2007 Conflict in Côte d'Ivoire**

Côte d'Ivoire, the world's leading exporter of cocoa, enjoyed a long period of political stability and economic development following its declaration of independence in 1960. With an average real GDP growth rate of 4.4 percent per year during 1965-1990, Côte d'Ivoire became an economic powerhouse in West Africa and an attractive destination for foreign investment and migrant workers from neighboring countries.<sup>7</sup> Political unrest followed the death of long-standing President Felix Houphouët-Boigny in 1993, with a number of coups d'état taking place

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<sup>5</sup> While the literature generally indicates that the negative shocks to health in early childhood and *in utero* shocks are irreversible, recent studies suggest there is potential for a reversal of this impact (Mani, forthcoming).

<sup>6</sup> An online appendix with detailed data descriptions and sources is available on [www.camelia-minoiu.com/civ-appendix.pdf](http://www.camelia-minoiu.com/civ-appendix.pdf)

<sup>7</sup> By end-1998, more than a quarter of the population consisted of foreign workers, more than a half of which were of Burkinabe origin.

during the 1990s. The decade ended with a military coup in December 1999 which caused a deep sociopolitical crisis. Nevertheless, the power struggle that marked the 1990s was not uncommon to a number of African countries transitioning to a multi-party elections-based system.

The 2002-2007 civil conflict was rooted in controversies over nationality laws, voting rights and land reform. As tensions flared over eligibility conditions for national elections,<sup>8</sup> the armed conflict began in September 2002 with multiple attacks by rebel forces representing mostly the Muslim, northern parts of the country. Violence erupted in several cities, including Abidjan in the south, Bouaké in the center, and Korhogo in the north (marked on a map of Côte d'Ivoire in Figure 1). In the period that followed, the rebel forces (*Forces Armées des Forces Nouvelles*) retreated to the northern and western parts of the country (UK Home Office, 2007), where they established a "parallel administration, economy, treasury, judicial system, and security structures" (UNSC, 2010, pp. 7). The south remained under government control. Inter-communal land disputes, fueled by a 1998 Rural Land Law that denied non-Ivorians the right to own land (Daudelin, 2003), were also common during the conflict.<sup>9</sup>

Delivery of basic social services in rebel-held areas remained limited throughout the conflict, and this limited delivery is an important channel through which the population was impacted by the conflict. According to surveys analyzed in Fürst et al. (2009), the three most important conflict-related problems reported by households in the western province of Man concerned health (48 percent), followed by the lack of food (29 percent) and the interruption of public services (13 percent). Precarious water distribution during the conflict compounded existing health problems, with reports that only one fifth of water pumps in the rural north were operational (UNOCHA, 2004). Education services were also severely disrupted in the north, where 50 percent of school-age children were deprived of education by 2004 (Sany, 2010). It is also estimated that 70 percent of professional health workers and 80 percent of government-paid teachers abandoned their posts in the northern and western parts of the country (UNOCHA, 2004; Sany, 2010).

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<sup>8</sup> The 2000 constitution stipulated that presidential candidates be born in Côte d'Ivoire from Ivorian parents.

<sup>9</sup> The seeds of the conflict were sown in the mid-1990s when the concept of "Ivoirité" (or "Ivoiry-ness") entered the political discourse. As the country has a mix of ethnically-diverse population, a large share of foreign workers, and naturalized first- and second generation Ivorians, the denial of voting rights, land rights, and hostility towards migrants led to tensions that culminated in the 2002-2007 conflict (Sany, 2010).

The initial, more violent phase of the war (2002-2004) was followed by a tense period marked by isolated bouts of violence (2005-2007). McGovern (2011) argues that this "no war, no peace" situation benefitted those who stood to gain from the conflict, thus supporting the idea of an economic opportunity motive for armed conflict suggested by Collier and Hoeffler (2004). McGovern also points out that during the less violent phase of the conflict, armed checkpoints and roadblocks in Côte d'Ivoire were a widespread means for generating revenues for those manning them.<sup>10</sup>

Over the period many peace talks and negotiations took place with the aim of reunifying the country and restoring peace. A timeline of events based on the reports of the UN Mission in Côte d'Ivoire (ONUCI) is shown in Figure 2. The conflict ended officially in March 2007 with the Ouagadougou Political Accord and agreements were soon reached to begin disarmament and reintegrate the rebels into the national armed forces. While the conflict resulted in relatively few casualties (600 battle fatalities per year in the initial phase) compared to ten times as much for the average civil war in the Battle Deaths Dataset (UCDP/PRIO, 2009), it led to significant population movements. The economic impact of the conflict during the period 2002-2007 was also substantial, with an average per capita GDP growth rate of -1.5 percent, the second lowest in the region, and an increase in the national poverty rate by 10 percentage points to 48 percent in 2008.<sup>11</sup>

To identify conflict-affected regions, we use information from the ACLED database containing the exact dates and locations of violent incidents during the conflict, including riots, protests, armed battles, and violence against civilians. We match conflict events within each location and for each year to children's residence and year-of-birth in the surveys. We define conflict regions as those provinces for which ACLED reports at least one conflict event from September 2002 to December 2007. Figure 3 depicts the spatial distribution of conflict events recorded in the ACLED dataset. With the exception of Abidjan, the economic and former political capital of Côte d'Ivoire, provinces with a higher incidence of violence, shown in darker shades, are concentrated in the rebel-held, northern and western parts of the country.

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<sup>10</sup> Roadblocks were especially profitable along important transit routes, for example near the peaceful border with Ghana (McGovern, 2011, pp. 185) and the cost of roadblock "shakedowns" amounted to \$230-363 million per year.

<sup>11</sup> Sources: World Development Indicators (World Bank, 2010) for per capita GDP growth; and IMF (2009) for poverty estimates.

In Figure 3 western Côte d'Ivoire stands out as the area most affected by high-intensity conflict (based on the frequency of conflict events reported in the ACLED dataset). Several reasons may explain this pattern. First, fertile cocoa-growing regions of western Côte d'Ivoire had long-standing tensions between indigenous ethnic groups and non-Ivorians (mostly of Burkinabe and Malian origin) over property and land rights (Mitchell, 2011). Second, the region hosts large numbers of Liberian refugees who in the aftermath of the 1999-2003 Liberian Civil War settled in a special refugee zone extending over four western provinces. About one third of the population in these provinces is of foreign origin (Kuhlman, 2002, pp. 18) and foreigners were targeted during the conflict.<sup>12</sup> Third, during the second phase of the conflict the western regions witnessed a large number of attacks by local militarized groups, including attacks against United Nations bases and property (UNOCHA, 2006a, 2006b).<sup>13</sup>

### **III. Data and Methods**

#### *III.1. Household Surveys*

The analysis employs data from the nationally representative 2002 and 2008 Côte d'Ivoire HLSS, as well as the 2006 MICS3 dataset, all of which provide anthropometric information for 15,443 children aged 6-60 months at the time of the survey. Our health measure is height-for-age z-scores, which is a commonly used indicator of long-run child nutritional status and health (Martorell and Habicht, 1986). We compute z-scores for each child's height-for-age using World Health Organization (WHO) reference datasets. The z-score is the difference between surveyed children's height and the average height from the WHO reference population of same-age children, divided by the standard deviation of the latter. As shown in Table 1, average height-for-age z-scores for Ivorian children were lower than for the international reference population by almost two standard deviations in 2002, and 1.5 standard deviations in the 2006 and 2008 surveys.

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<sup>12</sup> In particular, hostilities resurfaced in Côte d'Ivoire between the same ethnic groups which had fought on the Liberian side of the border during the 1999-2003 Liberian War. Several UN documents report hostilities in the Liberian community during the Ivorian conflict (UNOCHA 2003a, 2003b). According to McGovern (2011, pp. 207), both parties to the conflict often attributed especially violent events to Liberian militias. He writes that the reason was that Ivorians "were keen to preserve the idea they had of themselves as being sophisticated." McGovern argues that this strategy of image preservation helped to contain the violence.

<sup>13</sup> Chelpi-den-Hamer (2011) provides a detailed account of the motivations and activities of armed factions in western Côte d'Ivoire during the conflict.

Across surveys, average height-for-age z-scores are also higher in conflict regions compared to non-conflict regions (Table 1), suggesting that child health improved during 2002-2007 despite the conflict. Notably, there are no significant differences in average age across surveys, nor between conflict and non-conflict regions within each survey. This reduces the likelihood that age differentials explain the war impact we seek to estimate. Comparing the remaining variable means across conflict and non-conflict regions (Table 1, columns 4-5), we note statistically significant differences in the share of children of various ethnicities and religions. Similarly, mother's education is slightly higher in the regions more exposed to the conflict, and children in conflict regions are less likely to reside in rural areas but more likely to come from poorer households.<sup>14</sup> We include these variables as controls in our regression analysis to ensure that our results are not driven by these differences. Since poverty can be either a pre-condition for or an outcome of the conflict, we also perform regression analysis for the samples of poor and non-poor households.<sup>15</sup>

### III.2. Baseline Specification

We begin by estimating the following difference-in-differences specification:

(1)

$$\text{HAZ}_{ijt} = \alpha_j + \delta_t + \lambda_{jt} + \beta_1(\text{Conflict Region}_j * \text{War Cohort}_t) + \varepsilon_{ijt}$$

where  $\text{HAZ}_{ijt}$  is the height-for-age z-score for child  $i$  in province  $j$  born during year  $t$ ;  $\alpha_j$  are the province fixed effects,  $\delta_t$  are birth-cohort fixed effects,  $\lambda_{jt}$  are province-specific trends in cohort health, and  $\varepsilon_{ijt}$  is a random, idiosyncratic error term. Indicator variables for female children and rural residence are included in all regressions. The 'War Cohort' variable identifies children measured in the 2006 and 2008 surveys who were thus exposed to the conflict either in infancy or *in utero*. Note that while the 2008 survey includes only data for children born after the conflict, the 2006 survey contains data for children born between August 2001 and April 2006, and thus covers children born before and during the conflict. In this specification, the main

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<sup>14</sup> Poverty is defined relative to the national (consumption) poverty line in 2002.

<sup>15</sup> See Appendix Table A1 for pre-war poverty rates and average height-for-age z-scores by region.



coefficient of interest is on the difference-in-differences term ( $\beta_1$ ), which captures the average impact of conflict on the health of children in the war cohort.

