Unpacking the Links between Conflict and Child Health: Evidence from a Foreign Insurgency *

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Abstract

Violent conflict has enduring effects on child health, but the speed at which these effects manifest is not fully understood. This study investigates the immediate effects of deteriorating security environment caused by foreign-borne insurgent terrorism on children's health, using data from a decade before to shortly after the Nigerian Boko Haram insurgency extended across the border to Cameroon. Boko Haram attacks decrease weight-for-height for children under five – an indicator of short-term health and nutrition – within an average of 2.6 months after the attacks. This effect is likely driven by a reduction in healthcare service utilization, which can exacerbate the prevalence and the severity of conditions such as fever and diarrhea. However, the attacks do not affect dietary diversity or child mortality. The results underscore the importance of maintaining healthcare service accessibility following the eruption of violence to prevent irreversible impacts, a concern that is increasingly relevant for countries combating the infiltration of foreign terrorists.

Keywords: Terrorism, Boko Haram, Child health and nutrition, anthropometry, Cameroon.

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1 Introduction

Violent conflict can have enduring effects on children's health and well-being, often persisting long after the violence has ended. However, these longer-term consequences can be mitigated by taking rapid policy action at the onset of violent eruptions. This is particularly relevant for the growing number of West African countries that are currently combating terrorism along their borders (ECFR, 2022).

Conflict has been found to increase stunting, the leading cause of child mortality (Bundervoet, Verwimp, and Akresh, 2009; Akresh, Verwimp, and Bundervoet, 2011; Akresh, Lucchetti, and Thirumurthy, 2012; Minoiu and Shemyakina, 2012; Minoiu and Shemyakina, 2014).[1] These effects on stunting, that is, a child under five years of age having a low Height-for-Age (HAZ), are often observed after at least one year of exposure to conflict or after the conflict has ended. However, the immediate pathways that ultimately lead to children's stunting in conflict areas are not fully understood. Low Weight-for-Height (WHZ), a measure of acute malnutrition, is a precursor to stunting (Isanaka et al., 2019; Thurstans et al., 2022). Weight decreases rapidly under adverse conditions, while the effects on height take longer to manifest. During times of conflict, children's weight could decrease for example due to higher prevalence of illnesses and the lack of healthcare, or changes in nutritional intake, when food production and markets are disrupted. Given the severe and lasting consequences of stunting into adulthood – including diminished educational attainment, lower earnings, and poorer health outcomes (Dewey and Begum, 2011; Black et al., 2013) – it is important to understand how acute malnutrition progresses to stunting.

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[1] Related studies show that child health outcomes are affected in-utero, as children born during conflict have been found to have lower birth weight (Mansour and Rees, 2012; Grossman, Khalil, and Ray, 2019) and poorer health after birth (Oskorouchi, 2019).

We examine the immediate impacts of conflict on children's short-term health outcomes, namely, WHZ and its precursors, illnesses, health care utilization, and nutrition just under three months after the first violent eruptions. We further confirm the longer-term effects on stunting four years after the eruption of violence. Our empirical strategy leverages the eruption of terrorist violence in northern Cameroon, which was unexpectedly affected by the rise of the Boko Haram insurgency that spread from northeast Nigeria to Cameroon and which therefore was largely unrelated to the grievances of the Cameroonian population. We use spatial variation in the intensity of conflict, measured by the total number of fatalities, to assess the impact on children's short-term health outcomes. Children living in survey clusters within a 20-km radius of Boko Haram violence are considered affected, while those outside this radius are treated as unaffected. Additionally, we use three nationally representative household surveys: one collected within months after the first attacks in northern Cameroon and, to control for pre-conflict outcomes, two collected up to a decade before the conflict, during a long period of peace and stability in the country.[2] For data on conflict-related fatalities, we utilize the geo-coded Armed Conflict Location and Event Data Project (ACLED) database (Raleigh et al., 2010) to determine which survey clusters were located near fatal Boko Haram attacks.

We find that in the matter of an average of 2.6 months, eruptions of conflict decreased children's weight. We find a decrease in WHZ by 0.05 standard deviations and an increase in extreme wasting – a severe form of acute malnutrition – by 0.4 percentage points, a 14 percent increase for conflict-exposed under-five children. As expected, we do not find that children's height responded to conflict during the 2.6-month period as measured by HAZ and stunting, as stunted growth is a longer-term response to weight loss, sustained deterioration of nutrition, and spells of illnesses (Isanaka et al., 2019; Thurstans et al., 2022). However, using data from 2018, we do find longer-term effects on stunting among

[2] The surveys used are the Multiple Indicator Cluster Survey (MICS) 2014 by UNICEF (UNICEF/INS, 2014) and the Demographic and Health Surveys (DHS) by USAID from 2011 and 2004 (Institut National de la Statistique (INS), 2004; Institut National de la Statistique (INS), 2012).

children who were babies in 2014, a finding in line with the previous literature. Various measures of infant and child mortality remain unaffected. The results are robust to the exclusion of control variables, as well as to various specification changes.

Reductions in weight can occur immediately as a response to illnesses or inadequate nutritional intake (World Health Organisation, 2021). Indeed, we find a slight increase in the prevalence of diarrhea, which may be an immediate consequence of, for example, drinking impure water or digesting low-quality food, but no effect on fever or cough, common symptoms of malaria. The severity of the illnesses may have worsened due to decreased access to health services. We find an associated decrease in the propensity to seek treatment from healthcare professionals. Given that over a fifth of children were reported having had diarrhea and fever in the last two weeks, this decrease may have aggravated the health consequences of these highly prevalent illnesses. The result may be due to the insurgents having destructed and damaged healthcare centers, deteriorating their operational capacity (International Crisis Group, 2017b). It is also possible that heightened insecurity prevented households from making a safe trip to the nearest health facility.

We do not find that eruptions of conflict lead to lower dietary diversity, which was extremely low among the study population even before the conflict, as on average children only consumed from two food groups, of the four, which is regarded as the minimum threshold for dietary diversity (UNICEF, 2016). We observe some changes in the composition of less often consumed food groups, which may result from changes in the portfolio of crops and livestock holdings as a response to conflict (Rockmore, 2020). Particularly, an increase in the consumption of solid foods for 24-36-month-old children may explain a lower reduction of WHZ for them than for smaller infants. These results may be explained by on one hand, the short time span of the study, during which households may have had food buffers. Even if the conflict had resulted in food shortages, households may have prioritized food intake of children under 36 months of age over that of older household members. This may well be the case given the low dietary diversity of children's food consumption before the eruption of conflict.[3]

Our paper contributes to the existing literature on the effects of violent conflict on children by investigating the immediate pathways through which conflict affects child health in the long term. Stunted growth is an indicator of irreversible damage to child development that can lead to death or to long-term consequences to adult health (Akresh et al., 2012; Akresh et al., 2023; Dewey and Begum, 2011). Previous literature has documented a sustained effect of conflict on child HAZ and stunting several years after the eruption of violence in the context of the war between Eritrea and Ethiopia (Akresh, Lucchetti, and Thirumurthy, 2012), the civil war in Burundi (Bundervoet, Verwimp, and Akresh, 2009), Rwanda (Akresh, Verwimp, and Bundervoet, 2011), the Ivory Coast (Minoiu and Shemyakina, 2012; Minoiu and Shemyakina, 2014); and infant mortality (accompanied by a decrease in WHZ) in the Boko Haram conflict in Nigeria (Ekhator-Mobayode and Asfaw, 2019).[4] By using data collected in three months from the conflict eruption, our evidence adds to this literature by focusing on the immediate impacts on variables for which such changes are detectable, namely, WHZ, as well as diseases, and inputs affecting these outcomes such as the treatment of illnesses and nutritional intake. Given that height is a stock variable, persistent harmful disruptions to child development need to occur for a child to become stunted. Investigating WHZ and diseases is thus crucial to understanding. This is important from a policy perspective, as the negative effects on WHZ, illnesses, and health care utilization can be reversed with timely interventions.

We also expand the literature on the consequences of conflict on health by studying a

[3]Related literature shows that rising insecurity can decrease the efficiency of food markets, and insurgent attacks against farms can disrupt farming activities and farmers' access to their plots. Through such mechanisms, conflict can reduce *household* food security: Adelaja and George, 2019 show that the Boko Haram conflict decreased food production in Nigeria, and Justino (2012), Kaila and Azad (2023), Rockmore (2017), and Adong et al. (2021) show a decrease in household consumption due to conflict, Kaila and Azad (2023) in the context of the Boko Haram insurgency. Our research differs from these studies in that it analyzes the near-term effects on small children, while the aforementioned studies look at longer periods.

[4]Ekhator-Mobayode and Asfaw (2019) also finds a reduction in WHZ alongside infant mortality but after 5 years of the start of the conflict in Nigeria.

case, where insurgent violence spilled over to a neighboring country, an increasing common phenomenon in West Africa (Durmaz, 2022).[5] Northern Cameroon's economic and social conditions did not contribute to the emergence of Boko Haram, an insurgency that targets the Nigerian government and society. In fact, Boko Haram violence in Cameroon disrupted a long period of peace and security. Before the violence spread over, Northern Cameroon was merely a safe haven and a logistical base for insurgents. In the first year of violence in Cameroon, the attacks occurred predominantly between the Cameroonian security forces and Boko Haram, while in Nigeria, terrorist attacks targeting civilians were a relatively more often used form of violence. Therefore, it is not clear ex-ante how this type of violence affected the Cameroonian civilians. Our study thus differs from the existing literature on conflict and child health, which examines the effects of conflict in contexts where the government and civilians have been active participants in either domestic or international conflict. Akresh, Verwimp, and Bundervoet (2011), Bundervoet, Verwimp, and Akresh (2009), Minoiu and Shemyakina (2012), Minoiu and Shemyakina (2014), Ekhator-Mobayode and Asfaw (2019), and Grossman, Khalil, and Ray (2019) focus on the consequences of domestic conflict, Related studies also focus on conflict between countries or regions, such as Akresh et al. (2012), who analyze the health consequences of the Ethiopia-Eritrea war[6]

This paper proceeds as follows. In section 2 we discuss the Nigerian Boko Haram insurgency in Cameroon. In section 3 we discuss the conceptual framework, in section 4 we present the data used in the analysis, and in section 5 we present the empirical framework. Section 6 presents the results, and finally, the last section concludes.

[5]Specifically, conflicts in West Africa are spilling over from the Sahelian countries towards the coastal countries.

[6]A related literature on child education also focuses on domestic conflict (Shemyakina, 2011; Swee, 2015; Monteiro and Rocha, 2017; Bertoni et al., 2019) and on conflict between regions (Brück, Di Maio, and Miaari (2019) and Di Maio and Nandi (2013), who investigate the effects of the Israel-Palestine conflict on education in the West Bank).

2 The Nigerian Boko Haram Insurgency in Cameroon

Boko Haram represents a jihadist ideology that opposes Western influence and education in Nigeria, with the aim to establish an Islamic state in Nigeria. Boko Haram was formed in 2002, and the group started attacks against the Nigerian government and civilians in 2009. The center of the Boko Haram operations is in the northeastern state of Borno, with its capital Maiduguri - an urban center at the heart of the conflict and Boko Haram's headquarters - being located only 140 km from the Cameroonian border by road. At the peak of Boko Haram's power in 2013-14, violence spread across the border to northern Cameroon, a region bordering northeastern Nigeria, Chad, and Niger in the Lake Chad area. Partly due to this proximity, Cameroon is the most affected foreign nation among the countries in the Lake Chad region. Figure 1a displays how Cameroon is situated within West and Central Africa, and the area inside the square shows northern Cameroon and illustrates how it borders northeast Nigeria.

The eruption of the Boko Haram violence in 2013-14 was unprecedented in Cameroon, as the country has been relatively peaceful since the 1970s. This long period of peace was sustained throughout the democratic transition in 1990. Cameroon has, therefore, been an exception in the region, given that countries bordering Cameroon – Nigeria, Chad, and the Central African Republic – experienced civil wars and conflict during the recent decades. Figure 2 panel (a) shows that conflict events in Cameroon started in 2013 and peaked in 2014, breaking a long peaceful period in Cameroon. The evolution of the number of fatalities in those incidents closely follows this pattern. Figure 2 panel (b) further shows that the fatalities that occurred in Cameroon since 2013 were from clashes in which Boko Haram was an actor.

Before violence spread over to Cameroon, Northern Cameroon was considered a safe haven for Boko Haram, when Nigerian counterinsurgency operations became more effective (International Crisis Group, 2016; Zenn, 2018). Cameroon was also considered important for logistical reasons (International Crisis Group, 2016). The insurgency gained a foothold in the local informal economy by engaging struggling traders in contraband trafficking. Even though the spread of the conflict was largely unrelated to the grievances of the Cameroonian population, the presence of a foreign terrorist group was of considerable concern.

However, the violent eruptions were quite different in Cameroon than in Nigeria: Of the conflict events involving Boko Haram in Nigeria since the start of the insurgency (between 2009 and 2014), 49 percent were classified as "Violence against civilians", while in Cameroon the share of these events was much lower, 21 percent (at the onset of the violence in the end of 2013 and during 2014). Indeed, 70 percent of all events in Cameroon were clashes between the Boko Haram and Cameroonian military or police, (those classified as "Battles" in the ACLED database).

Eventually, as the conflict grew stronger in Cameroon, there were similarities in the modes of attacks, namely, car bombings, kidnappings, and armed attacks against schools and health centers, disrupting their activities and leaving considerable infrastructural damage. By 2016, it was estimated that 128 out of 793 schools and 30 out of 217 health clinics had been destroyed or damaged (International Crisis Group, 2017b; Obi and Eboreime, 2017).

Figure 1b displays a map of the Boko Haram attacks as well as the survey clusters of our dataset. We can see that these violent attacks have affected households residing in the Far North region (the northernmost part of northern Cameroon), particularly those close to the Nigerian border. According to the International Crisis Group (2016), conflict events in the Far North region alone claimed the lives of 1,500 people. In 2018-19, it was estimated that more than 50 percent of households in the Far North (1.9 million people) needed humanitarian aid, and 222,000 children under five were suffering from acute malnutrition, including 60,000 with severe acute malnutrition (UN OCHA, 2019).

The capacity of northern Cameroon to overcome this crisis had been weak from the onset. The northern parts of the country are more sparsely inhabited, more rural, and more impoverished than the rest of Cameroon. In particular, the Far North has been the poorest and least educated region in Cameroon even before the Boko Haram crisis (Yenwong-Fai, 2019). Furthermore, the Far North is weakly integrated into the rest of the country, which may have further hindered its capacity to respond to the infiltration of foreign terrorists.

The conflict inside and outside of Cameroon could have potentially led to two types of population movements: Nigerians fleeing to northern Cameroon and Cameroonians in the north escaping to safer areas of the country. First, some Nigerians escaped to the relatively more peaceful Cameroon even before violence broke out on Cameroonian territory, although these movements were likely to be limited before 2012 as Jedwab et al. (2021) finds using remotely sensed data. There was no evidence of population movements from Nigeria to Cameroon outside refugee camps. However, by 2017, multiple years after our study period, the conflict between the Nigerian security forces and Boko Haram in north-east Nigeria intensified substantially, leading to over 75,000 Nigerians fleeing to Cameroon. Most of these refugees were being hosted in a camp, while an estimated 14,000 Nigerians lived in villages in Cameroon (UNHCR, 2017). Given the estimated population size of the northern study region in our sample (9.5 million people in 2014), the number of refugees from Nigeria is a meager fraction, just 0.2 percent in 2017. Second, the conflict could have led to Northern Cameroonians fleeing to safer areas in the country. However, data from internally displaced persons (IDPs) from UNHCR (2024) show that there were no IDPs in Cameroon between 2003 and 2014, while IDPs have been recorded only from 2015 onwards. Second, the closure of the road between North and South in 2014 essentially prevented movements from the north towards the south of Cameroon when violent conflicts erupted (International Crisis Group, 2017b).

