Linking armed conflicts and children undernutrition in Nigeria: the mitigating effects of maternal bargaining power

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Abstract

Does armed conflicts exposure increase the risk of malnutrition among children? how can these effects be mitigated? in this paper, I seek evidence on the effects of armed conflict on children's nutritional outcomes and how maternal bargaining power can mitigate these effects in the Boko Haram (BH) conflict-affected areas of Nigeria. The individual characteristics were drawn from three rounds of the Nigerian Demographic and Health Survey (NDHS) and information on the BH conflict was sourced from the Armed Conflict Location and Event Dataset (ACLED). The identification strategy exploits temporal and spatial variation across birth cohorts to measure children's exposure to the BH conflicts. By analyzing various proxies of maternal bargaining power, I find that children born to women with low bargaining power are more likely to be affected by the BH conflict than children born to women with high bargaining power. I also show that male and older children born to mothers with low bargaining power are disproportionately affected by the BH conflict. The main factor contributing to the negative nutritional effects of the BH conflict is the utilization of healthcare services, particularly maternal healthcare. The results are not affected by selective mortality, migration and the endogeneity of maternal bargaining power to the BH conflict. The findings remain consistent across various specifications and are not driven by rainfall shocks. The evidence suggests that policies and interventions designed to mitigate the negative impact of BH conflict on children should exploit progress in the level of maternal bargaining power alongside other protective measures.

Keywords: armed conflicts, women's bargaining power, children's nutrition. JEL: I15, J16.

Introduction

Armed conflicts and insecurity are threats to economic activities for many developing countries as it disrupts various channels of economic growth. Apart from the immediate killing and destruction of physical infrastructure (ICRC, 2021), armed conflicts can have several indirect repercussions on children's nutrition and health which substantially increases the overall cost of conflict. Children living in armed conflicts areas are at a significantly higher risk of experiencing malnutrition, with over double the likelihood compared to those residing in peaceful areas (Save the Children, 2021). The disruption of food systems, forced-displacement, economic instability, direct violence and challenges accessing clean water or healthcare services can all contribute to child malnutrition in armed conflicts areas (Stewart, Humphreys and Lea, 1997; Kirschner and Finaret, 2021; Eseosa Ekhator-Mobayode and al. 2022). The early stages of life, particularly infancy, is critical in shaping an individual long-term health, education and employment prospects (Strauss and Thomas, 1998; Behrman and Rosenzweig, 2004; Maccini and Yang, 2009), as such, nutrition shocks resulting from conflicts during this period can have significant implications for economic growth and welfare.

Several studies conducted in developing world concluded that children living in regions affected by armed conflicts experience adverse health outcomes (Camacho, 2008; Akresh, Lucchetti and Thirumurthy, 2012; Mainuddin and al. 2015). Nonetheless, a majority of these studies have certain limitations due to the unobserved heterogeneity of the population under examination, which can result in an under or overestimation of the true effect of the conflict exposition. Out of the various factors contributing to heterogeneity, the level of bargaining power held by mothers of the children is particularly crucial. In fact, a flourishing literature links a woman increased ability to make choices to an improvement in children schooling, health and nutrition (Duflo, 2003; Qian, 2008; Lépine and Strobl, 2013; Imai and al. 2014). Assuming there is a correlation between bargaining power and child nutrition, the impact of armed conflicts on child nutrition would vary between those born to mothers with high bargaining power and those born to mothers with low bargaining power.

This paper seeks to provide evidence-based insights into the complex interplay between armed conflicts, women's bargaining power and child's nutrition with the aim of identifying effective strategies to improve the nutritional status of children in conflict-affected areas. It is build on the assumption that in the household where females have high bargaining power, the investment in children health and nutrition increases therefore it may play a mitigating role in protecting children from the exposition to the conflict. To investigate this potential scenario, I use data from the Boko Haram (BH) insurgency in Nigeria. Since 2009, the northeastern regions of Nigeria have been facing the BH insurgency, a group which aims to topple the existing government and establish an Islamic

law-based regime. Research conducted in Nigeria indicates that this region experienced a considerable decrease in total agricultural output and productivity (Adelaja and George, 2019), ultimately leading to higher levels of food insecurity (Kaila and Azad, 2023) which particularly affect children nutrition (Ekhator-Mobayode and Asfaw, 2019). The BH insurgency has also been found to reduce access to maternal healthcare services, including antenatal care visits, delivery at a healthcare center and delivery by a skilled health professional, which increases the risk of undernutrition and child mortality (Chukwuma and Ekhator Mobayode, 2019).

Maternal bargaining power can play a mitigating role when studying the impact of the BH conflict on children's nutrition and health through increasing food intake and health services access due to control over household financial resources which result in better childcare and overall children health. To illustrate this point, I refer to the non-unified preferences framework proposed by Maitra (2004) in this particular situation. She assumes that male and female bargaining power affects children's health by affecting their health inputs, which are also a function of market goods prices. A change in children health can result from a change in the budget constraint or a change in the utility function due to relative changes in power within the household. In the Nigerian context, empirical evidence suggests that household members experience either a direct shock (a reduction in income) or an indirect shock (by the rising prices of goods available in the market, including those related to health) due to exposure to BH (Adelaja and George, 2019; Kaila and Azad, 2023), but the relative bargaining power of the household members remains unchanged (Eseosa Ekhator-Mobayode and al. 2022). This income shock will tighten the budget constraint and affect investment in children health inputs, including nutrition [1] and thus increases the risk of undernutrition, ultimately leading to a higher risk of mortality. In a context where fathers exercise a disproportionate degree of power over family decisions, they may increase overall fertility to prevent child mortality and keep the household size constant, but this decreases the utility of mothers as they bear a high share of the cost of bearing children (Eswaran, 2002; Rasul, 2008). Therefore, in regions where households have similar levels of exposure to the conflict and similar characteristics, except for the level of the mother bargaining power, women with higher bargaining power would, *ceteris paribus*, reduce fertility and increase investment in health inputs including nutrition (Rasul, 2008; Komura, 2013), hence, the impact of the armed conflict on their children's nutritional outcomes is expected to be less significant in comparison to children born to mothers with a low level of bargaining power.

The sample for this study is derived from the recode of the Nigeria Demographic and Health Survey (NDHS) conducted in 2008, 2013, and 2018 [2] and comprises more than

1. Malnutrition can make children more vulnerable to diseases by weakening their immune system, ultimately leading to a higher risk of mortality. Additionally, disease can further compromise nutrient intake while the body is particularly in need (Macallan, 2009).

2. These data are collected from Integrated Public Use Microdata Series (IPUMS-DHS).

35,339 children under the age of five. The outcome variables of interest are children's anthropometric indicators: Weight for Age z-scores (WAZ), Height for Age Z-scores (HAZ), and Weight for Height Z-scores (WHZ). Information on the BH insurgency is drawn from the Armed Conflict Location and Event Data Project (ACLED). I spatially match each armed conflict event with at least one fatality related to BH that happened between 2009 (the year in which the BH conflict started) and 2018 to the NDHS cluster to build the exposition variable[3]. I started my investigation by running a regression model without any of the proxies of maternal bargaining power. The results suggest that the overall effect of the conflict on children nutrition is negative and statistically significant. In the following steps, using several proxies for maternal bargaining power, I find that each BH conflict negatively affects child nutrition, thereby increasing the probability of undernutrition (especially in terms of WAZ and WHZ, however, the estimates for the HAZ were not statistically significant) particularly for children born to mothers with low levels of bargaining power. Also, the effect of the BH conflict on children born to mothers with low levels of bargaining power is more pronounced for male children; the differences with female children born to the same group of women are not statistically significant. The estimated effect on children born to mothers with high bargaining power was not significant and similar for both boys and girls. The difference between the children born to the two groups of women is significant. I also found that older children born to mothers with a low level of bargaining power are more affected by the conflict, and there is a preference for first-born children among women with high bargaining power.

Examining the impact of shocks such as conflict on children health outcomes is challenging due to the possibility of biased estimates caused by selective survival. The survivors of such shocks may have better health endowments or come from wealthier families, leading to an underestimation of the effect of the shock on child health and nutrition (Akresh, Lucchetti and Thirumurthy, 2012; Mainuddin and al. 2015; Ekhator-Mobayode and Asfaw, 2019) for the groups of women with low and high bargaining power. To address this issue, I assessed the potential for selective survival by looking at two aspects: infant mortality (mortality before the first year) and the probability of having an under five child alive during the survey. I don't find any evidence of selective survival for the two groups of women. Another source of bias could arise from how the BH conflict affects the women's bargaining power. If mothers experience changes in bargaining power due to the BH conflict, a selection problem may arise, as women who manage to maintain high their level of bargaining power might possess some intrinsic characteristics that make them different from those who lose their level of bargaining power and these intrinsic characteristics can affect their child nutrition as well. To address this problem, I looked at how the BH conflict affected the proxies of bargaining power. I find that the BH conflict

3. Between 2009 and 2018, more than 2,029 conflicts related to BH occurred in Nigeria, according to the ACLED dataset.

doesn't correlated with the women's level of bargaining power, which is consistent with previous findings from Eseosa Ekhator-Mobayode and al. (2022).

Exploring the underlying factors that clarify these findings is essential for understanding them and formulating policies. Previous research in regions unaffected by conflict highlights two primary pathways through which maternal bargaining power can improve child nutrition: firstly, the quality and diversity of infant feeding practices (Malapit and al. 2015; Malapit and Quisumbing, 2015; Bonis-Profumo, Stacey and Brimblecombe, 2021) which directly impact child nutrition; and secondly, healthcare service utilization (Lim and al. 2010; Maitra, 2004; Story and Burgard, 2012), crucial for preventing and treating malnutrition related illnesses. Due to data constraints, I mainly focus on the health-related transmission channel. I find that the BH conflict did not have any significant effect on the probability of a given child being vaccinated, but it did negatively impact the likelihood of mothers with low bargaining power using maternal care. The BH conflict also increases the likelihood that women with low bargaining power face barriers to accessing healthcare services. Interestingly, the estimated effect of the conflict on women with high bargaining power is not statistically significant highlighting their role in protecting children in conflict settings. The results are robust to several alternative definitions of the exposure variable. They also remain unchanged if I include all types of conflict regardless of the actors involved and are not driven by shocks in rainfall patterns.

Aside from the existing body of literature concerning the impact of conflicts on socio-economic status, this paper contributes to the fast-growing literature on female bargaining power and children health. To the best of my knowledge, this is the first study to examine the effect of female bargaining power using several proxies in a context where children are more vulnerable to malnutrition (due to conflict exposure). It also contribute to the literature on gender based bias in the effect of bargaining power by examining gender differential effects in the estimated.

The paper is structured as follows: section 1 present an overview of the BH conflict insurgency and review the relevant literature; section 2 provides a detailed description of the survey data used in this analysis, including an explanation of the key variables; section 3 describes the identification strategy; section 4 outlines the primary findings of the analysis along with the results of the heterogeneity analysis; in section 5, various channels that could explain the obtained results are discussed and results of the robustness tests are presented in section 6 before drawing conclusions.

1 Context and Background

1.1 Boko Haram insurgency in Nigeria

Nigeria, with its estimated population of 200 million (World Bank, 2021), has been struggling with a disturbing level of violence since gaining independence from British rule in the late 1960s. This violence is fueled by a dangerous combination of extremist factions, organized crime syndicates, and a cropland crisis. Among these extremist groups, BH is by far the most perilous. BH is a militant Islamist group founded in 2002 by *Mohammed Yusuf* in the northeastern Nigerian state of Borno. The purpose of its members is to establish a state in Nigeria based on Islamic principles (American Foreign Policy Council, 2019). While BH was initially peaceful, their violent activities begin in 2009 following clashes between *Mohammed Yusuf*, the group leader, and the authorities because of its extremist views which condemned western education. During the following years, BH has progressively spread its influence to other parts of the country and intensified its attacks targeting civilians, military and government installations which result in numerous fatalities and injuries. BH has gained infamy for its brutal treatment of children, with a particular focus on young girls. Its notoriety grew exponentially after it captured international attention in april 2014, when it abducted 276 schoolgirls from their dormitory in Chibok village in northeastern Nigeria (United Nations, 2014). The group has been known to use girls as both sexual and domestic slaves, and even as human bombs, carrying out attacks on civilian locations such as markets, hospitals, internally displaced person camps, churches and educational institutions (OHCHR, 2015) which forced displacement for over two million people since 2009 (EUAA, 2014) [4]. According to the Armed Conflict Location and Events Database (ACLED), between 2009 and 2018, there were 2,513 recorded conflict incidents in Nigeria involving BH as perpetrator. More than 81.5 percent of these conflicts (which represent 2,049 conflicts) resulted in at least one fatality[5]. Despite efforts by the Nigerian government and international community, the BH insurgency remains, till today, a significant threat in Nigeria, particularly after its alignment with Islamic State (IS) in 2016 (EUAA, 2014). The group was ranked as the deadliest terrorist organization worldwide in 2016, and Nigeria was the third most terrorized nation in 2017, according to Jacob (2017) during the same year. The children residing in the affected areas are also confronted with indirect consequences of the conflict that may harm their health, such as increasing risk of undernutrition in addition to the trauma caused by the killing related to BH attacks.

4. In early 2012, Ansaru, a group reportedly linked to Al Qaeda, separated from BH due to its use of brutal tactics. The indiscriminate killings of both civilians and Muslims caused further divisions within BH, resulting in a second split in 2016 and the emergence of the Islamic State - West Africa (ISWAP). For the purposes of this study, we will consider all conflicts directly related to BH or its factions.

5. Around 31,076 persons were killed as a result of exposure to BH during the study period. 94 percent of these killings happened in the northeastern region of Nigeria.

1.2 Armed conflicts and children's well-being

Armed conflict can have devastating effects on children's well-being, including significant impacts on their nutrition. The disruption of food systems, forced displacement, the spread of disease, economic instability and re-allocations of government funding away from health and social spending, infrastructure destruction, direct violence and maternal stress can all contribute to child malnutrition during armed conflicts (Stewart, Humphreys and Lea, 1997; Mansour and Rees, 2012; Ekhator-Mobayode and Asfaw, 2019; Kirschner and Finaret, 2021).

Numerous studies conducted in developing world have concluded that children living in regions affected by armed conflict experience adverse health outcomes with lower levels of well-being. A first set of the literature examines the effects of exposure to armed conflicts during pregnancy on child birth outcomes. Overall, it concludes that maternal exposition to armed conflicts reduces birth weight. For instance, Camacho (2008) used the Colombian vital statistics records from 1998 to 2003 on four million births to study the effect of exposure to landmine explosions on children's birth weight. She found that first trimester exposure to a landmine explosion in the municipality of residence was associated with a reduction of 2.2 grams in children's birth weight. This effect increases to 8.7 grams while using the sample of nonmigrant children born to the same mother. Exposition during the second and third semester was no significantly related to birth weight. Also, Mansour and Rees (2012) investigated the effect of intrauterine exposure to the al-Aqsa Intifada conflict on children's birth weight and early mortality using the 2004 Palestinian Demographic and Health Survey (PDHS), the information on conflict intensity is collected by B'Tselem [6] and available on a monthly basis. They found that an additional fatality in the early stage of the pregnancy (9-6 month before birth) is associated with an increase in the probability of low birth weight when the sample is restricted to siblings and mother fixed effects are included. No significant effect was found for children exposed during the last two trimester before birth. The authors also explore the role of mother educational attainment on children's birth weight. They found that children born to more educated women (more than twelve years of educations) are less impacted by the conflict that children born to less educated mothers.