We consider several variations of the specification in Eq. 1 to explore the impact of conflict on child health by exploiting variation in the duration of exposure to the conflict. For instance we replace the 'War Cohort' variable with a continuous measure of the duration of exposure to the conflict (in months) and then with indicator variables for zero months of exposure (reference category), exposure between one and 24 months, and exposure of at least 25 months. To allow for gender differentials in the health impact of the conflict, we also estimate Eq. 1 with additional interaction terms with a female dummy. In additional specifications we assess the sensitivity of our main results to adding controls for child, household head, and mother's characteristics.

### **III. Empirical Results**

#### *III.1. Baseline Regressions*

Table 2 presents baseline results from OLS regressions of height-for-age z-scores on conflict incidence in children's province-of-residence for the full sample of children from the three surveys. The results indicate that children with *in utero* or early childhood exposure to the conflict and who lived in conflict-affected regions had height-for-age z-scores 0.414 standard deviations (s.d.) lower than those born during the same period who lived in less affected regions (column 1), or 0.428 s.d. when allowing for a gender-specific impact. We then exploit individual variation in the duration of exposure to the war by replacing the 'War Cohort' dummy with indicator variables for exposure to the conflict either shorter or longer than 24 months (columns 3-4). This replacement yields estimates of the impact that are higher for younger children and lower for older children. An additional month of exposure to the war reduces the height-for-age z-score by 0.012 s.d. on average (columns 5-6).

The coefficient estimates on the triple interaction term with the female dummy do not reveal a gender differential in any of the specifications considered. The finding is not surprising in light of other anthropometric studies on sub-Saharan Africa. Unlike the research on child health and famines (Mu and Zhang, 2008) or natural disasters (Rose, 1999) focusing on Asian countries, there is no consistent evidence of sex bias in early child health studies on sub-Saharan

African countries, either during tranquil times or after negative shocks.<sup>16</sup> For example, Alderman et al. (2006) study anthropometric outcomes in Zimbabwe and do not find significant differences by gender in a sample of young children. Budervoet et. al. (2009), Akresh et al. (2011a, 2011b) show that health outcomes for girls and boys were equally impacted by the Burundian, Rwandan, and Eritrean-Ethiopian conflicts respectively. Using data from the 1986 HLSS, Strauss (1990) documents marginally lower, yet statistically insignificant height-for-age and weight-for-height for boys living in the rural areas of Côte d'Ivoire.

Table 3 contains the baseline specifications that are augmented with several sets of control variables. In particular, we control for child ethnicity and religion, characteristics of the household head (age, marital status, education) and characteristics of the child's mother (age and education). This ensures that the factors we found to differ significantly between exposed and non-exposed households (Table 1) do not bias our results. F-tests for the joint significance of these control variables show that the only factor that does not systematically affect children's health is their ethnic background. In these regressions the average health impact of conflict is of similar magnitude to that in the specifications without controls.

### *III.2. Robustness Checks*

#### *III.2.1. Alternative Baseline Cohort*

It is possible that pre-conflict events affected the health of our baseline cohort thus confounding our baseline results. A major event that may have affected the health of children in the pre-war cohort (and surveyed in 2002 and 2006) is a military coup that led to a change in government in Côte d'Ivoire on December 26, 1999. The coup had a significant impact on the Ivorian economy, leading to contraction of real GDP growth of -0.2 percent during 1999-2000 compared to an average growth of 5.8 percent during 1994-1998 (Doré et al., 2003). Following the coup, public investment projects were postponed, private investment collapsed, social spending was cut back, and migrant workers fled following ethnic clashes in the south. From 1998 to 2002, the national poverty rate rose by five percentage points to 38.4 percent. It is thus plausible that children born after December 1999 experienced a decline in their well-being as the crisis unfolded. Thus, children born between January 2000 and August 2002 in the pre-war survey may constitute a

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<sup>16</sup> One recent exception is Akresh et al. (2011a) who find that crop failure in rural Burundi has a stronger negative health impact on young girls.

poor baseline group to study the impact of the 2002-2007 civil conflict.<sup>17</sup> Furthermore, children born during the same period and surveyed in 2006 could also be a poor treatment group as they were exposed to two major shocks during their lifetimes, both the coup and the conflict. As a robustness check, we perform our regressions on the sample that excludes children born between January 2000 and August 2002 (from the 2002 and 2006 surveys), the month before the civil conflict erupted. Therefore, our new control group includes only children born before the coup and children born after the conflict started who lived in less affected regions.

The results (Table 4) show that children born during the 2002-2007 conflict had significantly worse health compared to those born before the December 1999 coup. In these specifications we control for child ethnicity and religion, as well as characteristics of the household head and child's mother. Notably, the coefficient estimates on the interaction term (Conflict Region\*War Cohort) are at least twice as large when we exclude the "post-coup" children compared to the baseline results (Tables 2-3). Our earlier results could thus be interpreted as conservative estimates of the impact of the Ivorian conflict on children's health.

### III.2.2. Results Across Sub-samples

We further evaluate the impact of conflict on children from different types of households and by gender. In Table 5 we present the estimates of regressions on sub-samples of children from poor and non-poor households, girls vs. boys, rural vs. urban areas, and for children from households headed by individuals with some education and without any education. Columns 1-2 report results of the baseline regression models (not including any controls) for the poor and non-poor sub-samples. Poor households are identified using an assets-based index which refers to the quality of the dwelling, and access to the grid and utilities.<sup>18</sup> We find that war-exposed children

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<sup>17</sup> The December 26 1999 military coup led to a sharp drop in the economic performance and increased political instability, making it possible that children born before December 1999 also experienced a worsening of their health. We assume that any such impact was experienced uniformly across the country. We aim to explore the impact of the 1999-2000 crisis in future work.

<sup>18</sup> The quality of the dwelling refers to whether the walls and floor are in cement or brick, and whether the roof is in metal, cement, or stone. Access to the grid is captured by question on whether the household has electricity and a phone. Investment in utilities represents access to a toilet and using oil, natural gas, coal or electricity for cooking, rather than wood. The assets index is calculated as the summation of indicator variables for each asset, and ranges between 0 and 7. Poor households are those with asset index values lower than 3.

in conflict-affected areas were negatively impacted in both poor and non-poor households, losing on average 0.303-0.549 standard deviations in their height-for-age z-scores (columns 1-2).<sup>19</sup>

When we separate the sample into boys and girls (Table 5, columns 3-4), we find that both girls and boys in the war-exposed cohort who lived in the conflict-affected regions suffered important health setbacks (significant at the 5 and 10 percent level, respectively). The results are consistent with findings of no sex bias from case studies of the Rwandan and Eritrea-Ethiopian conflicts (Akresh et al., 2011a, 2011b). The results for the sub-samples of children living in rural/urban households and respectively in households headed by educated/uneducated individuals reveal that the war cohort of children who also lived in conflict-affected areas was impacted more in rural households and in households headed by individuals without education. The latter result suggests that heads of households with higher educational status were better able to protect their children from the effects of the crisis.

#### **IV. Exploring the War Impact Mechanisms**

##### *IV.1. Measures of Conflict-Induced Victimization*

In this section we go one step further in analyzing the impact of conflict on child health by focusing on alternative measures of child exposure to the armed conflict. Specifically, we examine several types of conflict-related victimization as channels through which the war can adversely impact child development. We compute four household-level indices of conflict-induced victimization based on war experiences reported by the heads of households in the 2008 survey. The indices are calculated as simple sums of underlying questions, and capture a wide range of types of distress, including loss of productive economic assets and income, health impairment, displacement, and other forms of victimization.<sup>20</sup>

The 'economic losses' index is based on seven questions about economic damage during the war, such as whether a household experienced a decline in the assets or revenues, lost their farm or livestock, employment, or other productive assets. The 'health impairment' index is based on questions such as whether the household head experienced war-related nightmares, stress, fear

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<sup>19</sup> We also tested the null hypothesis that the estimated negative coefficients on the war impact variable are equal for poor and non-poor households, and failed to reject it (results not reported).

<sup>20</sup> A growing number of studies focus on the link between individual war experiences such as conflict-induced victimization, and post-war outcomes including social capital in Uganda (Rohner et al., 2011) and Sierra Leone (Bellows and Miguel, 2009), or economic development in the Democratic Republic of the Congo (Pellillo, 2011).

or anxiety, illness, or had to see a psychologist. The 'displacement' index refers to whether the household head went into hiding because of the conflict, had to move his household, or was displaced at the time of the conflict or interview (mid-2008).<sup>21</sup> Finally, the 'victim of violence' index captures additional ways in which the household head may have been victimized during the conflict, for instance by being robbed, subjected to sexual violence (including rape), or wounded; or by experiencing war-related deaths in the household. Table 6 lists the questions underlying each index. T-tests for the differences in mean values of the components show that negative economic shocks and displacement were more prevalent in conflict-affected regions, while households experienced relatively similar levels of health distress inside and outside conflict regions.

We spatially examine the experience of war in Figure 4, which depicts conflict victimization maps according to the province-level share of households that report at least one level of victimization. Darker shades represent provinces with a higher greater of households giving a 'yes' response to at least one question in each index. Panels A and B suggest that economic losses, and to some extent health effects, were more prevalent in the northern areas controlled by rebel forces. The displacement and victim of war violence indices (Panels C and D) appear to visually overlap the best with the ACLED-based conflict map (Figure 3), with more frequent reports of victimization in the western parts of the country, especially along the border with Liberia. The share of households reporting at least one level of victimization along the four dimensions considered, correlates positively with conflict intensity proxied by the number of conflict events in the ACLED dataset (Appendix Table A2) and the correlation coefficients range between 0.097 (economic losses) and 0.198 (victim of violence). The province-level victimization measures are also strongly correlated with one another, with the highest correlations (statistically significant at the 1 percent level) being between economic losses and health impairment (0.768); and displacement and victim of violence (0.859).

#### *IV.2. Selection into Victimization*

One concern in using self-reported victimization data to explore the war impact mechanisms is that households that report victimization may belong to a select sample that was targeted for

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<sup>21</sup> We focus on the impact of displacement on migrating households rather than receiving communities. For an analysis of the health impact of hosting refugees, see Baez (2011).

violence due to their observable or unobservable characteristics. To determine the extent to which victimization status is correlated with observables, we estimate regressions of each victimization index on a rich set of (mostly time-invariant) characteristics of the heads of households, including their ethnicity and religion, rural residence, age, marital status, education, and gender. The results are reported for the full sample and for non-migrant households in Table 7. We find little evidence of a systematic pattern of selection into victimization across all types of victimization based on observable characteristics. Older heads of households report more conflict-induced economic losses and health effects (columns 1-4), whereas more educated ones have higher levels of self-reported displacement and victimhood (columns 5-8).