3 Conceptual framework on child health

Our outcomes of interest comprise of both health inputs as well as outputs within a health production function. Specifically, our conceptual model builds on the health production function by Grossman (1972), which is the analytical point of departure for Maccini and Yang (2009) on illustrating the effect of early life shocks on health. The health production function resulting in a health stock H in time t can then be formulated as

$$H_t = f\left(H_0, N_1, \ldots, N_t, X, C_1, \ldots, C_t, D_1, \ldots D_t\right), \tag{1}$$

where H_0 is the initial health endowment determined by genetic factors at conception. Environmental factors and inputs start affecting the health stock right after conception and throughout life. The history of health inputs (e.g., nutritional intake and treatment for illnesses) is described by $N_1, \ldots, N_t$, chosen by the caretaker, while the health stock is also determined by exogenous factors, namely community infrastructure $C_1, \ldots, C_t$ and disease environment $D_1, \ldots, D_t$. We assume f is increasing in H_0, N_t, C_t and decreasing in D_t.

In our application, the Boko Haram insurgency could affect each time-varying factor of health production in multiple ways. First, health inputs may decrease. When the attacks disrupt economic activities, this can result in decreased household production or employment. The decreased household income can lead to a lower nutritional intake or a lack of treatment of illnesses. Second, community infrastructure may be destroyed. As noted in section 2, Boko Haram purposefully destroyed or damaged health and education facilities, which could prevent patients from seeking healthcare services. Even when the facilities are not destroyed, the danger posed by violent conflict could decrease access to health care suppliers. Third, conflict can also worsen the disease environment if security concerns prevent people from accessing services, such as clean water, outside their household. Finally, the possible interactions between these multiple channels may exacerbate the effect of the conflict. For example, diarrhea can increase due to changes in community infrastructure, such as reduced access to safe drinking water. Furthermore, the negative effect of diarrhea on overall health may further be compounded by the reduction in other health inputs, such as the inability to get treatment for the illness.

4 Data

We use three data sources for the empirical analysis: the 2014 Multiple Indicator Cluster Surveys (MICS), Demographic and Health Surveys (DHS) from 2004 and 2011, and Armed Conflict Location and Event Data (ACLED) database. DHS and MICS are nationally representative cross-sectional surveys that provide a range of indicators on under-five child welfare: anthropometric measures, the prevalence of illnesses, healthcare service utilization, nutrition, and many household-level information that we use to address the potential omitted variables bias. In additional analysis we also explore the time-use of older children in these households. Moreover, the datasets provide GPS information of the surveyed clusters, which we match with the geo-locations of the conflict events involving Boko Haram using the ACLED dataset.[7] We restrict our sample to northern Cameroon, which comprises four regions - the Far North, North, Adamaoua, and North West - that share borders with North-East Nigeria, where Boko Haram activities have been concentrated. Our sample covers 11,275 children aged 60 months or younger for child health and nutrition results. For the additional analysis on older children presented in Appendix B, we use data on 5-17 years old for child labor and education, 6,206 individuals. Finally, for the long-term analysis on HAZ and stunting, we use the 2018 DHS (in lieu of the 2014 data).

We measure health and nutritional status in early childhood using anthropometric

[7] The DHS surveys include an offset of the accurate cluster coordinates that are up to two kilometers and up to five kilometers in urban and rural areas, respectively, such that among rural clusters, an additional one percent of the clusters are displaced up to a 10-kilometer distance.

measures, WHZ and HAZ, following World Health Organization (WHO) guidelines. These measures are standardized z-scores, with the WHO reference mean zero for both. Our primary variable of interest is WHZ, as weight can fluctuate in the short run due to reasons such as illnesses, and HAZ to investigate the the long-run effects reported in the literature. Additionally, by using WHZ and HAZ, we construct indicator variables for acute and chronic malnutrition, namely, wasting and stunting, respectively. We also construct indicators for extreme wasting and stunting, which capture the most severe forms of malnutrition.[8]

To understand the mechanism of the immediate effect of conflict on children's nutritional and health status, we investigate a broader set of outcome variables, including the prevalence of fever and cough, and diarrhea in the two weeks preceding the survey date. Fever and cough are major symptoms of malaria. Severe diarrhea can be associated with, for example, dirty drinking water, and it can affect a child's weight within a short time. These illnesses can be detrimental for under-five children and, in worst cases, lead to death when prolonged and left untreated. Therefore, we also investigate healthcare utilization, which is measured by whether any medical treatment was sought in the case of a child's illness. We also examine the effects on diversity of nutritional intake for 0 to 36 month-old children. We measure nutritional diversity by constructing an aggregate measure– the number of food groups that the children consumed from, as well as an indicator for having consumed from more than four out of six food groups, which is an indicator of minimal dietary diversity for this age group (UNICEF, 2016). We also construct indicators for individual food groups which includes whether the child had starchy staples, legumes and nuts, meat and eggs, dairy, fruits, or vegetables in the 24 hours prior to the interview. [9]

[8]A child is defined wasted or stunted when their WHZ or HAZ score is two standard deviations below zero, respectively, while the threshold of three standard deviations below zero is used for extreme wasting and stunting.

[9]Additionally in Appendix B, we examine the effect of conflict on multiple time-use variables for activities both inside and outside the household for a sample of older children – 5 to 17 year-olds. We investigate children's work, defined as participation in economic activities and household chores. We also investigate

To identify conflict-affected households, we use information from the Armed Conflict Location and Event Data (ACLED) database on the dates and geo-locations of political violence events in Cameroon from 1997 to 2014. The dataset also provides information on the type of events, whether the events led to any fatalities, and the main actors involved in the event.[10] We use this information to construct our variable of interest: Boko Haram-related fatalities. We include fatalities in events where Boko Haram was recorded as one of the actors. We exclude riots and protests.[11] After these restrictions, our data includes 728 Boko Haram-related fatal events[12] that occurred between 2004 to 2014 in Cameroon and eastern Nigeria bordering Cameroon, with the number of fatalities ranging from 1 to 370.

We match this conflict information with the geo-location of surveyed clusters and the interview date to identify which households were exposed. We consider a household to be exposed to conflict if it is located within a 20km radius of a Boko Haram-related fatality.[13] Given how most eruptions of violence only occurred in 2014 shortly before the collection of the survey, the average duration for children exposed was just 2.6 months.[14] We use the number of fatalities in the last 3 months preceding the survey date as our main variable of interest that measures the intensity of the Boko Haram conflict.

Table 1 presents the mean and standard deviations of number of fatalities (Panel A), control variables (Panel B), outcome variables for 0-5 years old (Panel C), and outcome variable for the sample of children 5-17 years old (Panel D). Panel A shows that the aver-

schooling outcomes, namely i) whether a child attended school in the current school year, ii) whether a child stopped attending school this year (dropout), and iii) whether or not a child has ever studied in school. We use the last variable as a placebo outcome.

[10] Details on how ACLED collects data on political violence from various news sources and how violence incidents were classified is available at ACLED (2019).

[11] From Figure 2, we can see that the rise in violence is largely due to to Boko Haram clashing with the Cameroon military.

[12] We excluded Boko Haram events without fatalities. Fatalities may have been caused by any of the actors involved in the clash with Boko Haram.

[13] We run a sensitivity check with a 40km radius, and the results remain robust to this specification.

[14] This is the average number of months a child was exposed to conflict, conditional on exposure, which is calculated as the number of months between the first fatal event they were exposed to in the 20km radius, and the survey date.

age number of fatalities within 20km radius from the households is 21.8. In Panel B, we can see that the under-five children sample are 50 percent female, on average 29 months old, and live in a household with on average 8 members. Sample households are from low socioeconomic status. Educational attainment of mothers is low; just 49 percent of the mothers have received primary or higher education, indicating that more than 50 percent of the mothers had education less than the primary level. The sample is also predominantly rural 73 percent of children living in the rural area. Individuals in households where Christianity is the main religion comprise 50 percent of the sample, while 38 percent are from Muslim households.

Children in our sample also show poor nutritional status. Panel C shows that HAZ is -1.42, and WHZ -0.15 on average; that is, both are below the reference mean of zero in the WHO standardization. As many as 34 percent of the children experienced fever or cough and 24 percent diarrhea in 2 weeks prior to the survey. On average, the number of food groups that a child consumed from is 1.92, and only 17 percent of children consumed from more than 4 food groups in the 24 hours prior to the survey.

Children aged 5-17 are often engaged in work. Looking at Panel D of Table 1, we can observe that 55 percent of children had been working in an economic activity outside the household in the 7 days prior to the survey. As many as 77 percent of children are engaged in household tasks, while 62 percent are attending school. Over the last school year, just 1 percent had dropped out, but as many as 34 percent of children have never been to school.[15]

5 Empirical strategy

Our empirical strategy makes use of the sudden eruption of The Nigerian insurgency in Cameroon, and estimates near-term impacts of the eruption of violence on child out-

[15] We define dropout as children who had attended school in the previous school year, but not in the current (for MICS 2014), and using a direct question on school dropout for the DHS surveys.

comes. We pool three cross-sectional surveys, collected in 2004 and 2011 during a peaceful time-period, and in late 2014, shortly after the eruption of conflict in Cameroon.[16] Thus, we are able to estimate the near-term effects of being exposed to violence in the last 3 months on child outcomes, while controlling for a long pre-trend.

Specifically, we estimate the following linear regression equation:

$$Y_{i,r,w} = \alpha + x'_{i,r,w}\beta + \gamma \text{Fatalities}_{i,r,w} + \delta_{t,m} + \tau_w + \rho_r + \xi_{i,r,w} \tag{2}$$

where $Y_{i,r,w}$ denotes an outcome variable of interest of child i measured in survey wave w in district r. Fatalities$_{i,w}$ is the main explanatory variable, which denotes the number of fatalities in Boko Haram-related conflict events recorded in the ACLED dataset within the 20km radius in the last 3 months preceding the survey date, excluding riots and protests.[17] A similar specification of a conflict variable is also used in Bertoni et al., 2019 who analyze the effects of Boko Haram on educational outcomes, where the authors use 20km as a radius of conflict exposure. We follow this approach and note that this is a somewhat conservative specification as Bertoni et al. (2019) find their effects to be stronger with a smaller radius. We also run sensitivity checks with a wider 40km radius.[18]

The vector $x'_{i,r,w}$ captures child and household control variables: the gender of the child, household size, whether the head of the household is female, a dummy for a rural location, household wealth score, household's religion and ethnicity, mother's age, education level, and marital status.[19] We also present the results without controls throughout

[16] Additionally, we estimate the effects long-run effects HAZ by using the 2018 DHS as the third round instead of the 2014 MICS.

[17] The 3-month threshold is not a limiting factor to the conflict variable, as the first Boko Haram attack in Cameroon happened in 2013. That is, increasing the recall period would have little effect on the conflict variable. Furthermore, prior to 2013 Cameroon had a very long period of security, as illustrated in Figure 2.

[18] Our model is similar to Bertoni et al. (2019) also in the sense that they consider a school year as a period of interest, a similar time-interval to our specification.

[19] Wealth index is readily constructed in the DHS and MICS datasets using principal component analysis (PCA), as using household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities as variables entering the PCA. A detailed description of the DHS methodology can be found at `https://dhsprogram.com/topics/wealth-index/Wealth-Index-Construction.cfm`

the paper, to account for the fact that some of the control variables may also be affected by conflict.

Children born in different time periods may have been exposed to different conditions in terms of health infrastructure and the state of the economy throughout their life. To control for such covariate changes that affect birth cohorts differently, we add birth-year times birth-month fixed effects denoted by $\delta_{t,m}$. Additionally, we control for survey wave fixed effects τ_w and district fixed effects ρ_r, that is, fixed effects at the level of the sub-regional administrative unit. Standard errors are clustered at the district level across all specifications. We also present sharpened False Discovery Rate (FDR)-adjusted q-values correcting across dependent variables within each family of outcomes as listed above, as a multiple hypothesis testing (Anderson, 2008).

While the eruption of violence in Cameroon resulted from a foreign-borne insurgency, of which the root causes and the timing of the spread of the violence to Cameroon was unrelated to the grievances of the Cameroonian population, there are nevertheless multiple threats to identifying the effect of violent eruptions on child outcomes, which we investigate in section 6.5. The effects on child outcomes may be biased if the population in locations that were attacked changed over the course of the study-period, for example, due to migration, or due to mortality. We do not believe selective migration threaten our identification, since population movements were limited during our study period, as described in section 2. Nevertheless, we investigate whether the sample changed over time. We also investigate whether there were pre-conflict differences in the sample characteristics to assess potential selective locations of the attacks. Furthermore, if child mortality increased as a consequence of violent eruptions, the characteristics of the children remaining in our sample within the 20km radius from conflict locations – including their health and nutrition status – may differ from that of the children outside of the conflict locations. In this case, our estimates would not capture the true extent of conflict to children's health. However, we find no increase in child mortality.

While we conduct our main analysis using district fixed-effects to control for location-specific time-invariant characteristics, we are wary of the issues in the study design that may lead to biases in the estimates.[20] We simply also run our results without the district-level fixed effects in Section 6.6 and show that the results are robust to excluding the potentially biasing fixed effects.[21]

We also run multiple robustness and sensitivity checks to our findings, varying the distance to conflict, the time period of conflict relative to the outcome, and by replacing birth cohort fixed effects with birth month fixed effects to control for seasonality of birth timing. The results are reported in Section 6.6.

6 Results

This section presents the results on the effects of fatalities in Boko Haram attacks on child outcomes. Tables 2 - 4 display the results with control variables (Panel A), and without them (Panel B).

6.1 Effects on nutritional status

We find that Boko Haram attacks hurt the short-term nutritional status of under-five children. Table 2 reports that conflict-related fatalities decrease WHZ and increase the probability of being extremely wasted. Column (1) of Panel A shows that an additional conflict-related fatality decreases the WHZ by 0.001 standard deviations, and this result

[20] While our data analysis exploits both time- and cross-sectional variation akin to differences-in-differences (DiD), it is not similar to a two-way fixed effects design, since our fixed effects (districts) and the geographic variation of conflict (GPS coordinates of attacks and their 20km radius) are not the same. This prevents us from correcting possible biases using the method proposed by de Chaisemartin and D'Haultfœuille (2020) as an alternative specification.

[21] Another potential bias arising from our empirical set-up is that of the heterogeneity with respect to our continuous treatment effects, whereby the effect may vary across different values of the treatment (Callaway, Goodman-Bacon, and Sant'Anna, 2024), a discussion we need to abstract away due to the absence of estimation methods that specifically would address these issues, and we thus report our linear estimates of the continuous treatment effects.

is statistically significant at five percent level. However, the propensity to be wasted is not affected substantially, indicated by the statistically insignificant coefficients (Column (2) in Panel A and Panel B). The effect could be concentrated at the lower end of the WHZ distribution, so we also examine the effects on the prevalence of extreme wasting (Column (3)). We can see that an additional fatality leads to a 0.02 percentage point increase in the propensity to be extremely wasted, although this effect is estimated with a statistical significance of 10 percent. All of these estimates are robust to the exclusion of control variables (Panel B).