A second set of research examines the effect of armed conflict on both short and long term children nutritional status. Findings indicate that children who have experienced conflict are more likely to suffer from malnutrition than those who have not been exposed. In Akresh, Lucchetti and Thirumurthy (2012), the authors study the effect of the 1998–2000 Eritrea-Ethiopia war on children's nutrition using the 2002 Eritrea DHS along with the 2000 and 2005 Ethiopia DHS. Their identification strategy is a difference-in-difference which compares birth cohorts of children exposed to war with children not

6. B'Tselem is the Israeli information center for human rights in the occupied territories of Palestine.

exposed to the war. They find that children born and living in a war region have 0.42 standard deviations lower Height-for-Age Z-scores (HAZ), that children in a non-war exposed region. Their results are robust to migration, fertility and mortality. Likewise, in Minoiu and Shemyakina (2014), the authors studied the impact of the 2002-2007 Ivorian civil war on children's nutritional status measured by the HAZ. For the purpose of this study, the authors used data from the Household Living Standards Surveys (HLSS) with the ACLED database and exploited both temporal and spatial variation across birth cohorts in exposure to the conflict. They find that children who were exposed to the conflict either in utero or during early childhood, and lived in conflict-affected regions, have an average HAZ that is 0.414 standard deviations lower than that of children living in no conflict regions. They also find that the stature deficit is more pronounced for boys and children exposed to conflict for longer periods of time. A household head with higher educational attainment can lower the risk of undernutrition. Their results are robust to the sample composition, migration, selective fertility and mortality. A similar investigation was conducted in Ekhator-Mobayode and Asfaw (2019) on Nigeria. The authors use data from both NDHS and the Global Terrorism Database (GTD) as source for the armed conflicts events and investigate how BH insurgency affect child malnutrition. Their results suggest that children in BH affected areas have reduced Weight-for-Height Z-scores (WHZ) and increasing probability of wasting. The main distinction between our paper and the previous one is that we primarily examine the impact of the insurgency on the likelihood of children falling below the acceptable minimum threshold, and how bargaining may serve as a mediator on this probability.

Armed conflict can also affect children's nutrition by decreasing dietary diversity status in the conflict affected regions which affect the households food security status. In fact, having a variety of foods in one's diet can enhance the chances of fulfilling nutritional needs, and can lead to better nutritional well-being (FAO, 2010). A multitude of factors can impact the diversity of household food during armed conflict, including reduced agricultural production due to physical insecurity, absence of agricultural inputs, destruction of food processing facilities and distribution systems, damage to infrastructure such as roads and markets, as well as loss of income in conjunction with increased prices. Research conducted in Côte d'Ivoire (Dabalen and Paul, 2014) and Nigeria (Kaila and Azad, 2023) find strong evidence of food insecurity among conflict-affected population.

1.3 Women bargaining and children's nutrition

The issue of female empowerment and how it impacts household members well-being gained a particular attention in research over the last decades. A specific attention was given to how women empowerment through increased bargaining power influences the health and nutrition of children. The literature identify two ways through which higher

decision making power improves children's health: by increasing health services access due to the control over financial resources and control over fertility which result to better childcare at home and overall children's health (Maitra, 2004; Lim and al. 2010; Lépine and Strobl, 2013). However, the majority of these studies were conducted in a context without violence or where households did not experience a specific shock, unlike our study.

Overall, studies on developing countries find a positive and significant relation between women empowerment and children's well-being. Maitra (2004) explores the relationship between women status in the household and the utilization of healthcare services such as hospital deliveries and prenatal care using the National Family and Health Survey (NFHS) of India in 1999. Her findings suggest that when women have greater access to education and control over household resources, it leads to an increase in healthcare utilization and a decrease in the risk of infant mortality. Also, Lim and al. (2010) examined the impact of a conditional cash transfer program designed to encourage women to deliver their babies at a healthcare facility in India. They found a noteworthy correlation between the conditional cash transfer program and an increase in both antenatal care utilization and in-facility deliveries. In Story and Burgard (2012), the authors investigated how women empowerment affects health care service utilization in Bangladesh using data from the 2007 Bangladesh DHS. Their findings suggest that joint decision making between husbands and wives increases the antenatal and skilled delivery care use as compared to husband-only decision-making.

In Pal (1999), the author examines the role of individual and household characteristics in the nutritional status of children in India. He uses an ordered measure of the nutritional status of children based on Weight for Age Z-scores (WAZ), as it captures both long-term and short-term nutritional deprivation. He finds that female literacy decreases the likelihood of malnutrition for male children and increases the likelihood for female children. The per capita current income increases both boys and girls nutritional status. Furthermore, Duflo (2003) study the effect of a cash transfer program in South African targeted at elder citizens on children's nutritional status. This cash transfer program increase the income of the recipient women and creates a shift in their level of bargaining power in their household. She found that income directed to women increases the WHZ of girls by 1.19 but did not significantly increase that of boys. Income directed to men are not associated with an improvement in the nutritional status of either girls or boys. In Allendorf (2007), the author defined women empowerment by their access to land rights and study how it affect children's nutrition using data from the 2001 Nepali DHS. She argues that land access serves as a means of promoting their economic development and can enhance their bargaining power within the household. She found that Nepali women who possess land are more likely to exercise the final decision-making power within their households, and their young children have a lower probability of being severely

underweight. A similar result was find in Shroff and al. (2011). The paper shows that increased maternal involvement in household decision-making is associated with a lower incidence of underweight and wasting among infants.

Also, in Lépine and Strobl (2013), the authors use several measures of women participation in decision making within the household and build an indicator of women bargaining power to examine its effect on children's nutritional status in rural Senegal. Using an OLS regression model, they found that women bargaining power increases child nutrition. The authors also explore an exogenous source of variation in women bargaining power and show that its true effect on children's nutrition is underestimated if the endogeneity of the bargaining power is not taken into account. In a similar study, Imai and al. (2014) investigate the role of maternal empowerment on children's nutritional status in rural India using three rounds of National Family Health Survey (NFHS) data in India. In this study, the authors define women bargaining power as the existence of a gap in the number of schooling years between the woman and her husband. They also find a positive and significant relation between women bargaining power and short term measures of children's nutritional status (wasting and underweight). Women bargaining power is also correlated with a chronic measure of nutritional status, the HAZ. Women empowerment has been shown to improve the quality and diversity of household diets, which can improve nutrition status for both adults and children in the household. Evidence on low-income countries show that female empowerment in agriculture, measured using the Women's Empowerment in Agriculture Index (WEAI)[7] is associated with greater quality of infant and young child feeding practices and diversity (Malapit and al. 2015; Malapit and Quisumbing, 2015; Bonis-Profumo, Stacey and Brimblecombe, 2021).

Although the argument that empowering women increases household well-being has been widely documented, other sets of research on developing countries don't find significant effect of female empowerment on children's nutrition. In Chou and al. (2010), the authors used the expansion of the school system in Taiwan and show that the impact of women education on child health was not significantly different from the effect of male education. Duflo (2012) argues that many of the correlations between female empowerment and household outcomes may be misleading due to two factors. The first reason is that a woman education or earnings may be linked to hidden factors, such as family background or societal norms, that directly affect a child nutrition and health. The second reason is that comparing the impact of men and women education or earnings may also be influenced by hidden traits of men (e.g its possible that women with higher education levels tend to marry men who also have higher education levels and are more invested in their children's nutrition.). In Akresh, De Walque and Kazianga (2016), the authors conducted a randomized control trial to study the impact of a cash transfer program on children's outcomes in rural Burkina Faso. They find that transfers directed towards women did

7. See Alkire and al. (2013) for more

not have a significant impact on children's health, whereas transfers directed towards men increased children's health. Using a similar approach, Haushofer and Shapiro (2016) don't find any significant differences between male and female recipient of cash transfert in Kenya.

2 Data, descriptive statistics and measures

The Armed Conflict Location and Event Data (ACLED)

Data on the conflict were obtain from the ACLED[8]. The ACLED dataset is an event based dataset which provides disaggregated incident information on a range of violent and non-violent hostilities by military force, rebels, militias and civilians. Theses information included each event date, its location and GPS coordinates, the authors involved and the number of fatalities for several countries including Nigeria. The geocoded armed conflict events that occurred between 2009 and 2018 are spatially matched with the NDHS dataset to build the exposition variable. The figure 1 relates each BH conflict with at least one fatality to the location where it happened in Nigeria between 2009 and 2018. The northeastern states[9] has a disproportionate level of exposure to the BH conflict with approximately 92 percent of all conflicts related to BH during this period. Within the northeastern states, the state of Borno is by far the most affected state with more than 74 percent of all armed conflicts related to BH with at least one fatality. Around 82 percent of all conflicts related to BH occurred between 2014 and 2018. The neighboring states of the north western [10] and north central[11] part of the country account for around 7 percent of these conflicts. The remaining states of the country experienced fewer than five conflicts related to BH during the study period.

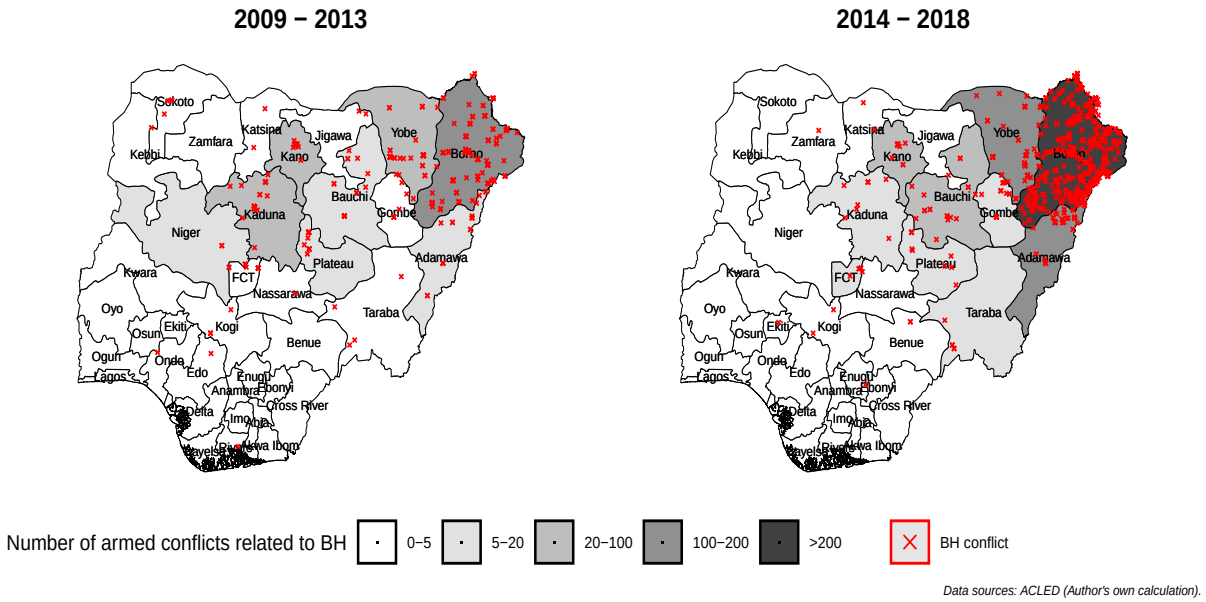
8. We chose this data source because it provides GPS coordinates for the violent conflict events, as compared to the GTD dataset.

9. The northeastern zone is composed of six states: Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe.

10. The north western zone is composed of seven states: Kaduna, Kano, Katsina, Kebbi, Jigawa, Sokoto and Zamfara.

11. The north central zone is composed of seven states: Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau as well as Nigeria's Federal Capital Territory(FCT)

Figure 1: Number of armed conflicts related to BH with at least one fatality by state and time in Nigeria.



The Nigerian Demographic and Health Surveys (NDHS)

The individual characteristics are drawn from the NDHS data collected in 2008, 2013 and 2018. The NDHS is a national cross-sectional survey that provides up-to-date information on background characteristics of the respondents from across all 37 states of Nigeria. The NDHS sample is representative at the national and state levels and for urban and rural areas. This survey collects information on the socioeconomic status of women between the ages of 15 and 49, which includes their level of decision-making power within the household, participation in the labor force, level of education, their religion, their ethnicity and some characteristics of their husbands (age, education etc.). For each of the women, information is gathered about her offspring who are under the age of five, including their weight [12], age, sex, height, and other characteristics of the household. The anthropometric status of each children (WHZ, WAZ, HAZ) is then computed using the World Health Organization (WHO) standard and made available in the dataset. The NDHS also includes information on the location of the household and the GPS coordinates of its cluster. The dataset includes data from over 111,536 children gathered across three rounds of the DHS survey. After excluding children with missing data on both control and outcomes variables, the final sample comprises 35,339 children under the age of five, born to 23,521 mothers and living in 23,264 households across the country [13].

12. The child's birth weight is available but have many missing values, which prevents using this variable as an outcome variable.

13. I also excluded children born into polygamous households because the definition of bargaining power for women in these households is unclear. After removing missing values there were 7,129 polygamous households in the database. This represents approximately 10,468 women in the sample who gave birth

The tables 9, 10, and 11 in appendix summarize various characteristics of the children, mothers and husbands, and households, respectively, categorized by their exposure to the BH conflict.[14]. The first three columns provide some statistics on all children for which data is available and the remaining columns restrict the sample to the siblings (which consists of under-five children who have at least one sibling below the age of five)[15]. The sibling sample represents around 63 percent of the children sampled and is born to 11,599 women, which represents around 50 percent of the total women. Overall, children who have experienced at least one BH conflict are, on average, older, present worse indicators in terms of nutrition and less likely to be vaccinated as shown in 9. These differences are statistically significant in both the baseline and sibling samples. The women's and husbands' characteristics depicted in table 10 show that women who were exposed to the BH conflict are, on average, less likely to have decision-making power (except for the *aut. on own ear.*, for which the proportions are similar). They are also younger and more likely to be Muslim than women who did not experience any conflict. Women exposed to the conflict, on average, come from larger households, have more children and are less likely to come from the poorer quintile as shown in the table 11.

Outcomes variables

This study focuses on children's anthropometric indicators as proxies of their nutrition. In the literature, three main proxies are used: the Weight for Age Z-scores (WAZ), the Height for Age Z-scores (HAZ) and the Weight for Height Z-scores (WHZ). The WAZ is an indicator that reflects medium-term food deprivation and is used to assess child underweight. Underweight is a condition that refers to children weighing less than what is considered healthy and well-nourished for their age. It is measured by a WAZ lower than two standard deviations. It can be due to insufficient growth in both height and weight, or recent weight loss. While underweight can indicate wasting or stunting or both the two, it cannot differentiate between then. The HAZ is used to detect chronic malnutrition or child's stunting. Stunting refers to a condition where a child growth is hindered causing them to fall short of their growth potential. Stunting is a consequence of prolonged undernutrition, which if not treated can lead to delayed cognitive development, impaired academic performance, and diminished intellectual capabilities. Therefore, it is not just a childhood issue but a problem that can persist throughout a person life. It determines if the children are too short for their age. If a child height falls two standard deviations below the height of a similar child with the same age, then this child is stunted. The WHZ is a measure used to assess child wasting. Child wasting, also known as acute mal-

to 15,503 children. I conducted a t-test and found no correlation between polygamy and exposure to the BH conflict.