For ethnic groups the results are more mixed, with the Southern Mandé (who live primarily in the western regions extensively affected by the conflict) systematically reporting more conflict-related health impairment, displacement or other victimhood (than the Akan ethnic group, the reference category). This result is consistent with the visual examination of the victimization maps (Figure 4), the conflict region map (Figure 3), as well as reports on the intensity of conflict events. Naturalized Ivorians, who constitute only 0.3 percent of the dataset, are significantly less likely to report conflict-related victimization. We would have expected the opposite effect as foreigners were targeted during the conflict but many ethnic groups native to Côte d'Ivoire are also found in neighboring countries, and thus the ethnic status may not be a good basis for classifying individuals as outsiders (Levinson, 1998). McGovern (2011, pp. 71) also points out that in western Côte d'Ivoire, "anyone not born in a village is technically a 'stranger' ..." and that men moving 20 or 2,000 kilometers away from their native villages would be treated as foreigners in their new place of residence.

F-tests of the joint significance of household head's characteristics in explaining the self-reported level of victimization (Table 7) indicate that religion rarely plays a role, while ethnicity and other characteristics are sometimes important.<sup>22</sup> Overall, the regression results indicate that there is no strong pattern regarding the characteristics of households that report different forms of victimization. Nevertheless, we allow for systematic patterns in our regressions exploring the war impact mechanisms by including indicators for child ethnicity, which is strongly correlated with household head ethnicity, and the main results remain robust and statistically significant.

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<sup>22</sup> In results not reported, we find that economic status in 2008, proxied by an indicator variable for non-poor households, is positively correlated with reports of economic losses. However, since income status is likely to change during the conflict, we do not include the poverty indicator in the regressions reported.

We noted that conflict-affected regions experienced high levels of migration, which may have been caused by exposure to the conflict and potential or actual victimization. Selective migration out of conflict areas would lead to a downward bias on the war impact coefficient if the households that stayed behind were consistently worse off in terms of child health. Put differently, the war impact coefficients may also be picking up negative selection into staying in conflict-affected regions in addition to the conflict effect. To examine this issue, we perform two tests. The first is to compare the characteristics of households in conflict vs. non-conflict regions before and after the conflict. The results are reported in Table A3 and suggest that there are no systematic changes in the average household profile before and after the war neither in nor outside conflict regions. The only exception is a smaller post-conflict share of foreigners everywhere which likely reflects conflict-induced migration to neighboring countries.

The second test is to look for evidence of differential exposure to victimization among migrant and non-migrant households. We do so using alternative definitions of conflict-induced migration. The first definition refers to households that moved *during* the conflict, for any reason, and is based on the reported duration of their residency in the current location. This is the migration variable used so far in the analysis. Migrant households according to this definition represent 15 percent of the post-conflict sample. The second definition refers to households representing about 8 percent of the sample that responded affirmatively to the question "Have you been displaced by the conflict?". The third definition identifies households that responded affirmatively to the question "Did your household move because of the conflict?" and they account for about 10 percent of the sample.

To test for the differential exposure to victimization across migrant and non-migrant households, we regress each component of our victimization indices on the three migrant variables defined above, while controlling for economic status (poor vs. non-poor), area of residence (rural vs. urban), household head characteristics, and province fixed effects. The results, reported in Table A4 (columns 1-2), indicate that households that migrated during the conflict, regardless of the reason for doing so, were significantly more likely to have their assets and properties damaged, lose employment, experience war-related ailments or sickness, seek medical help, and experience conflict-related deaths in the household. Many of these households were displaced by the conflict. In addition, households in which the head of households reported being displaced by the conflict (columns 3-4) or having to move the household because of the

conflict (columns 5-6) were statistically significantly more likely to report all types of victimization.

Overall, these results suggest that non-migrant households tend to report *less* victimization, whereas migrant households, especially those displaced by the conflict, tend to report *more* victimization. Put differently, there is evidence of positive selection in conflict regions and negative selection into migration. It follows that any estimated impact of conflict-induced victimization on child health in conflict regions is likely to underestimate the true impact of conflict due to the positive selection into staying in conflict affected regions.



### IV.3. Identifying the Mechanisms

To examine the potential role played by each of the four forms of victimization discussed, we estimate two sets of specifications. First, we examine the cross-sectional impact of conflict-induced victimization using the post-war (2008) survey. We estimate the following specification: (2)

$$\text{HAZ}_{ijt} = \alpha_j + \delta_t + \lambda_{jt} + \beta_3(\text{Victimization}_i) + \varepsilon_{ijt}$$

The coefficient of interest,  $\beta_3$ , is an estimate of the direct effect of victimization on the health of children in the war cohort.<sup>23</sup> The results are reported in Table 8 for each victimization index, for the full sample and by gender. Since non-migrant households are less likely to be victimized by the war, we show the estimates separately for all households (first two rows) and non-migrant households (next two rows). Household-level victimization had a negative impact on children's height-for-age z-scores, with signs mostly negative for either sample, but the impact estimates are statistically significant only for the 'economic losses' index. An additional 'yes' response to the questions about loss of productive assets, employment or income, is associated with a height-for-age z-score for children in the war cohort lower by between 0.098 s.d. and 0.142 s.d. depending on the set of controls (column 1). The result is more pronounced for boys (column 3), but there are no systematic gender differences for any other form of victimization (columns 4-12). A test for the equality of coefficient estimates across migrant and non-migrant households, with p-values reported in the last two rows of the table, indicates that the effects are statistically equal regardless of migration status.<sup>24</sup>

Second, we assess whether the war impact on child health identified in our baseline results varies with the extent of victimization experienced by households during the conflict. To do so, we exploit the additional cross-sectional variation given by children living in households victimized by the war, and interact the difference-in-differences term (Conflict Region\*War

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<sup>23</sup> Since the conflict-induced victimization variables are only available in the post-war 2008 survey, observations from the 2006 survey are excluded from this analysis.

<sup>24</sup> We also perform an additional set of regressions on the sub-sample of non-migrants according to the alternative definitions from the previous sub-section and find broadly similar results, but with slightly more consistent negative effects of conflict-induced household victimization on the health of boys (Table A5). Furthermore, p-values for the test that coefficient estimates across displaced and non-displaced households suggest that the effects are the same regardless of migration status.

Cohort) from Eq. 1 with each of the four victimization indices. Since victimization variables are available only in the post-conflict survey,<sup>25</sup> this procedure amounts to estimating:

(3)

$$HAZ_{ijt} = \alpha_j + \delta_t + \lambda_{jt} + \beta_4(\text{Conflict Region}_j * \text{Victimization}_i) + \beta_5(\text{Victimization}_i) + \varepsilon_{ijt}$$

By estimating Eq. 3 we look for a differential impact of conflict on child health according to the degree of conflict-related victimization experienced by the heads of households. This effect is captured by the estimate for  $\beta_4$ . The specification allows us to assess the *joint* impact of living in a conflict-affected region and in a victimized household (compared to all other households), and thus to examine the role of different channels through which conflict may affect child health. As in previous specifications, we control for average health differences across genders and area of residence (rural/urban), and add an interaction term with the female dummy to explore gender differentials in the estimated magnitude for  $\beta_4$ .<sup>26</sup>

Table 9 presents the results for the full sample both with and without controls for child, household head, and mother's characteristics. The results suggest that the negative impact of the conflict on children's height-for-age z-scores is larger for children living in households victimized by the war. The estimated marginal impacts range from -0.291 (column 2) to -0.783 s.d. (column 12) for each additional positive answer to the underlying questions, depending on the index and the set of controls. For non-migrant households, the results are qualitatively similar to the full sample for all forms of victimization other than displacement (Table 10). For the latter, the estimated coefficients on the interaction term for non-migrant households are similar in magnitude to those based on the full sample but less precisely estimated (columns 7-9). This result is consistent with the fact that non-migrants are less likely to report conflict-related displacement.<sup>27</sup>

Overall, there is no strong evidence that the impact of the conflict on the health of children living in households victimized by the war depends on migration status. In conflict-

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<sup>25</sup> This implies that (Conflict Region\*War Cohort\*Victimization) is equal to (Conflict Region\*Victimization) and (War Cohort\*Victimization) is the same as (Victimization).

<sup>26</sup> The estimated coefficients on the interaction terms with the female dummy, namely (Female\*Conflict), (Female\*War cohort) and (Female\*Victimization), are not shown in the tables for simplicity, but are included all specifications. We consistently find that these variables have statistically insignificant joint effect on height-for-age.

<sup>27</sup> It also strengthens our confidence in the quality of self-reported victimization variables.

affected areas, possible war impact mechanisms such as economic losses, health impairment, and being a victim of violence, are factors that negatively affect the health of children from *all* households, while conflict-induced displacement has a stronger impact in migrant households.

## **V. Discussion and Conclusions**

We examined the effect of the 2002-2007 armed conflict in Côte d'Ivoire on children's height-for-age z-scores using data from three household surveys respectively collected before, during and after the conflict, coupled with information on the location of conflict events. In the results we have presented, children aged 6-60 months that lived in conflict-affected areas suffered significant health setbacks compared to those in less affected areas. The negative impact is stronger for children exposed to the conflict for longer periods. In line with other studies of child health in sub-Saharan African countries, we did not find any evidence of sex bias.

Studies on the consequences of armed conflict have proposed several mechanisms through which war affects populations, including destruction of economic assets and loss of income, lower access to public infrastructure, and significant population movements. We were also able to document the importance of different war impact mechanisms using a rich set of variables on the experience of war by heads of households available in the post-conflict survey. Our results suggest that conflict-related economic losses, health impairment, displacement, and other forms of victimization have a large and negative effect on child health in conflict regions.<sup>28</sup> These results thus help explain the adverse effects of armed conflict identified in the literature.

Several recent case studies of the Ivorian conflict document the state of the health infrastructure and households' coping strategies during the conflict, providing support for our findings as well as complementary views.<sup>29</sup> For example, Fürst et al. (2010) assess the socioeconomic status of households using pre- and post-war panel data on households from the conflict-affected western region of Man. Almost three quarters of the sampled households attributed economic difficulties to the conflict. Households also reported turning to agricultural production to make ends meet, which suggests a pattern of changed livelihoods. Nevertheless, there are no differences in resilience or coping strategies by income, nor statistically significant

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<sup>28</sup> Our results should be interpreted with some care as they may be subject to survivor bias.