To better contextualize the effects, we also analyze the average effect, which we calculate by multiplying the number of average fatalities (21.85) and the estimated coefficients, and present the coefficient and the p-value at the bottom of each panel. The average effects on short-term nutritional status are substantial. On average, the WHZ score decreases by 0.05 standard deviations. Given that the average child has a WHZ score of -0.16, lower than the WHO reference mean of zero, the negative effect on WHZ we find is alarming for the children in our sample, whose weight is already low. The propensity to be extremely wasted increases by 0.4 percentage points, a 14 percent increase. While the effect is measured at a 10 percent significance level, the result is problematic as it suggests potential extreme acute malnutrition due to conflict.

As expected, HAZ, a measure of long-term nutritional status does not change in response to fatalities during such a short time span. Estimated effects for HAZ (Column (1)), the propensity to be stunted (Column (3)), and extremely stunted (Column (5)) are not statistically significant.

Taken together, the adverse effects on WHZ are substantial, especially considering the low average HAZ score. The average HAZ being -1.42 is not far from the threshold of stunting, -2 (Table 1). This implies that children in our sample were already suffering from prolonged low nutritional status. Therefore, such immediate adverse effects on child nutrition, and its accumulation over time can lead to chronic malnutrition easily in this setting.

Note that there may be measurement errors on both our indicators for height and the conflict fatalities. Given that ACLED uses information collected from newspaper sources, the fatalities we observe may be undercounted if we expect some conflict-related fatalities not to have been reported in newspapers and other public sources used by ACLED, which may attenuate our results. There may also be measurement error in HAZ given the issues in misreporting of child age in surveys when birth records are not available for the enumerators. Such concerns on non-classical measurement error are thus present for HAZ, but not in our main variable of interest, the WHZ (Agarwal et al., 2017; Larsen, Headey, and Masters, 2019).[22][23]

We also examine longer-term effects of conflict-related fatalities to assess whether the immediate effects persisted, by using data from Cameroon DHS 2018. To separately examine the effects on 2018 outcomes, we replace the 2014 sample with the 2018 sample, and follow the same empirical specifications. Given that the DHS module on nutritional status includes children under 60 months old, we construct a sample of children in 2018 who could have been affected by conflict in 2014: This sample consists of children who were in-utero or less than 12 months old as of the 2014 survey, and between 36 to 60 months old during the 2018 round.

One caveat with this approach is that the Anglophone crisis between the Cameroonian government and separatist rebel groups, that started in September 2017 could have also affected these outcomes. Although the crisis started and has been concentrated in the Northwest and Southwest region, outside of our study area, we cannot rule out this

[22]In studies that investigate the effect of a specific shock on HAZ, the direction of the bias depends on the calendar month of the shock. Given that the conflict fatalities have occurred over the course of several months spanning over a year, there is not one month-specific bias that would dominate. Given that our results show no effects on HAZ, we expect that these biases together may 'overestimate' our null result.

[23]Furthermore, we do not expect the measurement errors on anthropometry and conflict fatalities to be correlated, given that the data come from different sources. We are wary that measurement error in controls and outcome variables may be correlated given that the data sources are the same DHS and MICS surveys, and this can have implications for the sign and size of the bias (Abay et al., 2019). This concern highlights the importance of reporting results both with and without controls throughout the paper.

possibility, and the results need to be interpreted with caution. Nevertheless, we would expect the longer-run results to show a decrease in HAZ, and potentially in relevant indicators – stunting or extreme stunting as a consequence of the 2014 violence. The effects on WHZ and wasting indicators, on the other hand, would not be relevant, as they can respond to short-term fluctuations.

Our findings, which are reported in Table A1, indeed show a decrease in HAZ for children exposed to Boko Harm-related conflict in 2014, and an increase in the likelihood of stunting and extreme stunting in 2018 (Columns (4)-(6)). While these effects are statistically significant, the magnitudes are modest: HAZ decreases by 0.01 SD on average, the likelihood of stunting increases by 0.6 percentage points, and extreme stunting by 0.3 percentage points.

6.2 Illnesses and access to medical treatment

We also find evidence of the increased prevalence of illnesses and decreased use of health care services in the case of illness. The results reported in Table 3 suggests that the conflict-related fatalities increased slightly the probability of a child having diarrhea, and had no effect on fever or cough. The coefficient estimates on fever or cough are positive but the effects are not statistically significant. An additional fatality from conflict within 3 months prior to the interview increases the likelihood of having had diarrhea by 0.8 percentage points. However, this effect is significant only at the 10 percent level. Considering that 24 percent of children had diarrhea in the two weeks preceding the survey, the related increases amount to a 3 percent increase from the average. Taken together, the increase in the prevalence of diarrhea may be one channel through which conflict negatively impacts child health status.

The effect of illnesses on longer-term health outcomes can be mitigated if children receive appropriate and timely treatment from formal healthcare providers. Untreated and prolonged diarrhea and fever, especially when fever is a symptom of malaria, can be dangerous in the short term and ultimately lead to long-term adverse outcomes. Therefore, we also examine whether respondent sought for medical care when the their children become ill. Columns (2) and (4) of Table 3 Panel A show that an additional fatality decreases the likelihood of taking a child with fever or cough to any health care provider by 0.06 percentage points, and with diarrhea by 0.01 percentage points. On average, these effects translate to a decrease of 1 percentage points for both. Both coefficients are statistically significant at the 1 percent level. Over a half of the cases of either illness result in caretakers not seeking medical assistance on average, so our results translate into a two percent reduction in seeking assistance for fever or cough and diarrhea, respectively.

One of the reasons why seeking treatment decreased relates to the reduction in the supply of health care. Boko Haram conducted attacks against health facilities in Cameroon (International Crisis Group, 2017b). Another potential reason could be the widespread insecurity which constrains people's movement to health care facilities, regardless of the operational status of the nearby health care facilities.

We further investigate whether there was a change in the composition of health care providers used to see if the results may be driven disproportionately by formal health facilities. Table A2 show the estimated effects of conflict on the use of formal, informal, and traditional care providers, *conditional* on seeking help. None of the results are statistically significant; that is, we do not find changes in the composition of the type of care used. We do find a reduction in traditional care, which is significant at the 10 percent level. Still, this decrease is not accompanied by an increase in any of the other categories, implying little evidence on compositional changes in the type of health care providers used.

Taken together, our results point to obstacles in connecting with health care providers in general, while diarrhea became more prevalent. It may be that the reduced security situation has prevented households from seeking care from all kinds of providers or that all providers have faced obstacles in providing services. In any case, it could aggravate the consequences of these illnesses; for example, malaria can be life-threatening if left untreated. Moreover, untreated diseases can result in loss of weight and can have severe long-term consequences for child health.

6.3 Nutritional intake

Next, we analyze whether conflict-related fatalities affect the food intake of children aged 7-36 months.[24] We do not find changes in dietary diversity as a consequence of conflict. Results reported in Table 4 show that there is no detectable change in the number of food groups or in the prevalence of consuming more than four out of six food groups, an indicator of minimal dietary diversity for children under three years old ((Columns (1) and (2)). On average, children only consumed from two food groups in the last seven days preceding the survey.

In columns (3) to (8), we show the results per each food group. Each dependent variable is a dummy denoting whether the child had consumed anything from this food group. Starchy staples are the food group that children most often consumed (69 percent of children), followed by vegetables (40 percent of children). We do not see statistically significant changes in having consumed from these two most prevalent food groups. We find an increase in the prevalence of having consumed dairy, which is on average consumed by 14 percent of children.[25] For the remaining less-consumed food groups, we find some compositional changes indicating a slight decrease in the consumption of legumes and nuts, and a slight increase in the consumption of fruit.[26]

[24]In the repeated cross-section the module is consistently available for children under 36 months. We further exclude children under 6 months old from the main analysis since they are recommended to be breastfed exclusively. However, we run a heterogeneity check with children 6 months or younger in Table A3.

[25]While many children in this age range are still being breastfed, this increase does not affect children who are in the age of being exclusively breastfed, as shown in the heterogeneity check in Table A3. For older children, this could be due to the shift in mothers' activities towards other activities, or stress due to conflict. However, we are unable to investigate the effects on breastfeeding directly as we do not have repeated cross-sectional information on breastfeeding nor mothers' time use in our data.

[26]The share of children consumed legumes and nuts decreased by 0.04 percentage point (average effect is 0.8 percentage point), and the coefficient is statistically significant at the 5 percent level. 23 percent of children consumed this food group, which means there was a 3 percent decrease in the children who ate legumes and nuts. The decrease in the share of children who consumed fruit is statistically significant only

Taken together, we do not find substantive changes in children's dietary diversity as a consequence of conflict, although we find some compositional changes in consumption of food groups. It is important to point out that dietary diversity is already very low, with the average child only consuming from two food groups. The compositional changes may reflect the fact that agricultural households may change both their livestock as well as crop portfolio in the face of conflict risk (Rockmore, 2020). Therefore, in conflict situations where agricultural activity is not entirely disrupted, the dietary diversity of small children may not change as households move from profit-maximizing to risk-mitigating farming strategies and maintain a certain level of food production. Furthermore, these extensive margin effects may mask any effects in the *quantities* consumed.

Finally, an increase in food prices in markets close to conflict locations could be indicative of potential increased demand due to food shortages. Therefore, we performed additional analysis on geocoded market-level data on food prices by linking the monthly food price index from the World Bank (Andrée, 2021) with the ACLED dataset on conflict. Figure A1 shows that while food prices increased in markets that were in the 20km radius of conflict events during 2014, the increase was very similar in markets that were outside of this radius. Therefore, we conclude that shortages of food sold on the market are likely not to explain our results on food consumption.

6.4 Heterogeneity by age

Next, we investigate whether the observed impacts in anthropometry, illnesses and health care utilization vary across age groups among the under-five children. Children grow faster when they are younger and at a relatively steady pace after turning two years old. Therefore, changes in anthropometric measures of younger children may be easier to detect statistically. On the other hand, younger children – children below two years of age – may be less susceptible to changes in their living environment, as they are often breastfed,

at the 10 percent level.

and babies under six months are often exclusively breastfed, which may protect children in this age group against changes in food availability to the household. To investigate potential heterogeneity by age, we divide our sample into younger children aged between 0 and 24 months and older children aged from 25 to 60 months.

We find that the children in both age groups experience reductions in WHZ, although the reduction is larger for children under 24 months and the statistical significance is stronger for children between 25 and 60 months old (Table A4).[27] Note that the younger children have a lower WHZ on average (0.39 standard deviations below zero) than the older children (0.01 standard deviations above zero).[28] This result is alarming since child growth at a younger age could have a persistent effect on child development over time. Consistently, the increase in the probability of being extremely wasted is statistically significant at the 10 percent level among children under 24 months old only while the increase in the probability of wasted is statistically significant at the 10 percent level among children over 24 months old.

In Table A5, we also show that while the children under 24 months became more likely to have diarrhea, and children over 24 months were less likely to seek medical care when they experience the illnesses.[29] On average, the prevalence rate of diarrhea was 30 percent among the younger children, while it was 19 percent among the older children. In both age groups, 60 percent or less children experiencing diarrhea or fever/cough sought any medical treatment (Table A6). The increases in already prevalent diarrhea in children

[27]Table A4 reports that the WHZ decreased for children 24 months and below (on average by 0.037 SD) and this effect is significant at the 10 percent level. The effects on children between 25 and 60 months are negative (an average decrease of 0.025 SD) and statistically significant at the one percent level. The estimated effects on the WHZ of the two groups are not statistically different.

[28]The summary statistics on outcome and control variables by age are presented in Table A6.

[29]Table A5 reports that on average, the prevalence of fever or cough was not affected by the conflict in both age groups (Column 1), and diarrhea increased only in the younger age group by 1.1 percentage points on average (Column 3). On the other hand, the decreasing effects of conflict on seeking healthcare in the case of both fever or cough and diarrhea are statistically significant only for the older children (Columns 2 and 4). The heterogeneity of the effects on healthcare seeking behavior where caregivers are more likely to seek healthcare services for younger than older children within under five age range is consistent with the documented behaviors (Taffa and Chepngeno, 2005; Bennett et al., 2015; Kanté et al., 2015; Abdulkadir and Abdulkadir, 2017; Lungu, Darker, and Biesma, 2020; Khasanah et al., 2023). Previous studies refer to the vulnerability of younger children as a potential reason behind these findings.

under 24 months and the decrease in medical care sought for children over 24 months support the result we find on the decrease in WHZ for both age groups.

We find that the some heterogeneous effects on nutritional diversity across age groups (Table A3). The consumption of dairy increased in both groups, but more among the 7-24 month-olds, which suggests a substitution of breast milk. We find no increase in the number of food groups, among these younger children, but an increase in the number of food groups among the older children over 24 months.[30] We also observe compositional changes among food groups for older children, such that there are increases among older children in several food groups, consistent with the increase in the number of food groups.[31] The results supports a larger decrease of weights among children under 24 months: the plausibly illness-related decreases in WHZ among older children is perhaps mitigated through the increase in the consumption from these solid food groups.[32]

6.5 Alternative mechanisms

Other potential mechanisms could explain the worsened child health and nutritional outcomes. First, our results may have been driven by selective child mortality rates. Violent conflicts can increase child mortality directly through conflict-related fatalities, as well as indirectly through the deterioration of health. If child mortality increased substan-

[30] Table A3 reports that the number of food groups consumed by children over 24 months increased statistically significantly at 5 percent level, by 2.3 percentage point on average. The effects on children under 24 months was not statistically significant, but the size of the coefficient estimates are smaller than that of children over 24 months, supported by statistically insignificant difference of the effects between the two groups (Column 2).

[31] Specifically, we find an increase in starchy staples (Column 3) and meat and eggs (Column 5) among children over 24 months, by 0.4 percentage points and 0.8 percentage points both at five percent significance level, with the effects on children under 24 months being negative and statistically insignificant. The difference was also statistically significant at five percent level for meat and eggs. Consumption of fruits (Column 8) increased in both age groups at five percent significance level. The younger children, on the other hand, were less likely to consume legumes and nuts, which was statistically significant at 10 percent level (Column 4). Other food groups such as starchy staples, meat and eggs, and vegetables – were also estimated to decrease among children under 24 months but the effects were not statistically significant.