14. The variable used to measure exposure is the number of BH conflicts that occurred within a 10-kilometer radius of the child cluster center. Further explanation about this choice will be provided.

15. This sample is used in the empirical strategy to include mothers fixed effect.

nutrition, occurs when a child's weight is too low compared to their height. This usually happens because of rapid weight loss or insufficient weight gain. This condition increases the risk of death among under five children. The main causes of child wasting are severe food shortages, recent illnesses, improper childcare practices, or a combination of these factors. Child wasting is marked by significant weight loss, leading to a low WHZ. A child whose weight falls two standard deviations below their expected weight for their height is defined as wasted[16]. The growth standards for children currently employed by WHO serve as a basis for constructing the WAZ, HAZ and WHZ, all of which are included in the NDHS dataset. The table 9 summarized these nutrition indicators for both the baseline and sibling sample. In general, children exposed to at least one BH conflict are worse off. In terms of WAZ, the average difference is 0.442 (1.435 - 0.993), which is approximately 31 percent higher than the mean value for children exposed to the conflict. The difference in WHZ is around 0.548 (0.893 - 0.345), representing approximately 61 percent of the WHZ for children exposed to the conflict. As for HAZ, the difference is significant in the baseline sample, around 0.131 (1.424 - 1.293) but not statistically significant in the sibling sample.

Exposure to the BH insurgency

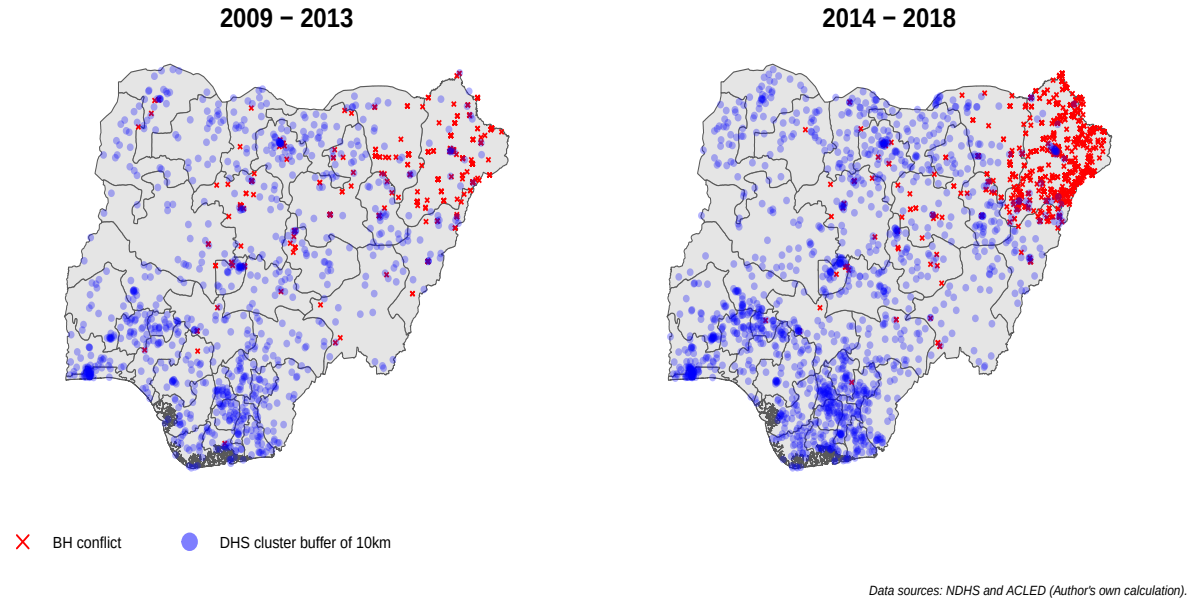
There are various definitions of exposure to conflicts found in the literature. Some of them are based on the geographic location of the individual, either within the administrative areas the conflict events (Camacho, 2008; Mansour and Rees, 2012; Akresh, Lucchetti and Thirumurthy, 2012) or within buffer zones around conflict events (Chukwuma and Ekhator Mobayode, 2019; Eseosa Ekhator-Mobayode and al. 2022). For example, Camacho (2008) defines exposure to conflict as being located in a municipality that has experienced a landmine explosion, while Mansour and Rees (2012) defines exposure to conflict as residing in a district impacted by the armed conflict. On the other hand, Chukwuma and Ekhator Mobayode (2019) use narrower buffer zones ranging from 3 to 10 kilometers in radius to examine the effect of BH insurgency on the availability of maternal health services in Nigeria, taking into account the catchment area for accessing health facilities. Also, to investigate the impact of conflict on child nutrition and mortality in Nigeria, Howell and al. (2020) used a buffer zones ranging from 2 to 10 kilometers. Eseosa Ekhator-Mobayode and al. (2022) adopt a buffer zone of 10 kilometers in their analysis of the prevalence of Intimate Partner Violence (IPV) among women affected by the BH conflict. They argued that it is a suitable radius in which conflict-related incidents might have an impact. Following Eseosa Ekhator-Mobayode and al. (2022), the present study defines exposure to the BH insurgency as the number of conflicts related to BH that occurred within a 10-kilometer radius[17] of the children's cluster center from

16. The WHZ ratio varies among children and to account for this variability, the WHO defines an acceptable range around the median expectation. This range, which spans two standard deviations, allows for differences in individual measurements.

17. Using binary coding for the exposure variable provides similar estimates for the baseline specifica-

the child's date of birth until the day of the interview during the study period in Nigeria. The figure 2 below plots the NDHS clusters and the geographic locations of BH violent activities that occurred between 2009 and 2018. Around 4.45 percent of the under five children born in Nigeria during the study period experience at least one armed conflict related to BH in less than 10 kilometers of their NDHS cluster of residence. I further examine the sensitivity of the results on the size of the buffer zone. Exposed children, on average, experienced around 19 conflicts with a median value of 3, as shown in table 9. The average number of fatalities related to these conflicts is approximately 146.

Figure 2: The BH attacks that took place within a 10-kilometer radius of the surveyed cluster during the study period.



Measures of bargaining power

Research on female bargaining power within the household use various proxies [18] to capture women status in the household and how it affects resources allocated to children. Several studies have utilized women involvement in household's decisions as an indicator of their bargaining power. They rely on questions regarding the individual responsible of decisions related to major household expenses, daily expenditures, and matters such as the health of the wife and children or visits to relatives without the husband consent. Examples of such studies include Shroff and al. (2011), Lépine and Strobl (2013), and Imai and al. (2014). Other studies use indirect measures of women decision making ability as an indicator of her level of bargaining power in the household (Duflo, 2003; Maitra, 2004;

tion, but it cannot give estimates for the siblings' sample because there is no variation in the conflict exposure to exploit.

18. The measurement of women bargaining power is a challenging task, as it is not directly observable. This is why the literature uses proxies to define bargaining.

Akresh, De Walque and Kazianga, 2016; Dovis, Augier and Sadania, 2021). The proxies used in these studies include the gap in the number of years of schooling between the wife and husband, the age gap between them, women access to a cash transfer program, their labor force participation status, land property, the assets brought into the marriage, access to their own earnings. The NDHS data includes several variables that can be utilized as proxies for female bargaining power. In this study, I used both direct and indirect measures of women bargaining power in the household which indicate access to household financial resources : women participation in big household purchases (such as buying a car, house, land etc...), autonomy regarding her own earnings, ability to influence husband's spending and [19] and a binary variable which indicate whether or not the woman earns more than her husband. The table 1 below shows the children's nutritional indicators for two groups of women for each of the two samples: those with low bargaining power and those with high bargaining power. Low bargaining power means the woman didn't have decision-making ability (represented as **0**), while high bargaining power means the opposite (represented as **1**). The first two columns summarize the mean Z-scores for women with low bargaining power based on their children's exposure to the BH conflict followed by the estimated difference. The next set of columns summarizes the mean values of anthropometric measurements for children born to women with high bargaining power along with their estimated differences in the last column. Overall, in the same circumstances (with or without conflict), children born to women with high bargaining power are better off than those born to women with low bargaining power and some differences are even statistically significant. Comparing the differences in the effects of conflict, it's clear that children born to women with low bargaining power are generally more affected by the BH conflict compared to children born to mothers with higher levels of bargaining power. We'll delve into how to better capture this initial difference in the empirical strategy section.

19. For these two variables, both sole and joint decision making ability are used to define the level of bargaining power held by mother as it provides a better assess of the level of bargaining power that women have in the household.

Table 1: Children's anthropometric indicators based on their exposure to the BH conflict and their mother's status in the household.

	Panel A: Aut. maj. hh purch. (Yes = 1, No = 0)					
	0			**1**		
	No conflict[1] 10 km around	**At least one conflict 10 km around**	**Difference[1]**	**No conflict 10 km around**	**At least one conflict 10 km around**	**Difference[1]**
Baseline	N = 18,831	N = 1,167		N = 14,935	N = 406	
WAZ	-1.165 (1.408)	-1.541 (1.396)	0.378***	-0.776 (1.256)	-1.131 (1.564)	0.355***
HAZ	-1.485 (1.996)	-1.539 (1.908)	0.054	-1.050 (1.804)	-1.092 (2.051)	0.042
WHZ	-0.429 (1.601)	-0.948 (1.703)	0.519***	-0.239 (1.414)	-0.733 (1.629)	0.494***
Sibling	N = 12,001	N = 777		N = 9,165	N = 236	
WAZ	-1.013 (1.380)	-1.397 (1.366)	0.384***	-0.986 (1.305)	-1.467 (1.506)	0.481***
HAZ	-1.348 (1.961)	-1.416 (1.921)	0.068	-1.232 (1.855)	-1.368 (1.991)	0.136
WHZ	-0.315 (1.547)	-0.840 (1.686)	0.525***	-0.382 (1.467)	-0.961 (1.721)	0.579***
	Panel B: Aut. own. earn. (Yes = 1, No = 0)					
Baseline	N = 15,597	N = 705		N = 18,169	N = 868	
WAZ	-1.024 (1.400)	-1.335 (1.393)	0.311***	-0.966 (1.318)	-1.516 (1.494)	0.550***
HAZ	-1.369 (1.979)	-1.412 (1.944)	0.043	-1.227 (1.876)	-1.434 (1.965)	0.207***
WHZ	-0.322 (1.583)	-0.770 (1.656)	0.448***	-0.365 (1.471)	-0.993 (1.704)	0.628***
Sibling	N = 9,860	N = 459		N = 11,307	N = 554	
WAZ	-1.013 (1.380)	-1.397 (1.366)	0.384***	-0.986 (1.305)	-1.467 (1.506)	0.481***
HAZ	-1.348 (1.961)	-1.416 (1.921)	0.068	-1.232 (1.855)	-1.368 (1.991)	0.136
WHZ	-0.315 (1.547)	-0.840 (1.686)	0.525***	-0.382 (1.467)	-0.961 (1.721)	0.579***

[*] *Note* : WAZ : Weight for Age Z-score; HAZ : Height for Age Z-score; WHZ : Weight for Height Z-score. Mean value are provided and the standard errors are in parentheses. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

	0			1		
	No conflict[1] 10 km around	**At least one conflict 10 km around**	**Difference[1]**	**No conflict 10 km around**	**At least one conflict 10 km around**	**Difference[1]**
Panel C: Aut. on. husb. earn. (Yes = 1, No = 0)						
Baseline	N = 22,759	N = 1,267		N = 11,007	N = 306	
WAZ	-1.081 (1.381)	-1.542 (1.432)	0.461***	-0.811 (1.286)	-0.993 (1.454)	0.182***
HAZ	-1.394 (1.958)	-1.538 (1.950)	0.144***	-1.083 (1.838)	-0.951 (1.905)	-0.132
WHZ	-0.387 (1.560)	-0.953 (1.730)	0.566***	-0.259 (1.442)	-0.643 (1.467)	0.384***
Sibling	N = 14389	N = 830		N = 6778	N = 183	
WAZ	-1.081 (1.363)	-1.540 (1.422)	0.459***	-0.825 (1.275)	-0.960 (1.451)	0.135
HAZ	-1.384 (1.942)	-1.504 (1.945)	0.120**	-1.079 (1.809)	-0.872 (1.945)	-0.207
WHZ	-0.385 (1.537)	-0.963 (1.750)	0.578***	-0.278 (1.432)	-0.650 (1.464)	0.372***
Panel D: Earn. more than husb. (Yes = 1, No = 0)						
Baseline	N = 31,376	N = 1,510		N = 2,390	N = 63	
WAZ	-1.009 (1.362)	-1.444 (1.451)	0.435***	-0.779 (1.263)	-1.220 (1.465)	0.441***
HAZ	-1.311 (1.931)	-1.436 (1.956)	0.125***	-1.050 (1.835)	-1.139 (1.921)	0.089
WHZ	-0.354 (1.534)	-0.898 (1.698)	0.544***	-0.236 (1.377)	-0.780 (1.381)	0.544***
Sibling	N = 19727	N = 975		N = 1440	N = 38	
WAZ	-1.012 (1.345)	-1.439 (1.456)	0.427***	-0.812 (1.269)	-1.329 (1.095)	0.517***
HAZ	-1.301 (1.910)	-1.400 (1.960)	0.100	-1.076 (1.833)	-1.139 (1.950)	0.063
WHZ	-0.358 (1.513)	-0.906 (1.724)	0.548***	-0.247 (1.388)	-0.913 (1.159)	0.666***

[*] *Note* : WAZ : Weight for Age Z-score; HAZ : Height for Age Z-score; WHZ : Weight for Height Z-score. Mean value are provided and the standard errors are in parentheses. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

3 Empirical Strategy

I started the investigation by running the following model:

$$Y_{imct} = \alpha_1 nbrEvents_{ict} + \alpha_2 X_{imct} + \mu_i^M + \mu_i^Y + \mu_i^{SY} + \mu_{imt}^c + \mu_{imt}^{Int} + \epsilon_{imct} \quad (1)$$

The outcome variables Y_{imct} represent the anthropometric indicators of the child i born to mother m and residing in cluster c at time t[20]. $nbrEvents_{ict}$ is the measure of the intensity of the BH conflict registered in the 10 kilometers radius of the center of the cluster c between the child i birth date and the date of interview, it has a value of zero if there were no attacks. The controls variables X_{imct} include indicators for whether i is a twin, i's gender, i's birth order and age, the woman's m ethnicity, her age and age squared, woman and husband number of years of education, a binary indicating whether each of the husband or the woman work in the agricultural sector, the sex of the head of i's household, the number of household members, the number of under five children and the NDHS poverty quintile. $\mu^M i$ represents the fixed effect for child i's month of birth, which captures seasonal patterns in child nutrition. $\mu^Y i$ stands for the year of birth fixed effect, capturing common characteristics among children born in the same year. $\mu^{SY} i$ is the survey year fixed effect, capturing shared characteristics among children born in the same year. The coefficient $\mu^c imt$ represents cluster-specific fixed effects, addressing factors like urbanization and sanitary conditions that remain constant within each cluster over time. The coefficient μ_{imt}^{Int} captures the interview month fixed effect to account for seasonality stemming from the month of the interview. The aim of this first equation is to estimate the overall impact of the BH conflict on children's nutrition when the indicator for bargaining power are not included in the regressions.