<sup>29</sup> These analyses use pre- and post-conflict data on relatively small samples of households from conflict-affected regions and combine statistical analysis with anecdotal evidence to examine the economic consequences of conflict on the affected population.

socioeconomic dynamics. By contrast, we found that households with educated household heads were better able to prevent the negative impact of war on children's health. At the same time, children in poor and non-poor households were equally impacted. One reason explaining the different conclusions may be the relatively limited geographical focus of the surveys used by Fürst et al. (2010). Another may be that our difference-in-differences approach allows us to compare changes in child health in conflict regions relative to less affected areas using both before and after data, thus controlling for trends elsewhere in the country.

In a companion study based on the same dataset, Fürst et al. (2009) report significant deterioration in access to health services and pharmacies in the aftermath of the conflict. In 2003 interviewed households in the western region of Man mention a higher incidence of tropical diseases, including malaria. The majority of deaths in this community are attributed to diseases rather than the conflict itself. Betsi et al. (2006) utilize survey data representative of towns in the central, northern, and western regions of Côte d'Ivoire, collected around the same time, and document a large reduction in the number of health facilities and health personnel (especially doctors). In the two years following the start of the conflict, rebel-held regions lost between 75-90 percent of health personnel, and 72-90 percent of health facilities were closed after looting or destruction. Considering the relatively poor pre-conflict stock of health infrastructure, conflict-induced losses of health workers and facilities likely had a major impact on the health of children, both directly and indirectly through the adults in the household. In addition, the losses of public health infrastructure at a time when it was most needed may have compounded existing health deficiencies. To test this idea, data on pre- and post-conflict stock and quality of health infrastructure at the province or community level would be needed.

Our findings also suggest that displacement is an important channel through which the war affects child health. Displacement leads to reduced access to household resources and social networks. The conflict ignited widespread harassment of foreigners in Côte d'Ivoire, including migrant workers from the region and refugees from Liberia and Sierra Leone living on the outskirts of cities. Estimates of migration vary greatly, reflecting difficulties in estimating the size of displaced populations. Some reports indicate that by late-2002 the number of war-affected people had reached between 2.7 million (including the internally displaced) and four million (including evacuees and refugees to Burkina Faso, Guinea, Liberia, Mali, and Sierra Leone) (UNOCHA, 2003). Other sources indicate that in the first ten months more than 500,000 people

were displaced (UNICEF, 2003), of which more than two thirds were Burkinabe nationals (Sakurai and Savadogo, 2009).<sup>30</sup> The estimated magnitudes for most of our key parameters for the non-migrant sample are similar to those for the full sample. The only notable difference is in the results for displacement, which suggest a stronger negative impact for children from migrant households.<sup>31</sup>

Two years after end of the conflict, Côte d'Ivoire faced once again an internal crisis occasionally marked by episodes of violence. Nevertheless, the economy is now on the rebound and is receiving fresh inflows of foreign investment and development aid (IMF, 2011). By statistically documenting the contribution of different war impact mechanisms to lowering child health in conflict regions, we can suggest policies to mitigate the adverse effects of the 2002-2007 armed conflict on child health. Interventions that target the conflict-affected areas and aim at rehabilitating basic social services, restoring economic well-being (for instance, through cash transfers or employment programs), and assisting the return of the displaced would seem most fit in trying to reverse the effects of the conflict. Nevertheless, there is little research on which policy interventions can best mitigate the negative effects of war on well-being in general, and child health in particular. As knowledge on the impact of conflict on child anthropometric outcomes accumulates, more research into households' coping strategies and best public policy responses is needed.

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<sup>30</sup> Martone (2003) offers comparable estimates—750,000 internally displaced people and 500,000 refugees. Betsi et al. (2006) estimate that the conflict in the central, northern and western regions led to displacement of 40, 25 and 55 percent of the local population respectively and that about 1.8 million people had left rebel-held regions by mid-2004.

<sup>31</sup> In our case, the ethnicities that are most likely to report conflict-induced displacement are the Akan (living in the south, including the Abidjan area) and the Southern Mandé (living in western Côte d'Ivoire).

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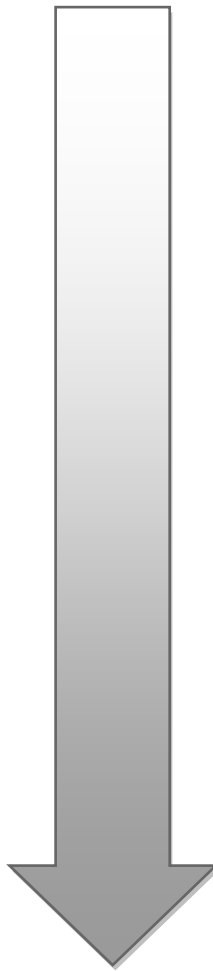
## Tables and Figures

Figure 1. Map of Côte d'Ivoire



Notes: The map indicates the cities in the north, center and south of Côte d'Ivoire (Korhogo, Bouaké, and Abidjan) where the armed conflict erupted in September 2002. Source: Based on United Nations.

## Figure 2. Chronology of the 2002-2007 Conflict



**September 2002** – Conflict erupts in Abidjan, Bouaké and Korhogo (see Figure 1). Rebels consolidate position in the northwest, while the south is under government control.

**January 2003** – The Linas-Marcousis Agreements are signed to permit restoration of peace. The situation remains precarious.

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

September-October 2003 – The *Forces Armées des Forces Nouvelles*, representing the rebel-held North, walk out of national reconciliation government.

December 2003 – Prisoners of war are released by the FAFN.

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

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.

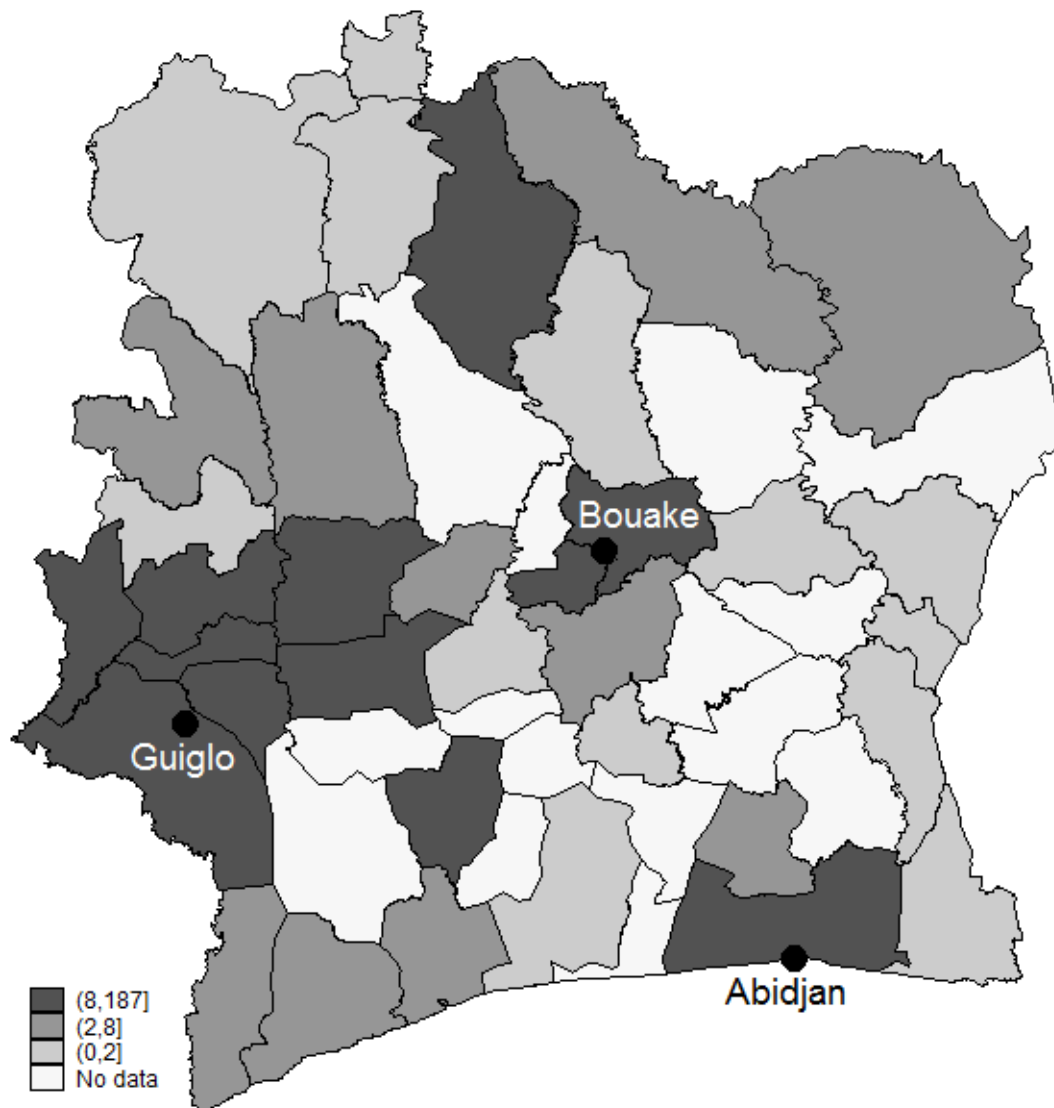
April 2005 – Pretoria Agreement declares immediate and final cessation of all hostilities and the end of the war in the national territory.

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

November 2007 – The government and rebel forces agree to begin disarming their troops by end-2007.

Sources: Globalsecurity.org (<http://www.globalsecurity.org/military/world/war/ivory-coast-2002.htm>) and United Nations Operation in Côte d'Ivoire (UNOCI) (<http://www.un.org/en/peacekeeping/missions/past/minuci/background.html>), both accessed November 9, 2010.

**Figure 3. Map of Conflict Events in Côte d'Ivoire, September 2002-December 2007**



Notes: Shaded areas represent conflict regions. Darker shades indicate a greater number of conflict events reported in the ACLED dataset. In the legend, the “No data” category stands for no reported incidents in the dataset and is treated as zero exposure to conflict in the analysis. The category (8, 187] includes 12 provinces, some of which had relatively low-intensity conflict (between 10 and 30 events) and some with relatively high-intensity conflict, such as Abidjan in the south (187 events), Bouaké in the center (62 events), and the province of Guiglo in the west (48 events). Data sources: Based on ACLED dataset, Raleigh et al. (2010).