[32] First, we added heterogeneity by age using another age cutoff: 36 months. Tables A7 and A8 report the results. Second, we also add a heterogeneity of the effects with age ranges of 12 months to supplement these results, presented in Tables A9 and A10. All results presented in these tables show qualitatively similar results.

tially within 20 km radius from the conflict locations, then characteristics of the survived children in our sample within the 20-km radius from conflict locations – including their health and nutrition status – may differ from that of the children outside of the 20-km radius from conflict locations. In this case, our child health estimates would not capture the true extent of conflict to children's health. Indeed, five years into the Boko Haram conflict in Nigeria, child mortality in states with Boko Haram activity was higher that in states not affected by the insurgency (Ekhator-Mobayode and Asfaw, 2019). To address this concern, we estimate the effects of conflict on mortality outcomes of children under five using birth history information from MICS 2014, which collects the birth histories of women of childbearing age, whether the children born survived or died, and at what age did the death occur. Thus, we have information on births and deaths of a child that have occurred even decades prior to the survey, given that this module is administered to all women 15-50 years of age. We investigate four mortality variables that may be affected by conflict: neonatal mortality, infant mortality, under-five mortality, and child mortality. Neonatal mortality includes deaths in the first month of life. It may be affected by conflict if women are less likely to give birth safely in a health care facility. Infant mortality concerns children under 12 months of age. It includes neonatal mortality and deaths after the first month, which can occur due to illnesses, among other things. Under-five mortality denotes whether the child died before reaching the age of five, and child mortality denotes whether the child died between the first and the fifth birthday.[33] Table A11 shows that conflict does not substantially affect any of the mortality outcomes. Our results are similar to those presented by Akresh, Lucchetti, and Thirumurthy (2012) for child mortality in the context of the Eritrean–Ethiopian civil war.

Next, we examine if the out-migration of better-off households with children with higher human capital could explain the results. In Table A12, we run models with demographic characteristics of the household as the dependent variable, and the independent

[33]Under-five mortality includes neonatal and infant mortality, while child mortality does not.

variable in each regression is the fatalities in 20km radius. We find that the demographic characteristics are not strongly or in economically meaningful magnitude correlated with the fatalities. None of the coefficient on mother's characteristics – which could be associated with selective migration given that it is done by adult members of the household– are statistically significant. Out of 12 demographic characteristics examined, four are statistically significant at least at the 10 percent level. There is a slight increase in the muslim survey population, which is small and statistically significant at the 10 percent level, and a statistically significant but near zero increase in the Christian population. Taken together, the changes in the religious composition are so small they are economically insignificant. Furthermore, the share of female children is statistically significant from zero, but the coefficient is arguably very small, while the wealth index is statistically significant but very close to zero. Therefore, the results suggest that the endogenous out-migration does not seem to drive the results. Indeed, as discussed in Section 2, the migration movements within Cameroon were extremely restricted, and in-migration to Cameroon from Nigeria likely constituted a negligibly small share of the total population in 2014.[34]

The attacks in Cameroon occurred close to the border to Nigeria (Figure 2), which probes the question of whether the households in the vicinity of the attacks differed at baseline from households further away from the attacks. This would be the case, if for instance, there was a strong influx of Nigerians escaping conflict in 2009 onwards. However, the share of foreigners in the data is 3 percent or less in each wave in our study region, which shows that this upper bound for Nigerians residing in the region outside of refugee camps is a small share of the total population. Furthermore, using remote-sensing data, Jedwab et al. (2021) find little evidence of significant population movements from Nigeria to Cameroon by 2012, that is, after the Boko Haram conflict erupted in 2009 in the country.

[34]We use our study samples for investigating this, given that no systematic data has been collected on migration during our study period. The only and most recent census of Cameroon during the period of our study was collected in 2005 (IPUMS, 2023).

In addition, we investigate the characteristics of the population within the 20km radius of the attacks and households outside of these locations before the attacks took place. Table A13 shows that in both pre-conflict waves – in 2004 (Panel A) and in 2011 (Panel B) – the households living within the conflict area were statistically significantly wealthier than households outside the study region, were more likely to be of the Muslim and less likely to be Christian. They are similar in the likelihood of living in rural area and the mothers' education to that of the households outside of the location of these attacks.

We also investigate the changes in the sample population to see trends in the demographic composition of the sample before the conflict in 2014. The results are reported in Panel C of Table A13. We do not find changes in household wealth, household size nor the education level or age of the mothers in the sample. We find a slight increasing trend of Christian population relative to Muslim in these areas, and a slight decrease in the households being female-headed and an associated increase in mothers' being married.

Lastly, we implement a placebo test, where we estimate the effect of conflict exposure on children's anthropometric outcomes measured before the conflict. Table A14 shows that the total number of fatalities from 2014 conflicts did not have substantial impacts on WHZ or HAZ in both 2004 and 2011, suggesting that the selection of children with better (or worse) nutritional status into the conflict-exposed area in 2014.

Taken together, the results suggests that there were not large changes within the population during the pre-period, although the areas where attacks occurred were inhabited by slightly different types of households, and some of these changes became more pronounced over time. The results are robust to the exclusion of control variables for these characteristics.

6.6 Robustness checks

We run several robustness checks to our main results. First, as an alternative to the birth cohort-specific trends, we control for intra-annual seasonality in birth outcomes, since intra-annual seasonalities – such as agricultural seasonalities – may impact children differentially in-utero or during first months of life. To do so, we included birth-month and birth-year dummies separately, replacing birth-year times birth-month fixed effects. Table A16 presents the result of this robustness check for the models with controls of Tables 2 and 3. We find that our results are robust to this specification.

Next, we assess the sensitivity of our findings to an alternative distance threshold to define conflict exposure by increasing the threshold to 40km. The results are presented in Table A15. We find that the results are robust to this sensitivity check – the results retain their statistical significance. However, we do find that the effect sizes are smaller as the threshold distance increases. An additional fatality further away is less detrimental to the child than those closer to the household.

We also investigate the sensitivity of our results regarding the timing of the attacks. We investigate fatalities in attacks in the 20km radius that occurred in the last 1, 2, 3, 4, 6, 9 10, and 24 months, in addition to the 3 months used in the main analysis.[35] The results are presented in Figure A2. We can see that the results are not sensitive to the timing of the events; the size of the coefficients varies little across the different specifications: At the 1-month exposure, the coefficient sizes are slightly larger but due to a low sample size the estimates are less precise, than between 2-24 months. Overall, the results of our main specification using the 3-months exposure are robust to any specification using an exposure time between 2-24 months.

In our main specification, we include district fixed effects to control for time-invariant geographic differences across the conflict and non-conflict areas. Given possible biases arising from such geographical fixed effects, we investigate whether the results are robust to excluding district fixed effects. The results are reported in Table A17. We find that main

[35] Note that between 12 to 24 months very few events took place, the vast majority of fatalities will have occurred 12 months prior to the survey.

results on child anthropometry are robust to this specification.[36][37]

7 Conclusions and Policy Implications

In this paper, we examine the immediate impact of violent conflict on child health using data sets collected up to a decade before and immediately after the eruption of violent attacks by the Nigerian Boko Haram insurgency in northern Cameroon. We find that under-five children experienced immediate health setbacks on their WHZ in the course of 2.6 months.

Low WHZ can result from illnesses and inadequate nutrition. We find an increase in the prevalence of diarrhea but not in the prevalence of fever and cough – common symptoms of malaria, and decrease in health service use for treating the highly prevalent diarrhea and fever. The result implies that the common illnesses may have been left untreated. We also find compositional changes in the food groups, and slight increases in the consumption of some solid foods among children over 24 months, a finding in line with lower reductions in WHZ for this group.

Given that the disrupted health care use is a potential channel through which children's nutritional status is affected immediately, policies for rapid recovery can focus on ensuring the accessibility of health care services for the population in conflict-affected areas. Indeed, programs targeted for health care center reconstruction and efforts to bring back health care workers and supplies have been set up in Nigeria (World Bank, 2016), and responses by NGOs have taken place in both countries. In the long term, as violent conflicts persist in the region, designing health care infrastructure to be more resilient in insecure settings, for example, by increasing the mobility of services to respond to the

[36] Given that the district and our study area of attack in the 20km radius are different geographically, our study design is not a two-way fixed effects estimator, which would call to question using methods by de Chaisemartin and D'Haultfœuille (2020) as an alternative specification.

[37] Additionally, we also examine the effects on older children (5-17 years of age), specifically on their time-use, finding that the conflict increases the likelihood of children dropping out of school, and shifts their activities to household tasks. These results are presented in Appendix B.

evolving geographical distribution of conflict risk, can prevent long-term negative consequences on child health from taking place.[38]

Our results carry important policy relevance, as extreme poverty and malnourishment is increasingly concentrated in fragile and conflict-affected countries (Corral et al., 2020). Also given the increased terrorist movements in Western Africa, the historically peaceful Cameroon was the first country to be struggling with foreign-borne conflict inside its own borders in 2014, before the insurgency spread across the borders of Chad and Niger (Africa Center for Strategic Studies, 2020). Since then, coastal West African countries have seen eruptions of terrorist violence in areas close to their northern neighbors. Benin, Togo and Ghana — countries that have been internally peaceful for decades — experienced violent eruptions inside their northern borders as insecurity has increased in neighboring Burkina Faso, Mali and Niger (Durmaz, 2022; ECFR, 2022). Meanwhile, the security situation in Cameroon has decreased significantly with the Anglophone crisis, a secessionist insurgency, that erupted in the western parts of Cameroon in late 2016 (Craig, 2021; International Crisis Group, 2017a), and a more recent intensified Boko Haram activity in the North (Africa Center for Strategic Studies, 2020). Our findings shed light on the immediate human capital consequences of such foreign-borne violence, right at its onset. Indeed, given how rapidly these negative consequences to children's human capital manifest, within Cameroon in a scope of 2.6 months, this calls to question not only appropriate investments in the health care sector, but also strong security at the borders to prevent spill-overs of violence.

[38] Additional results also show that conflict also had effects on older children's time use towards household chores and away from schooling. Children between 5-17 years of age are more likely to participate in household tasks, and to drop out of school due to conflict. It implies that households consider activities inside the household relatively safer than activities outside the household, but this may come at the expense of a decrease in education.

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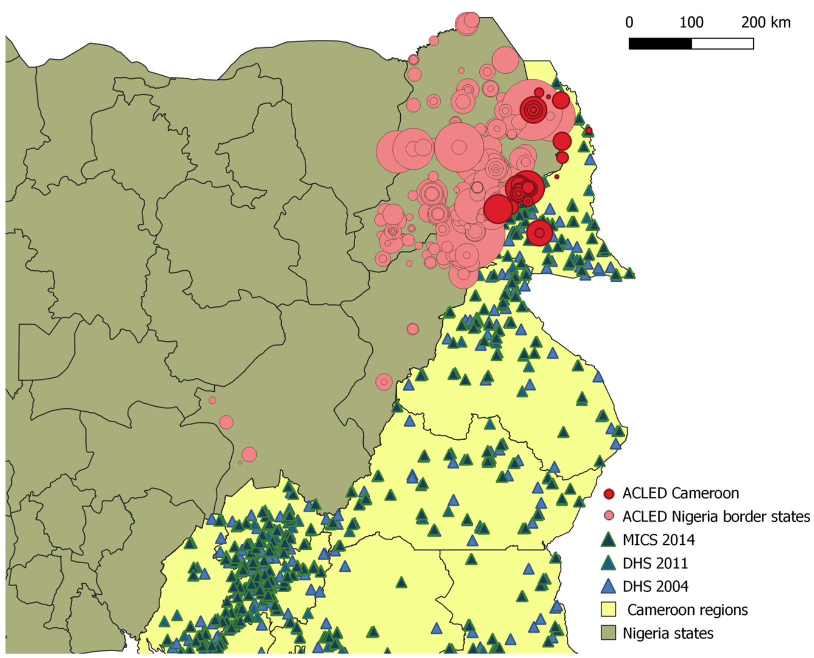
Figures

Figure 1: Map of Conflict Region and Boko Haram Attacks

(a) Conflict Region

(b) Boko Haram attacks in Cameroon and Bordering States in Nigeria

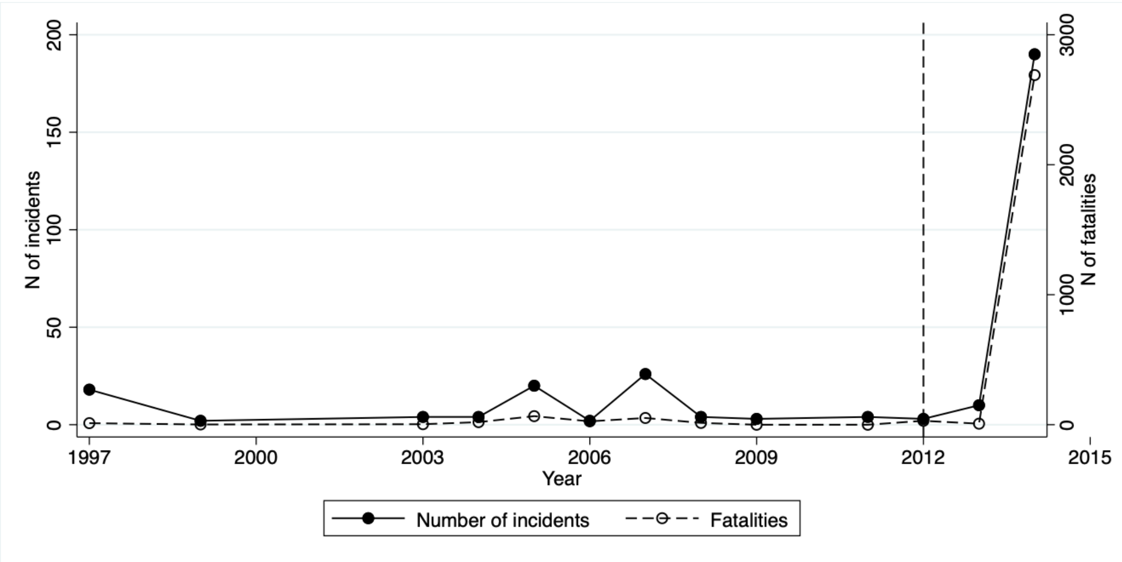


Notes: In Figure (a) the square displays the location of northern Cameroon. In Figure (b) the blue triangles labeled MICS 2014, DHS 2011 and DHS 2004 denote the survey clusters. The light and dark red circles denote incidents from ACLED dataset involving Boko Haram. The size of the circle is inflated reflecting the number of fatalities.

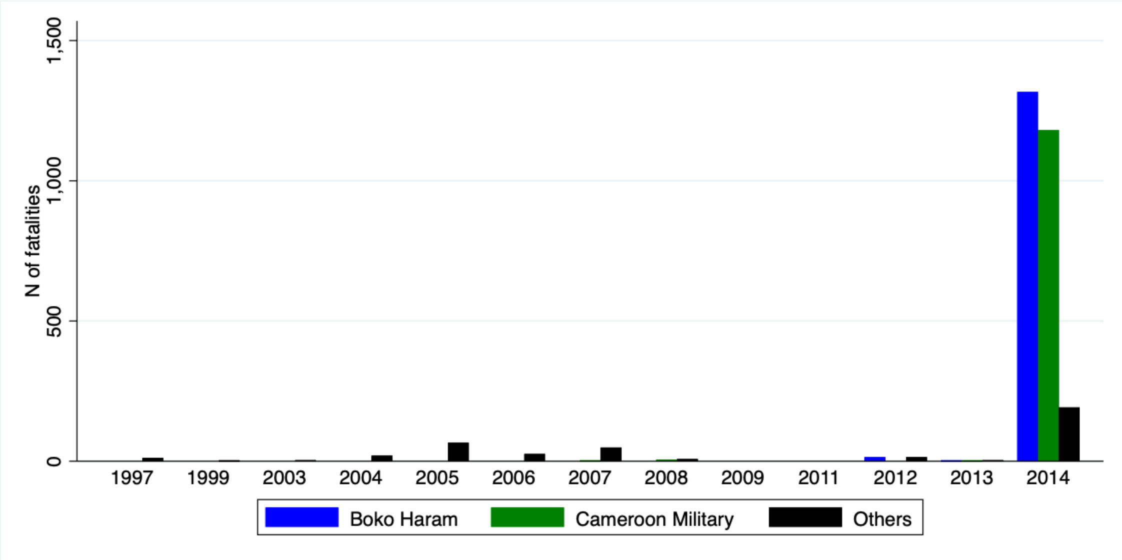
Source: Figure (a) compiled using ARCGIS online mapping tool. Figure (b) uses shapefiles Cameroon and Nigeria (for regions and states, respectively) downloaded from https://data.humdata.org/.