A limitation of the NDHS dataset is the lack of data on certain potentially significant factors, such as family income, woman's health, preferences over food allocation that can also affect children's nutrition. These variables can also have an impact on decisions regarding fertility response to the conflict (or anticipated conflict) exposure. Failing to control for these variables can create biased estimates as they are important in understanding children's nutrition outcomes. To ensure that the findings are not impacted by this effect[21], I restrict the sample to siblings and estimated the following equation:

$$Y_{imct} = \beta_1 nbrEvents_{ict} + \beta_2 X_{ict} + \mu_i^M + \mu_i^Y + \mu_{im}^m + \epsilon_{imct} \quad (2)$$

20. In the empirical specification, the children's anthropometric indicators are multiplied by 100 to facilitate reading the tables. This multiplication by 100 affects the estimated coefficients accordingly. Therefore, to obtain the true coefficients, you should consider dividing the table results by 100.

21. This is made possible because I assume that these unobserved variables are constant over time, and thus, adding fixed effects can account for their effects.

Where X_{ict} are the controls variables which include indicators for whether i is a twin, i's gender, i's birth order and his age. μ_{im}^{m} is the mother fixed effect. It capture all the within family unobserved characteristics specific to the child's mother, m, that do not change over time and affect children's nutrition (like her cooking abilities and her preference for breastfeeding). Since siblings from the same family were not born in different districts and different survey year, I don't incorporate both women and district fixed effects[22] in the equation 2.

To identify the mediating role of bargaining power on children exposed to the BH conflict, I incorporate the previous indicators for the level of bargaining power in the equations 1 and 2 and evaluate the models. To be more specific, I estimate the following equation:

$$\begin{aligned} Y_{imct} = \alpha_1 nbrEvents_{ict} \times highBP_{imt} + \alpha_2 nbrEvents_{ict} + \alpha_3 highBP_{imt} + \alpha_4 X_{imct} + \\ \mu_i^M + \mu_i^Y + \mu_i^{SY} + \mu_{imt}^c + \mu_{imt}^{Int} + \epsilon_{imct} \end{aligned} \tag{3}$$

Where $highBP_{imt}$ is a binary variable that indicates whether or not the mother m of the child i has a high level of bargaining. The controls variables X_{imct} include the same variables as the above equation 1. The coefficient I'm interested in is α_1, its represents the additional effect of one BH conflict on children born to a women with high bargaining power compared to children born to women with low bargaining power. I also estimate a similar model on the siblings sample to control for women's m unobserved characteristics. The following equation represents the model:

$$\begin{aligned} Y_{imct} = \beta_1 nbrEvents_{ict} \times highBP_{imt} + \beta_2 nbrEvents_{ict} + \beta_3 X_{ict} + \\ \mu_i^M + \mu_i^Y + \mu_{im}^m + \epsilon_{imct} \end{aligned} \tag{4}$$

Where X_{ict} are the same control variables as in the equation 2. The coefficient β_1 capture the additional effect of being born to a woman with high bargaining power. The overall effect of the conflict on children born to women with a high level of bargaining is the sum of the average effect of the conflict β_2 (respectively α_2) and the additional effect β_1 (respectively α_1) for the siblings (respectively baseline) specification. The standard errors are clustered at the NDHS cluster level. I use bootstrap techniques to estimates more accurate standard errors[23] of the aggregate effect of the BH conflict (see figure 3).

22. Mother fixed effects capture both cluster fixed effects and survey year fixed effects; thus, including them will not change the estimated coefficients (I test this empirically).

23. By employing bootstrap resampling, I can consider the variability related to the estimated coefficient by repeatedly sampling from the coefficient's distribution with replacement. This approach differs from standard error estimates that depend on mathematical techniques and presumptions since bootstrapped standard error estimates are determined computationally, they are more precise.

4 Results

Estimated regressions results

I started the empirical investigation by estimating the equations 1 and 2 for each of the anthropometric indicators and present the results in the table 3. The columns labeled "Baseline" report regression results of the equation 1 for different proxies of bargaining power, while the columns labeled "Sibling" corresponds to the regression results of the equation 2. As previously identified in the literature, the BH conflict is associated with a decrease in the child's nutrition (Ekhator-Mobayode and Asfaw, 2019) for the two sample of children. Each BH conflict reduces the WAZ by approximately 0.0033 z-scores, which is roughly 0.33 percent of the mean WAZ for the entire baseline sample of children. In the sibling specification, the estimated effect is 0.0057, indicating a reduction of about 0.55 percent of the mean z-score value of the sibling population. Similarly, the estimated effect on the WHZ reveals a reduction of 0.006 z-scores for the baseline sample which is nearly doubled in the sibling specification. This represents reductions of approximately 1.6 percent and 2.8 percent respectively. However, the estimates for HAZ are not statistically significant in either specification. This results aren't surprising because HAZ serves as a long-term indicator of undernutrition, often taking months or even years to fully manifest an effect[24]. Including the proxies of BH as controls in the estimation of the baseline regression did not appear to alter the estimated effect of the conflict. The average effects of bargaining power are generally not significant in the two samples of children.

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24. In Ekhator-Mobayode and Asfaw (2019), the authors also found that the estimated effect of the BH conflict on HAZ was not statistically significant.

Table 3: The estimated effect of the BH conflict on the nutrition.

	Specification:						
	Baseline						Sibling
	(1)	(2) aut. maj. hh purch.	(3) aut. own earn.	(4) aut. on husb. earn.	(5) earn. more than husb.	(6)	(1)
	Outcome variable:						
	*P*anel A : WAZ						
Nbr events	−0.33***	−0.33***	−0.34***	−0.33***	−0.33***	−0.57***	−0.57***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.22)	(0.22)
High bargaining		4.62**	−4.42**	0.40	−0.98		
		(1.82)	(1.73)	(1.82)	(3.08)		
R^2	0.22	0.22	0.22	0.22	0.22	0.84	0.74
	*P*anel B : HAZ						
Nbr events	0.14	0.15	0.14	0.14	0.14	0.23	0.23
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.45)	(0.45)
High bargaining		4.58*	−0.18	2.39	−1.14		
		(2.43)	(2.41)	(2.48)	(4.22)		
R^2	0.23	0.23	0.23	0.23	0.23	0.84	0.73
	*P*anel C : WHZ						
Nbr events	−0.60***	−0.59***	−0.61***	−0.60***	−0.60***	−1.05***	−1.05***
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.27)	(0.27)
High bargaining		2.94	−6.36***	−1.15	0.76		
		(2.18)	(2.01)	(2.29)	(3.41)		
R^2	0.12	0.12	0.12	0.12	0.12	0.81	0.69
Survey year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No
Cluster fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No
Women fixed effects	No	No	No	No	Yes	Yes	No
Observations	35,339	35,339	35,339	35,339	35,339	35,339	22,180

* *Note* : the estimated model is an OLS model. The baseline regressions include controls for mother ethnicity, her age and age squared, mother and father number of years of education, their working in agriculture sector binaries, the sexe of the head, the number of household members and under five children and the NDHS poverty quintile. The birth month and year of the child and interview's month FE are included in all regressions. WAZ : Weight for Age Z-score; HAZ : Height for Age Z-score; WHZ : Weight for Height Z-score. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

The estimation results of the mediating role of bargaining power for each BH conflict on the WAZ, HAZ and WHZ are depicted in the table 4 below (the estimated for the controls variables can be found in tables 12, 14, and 13, respectively in appendix). The first four columns of the table report the regression results of the equation 3 and the second set of columns report the results of the equation 4 using different proxies for bargaining power as specified in the column names. The results of the baseline regressions indicate that their is a negative and statistically insignificant effect of each BH conflict on the WAZ (panel A of table 4) and the WHZ (panel C of table 4) for children born to women with low bargaining power. The intensity of the effects is similar to those in table 3 above for the WAZ, but it slightly increases for the WHZ. The estimates on the HAZ are not significant. Furthermore, while the specific effect of the BH conflict on children born to women with high bargaining power is generally not significant, their average effect is also not statistically significant. When I restrict the sample to siblings and include women fixed-effect, the differences between the two groups of children become more pronounced. Each BH affect negatively the WAZ for children born to women with low level of BP as it can be seen in the panel A of table 4. Being born to a women with high bargaining power compensates for this effect by approximately the same value thus playing a mitigating role.

The analysis of the panel B of the table 4 indicates that the effects of the BH conflict on the HAZ of the children born to mothers with high and low bargaining power is not statistically insignificant. Since lower HAZ is a result of chronic malnutrition that has occurred over a long period of time, the effect of the conflict exposure on it can be difficult to capture during early stage of life (before the age of five) as we don't observed the children during a long period of time. For WHZ, the results from panel C of the table 4 indicate that the mediating effect is still noticeable for most of the proxies of bargaining power in the sibling specification.

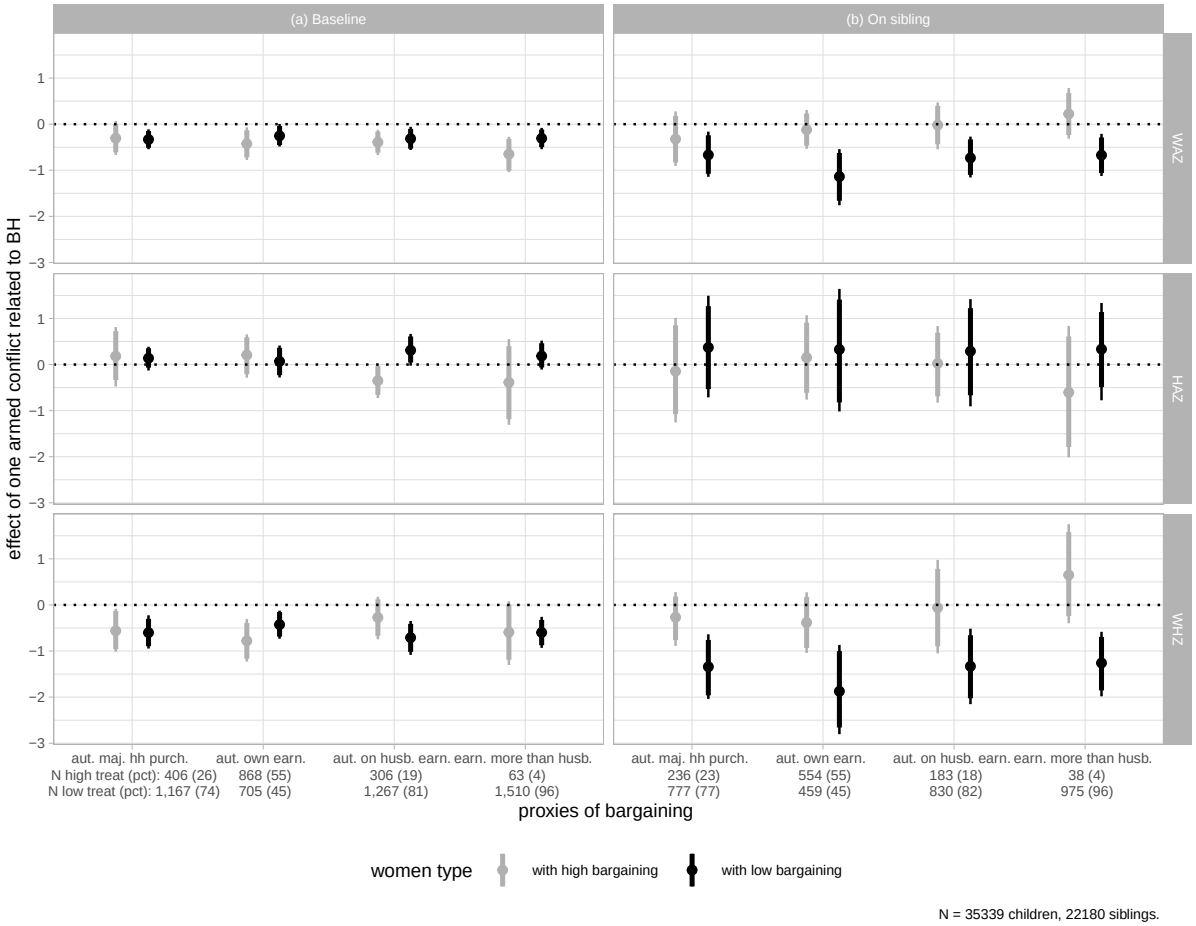
Table 4: The estimated effect of the BH conflict on the child's nutrition.

	Specification:							
	Baseline				Sibling			
	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.
	Outcome							
	Panel A : WAZ							
Nbr events	−0.33***	−0.25**	−0.31**	−0.31***	−0.67***	−1.14***	−0.73***	−0.67***
	(0.11)	(0.12)	(0.13)	(0.12)	(0.26)	(0.30)	(0.23)	(0.23)
Nbr events * High bargaining	0.03	−0.17	−0.08	−0.34	0.34	1.02***	0.71**	0.90**
	(0.18)	(0.20)	(0.16)	(0.23)	(0.34)	(0.31)	(0.31)	(0.37)
High bargaining	4.61**	−4.26**	0.45	−0.74				
	(1.82)	(1.73)	(1.82)	(3.09)				
R^2	0.22	0.22	0.22	0.22	0.74	0.74	0.74	0.74
	Panel B : HAZ							
Nbr events	0.15	0.09	0.33	0.23	0.37	0.33	0.29	0.33
	(0.32)	(0.40)	(0.29)	(0.28)	(0.56)	(0.69)	(0.60)	(0.53)
Nbr events * High bargaining	0.04	−0.35**	0.44**	0.01	1.07**	1.49**	1.27	1.91**
	(0.19)	(0.16)	(0.17)	(0.28)	(0.52)	(0.62)	(0.83)	(0.79)
High bargaining	2.92	−6.04***	−1.44	0.75				
	(2.18)	(2.02)	(2.29)	(3.42)				
R^2	0.12	0.12	0.12	0.12	0.69	0.69	0.69	0.69
	Panel C : WHZ							
Nbr events	−0.80***	−0.72***	−0.92***	−0.83***	−1.34***	−1.88***	−1.33***	−1.26***
	(0.20)	(0.18)	(0.20)	(0.19)	(0.36)	(0.49)	(0.40)	(0.35)
Nbr events * High bargaining	0.04	−0.35**	0.44**	0.01	1.07**	1.49**	1.27	1.91**
	(0.19)	(0.16)	(0.17)	(0.28)	(0.52)	(0.62)	(0.83)	(0.79)
High bargaining	2.92	−6.04***	−1.44	0.75				
	(2.18)	(2.02)	(2.29)	(3.42)				
R^2	0.12	0.12	0.12	0.12	0.69	0.69	0.69	0.69
Survey year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Cluster fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Women fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	35,339	35,339	35,339	35,339	22,180	22,180	22,180	22,180

* *Note* : the estimated model is an OLS model. The baseline regressions include controls for woman's ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head, the number of household members and under five children and the NDHS poverty quintile. The birth month and year of the child and interview's month FE are included in all regressions. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

The overall impact of a BH conflict on child nutrition is illustrated in figure 3 below. For every level of maternal bargaining power and each of the proxies used to define it, figure 3 presents the estimate along with its associated confidence interval at the five and one percent levels of significance. For the baseline sample, the estimate for the two groups of women are very closed and mixed. The differences between children born to the two groups of women become more pronounced when I incorporate the women fixed-effect (estimates on sibling). The differences between children born to the two groups of women become more pronounced when I incorporate the women fixed effect (estimates on siblings). In fact, for almost all the proxies used to define bargaining power, the estimates for women with high bargaining power are negative but not statistically significant for the WAZ. However, the estimates for women with low bargaining power are negative and significant, confirming the results of the previous table 4. Similar results are found for the WHZ. The estimates for the HAZ are not statistically significant for the two groups of women across all proxies of bargaining power for reasons previously mentioned.