**Table 1. Summary Statistics**

	Obs.	Full	Non-migrants	Conflict Region	Non-Conflict Region	Difference in Means [4]-[5]
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Child Variables</i>						
Height-for-age z-score (2002)	5,885	-1.93	-1.97	-1.88	-2.01	0.13 ***
Height-for-age z-score (2006)	7,232	-1.52	-	-1.49	-1.59	0.09 ***
Height-for-age z-score (2008)	2,326	-1.53	-1.59	-1.50	-1.60	0.10
Height-for-age z-score (pooled)	15,443	-1.93	-1.97	-1.88	-2.01	0.13 ***
Age in months (2002)	5,885	34.14	34.58	34.04	34.84	-0.81
Age in months (2006)	7,232	31.31	-	31.25	31.45	-0.19
Age in months (2008)	2,326	36.81	37.16	36.68	37.12	-0.44
Age in months (pooled)	15,443	34.13	34.58	34.03	34.83	-0.80
Child is female (pooled)	15,443	0.50	0.51	0.50	0.51	-0.01
Child resides in rural household (pooled)	15,287	0.56	0.61	0.52	0.65	-0.13 ***
Child resides in poor household (pooled)	15,010	0.35	0.39	0.34	0.40	-0.06 ***
Ethnicity (pooled)						
Akan	14,036	0.29	0.29	0.22	0.44	-0.22 ***
Northern Mande	14,036	0.13	0.14	0.15	0.09	0.06 ***
Southern Mande	14,036	0.13	0.14	0.16	0.05	0.11 ***
Krou	14,036	0.14	0.13	0.14	0.12	0.02 ***
Voltaïque/Gur	14,036	0.12	0.12	0.15	0.07	0.08 ***
Naturalized Ivorian	14,036	0.003	0.004	0.004	0.002	0.001
Non-Ivoirian	14,036	0.19	0.17	0.18	0.23	-0.05 ***
Religion (pooled)						
Muslim	15,402	0.35	0.36	0.37	0.30	0.07 ***
Christian	15,402	0.37	0.33	0.33	0.46	-0.13 ***
Other	15,402	0.28	0.32	0.30	0.24	0.06 ***
<i>Head of the Household (pooled)</i>						
Head's age	15,410	43.80	46.12	43.98	43.25	0.73
Head's education	15,413	0.44	0.39	0.45	0.42	0.03
Head is male	15,443	0.86	0.86	0.87	0.86	0.00
Head is married	8,209	0.87	0.86	0.87	0.86	0.01
<i>Child's Mother (pooled)</i>						
Mother's age	14,640	29.77	30.33	29.90	29.58	0.32
Mother's education	14,670	0.32	0.28	0.32	0.31	0.01 **
<i>Conflict-related Victimization Indices</i>						
Economic losses (2008)	2,211	1.77	1.75	1.86	1.57	0.29 ***
Health impairment (2008)	2,253	0.57	0.56	0.57	0.57	0.00
Displacement (2008)	2,267	0.42	0.34	0.44	0.39	0.05
Victim of violence (2008)	2,270	0.32	0.30	0.34	0.27	0.07 *

Notes: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The three conflict-related victimization indices are defined in Section IV.1 and range between 0, and respectively 7, 4, 4 and 2. In the 2002 survey, non-migrant households have lived in their current location (as of interview date) since December 1993; in the 2008 survey they are households in their current location since before the start of the war. Migration data is not available in the 2006 dataset. Education of the head of household and child's mother is proxied by an indicator variable for having attended school. The poverty rate is based on an asset index described in Section xx. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

**Table 2. Impact of Conflict on Child Health. Baseline Regressions. All Surveys. No Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]
Conflict region*War Cohort	-0.414**	-0.428**				
	(0.164)	(0.163)				
Conflict region*War Cohort*Female		-0.040				
		(0.160)				
Conflict region*Exposure 0-24 months			-0.444**	-0.508**		
			(0.206)	(0.220)		
Conflict region*Exposure at least 25 months			-0.395**	-0.393**		
			(0.180)	(0.177)		
Conflict region*Exposure 0-24 months*Female				0.067		
				(0.093)		
Conflict region*Exposure at least 25 months*Female				-0.068		
				(0.082)		
Conflict region*Exposure (no. of months)					-0.012***	-0.012***
					(0.004)	(0.004)
Conflict region*Exposure (no. of months)*Female						-0.002
						(0.002)
Female	0.217***	0.137	0.217***	0.137	0.217***	0.137
	(0.050)	(0.103)	(0.050)	(0.103)	(0.050)	(0.103)
Rural household	-0.484***	-0.473***	-0.484***	-0.473***	-0.484***	-0.473***
	(0.069)	(0.066)	(0.069)	(0.066)	(0.069)	(0.066)
Observations	15,173	15,173	15,173	15,173	15,173	15,173
R-squared	0.075	0.075	0.075	0.075	0.075	0.075

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. In columns 2, 4, 6 the coefficient estimates on interactions between 'Conflict region' or 'Exposure' variables and the female dummy were jointly statistically insignificant and are not shown. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

**Table 3. Impact of Conflict on Child Health. Baseline Regressions. All Surveys. With Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Conflict region*War Cohort	-0.344**	-0.383**	-0.362**	-0.393**								
	(0.145)	(0.154)	(0.136)	(0.141)								
Conflict region*War Cohort*Female			-0.038	-0.096								
			(0.110)	(0.127)								
Conflict region*Exposure 0-24 months					-0.371**	-0.401**	-0.444**	-0.478**				
					(0.168)	(0.176)	(0.188)	(0.203)				
Conflict region*Exposure at least 25 months					-0.324*	-0.373*	-0.319	-0.374*				
					(0.185)	(0.190)	(0.193)	(0.197)				
Conflict region*Exposure 0-24 months*Female							0.075	0.042				
							(0.115)	(0.122)				
Conflict region*Exposure at least 25 months*Female							-0.084	-0.105				
							(0.109)	(0.105)				
Conflict region*Exposure (no. of months)									-0.010**	-0.011**	-0.010**	-0.011**
									(0.004)	(0.005)	(0.004)	(0.005)
Conflict region*Exposure (no. of months)*Female											-0.002	-0.003
											(0.002)	(0.002)
Female	0.209***	0.217***	0.118	0.089	0.209***	0.217***	0.118	0.089	0.209***	0.217***	0.118	0.089
	(0.059)	(0.063)	(0.111)	(0.129)	(0.059)	(0.063)	(0.110)	(0.129)	(0.059)	(0.063)	(0.110)	(0.128)
Rural household	-0.415***	-0.416***	-0.404***	-0.402***	-0.415***	-0.416***	-0.404***	-0.402***	-0.415***	-0.416***	-0.404***	-0.402***
	(0.089)	(0.094)	(0.081)	(0.082)	(0.089)	(0.094)	(0.081)	(0.082)	(0.089)	(0.094)	(0.081)	(0.082)
Child controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Household head controls	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
Mother controls	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
<i>p-value F-test of zero effect of:</i>												
Child ethnicity	0.245	0.708	0.225	0.698	0.245	0.708	0.225	0.698	0.245	0.708	0.225	0.698
Child religion	0.041	0.195	0.042	0.186	0.041	0.195	0.042	0.186	0.041	0.195	0.042	0.186
Household head's characteristics	0.033		0.032		0.033		0.032		0.033		0.032	
Mother's characteristics		0.195		0.000		0.000		0.000		0.000		0.000
Observations	13,684	12,932	13,684	12,932	13,684	12,932	13,684	12,932	13,684	12,932	13,684	12,932
R-squared	0.083	0.101	0.083	0.101	0.083	0.101	0.083	0.101	0.083	0.101	0.083	0.101

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Child controls include ethnicity (Akan (reference category), Northern Mande, Southern Mande, Krou, Voltaique/Gur, naturalized Ivorian or non-Ivorian) and religion (Muslim, Christian, and other (reference category)).

Household head controls include age, gender, and education. Mother controls include age and education. In columns 3, 4, 7, 8, 11 and 12 the coefficient estimates on interactions between 'Conflict region' or 'Exposure' variables and the female dummy are jointly statistically insignificant and not shown. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).



**Table 4. Impact of Conflict on Child Health. Baseline Regressions on Sample Excluding Children Born After December 1999 Coup. All Surveys. With Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Conflict region*War Cohort	-0.894**	-0.980**	-0.971***	-1.036***								
	(0.322)	(0.353)	(0.302)	(0.337)								
Conflict region*War Cohort*Female			0.227*	0.114								
			(0.119)	(0.126)								
Conflict region*Exposure 0-24 months					-0.990***	-1.079***	-1.086***	-1.194***				
					(0.299)	(0.331)	(0.314)	(0.353)				
Conflict region*Exposure at least 25 months					-0.741*	-0.815**	-0.743*	-0.836**				
					(0.359)	(0.379)	(0.361)	(0.388)				
Conflict region*Exposure 0-24 months*Female							0.265**	0.236*				
							(0.105)	(0.123)				
Conflict region*Exposure at least 25 months*Female							0.065	0.039				
							(0.114)	(0.113)				
Conflict region*Exposure (no. of months)									-0.025**	-0.027**	-0.025**	-0.028**
									(0.010)	(0.010)	(0.010)	(0.011)
Conflict region*Exposure (no. of months)*Female											0.003	0.002
											(0.003)	(0.003)
Female	0.113	0.109	0.175*	0.104	0.113	0.109	0.175*	0.105	0.114	0.109	0.177*	0.107
	(0.069)	(0.086)	(0.093)	(0.114)	(0.069)	(0.086)	(0.093)	(0.113)	(0.069)	(0.086)	(0.093)	(0.113)
Rural household	-0.364**	-0.365**	-0.371**	-0.365**	-0.364**	-0.365**	-0.371**	-0.365**	-0.364**	-0.365**	-0.371**	-0.365**
	(0.140)	(0.146)	(0.142)	(0.143)	(0.140)	(0.146)	(0.142)	(0.143)	(0.139)	(0.146)	(0.142)	(0.143)
Child controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Household head controls	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
Mother controls	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
<i>p-value F-test of zero effect of:</i>												
Child ethnicity	0.490	0.513	0.498	0.511	0.490	0.513	0.498	0.511	0.489	0.513	0.497	0.511
Child religion	0.903	0.924	0.905	0.922	0.903	0.924	0.905	0.921	0.904	0.923	0.905	0.920
Household head's characteristics	0.009		0.007		0.009		0.007		0.009		0.007	
Mother's characteristics		0.924		0.001		0.001		0.001		0.001		0.001
Observations	10,148	9,551	10,148	9,551	10,148	9,551	10,148	9,551	10,148	9,551	10,148	9,551
R-squared	0.094	0.118	0.094	0.118	0.094	0.118	0.094	0.118	0.093	0.118	0.094	0.118