Figure 2: Evolution of Conflict in northern Cameroon

(a) Fatalities and Incidents by year



(b) Fatalities by group-year



Notes: In panel (a) Incidents denotes the number of fatal events in northern Cameroon by year as reported in the ACLED database. We include all events except riots and protest in our measure of incidents. Fatalities denotes the number of fatalities in these events. In panel (b) the number of fatalities are reported by actor involved in the incident. Most fatalities occur in clashes between the Boko Haram and Cameroon military.

Source: ACLED dataset (Raleigh et al., 2010).

Tables

Table 1: Summary Statistics

	Mean	SD	N
Panel A: Conflict Events			
N of fatalities	21.85	35.26	61
Panel B: Control variables			
Female child	0.50	0.50	11275
Age in months	29.15	17.28	11224
Household size	8.08	4.41	11275
Female-headed household	0.12	0.33	11275
wealth index factor score (5 decimals)	-0.64	0.70	11275
Mother: Age	28.04	6.99	11077
Mother: Currently married	0.91	0.29	11077
Christian	0.50	0.50	11275
Muslim	0.38	0.48	11275
Rural area	0.73	0.44	11275
Mother: Primary school	0.37	0.48	11275
Mother: Secondary school	0.11	0.32	11275
Mother: More than secondary school	0.01	0.08	11275
Panel C: Outcome variables, 0-5 years old			
Height-for-Age Z-score	-1.42	1.64	6068
Weight-for-Height Z-score	-0.15	1.37	5750
Had fever in last 2 wks	0.34	0.47	10292
Had diarrhea in last 2 wks	0.24	0.43	10037
Diarrhea: Seek medical treatment	0.55	0.50	2189
Fever: Seek medical treatment	0.58	0.49	3281
No. of food groups	1.94	1.52	6593
Food groups > 4	0.17	0.38	6593
Panel D: Outcome variables, 5-17 years old			
Economic Activities	0.54	0.50	1690
Household Tasks	0.77	0.42	6206
Attended School	0.62	0.48	5924
Dropped Out	0.01	0.08	5924
Never Went to School	0.34	0.47	6158

Notes: The variable No. of food groups takes values between 0 and 6. The omitted category in Mother's education is no education . Column (1) reports the mean, column (2) the standard deviation, and column (3) the number of observations for each variable.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table 2: Effect on Anthropometric Measures of Children (0-60 months old)

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Fatalities	-.00136**	-.0000343	.000178*	-.000347	.000034	-.000214
	(.000486)	(.000103)	(.0000926)	(.000599)	(.000222)	(.000335)
	[.07]	[1]	[.206]	[1]	[1]	[1]
Control	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.030	-0.001	0.004	-0.008	0.001	-0.005
P-val: Average effect	0.011	0.742	0.068	0.568	0.880	0.530
R-Squared	0.209	0.107	0.085	0.163	0.123	0.095
Panel B: Without control variables						
Fatalities	-.00224**	7.08e-06	.000166*	-.000984*	.000139	-.000176
	(.000801)	(.000114)	(.0000867)	(.000503)	(.000217)	(.000305)
	[.069]	[.907]	[.13]	[.13]	[.521]	[.521]
Coef: Average effect	-0.049	0.000	0.004	-0.022	0.003	-0.004
P-val: Average effect	0.011	0.951	0.069	0.064	0.529	0.570
N	5750	5750	5750	6068	6068	6068
R-Squared	0.175	0.098	0.077	0.139	0.101	0.081
Mean of Dep. Var.	-0.155	0.089	0.028	-1.421	0.375	0.163

Notes: Sample includes children under 5 years of age. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table 3: Effect on Children's Illnesses and Use of Medical Care (0-60 months old)

	Fever or cough		Diarrhea	
	Illness in 2 weeks	Seek medical care	Illness in 2 weeks	Seek medical care
	(1)	(2)	(3)	(4)
Panel A				
Fatalities	.000272	-.000649***	.000349*	-.000494**
	(.000237)	(.000219)	(.000169)	(.000214)
	[.075]	[.031]	[.055]	[.049]
Control	Yes	Yes	Yes	Yes
Coef: Average effect	0.006	-0.014	0.008	-0.011
P-val: Average effect	0.264	0.007	0.052	0.031
R-Squared	0.086	0.115	0.103	0.176
Panel B: Without control variables				
Fatalities	.000358	-.000764***	.000396	-.000466***
	(.00027)	(.000262)	(.000232)	(.000153)
	[.111]	[.017]	[.073]	[.017]
Coef: Average effect	0.008	-0.017	0.009	-0.010
P-val: Average effect	0.199	0.008	0.102	0.006
N	10292	3281	10037	2189
R-Squared	0.084	0.095	0.097	0.144
Mean of Dep. Var.	0.336	0.581	0.242	0.549

Notes: Sample includes children under 5 years of age. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. In columns (2) and (4) the sample is restricted to children who had been ill with fever or cough, or diarrhea, respectively. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table 4: Effect on Food Intake (7-36 months old)

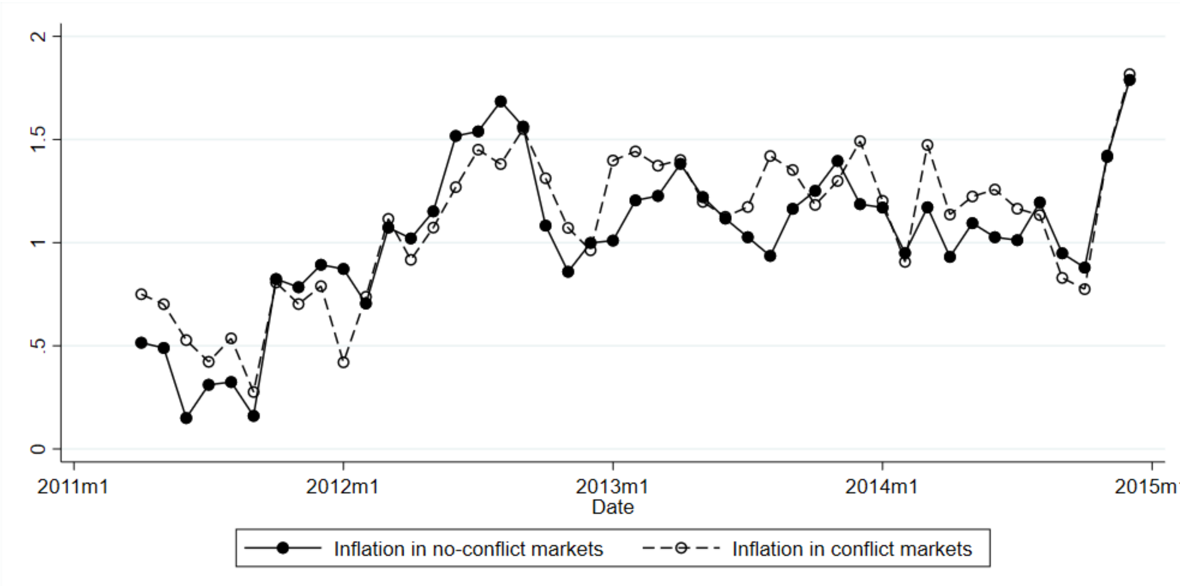
	Food groups > 4	No. of food groups	Starchy Staples	Legumes/ Nuts	Meat and eggs	Dairy	Vegetables	Fruits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A								
Fatalities	.000212	.000953	.0000519	-.000377**	.0000108	.00106***	-.000203	.000414**
	(.000202)	(.000653)	(.0000943)	(.000172)	(.000205)	(.000343)	(.000326)	(.000164)
	[.444]	[.249]	[.506]	[.088]	[.921]	[.046]	[.506]	[.076]
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	0.005	0.021	0.001	-0.008	0.000	0.023	-0.004	0.009
P-val: Average effect	0.307	0.159	0.588	0.040	0.959	0.005	0.540	0.020
R-Squared	0.139	0.328	0.333	0.098	0.283	0.135	0.172	0.149
Panel B: Without control variables								
Fatalities	.000312*	.00117**	.0000254	-.000312*	.0000774	.00106**	-.0000649	.000394**
	(.000172)	(.00048)	(.0000878)	(.000175)	(.000136)	(.000428)	(.000318)	(.000175)
	[.104]	[.104]	[.46]	[.104]	[.404]	[.104]	[.46]	[.104]
Coef: Average effect	0.007	0.026	0.001	-0.007	0.002	0.023	-0.001	0.009
P-val: Average effect	0.083	0.024	0.775	0.089	0.575	0.022	0.840	0.035
N	8438	8438	8438	8422	8435	8435	8437	8422
R-Squared	0.117	0.319	0.344	0.095	0.263	0.088	0.170	0.127
Mean of Dep. Var.	0.173	1.948	0.690	0.229	0.321	0.135	0.398	0.177

Notes: Sample includes children under 36 months of age. All dependent variables denote food intake in the last 24 hours preceding the survey. Outcome variables in Columns (3)-(8) are dummy variables denoting whether the child consumed anything from this food group in the last 24 hours. Food groups $>$ 4 is a dummy for whether the child ate from more than 4 out of 6 food groups in the last 24 hours. The variable number of food groups denotes the number of food groups a child consumed from (taking values from 0 to 6). Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear $\times$ Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Appendix

Figure A1: Food inflation in conflict and non-conflict markets



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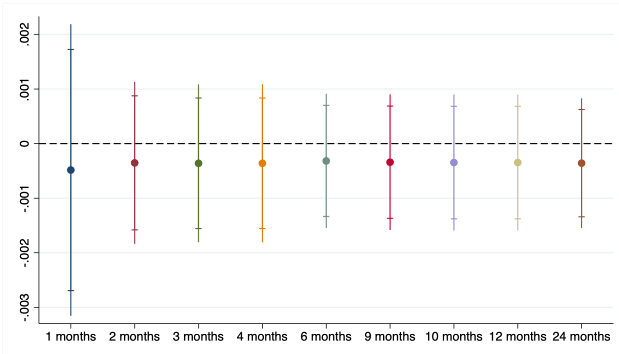
Notes: The figure displays monthly food inflation rate (%). Conflict markets are markets in the dataset in the 20km radius from the fatalities during the period for which the datasets overlap (April 2011 to December 2014). Non-conflict markets are markets that did not have any fatal conflict events during that time.

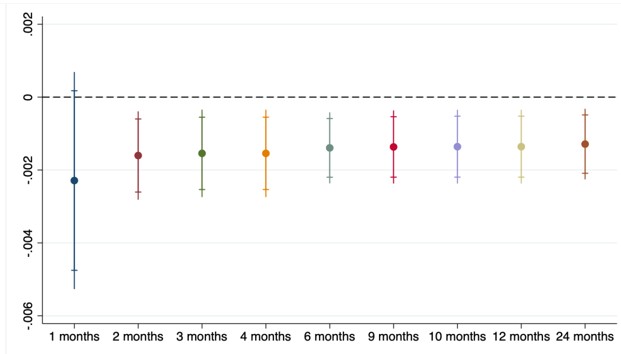
Source: Andrée, 2021 is the dataset used for food prices. Conflict data is from ACLED.

Figure A2: Effect on anthropometric measures by months of exposure

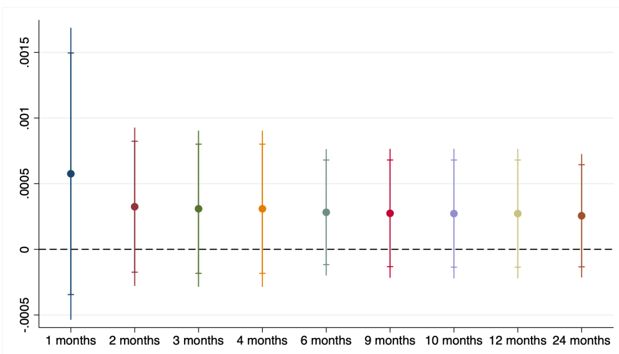
(a) HAZ



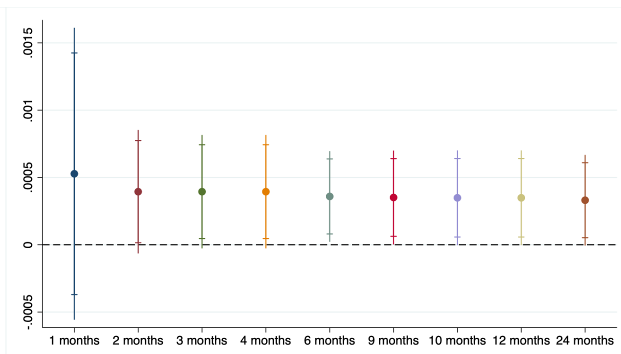
(b) WHZ



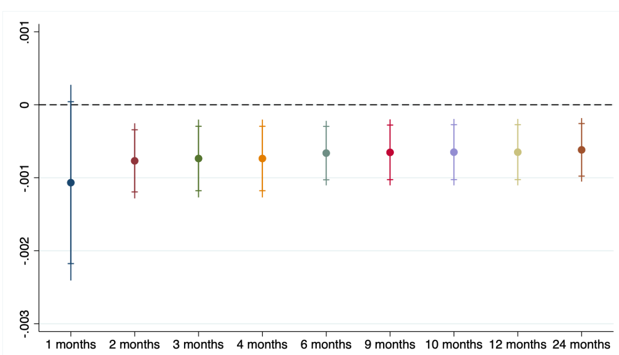
(c) Fever or Cough



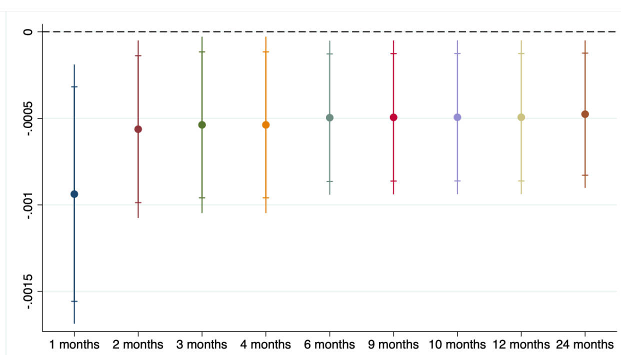
(d) Diarrhea



(e) Fever or Cough: Medical care



(f) Diarrhea: Medical care



Notes: The bars denote the coefficient estimate of a regression that estimates the effect of the number of fatalities in the 20km radius to the outcome variable in each panel. The vertical axis denotes the magnitude of the coefficient with 95 per cent confidence intervals. The horizontal axis denotes the recall period which is different for each regression. This ranges from 3 to 24 months. The 12 month coefficient estimate thus corresponds to results presented in Tables 2 and 3.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011, and the ACLED dataset.