Figure 3: The effect of one BH conflict on the child anthropometric indicators.



Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Heterogeneity analysis

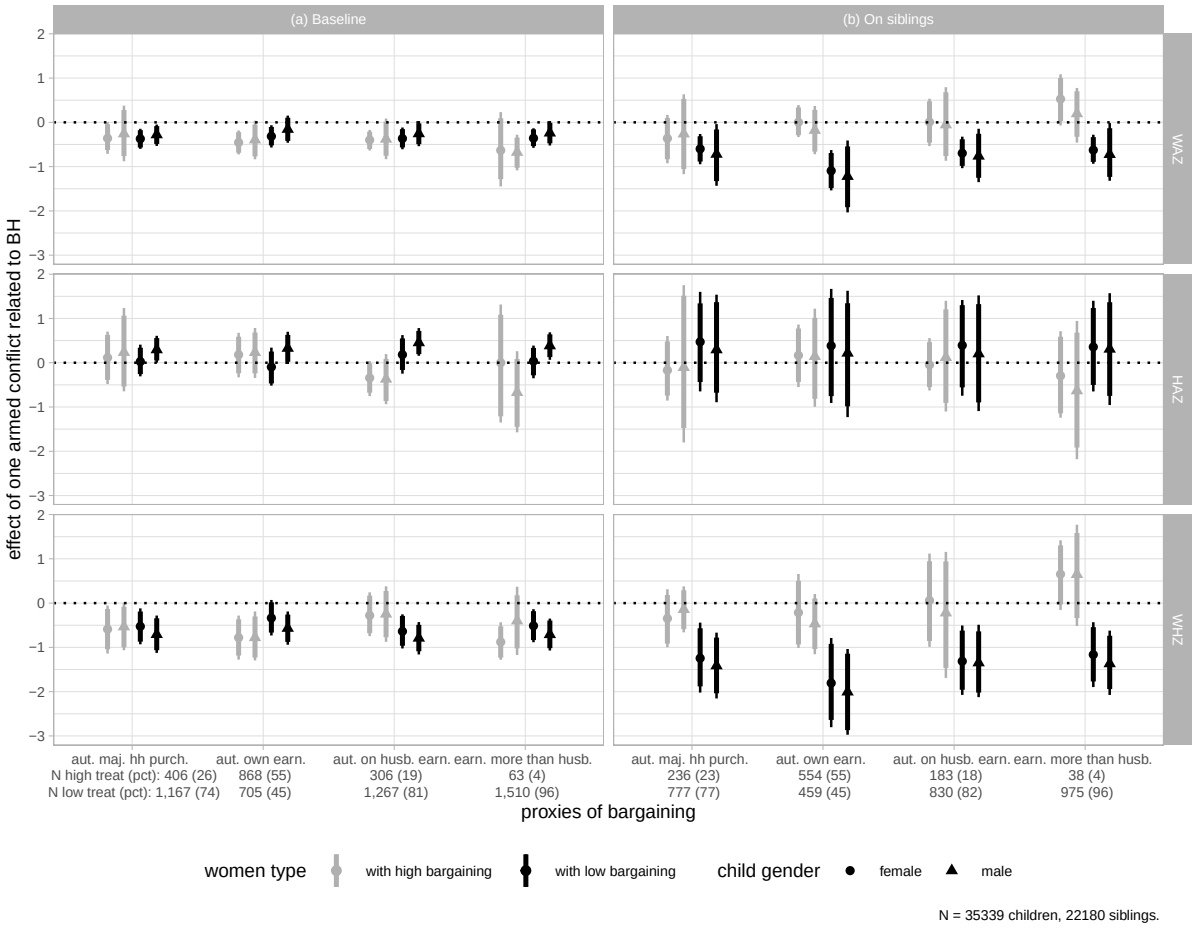
Male vs female children

The literature on female bargaining power finds the existence of gender based bias in the effect of bargaining power on children's nutrition (Paarlberg and al. 1999; Duflo, 2003; Akresh, De Walque and Kazianga, 2016). In Milazzo (2014), the author finds evidence for strong males children preference in Nigeria [25], theses preferences can result

25. In Milazzo (2014) and argued that the reason for such behaviors is related to the dominant role of males children in the Nigerian context in which descent and inheritance are transmitted through the male line. Also, male children play a vital role in cementing the relationship between a wife and her husband's family, as they ensure the continuation of his lineage and provide security for the mother's access to property and inheritance in the event of the husband's death.

in higher investment in male children's health and nutrition than the female children. Also, the BH conflict creates a context where the perceived return to investing on female children can decrease (BH is against female children education and is in favor of child marriage) specially after the Chibok kidnapping in 2014 (United Nations, 2014) and thus can affect investment in female children. Figure 4 below displays the estimation on the overall impact of one extra BH conflict on the child nutrition, categorized by maternal bargaining power, for both female and male children. Children born to women with low bargaining power have a higher risk of under nutrition (while measured with WAZ and WHZ) among male children than female children, but the contrast between male and female children is not statistically significant. The estimated effect on children born to women with high bargaining power is similar for both boys and girls and thus is beneficial for both gender. However, the estimates for the HAZ are not statistically significant for both genders.

Figure 4: The effect of one BH conflict on the child anthropometric indicators by child's gender.



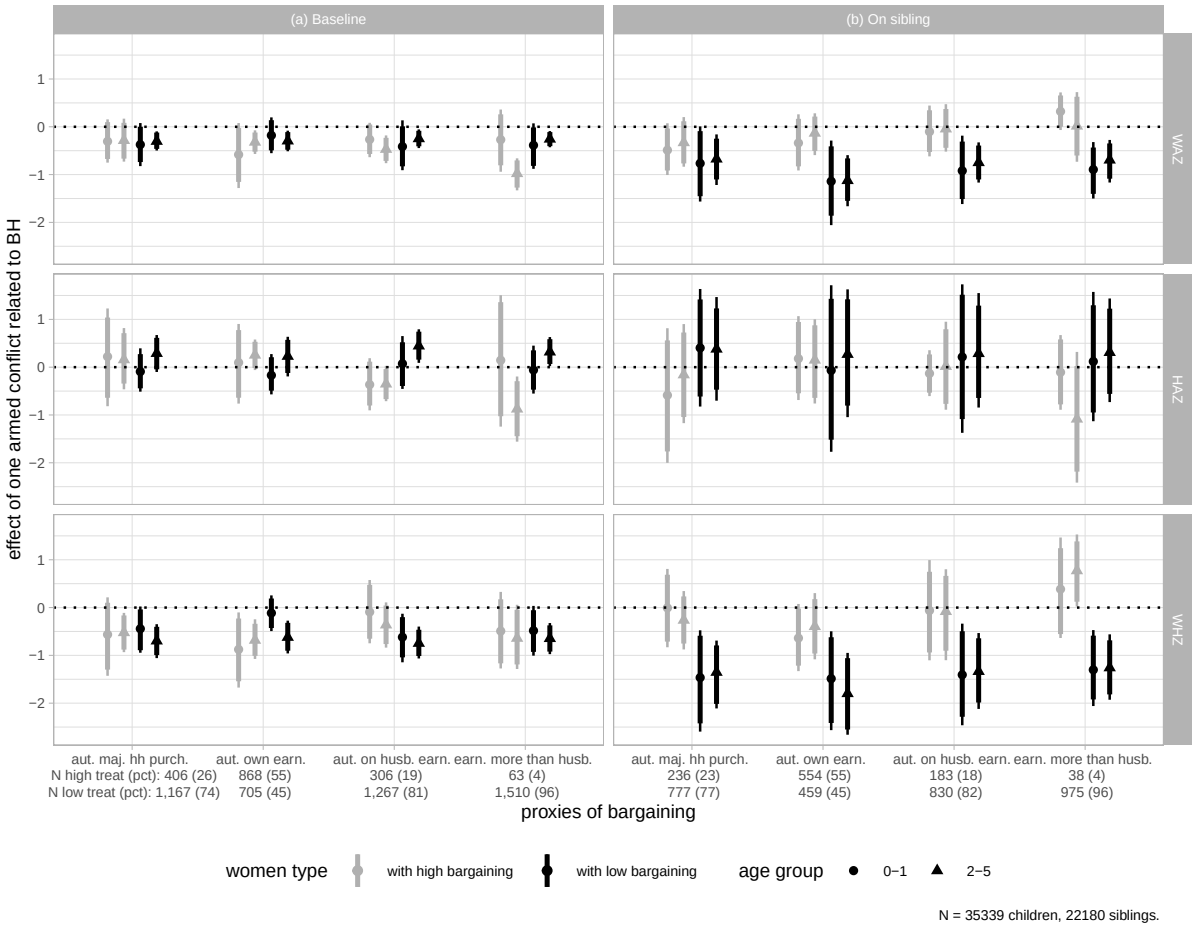
Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Younger vs older children

The exposure to conflict can also have a heterogeneous effect on the probability of child's undernutrition depending on their age group. Infants (children aged less than 1 year) can be more affected by the BH conflict as they have an immature immune system that makes them more susceptible to diseases, and thus increases their risk of undernutrition. Also, the forced displacement can affect healthcare service provision for infant children, which can result in the highest conflict effect within this group. Nevertheless, older children require more food and have higher caloric needs which also makes them susceptible to undernutrition. Therefore, the effect of the BH conflict can be heterogeneous for the two groups of children. In the figure 5, I investigated the mediating role of female bargaining

power on conflict exposure for two groups of children: those aged less than one year and those aged two to five years. The differences between the groups of children born to the two types of women are not statistically significant in the baseline specification for all outcomes variables. However, in the sibling specification, one can observe a significant difference between children aged two to five born to women with low and high bargaining power, but the differences for infants (aged between zero to one) are not statistically different for all the three outcomes. These effects can be explained by the fact that infant children are mainly breastfed and thus less exposed to food shocks. Overall, older children are more impacted on average by the BH conflict if they are born to a woman with low bargaining power but the differences with infant children are not statistically significant. Older children are exposed to conflict for a longer period of time compared to infants, which can explain the differences in the effect of the BH conflict. For children born to women with high bargaining power, there is not a strict preference between older or infant children, as the estimates are similar for both groups and not statistically different.

Figure 5: The effect of one additional BH conflict on the child anthropometric indicators by age group.



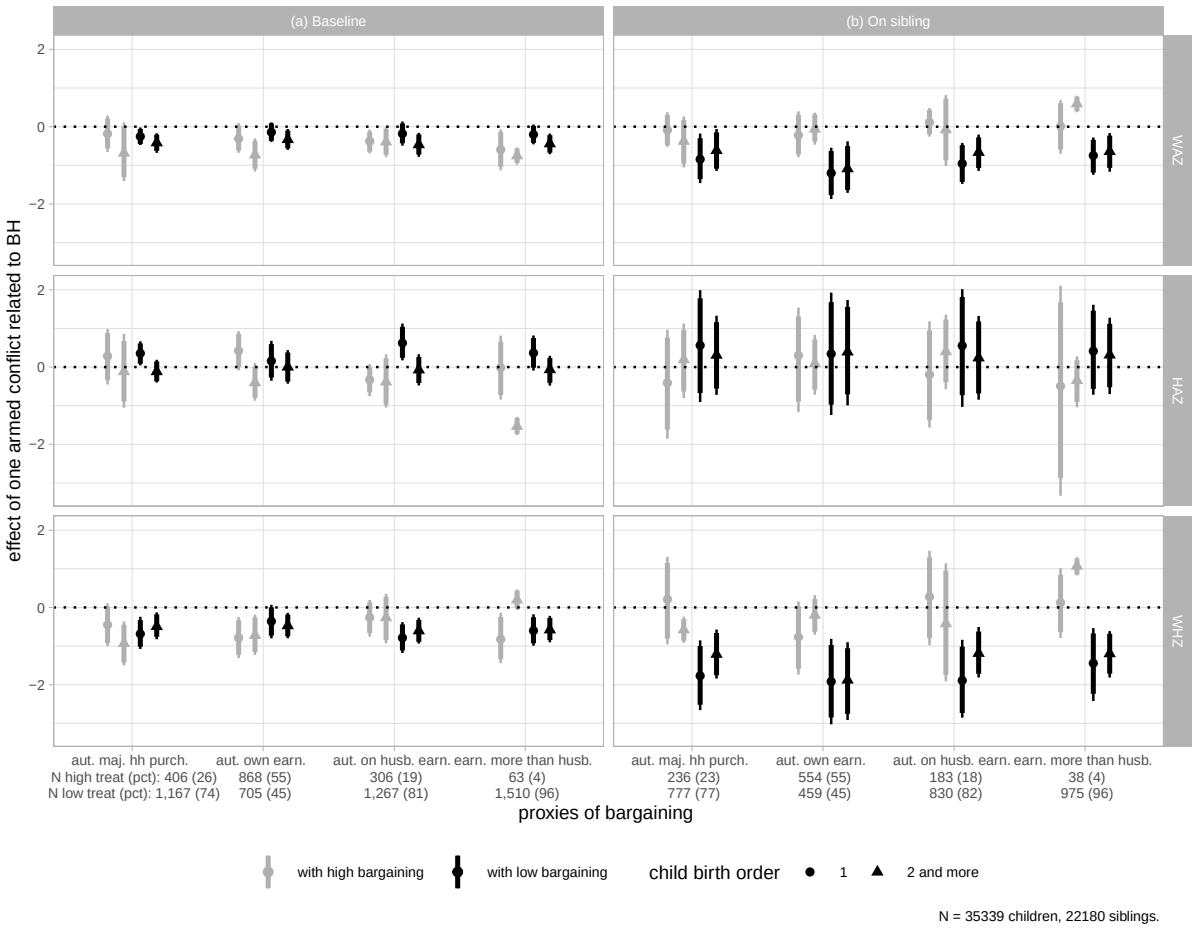
Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

First-born vs later-born children

It is also plausible that the effect of the BH conflict is different depending on the child's birth order. In developing countries, parents can be more cautious and protective of their first-born children as they are new to parenting and may feel more anxious about their child's safety and well-being. They may also invest more in their first-born child's nutrition in the hopes that he will be able to provide financial support for the family in the future and thus can be more protected from the BH conflict exposure than his other siblings. In figure 6 below, I studied the mediating role of female bargaining power on conflict exposure for first-born and later-born children. The estimates from the baseline model are overall mixed and not statistically different for the two groups of children on

all three outcomes. Nevertheless, in the sibling-specific analysis, I found that the effect of one conflict is similar for first-born and later-born children to women with low bargaining power. As they gain more bargaining power, women tend to be more protective of their first-born child compared to their other siblings, but the differences are not statistically significant.

Figure 6: The effect of one additional BH conflict on the child anthropometric indicators by child's order.