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Controls as in Table 3. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

**Table 5. Impact of Conflict on Child Health. Baseline Regressions on Different Sub-samples. All Surveys. No Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Poor	Non-poor	Girls	Boys	Rural	Urban	Head is educated	Head is not educated
Conflict region*War Cohort	-0.549** (0.255)	-0.303** (0.117)	-0.607** (0.269)	-0.294* (0.142)	-0.655** (0.238)	-0.008 (0.210)	-0.280 (0.272)	-0.507** (0.216)
Conflict region*War Cohort*Female	0.332 (0.215)	-0.209 (0.150)			-0.045 (0.138)	0.324* (0.180)	-0.048 (0.149)	-0.021 (0.224)
Female	0.273* (0.133)	0.106 (0.122)			0.217 (0.129)	0.152 (0.166)	0.111 (0.069)	0.179 (0.171)
Rural household	-0.016 (0.077)	-0.504*** (0.093)	-0.465*** (0.082)	-0.511*** (0.119)			-0.589*** (0.083)	-0.378*** (0.106)
Observations	4,718	10,032	7,355	7,818	8,763	6,410	6,712	8,435
R-squared	0.106	0.086	0.088	0.095	0.098	0.069	0.117	0.077

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. In columns 1, 2, and 5-8 the coefficient estimates on interactions between 'Conflict region' or 'War Cohort' and the female dummy are jointly statistically insignificant and not shown. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

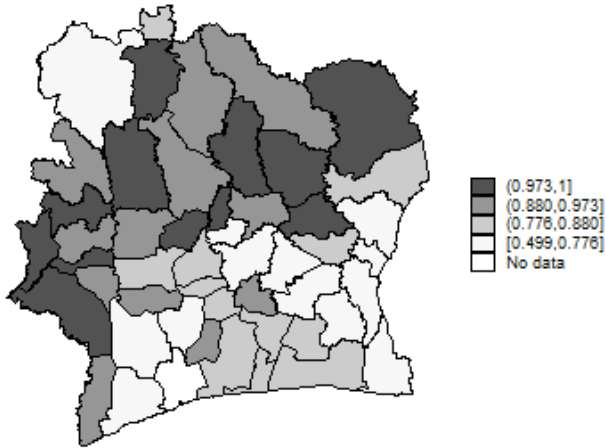
**Table 6. Response Tabulations for Conflict Victimization Indices**

	Conflict Region	Non- Conflict Region	Difference in Means [1]-[2]
	[1]	[2]	[3]
<i><u>Economic losses</u></i>			
Because of the conflict...			
Were your assets/properties damaged?	0.14	0.09	0.06 ***
Did your revenues decrease?	0.76	0.71	0.05 ***
Did you lose your job?	0.07	0.04	0.03 ***
Did you lose your farm?	0.04	0.04	0.00
Did you lose livestock?	0.05	0.04	0.01 *
Did you lose any other productive assets?	0.10	0.04	0.06 ***
Overall, has the conflict affected your life?	0.66	0.59	0.07 ***
<i><u>Health impairment</u></i>			
Do you experience conflict-related nightmares?	0.19	0.17	0.02
Do you experience conflict-related ailments (anxiety, stress)?	0.25	0.25	0.00
Did you experience any conflict-related illness?	0.15	0.11	0.04 *
Have you consulted a psychologist?	0.00	0.01	0.00
<i><u>Displacement</u></i>			
Have you been displaced by the conflict?	0.08	0.06	0.02 ***
Are you currently displaced by the conflict?	0.03	0.03	0.00
Did your household move because of the conflict?	0.10	0.08	0.03 ***
Did you have to hide because of the conflict?	0.22	0.18	0.04 **
<i><u>Victim of violence</u></i>			
Have you been a victim of conflict-related violence?	0.19	0.11	0.08 ***
Did you witness conflict-related deaths in the household?	0.17	0.15	0.02

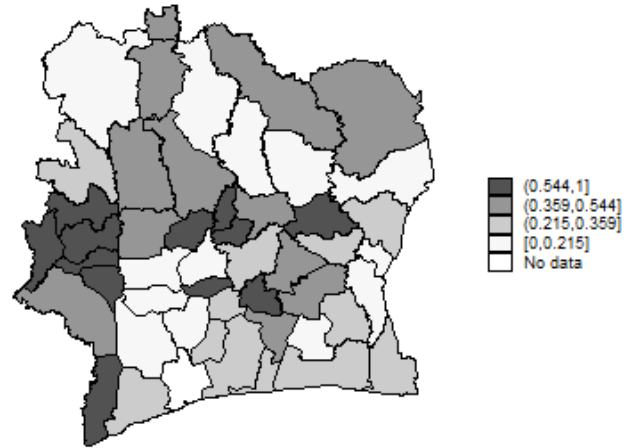
Notes: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The question "Overall, has the conflict affected your life?" refers to losses of economic activity, difficulties in caring for oneself or finding shelter, loss of employment, dropping out of school, losing parents, losing assets or goods, or experiencing complete destruction of assets or goods. The question "Have you been a victim of conflict-related violence?" refers to theft, rape, other sexual violence, being wounded, or experiencing other troubles. Significance levels (column 3) refer to one-sided t-tests of the null that variables means are higher inside than outside the conflict region. Estimates are weighted by inverse sampling probability. Data source: 2008 Côte d'Ivoire HLSS.

**Figure 4. Conflict Victimization Maps**

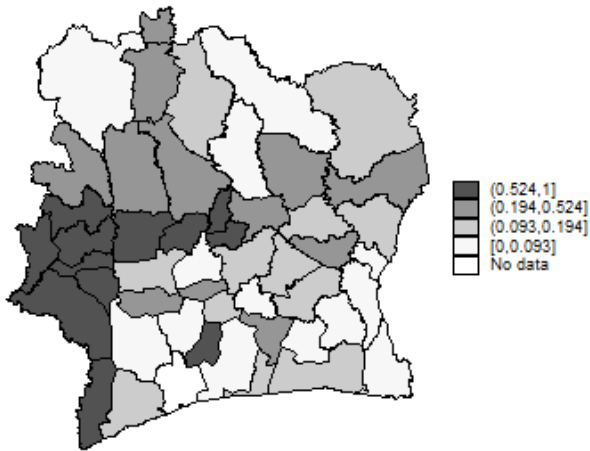
**Panel A. Economic losses**



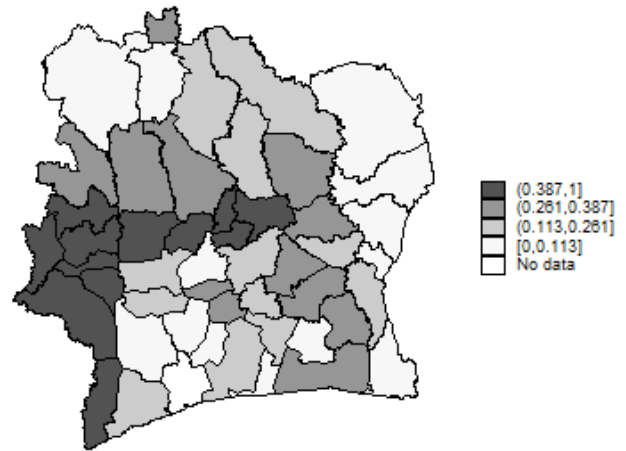
**Panel B. Health impairment**



**Panel C. Displacement**



**Panel D. Victim of violence**



Notes: Shaded areas represent regions where conflict-induced victimization was reported. Darker shades indicate a greater share of households reporting at least one level of victimization (one 'yes' answer to the questions underlying each index). In the legend, the "No data" category refers to the southern province Sassandra for which anthropometric information is missing for all observations in the 2008 survey. Data source: Based on the 2008 Côte d'Ivoire HLSS.

**Table 7. Evidence on Selection into Victimization. 2008 Survey.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Economic losses		Health impairment		Displacement		Victim of violence	
	Full	Non-migrants	Full	Non-migrants	Full	Non-migrants	Full	Non-migrants
Rural household	-0.107 (0.065)	-0.039 (0.078)	0.061 (0.036)	0.071** (0.033)	-0.071 (0.045)	0.004 (0.043)	-0.026 (0.035)	-0.002 (0.036)
Ethnicity: Northern Mande	-0.059 (0.088)	-0.042 (0.098)	-0.047 (0.091)	-0.134 (0.112)	-0.046 (0.080)	-0.091 (0.080)	-0.057 (0.044)	-0.103* (0.054)
Ethnicity: Southern Mande	0.271 (0.176)	0.309 (0.252)	0.363*** (0.114)	0.367*** (0.117)	0.203** (0.090)	0.184 (0.162)	0.327*** (0.067)	0.346*** (0.085)
Ethnicity: Krou	0.062 (0.115)	0.045 (0.105)	0.196* (0.111)	0.204 (0.125)	0.037 (0.109)	-0.047 (0.075)	0.119** (0.047)	0.098 (0.065)
Ethnicity: Voltaique/Gur	-0.075 (0.085)	0.002 (0.093)	0.058 (0.121)	0.037 (0.146)	-0.015 (0.084)	0.014 (0.100)	-0.048 (0.057)	-0.052 (0.065)
Ethnicity: Naturalized Ivorian	-0.146 (0.168)	-0.068 (0.212)	-0.154 (0.210)	-0.135 (0.253)	-0.525*** (0.142)	-0.451*** (0.155)	-0.198* (0.114)	-0.313*** (0.036)
Ethnicity: Non-Ivorian	-0.048 (0.074)	-0.038 (0.084)	-0.044 (0.074)	-0.082 (0.086)	0.058 (0.079)	0.042 (0.077)	-0.081* (0.043)	-0.102** (0.043)
Muslim	-0.096 (0.115)	0.039 (0.074)	-0.019 (0.064)	0.029 (0.090)	-0.164* (0.088)	-0.081 (0.076)	0.023 (0.034)	0.077* (0.041)
Christian	-0.109 (0.090)	-0.014 (0.088)	0.001 (0.039)	0.036 (0.052)	-0.041 (0.070)	-0.015 (0.049)	-0.024 (0.034)	0.018 (0.038)
Head's age	0.007** (0.003)	0.008** (0.003)	0.004** (0.002)	0.003 (0.002)	-0.001 (0.002)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Head's education	-0.029 (0.058)	-0.008 (0.080)	0.050 (0.038)	0.044 (0.036)	0.079** (0.031)	0.049 (0.033)	0.070*** (0.023)	0.066** (0.029)
Head is male	0.156 (0.098)	0.115 (0.138)	-0.131 (0.106)	-0.207 (0.141)	-0.086 (0.094)	-0.187 (0.127)	0.011 (0.046)	-0.044 (0.058)
Head is married	-0.085 (0.144)	-0.124 (0.144)	0.032 (0.104)	0.071 (0.119)	0.047 (0.111)	0.103 (0.117)	0.047 (0.049)	0.055 (0.063)
<i>p-value F-test of zero effect of:</i>								
Head's ethnicity	0.408	0.782	0.001	0.007	0.000	0.004	0.000	0.000
Head's religion	0.488	0.668	0.950	0.785	0.077	0.521	0.142	0.074
Head's other characteristics	0.009	0.043	0.021	0.008	0.146	0.214	0.034	0.155
Observations	4,157	3,449	4,249	3,521	4,253	3,526	4,292	3,557
R-squared	0.168	0.181	0.124	0.139	0.205	0.207	0.188	0.195

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variables are the conflict-related victimization indices. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. All estimates are weighted by inverse sampling probability. Data source: 2008 Côte d'Ivoire HLSS.