Table A1: Effect on Anthropometric Measures of Children (In utero to 12 months old in 2014)

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Total N of fatalities in 20km	.000509*	-.000108***	-.0000317***	-.000559**	.000292***	.00015***
	(.000268)	(.0000335)	(9.59e-06)	(.000201)	(.000096)	(.0000423)
	[.014]	[.009]	[.009]	[.009]	[.009]	[.009]
Control	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	0.011	-0.002	-0.001	-0.012	0.006	0.003
P-val: Average effect	0.071	0.004	0.003	0.011	0.006	0.002
R-Squared	0.201	0.089	0.046	0.164	0.159	0.119
Panel B: Without control variables						
Total N of fatalities in 20km	.00047	-.000105**	-.0000325***	-.000639***	.000323***	.000163***
	(.000322)	(.0000382)	(.0000109)	(.000142)	(.0000808)	(.0000448)
	[.028]	[.008]	[.006]	[.002]	[.002]	[.003]
Coef: Average effect	0.010	-0.002	-0.001	-0.014	0.007	0.004
P-val: Average effect	0.159	0.012	0.007	0.000	0.001	0.002
N	2037	2037	2037	1982	1982	1982
R-Squared	0.184	0.082	0.042	0.124	0.107	0.097
Mean of Dep. Var.	0.057	0.050	0.010	-1.692	0.421	0.199

Notes: Sample includes children under 5 years of age. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Source: Pooled dataset using Demographic and Health Survey (DHS) from 2004, 2011, and 2018.

Table A2: Effect on Types of Medical Care Sought

	Upon fever and cough			Upon diarrhea		
	Formal	Informal	Traditional	Formal	Informal	Traditional
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Fatalities in 20km	-.000214	.000312	-.000189*	-.000151	-.000124	-.000612*
	(.000613)	(.000665)	(.0000939)	(.000596)	(.0005)	(.00035)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.019	0.028	-0.017	-0.014	-0.011	-0.055
*1 P-val: Average effect	0.731	0.643	0.057	0.802	0.807	0.095
R-Squared	0.242	0.239	0.162	0.215	0.207	0.179
Panel B: Without control variables						
Fatalities in 20km	-.000727	.000773	-.000125*	-.000209	-.000103	-.000518
	(.000526)	(.000577)	(.0000623)	(.00063)	(.000518)	(.000326)
Coef: Average effect	-0.066	0.070	-0.011	-0.019	-0.009	-0.047
P-val: Average effect	0.181	0.194	0.058	0.744	0.844	0.127
N	1271	1271	1271	908	908	908
R-Squared	0.208	0.210	0.144	0.193	0.184	0.162
Mean of Dep. Var.	0.405	0.555	0.057	0.368	0.551	0.112

Notes: Sample includes children under 5 years of age who had been sick with fever (Columns 1-3) or diarrhea (Columns 4-6), and for whom medical care was sought for due to illness. Formal care includes both private and public hospitals and clinics, informal care includes pharmacies and shops, mobile and outreach clinics, and relatives and friends, and traditional care comprises of traditional practitioners. Panel A includes control variables, Panel B does not include control variables. Controls include all variables listed in Table 1 Panel B. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011, and the ACLED dataset.

Table A3: Effect on Children's Food Intake by Age Groups

	Food groups > 4	No. of food groups	Starchy Staples	Legumes/ Nuts	Meat and eggs	Dairy	Vegetables	Fruits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fatalities	-.0000549	.00105	-.000651***	-.0000872	-.000116	.00192	-.000105	.0000845
	(.0000432)	(.000866)	(.000227)	(.000072)	(.000093)	(.00119)	(.0000617)	(.0000736)
7-24 Month × Fatalities	.0004	.0000376	.00049**	-.000728	-.000376	.000572*	-.000477	.000564**
	(.000337)	(.00208)	(.000193)	(.000442)	(.000459)	(.000313)	(.000694)	(.000221)
25-36 Month × Fatalities	.000286*	.000187	.000837***	-.0000817	.00053***	-.00154	.000181	.00027**
	(.00015)	(.00124)	(.000202)	(.000107)	(.000176)	(.00112)	(.000161)	(.000113)
Coef (0-6 Months): Average effect	-0.001	0.023	-0.014	-0.002	-0.003	0.042	-0.002	0.002
P-val (0-6 Months): Average effect	0.217	0.239	0.009	0.239	0.227	0.122	0.102	0.264
Coef (7-24 Months): Average effect	0.008	0.024	-0.004	-0.018	-0.011	0.055	-0.013	0.014
P-val (7-24 Months): Average effect	0.351	0.415	0.520	0.118	0.364	0.020	0.438	0.029
Coef (25-36 Months): Average effect	0.005	0.027	0.004	-0.004	0.009	0.008	0.002	0.008
P-val (25-36 Months): Average effect	0.191	0.041	0.016	0.161	0.014	0.037	0.711	0.019
N	9582	9582	9582	9566	9579	9579	9581	9566
R-Squared	0.165	0.409	0.400	0.130	0.323	0.148	0.236	0.179
Mean of Dep. Var.	0.153	1.757	0.635	0.204	0.282	0.128	0.351	0.157

Notes: Sample includes children 7-36 months of age. Controls include all variables listed in Table 1 Panel B. All regressions include control variables, Birthyear × Birthmonth fixed effects, and survey wave fixed effects. Standard errors clustered at the commune level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A4: Effect on Anthropometric Measures of Children by Age

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Fatalities in 20km	-.00114***	-.000119*	.0000177	.000196	-.0000231	-.000298
	(.0003)	(.0000673)	(.0000261)	(.000955)	(.000385)	(.000421)
0-24 Month × Fatalities	-.000572	.000133	.000415*	-.000814	-4.61e-06	.00027
	(.000827)	(.000212)	(.00021)	(.000704)	(.000248)	(.000283)
Coef (25-60 Months): Average effect	-0.025	-0.003	0.000	0.004	-0.001	-0.007
P-val (25-60 Months): Average effect	0.001	0.092	0.504	0.839	0.953	0.487
Coef (0-24 Months): Average effect	-0.037	0.000	0.009	-0.014	-0.001	-0.001
P-val (0-24 Months): Average effect	0.055	0.940	0.060	0.334	0.904	0.881
N	5596	5596	5596	5924	5924	5924
R-Squared	0.228	0.131	0.099	0.192	0.148	0.118
Mean of Dep. Var.	-0.159	0.089	0.028	-1.425	0.376	0.162

Notes: Sample includes children under 5 years of age. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A5: Effect on Children's Illnesses and Use of Medical Care by Age

	Fever or cough		Diarrhea	
	Illness in 2 weeks	Seek medical care	Illness in 2 weeks	Seek medical care
	(1)	(2)	(3)	(4)
Fatalities in 20km	.000183	-.0013***	.000222	-.00212***
	(.000204)	(.000198)	(.000196)	(.00045)
0-24 Month × Fatalities	.000122	.00108**	.000274*	.00255***
	(.000151)	(.00044)	(.000146)	(.000619)
Coef (25-60 Months): Average effect	0.004	-0.028	0.005	-0.046
P-val (25-60 Months): Average effect	0.378	0.000	0.269	0.000
Coef (0-24 Months): Average effect	0.007	-0.005	0.011	0.009
P-val (0-24 Months): Average effect	0.295	0.590	0.029	0.168
N	10123	3204	9868	2149
R-Squared	0.097	0.143	0.123	0.220
Mean of Dep. Var.	0.335	0.582	0.243	0.547

Notes: Sample includes children under 5 years of age. In columns (2) and (4) the sample is restricted to children who had been ill with fever or cough, or diarrhea, respectively. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A6: Summary Statistics by Demographic Groups

	0-24 months old			25-60 months old		
	Mean	SD	N	Mean	SD	N
Panel A: Control variables						
Female child	0.50	0.50	4797	0.51	0.50	6427
Age in months	11.87	7.00	4797	41.93	9.97	6427
Household size	8.00	4.44	4797	8.14	4.39	6427
Female-headed household	0.12	0.32	4797	0.13	0.34	6427
wealth index factor score (5 decimals)	-0.64	0.69	4797	-0.64	0.71	6427
Mother: Age	26.73	6.81	4766	29.02	6.97	6293
Mother: Currently married	0.90	0.30	4766	0.92	0.28	6293
Christian	0.51	0.50	4797	0.49	0.50	6427
Muslim	0.37	0.48	4797	0.38	0.49	6427
Rural area	0.74	0.44	4797	0.73	0.44	6427
Mother: Primary school	0.38	0.49	4797	0.36	0.48	6427
Mother: Secondary school	0.13	0.33	4797	0.11	0.31	6427
Mother: More than secondary school	0.01	0.10	4797	0.00	0.06	6427
Panel B: Outcome variables, 0-5 years old						
Height-for-Age Z-score	-1.06	1.74	2766	-1.73	1.48	3302
Weight-for-Height Z-score	-0.39	1.50	2369	0.01	1.25	3381
Had fever in last 2 wks	0.37	0.48	4551	0.31	0.46	5741
Had diarrhea in last 2 wks	0.30	0.46	4526	0.19	0.40	5511
Diarrhea: Seek medical treatment	0.56	0.50	1220	0.53	0.50	969
Fever: Seek medical treatment	0.60	0.49	1568	0.57	0.50	1713
No. of food groups	1.81	1.51	4583	2.25	1.49	1959
Food groups > 4	0.15	0.36	4583	0.21	0.41	1959
	5-12 years old			13-17 years old		
Panel C: Outcome variables, 5-17 years old						
Economic Activities	0.49	0.50	1141	0.66	0.47	549
Household Tasks	0.75	0.43	4965	0.86	0.34	1241
Attended School	0.61	0.49	4729	0.70	0.46	1195
Dropped Out	0.01	0.08	4729	0.01	0.10	1195
Never Went to School	0.37	0.48	4925	0.19	0.39	1233

Notes: Panel C: Outcome variables, 5-17 years olds A and B report control and outcome variables, respectively, for children under 5 years of age, separately for 0-24 month-olds, and 25-60 month-olds. The variable "Number of food groups" takes values between 0 and 6. Panel C: Outcome variables, 5-17 years old C reports the outcome variables for 5-17 year-olds, separated between 5-12 year-olds and 13-17 year-olds.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A7: Effect on Anthropometric Measures of Children by Age

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Fatalities	-.00116***	-.000127	4.20e-06	-.0000121	-.000134	-.00022
	(.000372)	(.0000992)	(.0000149)	(.00117)	(.000415)	(.00029)
0-36 Month × Fatalities	-.000687	.000142	.000386*	-.000354	.000158	.0000286
	(.00086)	(.000207)	(.000222)	(.000632)	(.00017)	(.000239)
Coef (37-60 Months): Average effect	-0.025	-0.003	0.000	-0.000	-0.003	-0.005
P-val (37-60 Months): Average effect	0.005	0.213	0.782	0.992	0.750	0.456
Coef (0-36 Months): Average effect	-0.040	0.000	0.009	-0.008	0.001	-0.004
P-val (0-36 Months): Average effect	0.035	0.931	0.101	0.611	0.939	0.674
N	5596	5596	5596	5923	5923	5923
R-Squared	0.224	0.125	0.092	0.190	0.148	0.113
Mean of Dep. Var.	-0.160	0.089	0.028	-1.424	0.376	0.162

Notes: Sample includes children under 5 years of age. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A8: Effect on Children's Illnesses and Use of Medical Care by Age

	Fever or cough		Diarrhea	
	Illness in 2 weeks	Seek medical care	Illness in 2 weeks	Seek medical care
	(1)	(2)	(3)	(4)
Fatalities	.000269	-.00126***	.000604***	-.00226***
	(.000167)	(.000287)	(.000133)	(.000782)
0-36 Month × Fatalities	5.22e-08	.000758	-.000354	.00191**
	(.000343)	(.000536)	(.000228)	(.000815)
Coef (37-60 Months): Average effect	0.006	-0.028	0.013	-0.049
P-val (37-60 Months): Average effect	0.123	0.000	0.000	0.009
Coef (0-36 Months): Average effect	0.006	-0.011	0.005	-0.008
P-val (0-36 Months): Average effect	0.512	0.254	0.384	0.271
N	10123	3205	9868	2150
R-Squared	0.098	0.145	0.124	0.215
Mean of Dep. Var.	0.335	0.583	0.243	0.547

Notes: Sample includes children under 5 years of age. In columns (2) and (4) the sample is restricted to children who had been ill with fever or cough, or diarrhea, respectively. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A9: Effect on Anthropometric Measures of Children by Age

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Fatalities	-.00138**	.0000236	.0000137	-.00108	.000961*	.000379
	(.000605)	(.00021)	(.0000234)	(.00196)	(.000501)	(.000328)
0-12 Month × Fatalities	-.00207	.000592	.000835	-.000522	-.000729	.000147
	(.00292)	(.000654)	(.00058)	(.00281)	(.000763)	(.000722)
13-24 Month × Fatalities	.000277	-.00038	.000257*	.000802	-.00121***	-.000836*
	(.000747)	(.000267)	(.00013)	(.0013)	(.00032)	(.000421)
25-36 Month × Fatalities	-.000984	-.0000977	.000179	.00158	-.000819**	-.000862
	(.000751)	(.000261)	(.000115)	(.00126)	(.000391)	(.00114)
37-48 Month × Fatalities	.000344	-.000335	-.0000102	.00197	-.00181***	-.00107***
	(.000653)	(.000199)	(.000029)	(.0016)	(.000389)	(.000246)
Coef (49-60 Months): Average effect	-0.0302	0.000516	0.000300	-0.0236	0.0210	0.00827
P-val (49-60 Months): Average effect	0.0329	0.912	0.564	0.588	0.0687	0.261
Coef (37-48 Months): Average effect	-0.0227	-0.00681	0.0000779	0.0194	-0.0186	-0.0150
P-val (37-48 Months): Average effect	0.0178	0.00000924	0.800	0.214	0.000216	0.00503
Coef (25-36 Months): Average effect	-0.0517	-0.00162	0.00421	0.0110	0.00310	-0.0106
P-val (25-36 Months): Average effect	0.000447	0.588	0.0800	0.661	0.830	0.702
Coef (13-24 Months): Average effect	-0.0241	-0.00779	0.00592	-0.00605	-0.00551	-0.00999
P-val (13-24 Months): Average effect	0.0232	0.00967	0.0291	0.819	0.653	0.434
Coef (0-12 Months): Average effect	-0.0754	0.0135	0.0185	-0.0350	0.00507	0.0115
P-val (0-12 Months): Average effect	0.262	0.318	0.147	0.223	0.543	0.305
N	5590	5590	5590	5917	5917	5917
R-Squared	0.251	0.151	0.124	0.213	0.172	0.143
Mean of Dep. Var.	-0.159	0.089	0.028	-1.426	0.376	0.162

Notes: Sample includes children under 5 years of age. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A10: Effect on Illnesses and Use of Medical Care of Children by Age