Note: the estimated model is an OLS model. The circular-shaped points represent the baseline estimates, while the triangular ones represent the estimated on non migrant. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

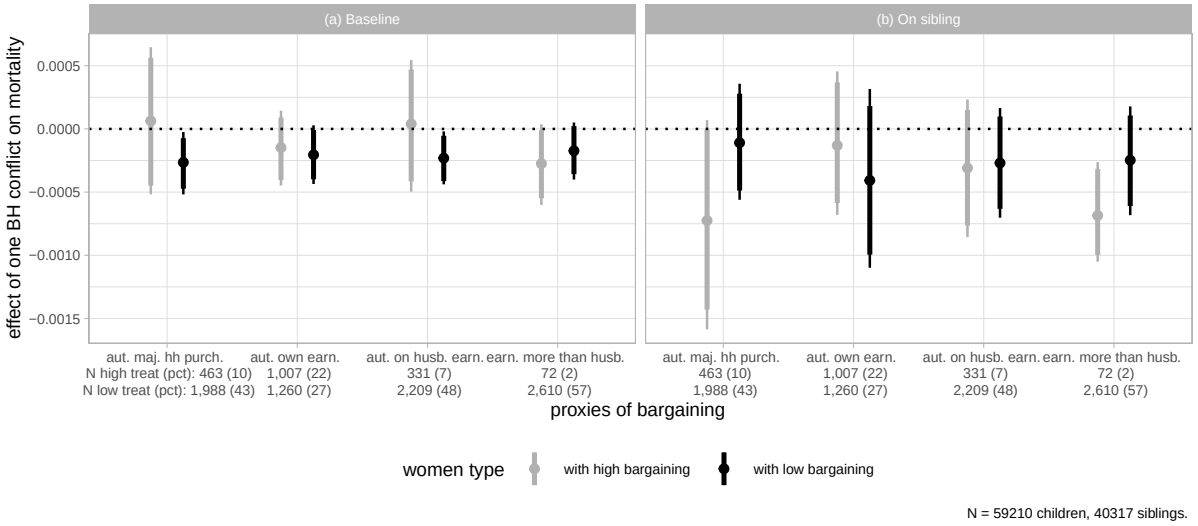
Sources of bias

Selective survival

The effect of the conflict on the child's nutrition may be distorted if the survivors children

included in the data are selectively culled based on their health or socioeconomic status during the attacks. As a result, the observed survivors during the conflict may have had a higher socioeconomic status or better health endowment potentially creating an underestimation of the child health effects of the BH conflict. Additionally, this underestimation may be more pronounced among women with low bargaining power as their children are more severely affected by undernutrition resulting in a heterogeneous selection bias depending on the level of maternal bargaining power. To assess whether the estimates are impacted by this effect (selective survival), I investigate two variables: infant mortality and the number of under five children alive during the survey. Infant mortality refers to mortality of children after birth and before they reach their first anniversary. By focusing on infant mortality, I can account for selective mortality because it represents deaths that occur before the age at which selective mortality is likely to occur. Infant mortality is determined by questioning the women in the NDHS about their living and deceased children. For each deceased child, the woman was asked about various aspects such as the child's gender, birth order, age at the time of death and twin status. I build a binary variable, which take the value of one indicating that the child died before reaching twelve months and zero otherwise. The number of under-five children in the household can reflect the household's short-term response to fertility in response to the BH conflict exposure. Selective survival can arise in cases where the BH conflict decreases the probability of having a surviving under-five child. In figure 7, I report findings from an investigation of the impact of the BH insurgency on infant mortality for the two groups of women. The results of the baseline model suggest a negative and statistically significant effect of the BH conflict on the probability of infant mortality. However, the estimated effect becomes insignificant when I include the women's specific FE while estimating the effect on siblings. The absence of a correlation between armed conflict exposure and children mortality was previously found also in Ekhator-Mobayode and Asfaw (2019) in Nigeria and by Minoiu and Shemyakina (2014) in Côte d'Ivoire.

Figure 7: The effect of one BH conflict on the probability of infant mortality

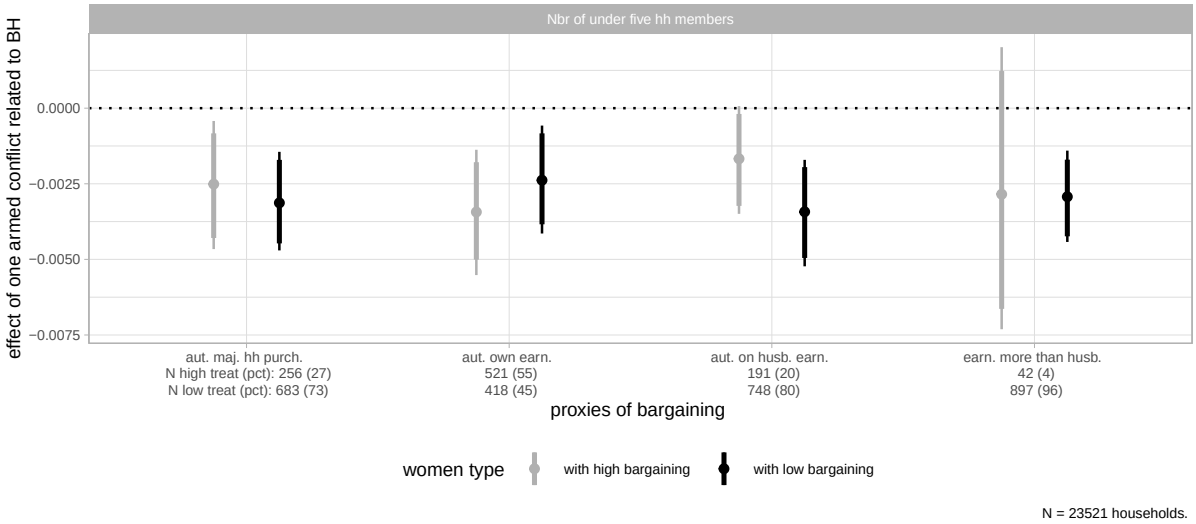


Note: *Note*: the estimated model is an OLS model. The outcome variable is the number of under five children in the household (or short term realized fertility). All models include binaries for twin, child's sexe and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. All regressions include state and survey year fixed effects. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Selective survival can also be addressed by considering the probability of having a newborn who is alive during the survey as it may reflect fertility choices made by parents because of the BH conflict. Armed conflict can affect short term realized fertility rates in several ways. First, the forced displacement and migration of individuals and families can lead to changes in living arrangements and reduced access to healthcare, which can have a negative impact on fertility rates. Second, BH promotes child marriage (marriage before 18 years) and is against female education which can result in high fertility rates. Also, the disruption of healthcare systems during armed conflict can lead to a decrease in the availability of contraceptive methods, which can increase the likelihood of unintended pregnancies and therefore increase fertility rates. Selective survival arise when the household member decide to reduce or increase short term realized fertility because of the BH conflict exposure. In the figure 8 below, I estimated the effect of one BH conflict on the number of under five alive during the survey. The estimates are negative and statistically significant for both groups of women, indicating the existence of a possible selection problem. However, there doesn't seem to be any specific pattern between the two groups of women as the findings are mixed across the proxies of female bargaining power. Such a result can lead to an underestimation of the true effect of the conflict, as the children who were missing because of the conflict may be those with low endowment

or those for whom parents have low preferences.

Figure 8: The effect of one BH conflict on the number of an alive under five children.



Note: the estimated model is an OLS model. The outcome variable is the number of under-five children alive during the survey born to the woman. The regression models include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members and the NDHS poverty quintile. All regressions include state and survey year fixed effects. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

BH conflict and bargaining power

The estimates can be subject to bias if the BH conflict affect the female level of bargaining power. Indeed, in Eseosa Ekhator-Mobayode and al. (2022), the authors found that each additional BH conflict in Nigeria increases Intimate Partner Violence (IPV) by 4 percentage points, this can undermine women's bargaining power and autonomy. Women may also be forced to take on additional caregiving responsibilities for wounded family members, which can limit their ability to participate in paid labor or engage in other activities outside the home. Also, the BH conflict may lead to the displacement or death of male family members, leaving women as the sole breadwinners or decision-makers in households. This can give them more bargaining power within the household. Assuming the existence of such a shock, the true mitigating effect of bargaining power can be underestimated or overestimated depending on the direction of the effect as it creates *endogeneity* in the estimated. On average, the women in the sample experience around 26 conflicts related to BH within 10 kilometers of their cluster since the start of the BH insurgency in 2009 as show un the table 10 in appendix. In the table 5 below, I estimated the correlation between one armed conflict related to BH and the probability of a woman to have a high bargaining power. I find that the BH conflict doesn't correlate to the level of bargaining power held by the women across all proxies. A similar results has been

shown previously by Eseosa Ekhator-Mobayode and al. (2022) in the context of the BH conflict.

Table 5: The effect of one BH conflict on female level of bargaining power.

	Outcome variables			
	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.
Nbr Events	0.0008	−0.0011	0.0012	−0.0020
	(0.0012)	(0.0012)	(0.0014)	(0.0021)
Survey year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	23521	23521	23521	23516
Pseudo R^2	0.1918	0.0989	0.1302	0.0768

Note : the estimated model is a logit model. The outcome variable is a binary for each proxy of BP. The regression models include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members and the NDHS poverty quintile. All regressions include state and survey year fixed effects. Standard errors in parentheses are clustered at the NDHS cluster level.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Missing data on outcome variables

Missing values in the outcome variables can significantly affect the reliability of the results. They reduce the effective sample size, decreasing the statistical power of the study and making it harder to detect real effects. If the missing values are not randomly distributed, they can introduce bias into the estimates, particularly if missing data is more common among certain subgroups, thus affecting the generalizability of the findings. Additionally, missing data can lead to less precise estimates, indicated by larger standard errors, reducing confidence in the results. Besides the full sample of 35,339 children, there were around 18,625 children for whom there were missing observations on the anthropometric indicators, representing about 34.5 percent. Several reasons can explain these missing values, including non-response (absence of the children, lack of parental consent, lack of trust or discomfort), data collection errors (incorrect recording or data entry mistakes), technical issues (equipment malfunction or lack of proper tools), health-related issues, and child displacement in conflict-affected areas. Understanding the factors that explain missing values in the dataset is important as it addresses the generalizability of the results.

To address this issue, I created a binary variable that takes the value of 1 if the child's anthropometric indicator is missing and 0 otherwise, and then ran a regression to identify the factors explaining missing values across the 53,964 children. The results of this analysis are presented in table 15 in the appendix. Except for the twin status of the children, all control variables, including the conflict exposure variable, have a

statistically insignificant effect on the probability of missing data. However, these results are not sufficient to argue that missing values are *randomly distributed* as there might be some unobserved variables that are not accounted for here and could explain the missing values, potentially confounding this analysis.

5 Mechanisms

Understanding how maternal bargaining power promotes children's nutrition during armed conflicts is crucial for creating effective interventions. In this part, I'll examine how maternal bargaining power affects children's undernutrition during armed conflicts in Nigeria. The literature in a conflict-free context identifies two main channels through which maternal bargaining power can promote child nutrition. These channels include the quality of infant feeding practices and diversity (Malapit and al. 2015; Malapit and Quisumbing, 2015; Bonis-Profumo, Stacey and Brimblecombe, 2021) and increasing access to maternal healthcare and healthcare service utilization (Lim and al. 2010; Maitra, 2004; Story and Burgard, 2012). Due to data constraints, the following analysis will primarily focus on health-related transmission channels. These include maternal healthcare utilization, child vaccination, and barriers to healthcare.

5.1 Can maternal healthcare service utilization offset the effect of exposure to the BH conflict?

The main channel identified in the literature in a conflict-free context is the direct impact of women's bargaining power on maternal healthcare service utilization (Lim and al. 2010; Maitra, 2004; Story and Burgard, 2012) which can promote better child's nutrition outcomes. In fact, prenatal care offers a vital opportunity for healthcare providers to monitor maternal health and fetal development, detect any potential complications early on, and provide essential interventions to support healthy growth and development. This includes nutritional counseling and the provision of supplements to address deficiencies that could impact both maternal, fetal health and after birth nutritional outcomes. Additionally, access to postnatal care ensures that mothers receive support and guidance in breastfeeding techniques and newborn care practices, promoting optimal nutrition during the critical early first months of life. Maternal healthcare services also serve as a platform for educating mothers about the importance of a balanced diet and appropriate feeding practices for infants and young children. By empowering mothers with the knowledge and resources they need to effectively nourish their children, maternal healthcare services contribute to improved nutritional outcomes and overall well-being for both mothers and their children. Therefore, maternal care can serve as an important transmission channel during armed conflict. In the NDHS, respondent women were asked about prenatal and

postnatal healthcare services utilization for their last-born child.[26] Using this information, I built a binary variable which takes the value of 1 if the woman takes prenatal or postnatal care and 0 if she doesn't take either. Here, my exposure variable is measured at the women's level (in other words, it represents the number of armed conflicts that have occurred within 10 km of the woman's cluster of residence since the start of the BH insurgency). Among the women who did not experience any conflict within 10 kilometers around the center of their cluster, 74 percent accessed maternal care, as shown in table 10 in the appendix. This proportion rises to 83 percent for women who experienced at least one conflict related to BH. I ran a logistic regression model to see how the conflict exposition correlates with maternal healthcare services utilization and the role of maternal bargaining power. The results of this exercise are depicted in the table 6 below. The estimated effect of the conflict on the use of maternal care is negative but not statistically significant. Such a result can indicate that despite the conflict, maternal care services may still be accessible to women, particularly if health facilities remain operational or if alternative services are available. Additionally, the estimates on the proxies used for maternal bargaining power are positive and statistically significant suggesting the possibility that women with high bargaining power in their household may prioritize seeking maternal care services despite the conflict due to its perceived importance on maternal and child health.

26. It's important to note that using the last pregnancy information as a proxy for maternal healthcare services utilization assumes that the conditions of the previous childbirth are similar. However, this is a strong assumption as it may either underestimate or overestimate maternal healthcare service utilization, hence, the direction of bias is unclear.

Table 6: The effect of the BH conflict on maternal care.

	Outcome : maternal care (1 = «Yes» and 0 = «No»)			
	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.
Nbr Events	−0.0001	−0.0017*	−0.0002	0.0003
	(0.0010)	(0.0007)	(0.0010)	(0.0009)
Nbr Events * high bargaining	0.0008	0.0057***	0.0035*	−0.0055***
	(0.0007)	(0.0014)	(0.0014)	(0.0007)
High bargaining	0.2580***	0.1982***	0.2536***	0.3111**
	(0.0644)	(0.0593)	(0.0753)	(0.1027)
Survey year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	23521	23521	23521	23521
Pseudo R^2	0.32	0.32	0.32	0.32

Note : the estimated model is a logit model. The outcome variable is a binary for any prenatal and postnatal care the woman is provided. The regressions model include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. Survey year and state FE are included in each regression. Standard errors in parentheses are clustered at the NDHS cluster level.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

5.2 Maternal bargaining power and barrier to health

Maternal barrier to healthcare pose significant challenges to ensuring optimal nutrition for children. These barriers, which may include financial constraints, cost of transportation or geographical remoteness, can limit access to essential maternal care and healthcare services. As a result, women may miss out on vital opportunities for early detection and management of maternal health conditions that can impact fetal development and nutritional status. It can also limit the access to nutrition education and guidance on breastfeeding and infant feeding practices which leave mothers without the necessary guidance to make informed dietary decisions for themselves and their children therefore affect their nutrition. Furthermore, limited access to healthcare resources, such as vaccines and nutrient supplements may increase children's vulnerability to malnutrition and its associated health risks. Maternal bargaining power can play an important role in overcoming these barriers, especially during armed conflicts when they are more likely to occur and it can helps to explain the results I obtained. Data on barriers to accessing health care faced by female respondents were collected during the NDHS. In this survey, women were asked whether they perceive their husband's permission, financial constraints, reluctance to go alone, and distance to the facility as barriers to their health care. Using this information, I constructed a binary variable that takes the value of 1 if the woman encounters at least one barrier to health access and 0 otherwise. As depicted

in table 10 in the appendix, approximately 56 percent of women in the complete sample encounter at least one health barrier. Among those who did not encounter any conflict linked to BH, 57 percent faced at least one health barrier. Conversely, about 40 percent of women exposed to at least one BH-related conflict experienced at least one barrier, resulting in a difference of 17 percentage points. I used a logistic regression model to study how exposure to the BH conflict affects the likelihood of facing at least one of these barrier. The results of this regression are depicted in the table 7 below. The BH conflict significantly increases the probability of facing at least one barrier to health in almost all of the four regressions below. However, the specific effect of the BH conflict on women with high bargaining power is negative and statistically significant. Such a result suggests that, during conflict, women with high bargaining power are more likely to overcome these barriers to health. Therefore, their children are more likely to be in better health and have proper nutrition.