**Table 8. Impact of Conflict-Related Victimization on Child Health, by Sub-sample. 2008 Survey. With Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	<u>Economic losses</u>			<u>Health impairment</u>			<u>Displacement</u>			<u>Victim of violence</u>		
	Full	Girls	Boys	Full	Girls	Boys	Full	Girls	Boys	Full	Girls	Boys
Full sample, child and hh head controls	-0.131*** (0.043)	-0.096 (0.063)	-0.162** (0.066)	-0.073 (0.064)	-0.019 (0.076)	-0.133 (0.085)	0.028 (0.068)	0.024 (0.094)	0.063 (0.103)	-0.109 (0.110)	-0.070 (0.196)	-0.162 (0.103)
Full sample, child and mother controls	-0.100** (0.047)	-0.096 (0.064)	-0.114* (0.057)	-0.085 (0.055)	-0.009 (0.078)	-0.154* (0.081)	0.030 (0.080)	0.037 (0.110)	0.057 (0.113)	-0.140 (0.110)	-0.081 (0.209)	-0.187* (0.099)
Non-migrants, child and hh head controls	-0.142*** (0.033)	-0.107 (0.064)	-0.195** (0.076)	-0.047 (0.079)	-0.008 (0.086)	-0.115 (0.110)	0.001 (0.087)	-0.009 (0.104)	-0.037 (0.139)	-0.109 (0.110)	-0.143 (0.194)	-0.120 (0.138)
Non-migrants, child and mother controls	-0.098** (0.039)	-0.101 (0.063)	-0.126* (0.069)	-0.066 (0.073)	-0.022 (0.090)	-0.123 (0.104)	-0.005 (0.099)	-0.052 (0.122)	-0.019 (0.150)	-0.125 (0.108)	-0.203 (0.188)	-0.082 (0.115)
<i>p-value t-test that coefficients for migrant and non-migrant households are equal</i>												
specifications with child and hh head controls	0.569	0.678	0.146	0.555	0.817	0.877	0.907	0.607	0.159	0.654	0.192	0.365
specifications with child and mother controls	0.853	0.592	0.499	0.892	0.846	0.822	0.731	0.726	0.311	0.523	0.094	0.194

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Each cell in the first four rows shows estimated coefficients on victimization indices from a regressions estimated on the full sample and the sub-samples of boys and girls. The top two rows report coefficients from the regressions on the full sample, while the next two rows refer to the sub-sample of non-migrant households (i.e., households that have lived in their current location since before the start of the war). The bottom two rows report p-values from a t-test of equality of coefficients across migrant and non-migrant households. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Controls as in Table 3. All estimates are weighted by inverse sampling probability. Data source: 2008 Côte d'Ivoire HLSS.

**Table 9. Exploring the Victimization Mechanisms of Conflict. 2002 and 2008 Surveys. With and Without Controls. Full Sample.**

Full sample	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	Economic losses			Health impairment			Displacement			Victim of violence		
Conflict region*Victimization	-0.305*** (0.077)	-0.291*** (0.073)	-0.305*** (0.092)	-0.568*** (0.181)	-0.530*** (0.181)	-0.635*** (0.146)	-0.433** (0.189)	-0.417** (0.168)	-0.484** (0.188)	-0.647*** (0.194)	-0.615*** (0.185)	-0.783*** (0.255)
Victimization	0.009 (0.068)	-0.010 (0.071)	0.027 (0.089)	0.258** (0.123)	0.210* (0.117)	0.233** (0.099)	0.223** (0.103)	0.209* (0.101)	0.236* (0.118)	0.211 (0.161)	0.146 (0.172)	0.207 (0.182)
Conflict region*Victimization*Female	0.162 (0.106)	0.157 (0.097)	0.104 (0.102)	0.126 (0.168)	0.116 (0.178)	0.141 (0.148)	0.119 (0.228)	0.159 (0.207)	0.126 (0.214)	0.408 (0.404)	0.350 (0.395)	0.400 (0.376)
Female	0.137 (0.122)	0.118 (0.111)	0.089 (0.130)	0.137 (0.122)	0.118 (0.111)	0.089 (0.130)	0.137 (0.122)	0.118 (0.111)	0.089 (0.130)	0.137 (0.122)	0.118 (0.111)	0.089 (0.130)
Rural household	-0.472*** (0.085)	-0.403*** (0.082)	-0.400*** (0.083)	-0.472*** (0.085)	-0.402*** (0.082)	-0.400*** (0.083)	-0.472*** (0.085)	-0.402*** (0.082)	-0.400*** (0.083)	-0.472*** (0.085)	-0.403*** (0.082)	-0.400*** (0.083)
Child controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
Household head controls	no	yes	no	no	yes	no	no	yes	no	no	yes	no
Mother controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
<i>p-value F-test of zero effect of:</i>												
Child ethnicity		0.233	0.711		0.232	0.709		0.232	0.709		0.232	0.710
Child religion		0.044	0.192		0.044	0.192		0.044	0.192		0.044	0.192
Household head's characteristics		0.034			0.034			0.034			0.034	
Mother's characteristics			0.000			0.000			0.000			0.000
Observations	7,828	7,742	6,979	7,868	7,783	7,019	7,882	7,794	7,026	7,886	7,799	7,034
R-squared	0.076	0.083	0.102	0.076	0.083	0.102	0.076	0.083	0.102	0.075	0.083	0.102

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Controls as in Table 3. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, and Raleigh et al. (2010).

**Table 10. Exploring the Victimization Mechanisms of Conflict. 2002 and 2008 Surveys. With and Without Controls. Non-migrants.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	Economic losses			Health impairment			Displacement			Victim of violence		
Conflict region*Victimization	-0.262**	-0.237**	-0.254**	-0.581***	-0.529**	-0.614***	-0.469	-0.421	-0.519	-0.651*	-0.600*	-0.669*
	(0.101)	(0.096)	(0.098)	(0.201)	(0.209)	(0.173)	(0.287)	(0.280)	(0.305)	(0.324)	(0.328)	(0.344)
Victimization	-0.054	-0.076	-0.026	0.289**	0.226*	0.262*	0.272	0.203	0.323	0.252	0.168	0.234
	(0.100)	(0.101)	(0.102)	(0.130)	(0.127)	(0.128)	(0.222)	(0.218)	(0.215)	(0.237)	(0.248)	(0.233)
Conflict region*Victimization*Female	0.082	0.070	0.028	0.228	0.211	0.244	0.300	0.323	0.354	0.368	0.304	0.422
	(0.143)	(0.146)	(0.155)	(0.199)	(0.205)	(0.182)	(0.400)	(0.353)	(0.419)	(0.586)	(0.602)	(0.619)
Female	0.151	0.139	0.132	0.151	0.139	0.132	0.151	0.139	0.132	0.151	0.139	0.132
	(0.128)	(0.114)	(0.141)	(0.128)	(0.114)	(0.140)	(0.128)	(0.114)	(0.141)	(0.128)	(0.114)	(0.141)
Rural household	-0.422***	-0.344***	-0.370***	-0.422***	-0.344***	-0.370***	-0.422***	-0.344***	-0.370***	-0.422***	-0.344***	-0.370***
	(0.114)	(0.111)	(0.123)	(0.114)	(0.111)	(0.123)	(0.114)	(0.111)	(0.123)	(0.114)	(0.111)	(0.123)
Child controls	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
Household head controls	no	yes	no	no	yes	no	no	yes	no	no	yes	no
Mother controls	no	no	yes	no	no	yes	no	no	yes	no	no	yes
<i>p-value F-test of zero effect of:</i>												
Child ethnicity		0.369	0.792		0.366	0.792		0.367	0.793		0.367	0.793
Child religion		0.067	0.162		0.067	0.162		0.066	0.162		0.067	0.162
Household head's characteristics		0.047			0.047			0.046			0.047	
Mother's characteristics			0.000			0.000			0.000			0.000
Observations	5,938	5,873	5,257	5,966	5,901	5,284	5,982	5,916	5,296	5,983	5,917	5,300
R-squared	0.066	0.075	0.089	0.066	0.075	0.089	0.066	0.075	0.089	0.066	0.075	0.089

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The dependent variable is the height-for-age z-score. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Controls as in Table 3. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, and Raleigh et al. (2010).