	Fever or cough		Diarrhea	
	Illness in 2 weeks	Seek medical care	Illness in 2 weeks	Seek medical care
	(1)	(2)	(3)	(4)
Fatalities	.000724***	-.00212***	.00118***	-.00255***
	(.000226)	(.00036)	(.000205)	(.000809)
0-12 Month × Fatalities	-.000887***	.00114	-.000982***	.000763
	(.000289)	(.001)	(.000319)	(.000969)
13-24 Month × Fatalities	-.000131	.00204***	-.000403**	.00385***
	(.00035)	(.000414)	(.000179)	(.00084)
25-36 Month × Fatalities	-.000668	.0000927	-.00201***	-.000989
	(.000704)	(.000708)	(.000334)	(.000753)
37-48 Month × Fatalities	-.000665*	.00172***	-.000934***	.00147
	(.000326)	(.000512)	(.000137)	(.000867)
Coef (49-60 Months): Average effect	0.0158	-0.0462	0.0257	-0.0556
P-val (49-60 Months): Average effect	0.00420	0.00000775	0.0000106	0.00488
Coef (37-48 Months): Average effect	0.00129	-0.00861	0.00529	-0.0235
P-val (37-48 Months): Average effect	0.812	0.312	0.139	0.136
Coef (25-36 Months): Average effect	0.00122	-0.0442	-0.0181	-0.0772
P-val (25-36 Months): Average effect	0.937	0.00259	0.0832	2.34e-11
Coef (13-24 Months): Average effect	0.0130	-0.00164	0.0169	0.0285
P-val (13-24 Months): Average effect	0.106	0.858	0.00991	0.00685
Coef (0-12 Months): Average effect	-0.00355	-0.0213	0.00424	-0.0389
P-val (0-12 Months): Average effect	0.562	0.359	0.522	0.00552
N	10121	3199	9866	2131
R-Squared	0.112	0.193	0.138	0.274
Mean of Dep. Var.	0.335	0.582	0.243	0.547

Notes: Sample includes children under 5 years of age. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A11: Effect on Mortality Measures

	Neonatal	Infant	U5	Child
	(1)	(2)	(3)	(4)
Panel A				
Fatalities*Post first attack	-.000139	4.43e-06	-.00003	-.0000344
	(.00027)	(.000116)	(.0000464)	(.000116)
Fatalities	.0000836	-.0000276	-.000013	.0000146
	(.000264)	(.000111)	(.0000425)	(.000126)
Post	-.259***	-.57***	-.895***	-.325***
	(.0142)	(.0168)	(.0116)	(.0174)
Control	Yes	Yes	Yes	Yes
Coef: Average effect	-0.012	0.000	-0.002	-0.003
P-val: Average effect	0.754	0.805	0.762	0.909
R-Squared	0.253	0.499	0.784	0.301
Panel B: Without control variables				
Fatalities*Post first attack	-.000138	8.90e-06	-.000032	-.0000409
	(.000275)	(.000115)	(.0000447)	(.000117)
Fatalities	.0000995	-.0000389	1.85e-07	.0000391
	(.00028)	(.000115)	(.0000426)	(.000134)
Post	-.259***	-.572***	-.898***	-.326***
	(.0141)	(.0166)	(.0114)	(.0171)
Coef: Average effect	-0.011	0.001	-0.003	-0.003
P-val: Average effect	0.726	0.738	0.997	0.773
N	9347	9347	9347	9347
R-Squared	0.250	0.498	0.783	0.299
Mean of Dep. Var.	0.035	0.077	0.122	0.045

Notes: Sample includes all births to women of 15-49 years of age surveyed in MICS 2014. The model is a regression where the dependent variables are: Column (1) Neonatal mortality denoting whether the child died during the first month of life. Column (2) whether the child died before first birthday. Column (3) under-five mortality, whether the child died before reaching the age of five. Column (4) Child Mortality, whether the child died after the first birthday but before the fifth birthday. The independent variable interacts the number of fatalities in the 20km radius with a variable Post first attack , an indicator variable taking the value one if the child death occurred after the first Boko Haram attack in the country (April 2012), and zero otherwise. Panel A includes control variables, Panel B does not include control variables. Controls include all variables listed in Table 1 Panel B. All regressions include Birthyear $\times$ Birthmonth fixed effects, and district fixed effects. Standard errors clustered at the district level are in parenthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Multiple Indicator Cluster Surveys (MICS) 2014, and the ACLED dataset.

Table A12: Effect on Stock variables

	Demographic characterstics
	(1)
Female child	.000169***
	(.0000547)
Household size	.00157
	(.00247)
Female-headed household	-.0000507
	(.0000773)
Wealth Index	3.81e-20
	(2.78e-20)
Mother: Age	4.75e-19
	(1.29e-18)
Mother: Currently married	4.74e-20
	(5.28e-20)
Christian	4.41e-19***
	(1.54e-19)
Muslim	.00163*
	(.000857)
Rural area	1.12e-19
	(1.85e-19)
Mother: Primary school	3.44e-19
	(5.46e-19)
Mother: Secondary school	-.000116
	(.000134)
Mother: More than secondary school	.000028
	(.000024)
Observations	11059

Notes: Sample includes children under 5 years of age. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1 Panel A. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A13: Pre-2014 difference on control variables

	Household characteristics						Individual characteristics					
	Household size	Female household head	Welath index	Christian	Muslim	Living in rural area	Female child	Age in months	Mother's age	Mother: married	Mother: Completed primary school	Mother : Completed secondary school
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: 2004												
Living within 20km from 2014 conflict area in 2004	.0945	-.00544	.571***	-.157***	.294**	-.169	-.0558**	-.152	.451	-.035	.017	.0379
	(.39)	(.00675)	(.184)	(.0347)	(.105)	(.128)	(.0238)	(.23)	(1.03)	(.0269)	(.0265)	(.0284)
N	3261	3261	3261	3261	3261	3261	3261	3261	3261	3261	3261	3261
R-Squared	0.067	0.106	0.256	0.306	0.344	0.126	0.024	0.997	0.070	0.078	0.208	0.110
Mean of Dep. Var.	8.160	0.109	-0.624	0.481	0.377	0.734	0.498	29.481	27.638	0.926	0.346	0.075
Panel B: 2011												
Living within 20km from 2014 conflict area in 2011	.361	-.0115	.377*	.119**	-.127	-.223	-.0189	-.419	.41	-.00706	.0379	-.0105
	(.454)	(.0355)	(.204)	(.0467)	(.0955)	(.139)	(.0262)	(.275)	(.449)	(.0131)	(.0484)	(.0114)
N	5382	5382	5382	5382	5382	5382	5382	5382	5382	5382	5382	5382
R-Squared	0.065	0.095	0.225	0.248	0.265	0.102	0.016	0.996	0.050	0.122	0.120	0.100
Mean of Dep. Var.	8.250	0.132	-0.615	0.519	0.401	0.743	0.515	28.931	28.018	0.906	0.401	0.099
Panel C: 2004 and 2011 joint test for trend												
Living within 20km from 2014 conflict area in 2004	-.0225	.0235	.429**	-.16**	.277**	-.166	-.0295	-.419	-.252	-.0378**	.00976	.0135
	(.396)	(.0174)	(.171)	(.0615)	(.122)	(.108)	(.0264)	(.481)	(.901)	(.0177)	(.0431)	(.0199)
Living within 20km from 2014 conflict area in 2011	.0714	-.0434*	.378**	.0217	-.0326	-.191*	-.00822	-.0865	.442**	.0206	-.0326	-.00483
	(.422)	(.0221)	(.136)	(.109)	(.161)	(.092)	(.018)	(.304)	(.211)	(.0139)	(.0491)	(.0262)
P-val: 2004 = 2011	0.528	0.034	0.474	0.011	0.001	0.646	0.332	0.471	0.437	0.008	0.428	0.518
R-Squared	0.052	0.079	0.217	0.145	0.152	0.107	0.019	0.995	0.059	0.084	0.109	0.131
Mean of Dep. Var.	8.080	0.135	-0.593	0.528	0.365	0.735	0.503	29.043	28.028	0.896	0.391	0.133

Notes: All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A14: Effect on Anthropometric Measures of Children

	Weight			Height		
	WHZ	Wasted	Extremely Wasted	HAZ	Stunted	Extremely Stunted
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 2004						
Total N of 2014 fatalities in 20km in 2004	-.000156	.0000385	-1.59e-06	.000877	-.000226*	-.0000676
	(.000275)	(.0000795)	(.0000524)	(.000543)	(.000114)	(.00012)
	[1]	[1]	[1]	[.573]	[.573]	[1]
Control	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.003	0.001	-0.000	0.019	-0.005	-0.001
P-val: Average effect	0.577	0.634	0.976	0.121	0.061	0.578
R-Squared	0.231	0.132	0.108	0.200	0.154	0.116
Panel B: 2011						
Total N of 2014 fatalities in 20km in 2011	.0000263	-.0000543	-.0000543***	-.000359	.000151	.0000832*
	(.0000827)	(.000036)	(.0000191)	(.000368)	(.000111)	(.0000475)
	[.391]	[.306]	[.062]	[.391]	[.306]	[.306]
Coef: Average effect	0.001	-0.001	-0.001	-0.008	0.003	0.002
P-val: Average effect	0.754	0.146	0.010	0.340	0.187	0.095
N	3295	3295	3295	3636	3636	3636
R-Squared	0.231	0.132	0.109	0.200	0.154	0.116
Mean of Dep. Var.	-0.275	0.103	0.037	-1.502	0.406	0.187

Notes: Sample includes children under 5 years of age. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A15: Effect on Anthropometric Measures and Illness of Children (Sensitivity on Distance to Conflict)

	HAZ	WHZ	Stunted	Wasted
	(1)	(2)	(3)	(4)
Panel A: Anthropometric measures				
Fatalities in 40km	.000274	-.000394*	-.0000355	.0000317
	(.000227)	(.000199)	(.0000819)	(.0000477)
Coef: Average effect	0.055	-0.080	-0.007	0.006
P-val: Average effect	0.240	0.061	0.669	0.513
N	5929	5606	5929	5606
R-Squared	0.163	0.209	0.123	0.108
Mean of Dep. Var.	-1.424	-0.162	0.376	0.089

	Fever in 2 weeks	Fever: Seek medical care	Diarrhea in 2 weeks	Diarrhea: Seek medical care
	(1)	(2)	(3)	(4)
Panel B: Illness and medical service use				
Fatalities in 40km	.000181*	-.000125	.0000597	-.0000316
	(.0000959)	(.000117)	(.0000938)	(.0000692)
Coef: Average effect	0.037	-0.025	0.012	-0.006
P-val: Average effect	0.073	0.295	0.531	0.653
N	10127	3207	9872	2159
R-Squared	0.087	0.115	0.103	0.176
Mean of Dep. Var.	0.335	0.582	0.243	0.548

Notes: Sample includes children under 5 years of age. All models include control variables listed in Table 1 Panel B. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. Variable 'Fatalities in 40km' denotes the number of fatalities within a 40km radius in the last 12 months. All models include sample weights. Standard errors clustered at the district level are in parenthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011, and the ACLED dataset.

Table A16: Effect on Anthropometric Measures and Illness of Children (Seasonality in Birth Month)

	HAZ	WHZ	Stunted	Wasted
	(1)	(2)	(3)	(4)
Panel A: Anthropometric measures				
Fatalities in 20km	-.000347	-.00136**	.000034	-.0000343
	(.000599)	(.000486)	(.000222)	(.000103)
Coef: Average effect	-0.030	-0.116	0.003	-0.003
P-val: Average effect	0.568	0.011	0.880	0.742
N	5929	5606	5929	5606
R-Squared	0.163	0.209	0.123	0.107
Mean of Dep. Var.	-1.424	-0.162	0.376	0.089

	Fever in 2 weeks	Fever: Seek medical care	Diarrhea in 2 weeks	Diarrhea: Seek medical care
	(1)	(2)	(3)	(4)
Panel B: Illness and medical service use				
Fatalities in 20km	.000272	-.000649***	.000349*	-.000494**
	(.000237)	(.000219)	(.000169)	(.000214)
Coef: Average effect	0.023	-0.055	0.030	-0.042
P-val: Average effect	0.264	0.007	0.052	0.031
N	10127	3207	9872	2159
R-Squared	0.086	0.115	0.103	0.176
Mean of Dep. Var.	0.335	0.582	0.243	0.548

Notes: Sample includes children under 5 years of age. All models include control variables listed in Table 1 Panel B. All regressions include Birthyear fixed effects, and Birthmonth fixed effects, survey wave fixed effects, and commune fixed effects. Standard errors clustered at the district level are in parenthesis. All models include sample weights. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011, and the ACLED dataset.

Table A17: Effects on Anthropometric Measures of Children (0-60 Months-old), without District Fixed Effects

	HAZ	WHZ	Stunted	Wasted	Extremely Stunted	Extremely Wasted
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Fatalities in 20km	-.000371	-.000952**	-.0000552	-.0000171	-.000234	.000139*
	(.000348)	(.000366)	(.000134)	(.000113)	(.000284)	(.0000724)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.008	-0.021	-0.001	-0.000	-0.005	0.003
P-val: Average effect	0.298	0.017	0.683	0.880	0.419	0.069
R-Squared	0.028	0.092	0.031	0.019	0.024	0.009
Panel B: Without control variables						
Fatalities in 20km	-.00107**	-.00207**	.0000933	.0000679	-.000143	.00015**
	(.000503)	(.00085)	(.000179)	(.000145)	(.000275)	(.0000701)
Coef: Average effect	-0.023	-0.045	0.002	0.001	-0.003	0.003
P-val: Average effect	0.046	0.024	0.608	0.644	0.608	0.044
N	6068	5750	6068	5750	6068	5750
R-Squared	0.003	0.020	0.003	0.003	0.003	0.001
Mean of Dep. Var.	-1.421	-0.155	0.375	0.089	0.163	0.028

Notes: Sample includes children under 5 years of age. Panel A includes controls, Panel B does not. Controls include all variables listed in Table 1 Panel B. All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A18: Summary Statistics by Survey Year

	2004			2011			2014		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Panel A: Control variables									
Female child	0.50	0.50	3261	0.52	0.50	5382	0.47	0.50	2632
Age in months	29.64	17.22	3261	28.98	17.42	5382	28.83	17.06	2581
Household size	8.15	4.79	3261	8.22	4.31	5382	7.69	4.04	2632
Female-headed household	0.12	0.32	3261	0.11	0.32	5382	0.16	0.37	2632
wealth index factor score (5 decimals)	-0.65	0.68	3261	-0.65	0.69	5382	-0.60	0.77	2632
Mother: Age	27.64	6.90	3261	28.06	6.91	5382	28.58	7.30	2434
Mother: Currently married	0.92	0.27	3261	0.92	0.27	5382	0.86	0.35	2434
Christian	0.47	0.50	3261	0.50	0.50	5382	0.53	0.50	2632
Muslim	0.37	0.48	3261	0.40	0.49	5382	0.35	0.48	2632
Rural area	0.71	0.45	3261	0.74	0.44	5382	0.77	0.42	2632
Mother: Primary school	0.35	0.48	3261	0.37	0.48	5382	0.41	0.49	2632
Mother: Secondary school	0.07	0.26	3261	0.09	0.28	5382	0.23	0.42	2632
Mother: More than secondary school	0.00	0.05	3261	0.01	0.08	5382	0.01	0.12	2632
Panel B: Outcome variables, 0-5 years old									
Height-for-Age Z-score	-1.50	1.73	1337	-1.51	1.68	2299	-1.29	1.54	2432
Weight-for-Height Z-score	-0.24	1.40	1204	-0.30	1.38	2091	0.01	1.33	2455
Had fever in last 2 wks	0.23	0.42	2903	0.35	0.48	4808	0.44	0.50	2581
Had diarrhea in last 2 wks	0.21	0.41	2800	0.28	0.45	4656	0.22	0.41	2581
Diarrhea: Seek medical treatment	0.44	0.50	529	0.56	0.50	1160	0.64	0.48	500
Fever: Seek medical treatment	0.66	0.47	604	0.55	0.50	1541	0.58	0.49	1136
No. of food groups	2.02	1.57	1851	1.68	1.43	3079	2.35	1.52	1663
Food groups > 4	0.21	0.41	1851	0.11	0.32	3079	0.23	0.42	1663
Panel C: Outcome variables, 5-17 years old									
Economic Activities				0.55	0.50	4516	0.54	0.50	1690
Household Tasks				0.77	0.42	4516	0.81	0.39	1690
Attended School				0.62	0.48	4468	0.92	0.27	1456
Dropped Out				0.01	0.08	4468	0.01	0.09	1456
Never Went to School				0.34	0.47	4468	0.18	0.38	1690

Notes: Number of food groups takes values between 0 and 5. Column (1) to (3) reports mean and standard deviations (in parenthesis) of the variables while Column (4) reports the mean difference and its p-values in parenthesis between the conflict exposed area prior to conflict events and never-exposed areas.
Source: Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011, and the ACLED dataset.