Table 7: The effect of the BH conflict on barrier to healthcare.

	Barriers to health (1 = «Yes» and 0 = «No»)			
	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.
Nbr Events	0.0016**	0.0028***	0.0012*	0.0005
	(0.0005)	(0.0004)	(0.0006)	(0.0004)
Nbr Events * High bargaining	−0.0033***	−0.0047***	−0.0041**	0.0029
	(0.0006)	(0.0007)	(0.0016)	(0.0018)
High bargaining	0.0233	−0.1100	−0.0991	−0.0932
	(0.1064)	(0.0667)	(0.0898)	(0.0879)
Survey year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	23521	23521	23521	23521
Pseudo R^2	0.12	0.12	0.12	0.12

Note : the estimated model is a logit model. The regressions model include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. Survey year and state FE are included in each regression. Standard errors in parentheses are clustered at the NDHS cluster level.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

5.3 Maternal bargaining power and child's vaccination

Vaccination can also be an important channel through which maternal bargaining power promotes children's nutrition in conflict contexts. De facto, children's vaccination significantly impacts their nutritional outcomes by preventing illnesses that can lead to malnutrition. It can protect against infectious diseases such as diphtheria, measles, pneumonia, tuberculosis and diarrhea, which can diminish appetite, impair nutrient absorption and

increase metabolic demands ultimately contributing to malnutrition. By immunizing children against these diseases, vaccinations reduce the risk of illness-related nutrient loss and prevent growth loss associated with infections. Additionally, vaccinations bolster the immune system, reducing the likelihood of infections that could further compromise nutritional status. Also, by preventing illnesses, vaccinations decrease healthcare costs enabling families to allocate more resources towards nutritious food and essential needs. Information on child vaccination status was collected during the NDHS for children aged 3 to 5 years old. Approximately 74 percent of the children in the sample are vaccinated, as shown in table 9 in the appendix. Among the children who experience at least one conflict related to BH, 68 percent are vaccinated compared to 74 percent for their counterparts. I analyzed how the BH conflict influences the likelihood of a specific child being vaccinated through a logistic regression model. The results are presented in the table 8 below. The BH conflict significantly reduces the likelihood that a child is vaccinated, with a similar effect observed across all regressions. However, the specific impact of the BH conflict on children born to women with high bargaining power is varied and not statistically significant, suggesting that the conflict affects both groups of women similarly in terms of their child's vaccination. Nevertheless, the average effect of being born to a woman with high bargaining power is positive and statistically significant confirming its beneficial influence on children.

Table 8: The effect of the BH conflict on child vaccination.

	Outcome : child vaccination (1 = «Yes» and 0 = «No»)			
	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.
Nbr events	−0.0087***	−0.0094***	−0.0074***	−0.0071***
	(0.0016)	(0.0026)	(0.0018)	(0.0020)
Nbr events * High bargaining	0.0062	0.0037	−0.0016	−0.0089
	(0.0046)	(0.0032)	(0.0056)	(0.0122)
High bargaining	0.1598**	0.4500***	0.1299*	0.0680
	(0.0524)	(0.0490)	(0.0545)	(0.0969)
Survey year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Observations	24202	24202	24202	24202
Pseudo R^2	0.14	0.15	0.14	0.14

Note : the estimated model is a logit model. The outcome variable is binary for vaccination of children between 3 to 5 years old. For theses regressions, I'm unable to include woman fixed effects as I did not have enough variation in the dataset to do so. The regressions incorporate controls for twin status, child's sexe, child's age and birth order, woman's ethnicity, her age and age squared, woman and husband's number of years of education, their working status in the agriculture sector (binary), the sex of the head of the household, the number of household members, the number of under-five children and the NDHS poverty quintile. Standard errors in parentheses are clustered at the NDHS cluster level.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

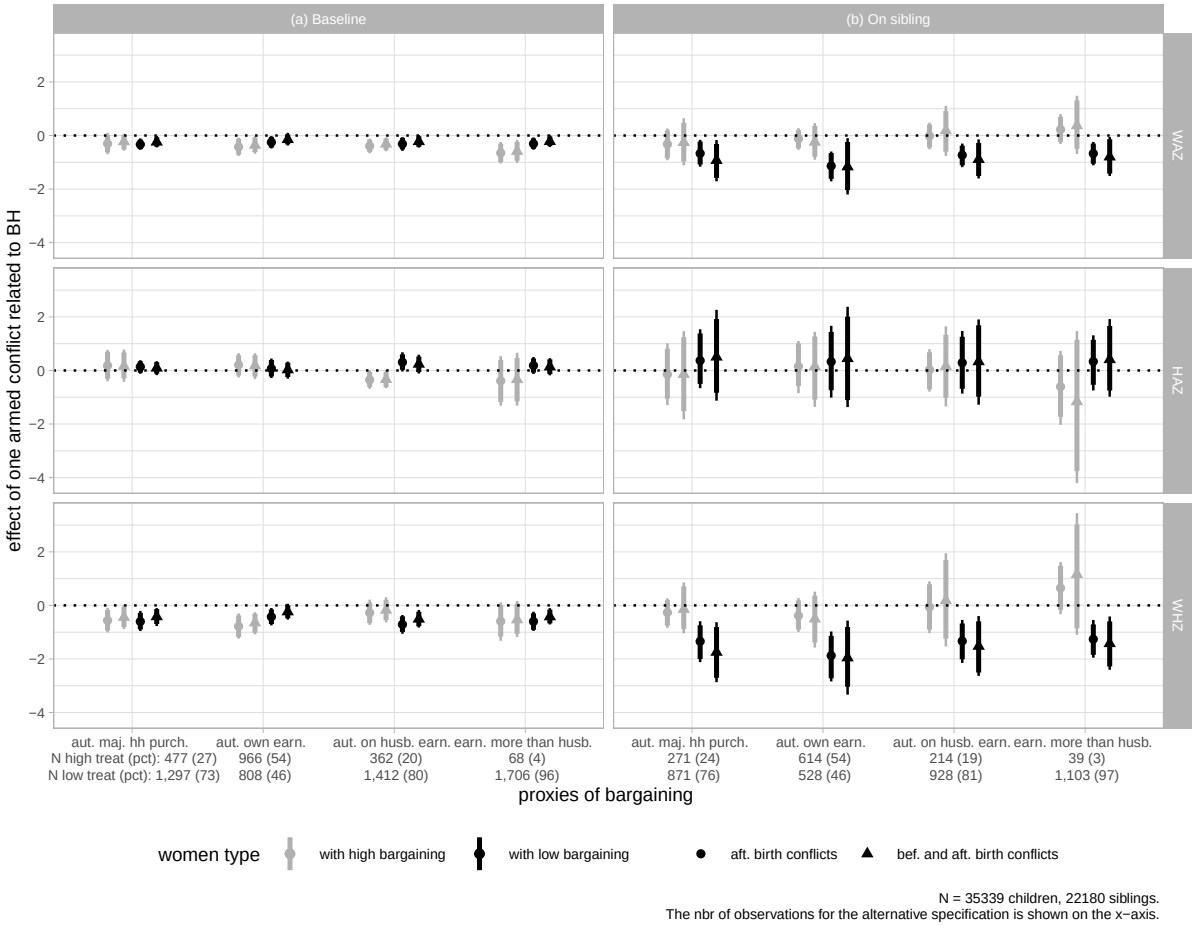
6 Sensitivity analysis

In this section, I test the sensibility of the results to some alternatives specifications.

Intrauterine exposure

Exposure to armed conflict during pregnancy can also affect child's nutritional outcomes. Research conducted in conflict-affected areas has consistently shown that both early and later stages of pregnancy exposure are associated with lower birth weights (Camacho, 2008; Mansour and Rees, 2012) and thus can have an indirect effect on the nutritional status of BH conflict exposed children. The main reasons for this effect, as explained in the literature, stem from the disruption of food supplies and limited access to adequate nutrition for pregnant women during conflicts that can leads to maternal undernutrition and a decrease in fetal growth. Additionally, pregnant women in conflict zones experience heightened stress, anxiety, and trauma, which can negatively impact their health and physiological functioning, further affecting fetal development and birth weight. Also, the disruptions in healthcare services, including limited access to prenatal care and essential supplements worsen these challenges. These factors can indirectly influence a child's current nutritional status, especially indicators like WAZ and HAZ, which may be adjusted in the long run. Therefore, it's important to consider intrauterine exposure to conflict when assessing the full impact of conflict on child nutrition. In figure 9 below, I compare the main results from figure 3 (represented by points in circular shape) to an alternative specification that accounts for conflicts occurring nine months before childbirth (represented by points in triangular shape). Overall, the findings are very similar to the main results, as the estimates are very close. However, the confidence intervals are larger in this alternative model both in the baseline and siblings specifications indicating a possible imprecision in the estimation.

Figure 9: The effect of one additional BH conflict on the child anthropometric indicators.



Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

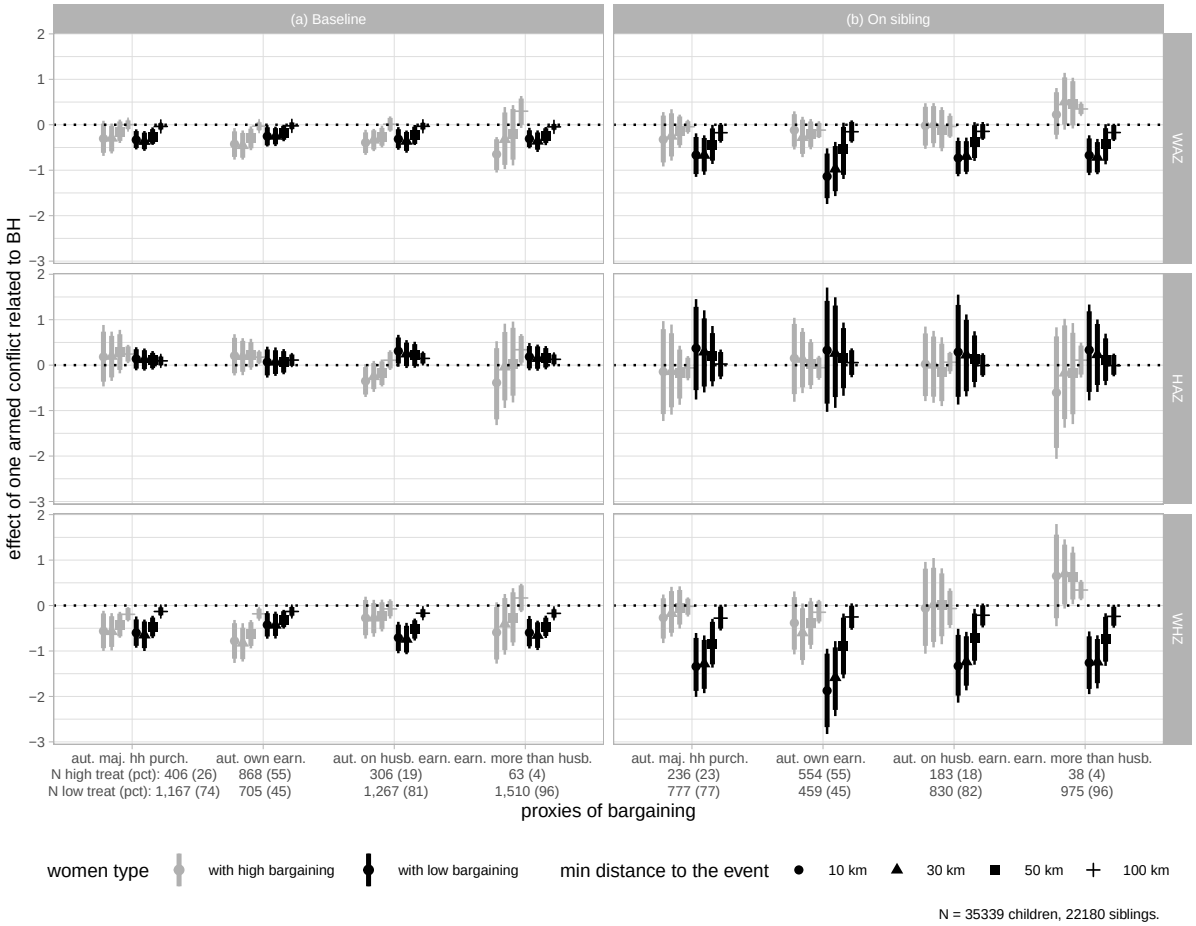
Sensibility to the exposition variable

Sensitivity to the geographical distance from the event

The estimates raise another critical issue regarding the definition of the exposure variable and its impact on the results. If conflicts occurring farther away also influence children's nutritional outcomes the findings may not entirely capture the true impact of the conflict as it will overestimate the impact of the conflict. Conversely, if proximity to the conflict zone has a more substantial impact, the estimates may underestimate the actual effect. To address the sensitivity issue, I conducted a test illustrated in figure 10, where I analyzed conflicts occurring at various distances from the NDHS cluster's center: 10 kilometers (represented by circular points), 30 kilometers (represented by triangular points), 50 kilometers (represented by squared points), and 100 kilometers (cross-shaped points).

The disparity between the two groups of women is most apparent when considering the 10 kilometers specification across all proxies of bargaining power. However, these distinctions diminish as I incorporate conflicts occurring at greater distances. At a distance of 100 kilometers, the estimates for the two groups of women become statistically insignificant for all three outcomes and proxies of bargaining power (except for the *earn. more than husb.*). Despite these differences in effect, the conclusion of the study remains overall unchanged, suggesting robustness in the findings regardless of the proximity to the conflict zone.

Figure 10: The effect of one additional BH conflict on the child undernutrition by distance to event.