## Auxiliary Tables and Figures

**Table A1. Average Child Health and Pre-Conflict Poverty Rates By Region**

	Pre-conflict poverty rate	Average height-for-age z-score		
		2002 HLSS	2006 MICS3	2008 HLSS
Agenby	0.12	-1.44	-1.49	-1.25
Bafing	0.61	-1.79	-1.33	-2.01
Bas-Sassandra	0.60	-2.52	-1.79	-1.52
Denguele	0.53	-1.51	-1.58	-1.36
Fromager	0.08	-0.87	-1.38	-1.37
Haut-Sassandra	0.42	-1.84	-1.41	-1.50
La Marahue	0.21	-2.34	-1.51	-1.70
Lacs	0.18	-1.19	-1.39	-1.28
Lagunes	0.14	-1.70	-1.21	-1.16
Montagnes	0.62	-2.18	-1.56	-1.73
Moyen Cavally	0.57	-1.82	-1.45	-2.43
Moyen Comoe	0.17	-1.69	-1.38	-1.41
N'zi Comoe	0.32	-2.20	-1.60	-1.91
Savane	0.41	-2.11	-1.76	-2.12
Sud Bandama	0.39	-2.35	-1.73	-1.90
Sud Comoe	0.29	-2.13	-1.44	-1.51
Vallee du Bandama	0.34	-1.72	-1.29	-1.22
Worodougou	0.49	-2.15	-1.49	-2.27
Zanzan	0.59	-1.80	-2.04	-1.37
<b>Conflict regions</b>	0.34	-1.88	-1.49	-1.50
<b>Non-conflict regions</b>	0.40	-2.03	-1.59	-1.60
<b>Total</b>	0.35	-1.92	-1.52	-1.53

Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

**Table A2. Correlation Matrix for Number of Conflict Events and Share of Households Reporting At Least One Level of Victimization**

	Conflict Region	Economic losses	Health impairment	Displacement
Economic losses	0.0965			
Health impairment	0.1118	0.7678*		
Displacement	0.1256	0.4395*	0.6100*	
Victim of violence	0.1979	0.4472*	0.5882*	0.8588*

Notes: \* significant at 1%. Data sources: 2008 Côte d'Ivoire HLSS and Raleigh et al. (2010).

**Table A3. Average Household Profile Inside and Outside Conflict Regions, 2002 Survey vs. 2006 & 2008 Surveys.**

	Unconditional				Conditional			
	Conflict Region		Non-Conflict Region		Conflict Region		Non-Conflict Region	
	[1] Coeff.	[2] S.E.	[3] Coeff.	[4] S.E.	[5] Coeff.	[6] S.E.	[7] Coeff.	[8] S.E.
Rural household	0.031	(0.043)	0.089	(0.053)	0.072	(0.046)	0.104**	(0.037)
Poor household	-0.052	(0.031)	-0.080**	(0.029)	-0.027	(0.020)	-0.078	(0.053)
Head's age	-0.705	(0.666)	0.823	(0.763)	-0.416	(0.660)	1.197*	(0.641)
Head's education	0.019	(0.031)	0.051	(0.044)	0.011	(0.024)	0.047	(0.033)
Head is male	-0.011	(0.010)	0.005	(0.023)	-0.004	(0.010)	0.020	(0.020)
<i>Head's ethnicity</i>								
Akan	0.054	(0.036)	-0.023	(0.050)	0.029	(0.021)	0.039	(0.041)
Northern Mande	0.012	(0.024)	0.034	(0.035)	0.006	(0.024)	0.022	(0.031)
Southern Mande	-0.050*	(0.026)	0.008	(0.013)	-0.003	(0.023)	-0.004	(0.010)
Krou	0.014	(0.040)	0.055*	(0.031)	0.021	(0.034)	0.021	(0.017)
Voltaïque/Gur	0.089**	(0.038)	0.014	(0.014)	0.064**	(0.026)	0.025	(0.014)
Naturalized Ivorian	-0.002	(0.002)	0.001	(0.003)	-0.001	(0.002)	0.001	(0.003)
Non-Ivoirian	-0.119***	(0.030)	-0.090*	(0.043)	-0.116***	(0.026)	-0.104	(0.070)
<i>Head's religion</i>								
Muslim	0.016	(0.044)	0.037	(0.034)	0.011	(0.038)	0.013	(0.029)
Christian	0.021	(0.043)	-0.047	(0.068)	-0.006	(0.035)	-0.036	(0.046)
Other	-0.038	(0.049)	-0.003	(0.047)	-0.006	(0.040)	0.010	(0.034)
Mother's age	0.204	(0.231)	0.559	(0.350)	-0.196	(0.375)	0.693*	(0.364)
Mother's education	0.042	(0.032)	0.033	(0.053)	0.025	(0.027)	0.051	(0.031)

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The table reports coefficient estimates from regressing household or household head characteristics on an indicator variable for observations from the 2006 and 2008 surveys. In columns 1-4 no controls are included. In columns 5-8 province fixed effects are included. All estimates are weighted by inverse sampling probability. Data sources: 2002 and 2008 Côte d'Ivoire HLSS, 2006 Côte d'Ivoire MICS3, and Raleigh et al. (2010).

**Table A4. Testing for Differential Exposure to Victimization across Migrant and Non-migrant Households. 2008 Survey. With Controls.**

	Household migrated during the conflict		Household head was displaced because of the conflict		Household moved because of the conflict	
	[1] Coeff.	[2] S.E.	[3] Coeff.	[4] S.E.	[5] Coeff.	[6] S.E.
<i>Economic losses</i>						
Because of the conflict...						
Were your assets/properties damaged?	0.082**	(0.032)	0.534***	(0.061)	0.524***	(0.066)
Did your revenues decrease?	-0.045	(0.039)	0.120***	(0.031)	0.130***	(0.039)
Did you lose your job?	0.106***	(0.030)	0.255***	(0.061)	0.203***	(0.067)
Did you lose your farm?	0.029	(0.035)	0.133*	(0.074)	0.124*	(0.068)
Did you lose livestock?	0.02	(0.024)	0.214***	(0.070)	0.205***	(0.067)
Did you lose any other productive assets?	0.033	(0.045)	0.124*	(0.070)	0.159**	(0.070)
Overall, has the conflict affected your life?	-0.028	(0.045)	0.217***	(0.062)	0.197***	(0.064)
<i>Health impairment</i>						
Do you experience conflict-related nightmares?	0.024	(0.036)	0.269***	(0.069)	0.235***	(0.063)
Do you experience conflict-related ailments (anxiety, stress)?	0.057*	(0.032)	0.275***	(0.064)	0.235***	(0.055)
Did you experience any conflict-related illness?	0.060*	(0.031)	0.247***	(0.037)	0.269***	(0.052)
Have you consulted a psychologist?	0.036***	(0.011)	0.068*	(0.037)	0.038*	(0.021)
<i>Displacement</i>						
Have you been displaced by the conflict?	0.151***	(0.035)	1.000***	(0.000)	0.691***	(0.059)
Are you currently displaced by the conflict?	0.129***	(0.022)	0.391***	(0.106)	0.275***	(0.073)
Did your household move because of the conflict?	0.123***	(0.032)	0.841***	(0.027)	1.000***	(0.000)
Did you have to hide because of the conflict?	0.118*	(0.062)	0.589***	(0.062)	0.585***	(0.074)
<i>Victim of violence</i>						
Have you been a victim of conflict-related violence?	0.035	(0.040)	0.352***	(0.103)	0.308***	(0.087)
Did you witness conflict-related deaths in the household?	0.074**	(0.027)	0.159***	(0.040)	0.147**	(0.055)

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The table reports coefficient estimates from regressing victimization indicator variables on a dummy variable for non-migrant households according to different definitions (see Section IV.2). Control variables include dummies for rural residence, poor households, household head characteristics (age, gender, education, marital status, ethnicity, and religion), and province fixed effects.

All estimates are weighted by inverse sampling probability. Data sources: 2008 Côte d'Ivoire HLSS.

**Table A5. Impact of Conflict-Related Victimization on Child Health. 2008 Survey. Alternative Definitions of Non-migrant Households. With Controls.**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
	<u>Economic losses</u>			<u>Health impairment</u>			<u>Displacement</u>			<u>Victim of violence</u>		
	Full	Girls	Boys	Full	Girls	Boys	Full	Girls	Boys	Full	Girls	Boys
Non-migrants 1/, child and hh head controls	-0.154*** (0.040)	-0.093 (0.070)	-0.217** (0.081)	-0.067 (0.076)	-0.046 (0.098)	-0.140 (0.092)	-0.080 (0.147)	-0.268 (0.205)	0.072 (0.185)	-0.176 (0.109)	-0.139 (0.207)	-0.243* (0.119)
Non-migrants 1/, child and mother controls	-0.108** (0.046)	-0.093 (0.074)	-0.150** (0.069)	-0.087 (0.070)	-0.061 (0.099)	-0.175* (0.086)	-0.068 (0.140)	-0.311 (0.236)	0.067 (0.184)	-0.223** (0.106)	-0.170 (0.196)	-0.306** (0.125)
Non-migrants 2/, child and hh head controls	-0.145** (0.051)	-0.086 (0.083)	-0.215** (0.092)	-0.063 (0.072)	-0.032 (0.092)	-0.128 (0.090)	-0.071 (0.174)	-0.278 (0.202)	0.075 (0.248)	-0.187 (0.110)	-0.153 (0.192)	-0.241** (0.113)
Non-migrants 2/, child and mother controls	-0.092 (0.061)	-0.065 (0.090)	-0.144* (0.081)	-0.076 (0.069)	-0.014 (0.102)	-0.161* (0.083)	-0.021 (0.182)	-0.160 (0.284)	0.040 (0.258)	-0.244** (0.100)	-0.166 (0.186)	-0.302** (0.107)
<i>p-value t-test that coefficients for migrant and non-migrant households are equal</i>												
specifications 1/ with child and hh head controls	0.135	0.207	0.278	0.981	0.571	0.737	0.447	0.092	0.963	0.176	0.278	0.330
specifications 1/ with child and mother controls	0.503	0.171	0.697	0.861	0.228	0.733	0.571	0.052	0.718	0.220	0.211	0.407
specifications 2/ with child and hh head controls	0.579	0.619	0.654	0.640	0.849	0.909	0.666	0.096	0.775	0.158	0.428	0.375
specifications 2/ with child and mother controls	0.653	0.964	0.861	0.550	0.955	0.916	0.865	0.352	0.643	0.161	0.440	0.362

Notes: Robust standard errors in parentheses, clustered at the province level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Each cell in the first four rows shows estimated coefficients on victimization indices from a regressions estimated on the full sample and the sub-samples of boys and girls. The top two rows report coefficients from the regressions on the sub-sample of non-migrant households (alternative definition 1) of household responded negatively to the question “Were you displaced by the conflict?”. The next two rows refer to the sub-sample of non-migrant households (alternative definition 2) that responded negatively to the question “Did you have to move your household because of the conflict?”. The bottom four rows report p-values from a t-test of equality of coefficients across migrant and non-migrant households. All regressions include province fixed effects, month-of-birth fixed effects, and province-specific time trends. Controls as in Table 3. All estimates are weighted by inverse sampling probability. Data source: 2008 Côte d’Ivoire HLSS.