Table A19: Mean comparison of variables by conflict exposure in 2014

	Conflict in 20km		No conflict in 20km		Conflict vs. No-conflict		N
	Mean	SD	Mean	SD	Coef.	SE	
Panel A: Control variables							
Female child	0.464	[0.500]	0.473	[0.499]	-0.009	(0.014)	2581
Age in months	30.4	[17.4]	28.7	[17.0]	1.68	(1.07)	2581
Household size	8.65	[5.70]	7.59	[3.81]	1.06	(0.880)	2581
Female-headed household	0.097	[0.297]	0.170	[0.376]	-0.073**	(0.034)	2581
wealth index factor score (5 decimals)	-0.920	[0.808]	-0.563	[0.757]	-0.357	(0.211)	2581
Mother: Age	29.5	[6.98]	28.5	[7.32]	1.01*	(0.518)	2416
Mother: Currently married	0.931	[0.254]	0.853	[0.354]	0.078***	(0.028)	2416
Christian	0.219	[0.414]	0.560	[0.496]	-0.342***	(0.110)	2581
Muslim	0.568	[0.496]	0.326	[0.469]	0.242	(0.219)	2581
Rural area	0.845	[0.362]	0.757	[0.429]	0.089	(0.120)	2581
Mother: Primary school	0.158	[0.365]	0.432	[0.495]	-0.274***	(0.081)	2581
Mother: Secondary school	0.131	[0.338]	0.244	[0.429]	-0.113	(0.081)	2581
Mother: More than secondary school	0	[0]	0.015	[0.121]	-0.015***	(0.005)	2581
Panel B: Outcome variables, 0-5 years old							
Height-for-Age Z-score	-1.30	[1.55]	-1.29	[1.54]	-0.010	(0.201)	2432
Weight-for-Height Z-score	-0.603	[1.29]	0.080	[1.32]	-0.683**	(0.261)	2455
Had fever in last 2 wks	0.488	[0.501]	0.433	[0.496]	0.055	(0.072)	2581
Had diarrhea in last 2 wks	0.313	[0.465]	0.207	[0.406]	0.106	(0.070)	2581
Diarrhea: Seek medical treatment	0.643	[0.482]	0.638	[0.481]	0.005	(0.042)	500
Fever: Seek medical treatment	0.460	[0.500]	0.590	[0.492]	-0.130	(0.093)	1136
No. of food groups	2.67	[1.66]	2.31	[1.50]	0.352**	(0.130)	1612
Food groups > 4	0.355	[0.480]	0.219	[0.414]	0.136*	(0.078)	1612
Panel C: Outcome variables, 5-17 years old							
Economic Activities	0.513	[0.502]	0.547	[0.498]	-0.034	(0.035)	1690
Household Tasks	0.856	[0.352]	0.811	[0.391]	0.045**	(0.019)	1690
Attended School	0.840	[0.370]	0.927	[0.260]	-0.087	(0.062)	1456
Dropped Out	0.046	[0.211]	0.007	[0.085]	0.039*	(0.022)	1456
Never Went to School	0.522	[0.501]	0.147	[0.354]	0.376*	(0.218)	1690

Notes: Panel A reports control variables, Panel B the outcome variables for 0-5 year-olds, where the variable "Number of food groups" takes values between 0 and 6, and Panel C reports the outcome variables for 5-17 year-olds for 2014 data only.The statistics under "Conflict in 20km" and "No Conflict in 20km" report the mean and standard deviation (in square brackets) of these samples.The statistics under "Conflict vs. No-conflict" report the mean difference conducted using a t-test on the sample that was exposed to conflict in the 20km radius in the 12 months prior to the survey, and the sample that was not exposed.The standard errors of the t-tests are in parenthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.
Source: Multiple Indicator Cluster Surveys (MICS) 2014

Table A20: Effect on Food Intake of Children by Age

	Food groups > 4	No. of food groups	Starchy Staples	Legumes/ Nuts	Meat and eggs	Dairy	Vegetables	Fruits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fatalities	.000464	.0018*	.000268**	-.000952**	.00119***	.00132**	.000425	-.000446**
	(.000391)	(.000928)	(.000105)	(.000388)	(.000414)	(.000582)	(.000345)	(.000158)
0-12 Month × Fatalities	-.000529	-.00252	-.000881***	.000102	-.00154*	.000773	-.0016*	.000619**
	(.000391)	(.0017)	(.000306)	(.00031)	(.000884)	(.000922)	(.000848)	(.000259)
13-24 Month × Fatalities	.0000381	.000292	-.000174	.000317	-.00182***	.00143**	-.000557**	.00108***
	(.000301)	(.000837)	(.000165)	(.000267)	(.000635)	(.000566)	(.000251)	(.000134)
Coef (25-36 Months): Average effect	0.0101	0.0393	0.00586	-0.0208	0.0260	0.0289	0.00929	-0.00974
P-val (25-36 Months): Average effect	0.249	0.0664	0.0186	0.0230	0.00919	0.0336	0.232	0.0102
Coef (13-24 Months): Average effect	0.0110	0.0456	0.00206	-0.0139	-0.0137	0.0602	-0.00288	0.0139
P-val (13-24 Months): Average effect	0.0258	0.000516	0.453	0.0717	0.0620	0.00321	0.636	0.000753
Coef (0-12 Months): Average effect	-0.00142	-0.0159	-0.0134	-0.0186	-0.00774	0.0458	-0.0257	0.00379
P-val (0-12 Months): Average effect	0.871	0.595	0.0486	0.104	0.497	0.103	0.277	0.564
N	8200	8200	8200	8190	8198	8198	8199	8190
R-Squared	0.160	0.391	0.364	0.130	0.320	0.134	0.221	0.185
Mean of Dep. Var.	0.153	1.848	0.677	0.188	0.286	0.124	0.379	0.193

Notes: Sample includes children under 5 years of age. All regressions include controls as in Table 2, Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Table A21: Pre-2014 difference on outcome variables

	Anthropometric				Diseases			
	WHZ	Extremely wasted	HAZ	Extremely stunted	Fever	Seek medical care for fever	Diarrhea	Seek medical care for diarrhea
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2011								
Living within 20km from 2014 conflict area in 2004	-.0218	-.0545**	-.112	.0106	-.0508***	.125**	-.0133	.116*
	(.301)	(.0238)	(.239)	(.0256)	(.015)	(.049)	(.0338)	(.0578)
N	1204	1204	1337	1337	2903	604	2800	529
R-Squared	0.206	0.151	0.171	0.093	0.110	0.180	0.116	0.244
Mean of Dep. Var.	-0.156	0.036	-1.512	0.187	0.208	0.637	0.189	0.422
Panel B: 2004								
Living within 20km from 2014 conflict area in 2011	.0614	.00157	-.061	.0286	-.0896*	.0661	-.031	.125**
	(.0632)	(.00802)	(.116)	(.0337)	(.047)	(.0788)	(.0315)	(.0553)
N	2091	2091	2299	2299	4808	1541	4656	1160
R-Squared	0.251	0.076	0.187	0.093	0.089	0.140	0.139	0.120
Mean of Dep. Var.	-0.237	0.033	-1.498	0.179	0.329	0.574	0.252	0.565
Panel C: 2004 and 2011 joint test for trend								
Living within 20km from 2014 conflict area in 2004	-.108	-.0233*	-.0928	.0215	-.0475	.249***	.0191	.187**
	(.205)	(.0117)	(.139)	(.0283)	(.0326)	(.0576)	(.0282)	(.0707)
Living within 20km from 2014 conflict area in 2011	-.0209	-.000352	-.197	.036	-.0867*	-.03	-.0182	.0921
	(.194)	(.00763)	(.18)	(.0344)	(.0449)	(.066)	(.0297)	(.057)
P-val: 2004 = 2011	0.674	0.114	0.555	0.579	0.558	0.003	0.317	0.371
R-Squared	0.157	0.073	0.136	0.071	0.081	0.082	0.088	0.135
Mean of Dep. Var.	-0.084	0.025	-1.405	0.158	0.323	0.586	0.219	0.548

Notes: All regressions include Birthyear × Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.
Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.

Appendix B: Effects on older children (5-17 years old)

Conflict might also affect which activities children engage in. We investigate this by using data from an older group of children, aged between 5 to 17 years, who are most often engaged in either work or schooling. Children's time use may be affected through an intra-household substitution effect if children need to take up adults' activities due to changes in adults' time use as a consequence of conflict, or as a response to household income losses due to conflict, which may move children's time use towards economic activities. For instance, foregone income could be substituted by engaging children in subsistence farming. However, security threats from conflict and constraints in mobility may decrease children's participation in any activity outside the household. Indeed, evidence from Northeast Nigeria shows that Boko Haram activity reduced school attendance (Bertoni et al., 2019). While the authors do not investigate effects on child labor, a reduction in time spent in school could result in increased child labor or time spent on household chores.

Table B1 reports the estimated effects on child labor, household chores, and schooling. Columns (1) and (2) are for the extensive margin of children's work; the dependent variables are dummies denoting whether a child of age 5-17 worked at any economic activity (outside of the household), and participated in household tasks, respectively. Indeed, child labor is highly prevalent; over 50 percent of children involved in economic activities, while as many as 77 percent of children in this age group participate in household chores. While we find a decrease in the participation in economic activities outside the household, we find an increase in the share of children participating in household chores, statistically significant at the one percent level and five percent level, respectively. This 1 percentage point decrease in economic work translates to 1.8 percent decrease, and 0.9 percentage points increase in household chores translates to 1.2 percent increase from the mean. Columns (3)-(5) of Table B1 show results for children's educational outcomes. If there was a reduction in school attendance, measured by whether a child attended school during any time of the school year 2013-14, we could hypothesize that the very first attacks in 2013 led to pulling children entirely out of school during the school year 2013-14. However, we find that attendance did not change substantially. On the other hand, the propensity to drop out of school between the 2012-13 and 2013-14 school years increased. It implies that we do find an increase in the *change* of attendance from one school year to another. Given that on average only 0.7 percent of children drop out at all, our mean effect of 0.2 percentage points indicates a 28 percent increase in dropout as a consequence of conflict. Column (5) shows results for a variable "Never went to school", which is a stock variable and less likely to have been affected by the conflict, as most of the children in the sample would have started school before the conflict began. Therefore, this dependent variable can be considered a placebo-check, resulting in null results as expected. Taken together, children 5-17 years of age seem to have increased their participation in household tasks, some at the expense of schooling.

Table B1: Effect on Child Schooling and Labor (5-17 years old)

	Work		Schooling		
	Economic activities	Household tasks	Attended school	Dropped out	Never went to school
	(1)	(2)	(3)	(4)	(5)
Panel A					
Fatalities in 20km	-.000512***	.000413**	.00106	.0000947***	.00125
	(.000178)	(.000191)	(.000826)	(.0000327)	(.00098)
	[.023]	[.044]	[.095]	[.023]	[.095]
Control	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.011	0.009	0.023	0.002	0.027
P-val: Average effect	0.009	0.042	0.215	0.009	0.215
R-Squared	0.189	0.215	0.325	0.013	0.354
Panel B: Without control variables					
Fatalities in 20km	-.000447**	.000411*	.00102	.0000916**	.00142
	(.000184)	(.000207)	(.000803)	(.0000356)	(.00101)
	[.066]	[.066]	[.111]	[.066]	[.111]
Coef: Average effect	-0.010	0.009	0.022	0.002	0.031
P-val: Average effect	0.025	0.060	0.219	0.018	0.177
N	1690	6206	5924	5924	6158
R-Squared	0.117	0.195	0.288	0.008	0.317
Mean of Dep. Var.	0.544	0.770	0.623	0.007	0.340

Notes: Sample includes children 5-17 years of age. Dependent variables in columns (1) and (2) are dummy variables denoting whether the child participated in any economic activities outside of the household, and in household tasks, respectively, in the 7 days preceding the survey. Dependent variables in columns (3)-(5) are dummy variables denoting school attendance in the 2013-14 school year, whether the child dropped out between the 2012-13 and 2013-14 school years, and whether the child ever attended school. Panel A includes control variables, Panel B does not. Controls include all variables listed in Table 1. All regressions include Birthyear $\times$ Birthmonth fixed effects, survey wave fixed effects, and district fixed effects. All models include sample weights. Standard errors clustered at the district level are in paranthesis, and sharpened q-value in square brackets. * denotes significance at 0.10; ** at 0.05; and *** at 0.01 level.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2011.

Table B2: Effect on Child Schooling and Work by school age group

	Work		Schooling		
	Economic activities	Household tasks	Attended school	Dropped out	Never went to school
	(1)	(2)	(3)	(4)	(5)
Panel A: Primary school age (6-12 years old)					
Fatalities	-.000569*	.000502*	.00187***	6.75e-06	.00173
	(.00028)	(.000251)	(.000276)	(.000032)	(.00104)
Control	Yes	Yes	Yes	Yes	Yes
Coef: Average effect	-0.012	0.011	0.041	0.000	0.038
P-val: Average effect	0.055	0.058	0.000	0.835	0.110
R-Squared	0.196	0.138	0.269	0.018	0.277
Panel B: Secondary school age (13-17 years old)					
Fatalities	-.000533	.000448*	-.000311	.000342*	.00115
	(.000323)	(.00024)	(.00143)	(.000186)	(.000788)
Coef: Average effect	-0.012	0.010	-0.007	0.007	0.025
P-val: Average effect	0.114	0.076	0.830	0.080	0.158
N	549	1239	1193	1193	1231
R-Squared	0.137	0.112	0.221	0.030	0.225
Mean of Dep. Var.	0.660	0.864	0.695	0.010	0.189

Notes: Odd-numbered columns do not include controls, in even-numbered columns controls are included. Controls include all variables listed in Table 1. All regressions include Year × Month fixed effects, and survey wave fixed effects. Standard errors clustered at the commune level are in paranthesis. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Source: Pooled dataset using Multiple Indicator Cluster Surveys (MICS) 2014 and Demographic and Health Survey (DHS) from 2004 and 2011.