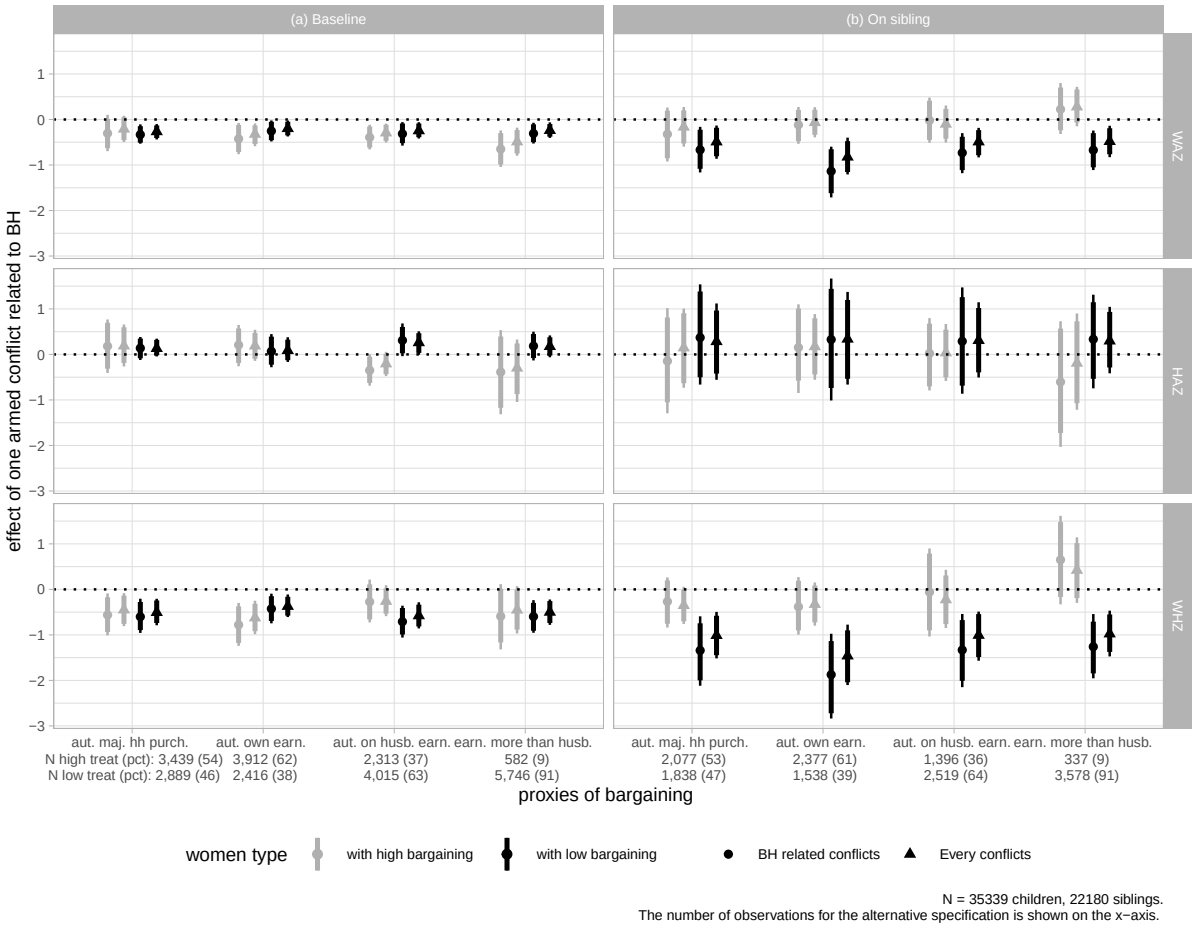
Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Sensitivity to the type of conflict

Another crucial consideration is that I exclusively concentrate on conflicts related to BH that occurred in Nigeria during the study period as the primary conflict actor. However,

this approach may lead to an underestimation of the true conflict exposure of households if conflicts involving other actors are not considered and hence result in biased estimates. By expanding the scope to include all type of conflicts, regardless of the conflict actor, I aim to address this potential limitation. Subsequently, I estimated equations 3 and 4 including all type of conflict and the results are presented in figure 11 below. The circular points represent the results of the model with BH conflict (main results), while the triangular points represent the results obtained when I include all types of actors. Remarkably, despite this broader specification, the findings remain consistent as the results are very close. This demonstrates the robustness of the observed patterns and strengthens the validity of the conclusions drawn from the analysis.

Figure 11: The effect of the BH conflict on the child undernutrition.



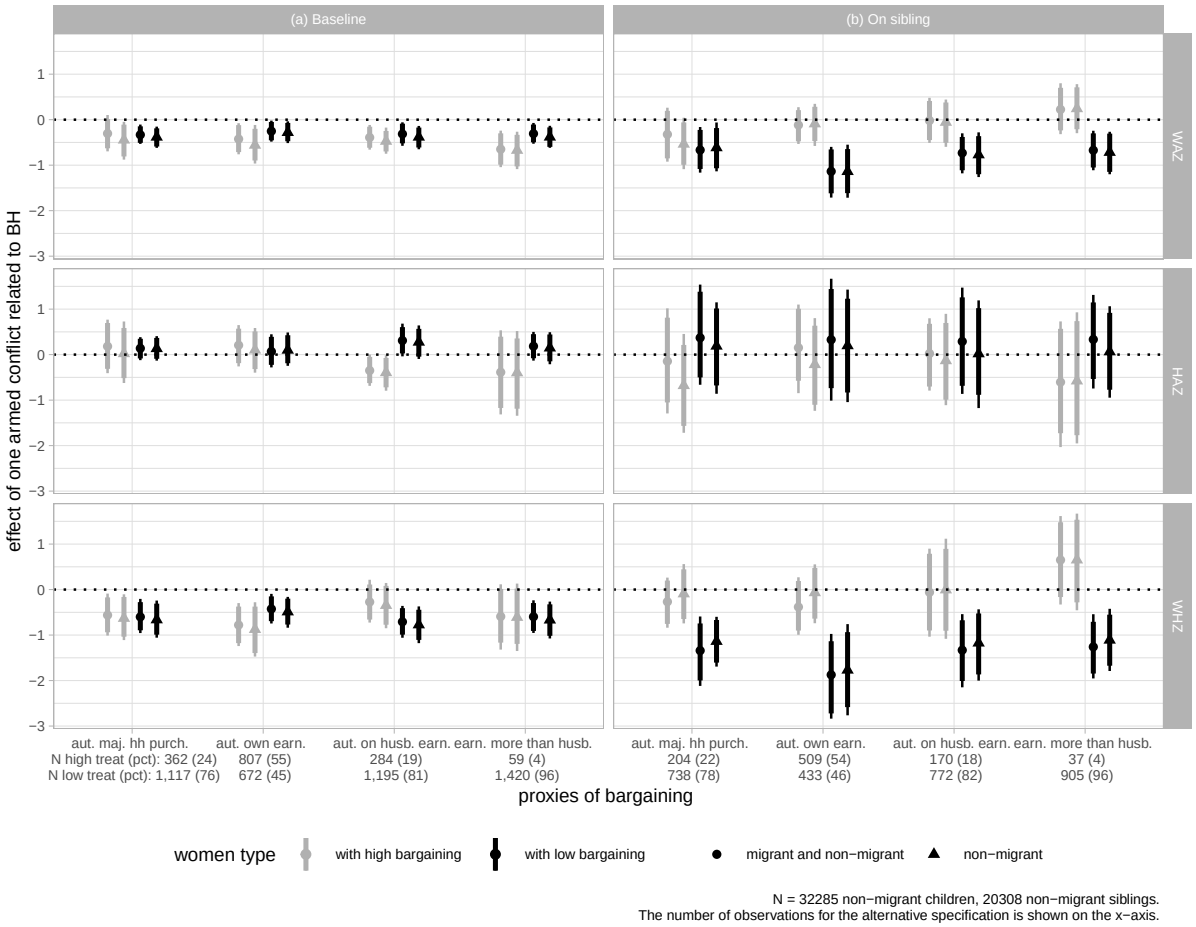
Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Migrant vs non migrant sample

Another concern about my estimate is that the results may be influenced by household migration or possible displacement caused by the BH conflict. Migrant parents are often exposed to unique and additional stressors that can exacerbate the effects of conflict on their children's nutrition. For instance, migrants may encounter discrimination, violence, and exploitation during their migration journey, as well as in the destination states where they seek refuge. These experiences can lead to increased levels of stress, anxiety, and trauma, which can further compromise their nutritional status and that of their children. To address this concern, I split the sample using a proxy for migration, considering households that were not usual resident of the place they were during the survey as migrants[27]. As shown in table 10 in the appendix, in total 8.8 percent of women are migrant in the full sample. Approximately 8.7 percent of women who did not experience any conflict are considered migrants in their current place of residence. In contrast, 11 percent of women who experienced at least one BH-related conflict are considered migrants in the current sample, resulting in a gap of 2.3 percentage points. Using this information on migration, I compare my main results to an alternative specification where I consider non-migrant children. The results of this exercise are depicted in figure 12 below. The circular points represent my main results while the triangular points represent the results when I restrict the sample to non-migrant children. The findings revealed that migrants were affected to a comparable extent as non-migrants, as the estimates are close. Hence, the results remains consistent with migration.

27. I use binary variable provide in the NDHS to determine the migrant status of individuals. This variable takes a value of 1 if the person is a permanent resident of the place they currently reside in, and 0 if they are not.

Figure 12: The effect of the BH conflict on the child undernutrition for migrant and non migrant.



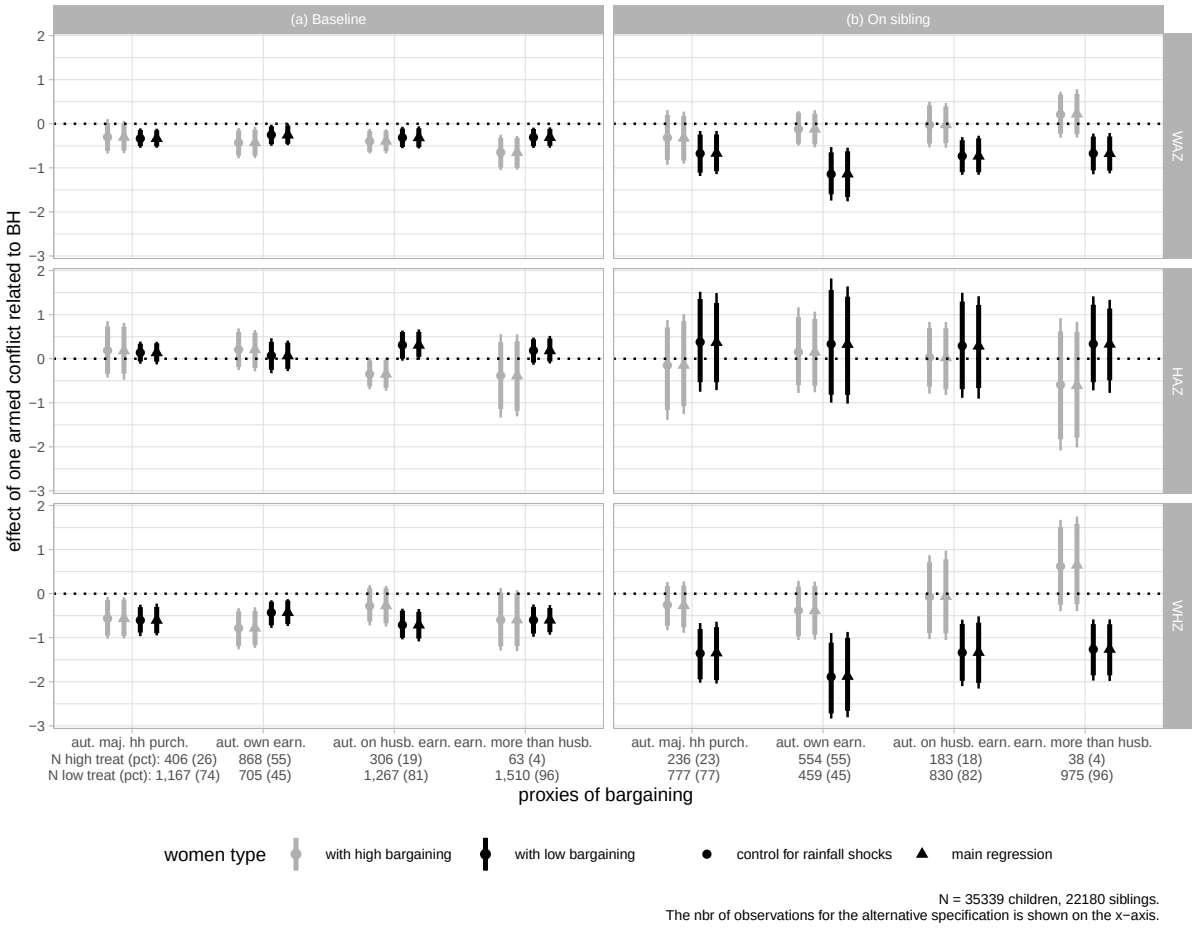
Note: the estimated model is an OLS model. The children's month and year FE are included in all regressions. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Control for rainfall

Rainfall shocks can have a significant impact on agricultural productivity and food availability. During times of drought or excessive rainfall, crop yields may be reduced or destroyed, leading to food shortages and increased food prices. This can have a particularly severe impact on vulnerable populations, including children. Failure to control for rainfall shocks may lead to biased estimates of the effect of conflict. If rainfall shocks are not properly taken into account, it may be difficult to determine whether changes in children's nutrition are due to the conflict itself or to changes in rainfall patterns. To account for this potential effect, I use data on rainfall by states collected from the **AidData** program from 1987 till 2018 (40 years). Next, I created an indicator variable that

takes the value of 0 if the child was born in a year when the state's annual average rainfall was below the first quintile (for years of drought) of the distribution of annual rainfall between 1987 and 2018. If the rainfall is between the first and third quintile (for normal years), the indicator takes the value of 1. Finally, if the rainfall is above the third quintile, the indicator takes the value of 2 (for excessive rainfall). I then estimated the equations 3 and 4 adding this indicator as control. The result of this estimates are depicted in the figure 13 below. The circular-shaped points represent my main estimated, while the triangular ones represent the estimated obtained when I include control for rainfall pattern. Overall, the primary estimates are similar to those obtained when controlling for rainfall, this supports the primary assumption that the results is due to the conflict exposition.

Figure 13: The effect of one additional BH conflict on the child anthropometric indicators.



Note: the estimated model is an OLS model. All models include binaries for twin, child's sexe, child's age and birth order. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head of the household, the number of household members, the number of under five children and the NDHS poverty quintile. In all regressions, child month, year of birth and interview month FE are included. The sibling regression includes women FE, while the baseline regression includes cluster FE. The bold line represents the 95 percent CI and the solid line represents the 99 percent CI. Standard errors are clustered at the NDHS cluster level.

Conclusion

This study contributes to the empirical literature examining the links between armed conflicts exposition and children's undernutrition and adds to it by investigating the role of maternal bargaining power as a mediator of the estimated relation. For the purpose of this research, I use the case study of Boko Haram (BH) in Nigeria. I spatially match each BH attack from the Armed Conflict Location and Event Data (ACLED) with observations from children recode of the Nigeria Demographic and Health Survey (NDHS) to build the exposition variable. I began the empirical investigation by running a first set of models that did not account for any proxies of bargaining power. I found that each BH conflict increases the risk of undernutrition. Using several proxies for the level of maternal bargaining power, I found that there is a mitigating effect of maternal bargaining power on the children's medium-term (the Weight for Age Z-score) and short-term (Weight for Height Z-score) nutritional indicators after including the women fixed effects. However, I didn't find such an effect on the long-term nutritional (Height for Age Z-score) indicator. Furthermore, the results of the heterogeneity analysis suggest that male and older children (aged 2 to 5 years) born to mothers with low bargaining power are more likely to be affected by the BH conflict. For children born to women with high bargaining power, I don't find any difference in impact between male and female children or infants (aged less than 1 year) and older children (aged between 2 to 5 years). However, I find that first-born children are less likely to be affected by the BH conflict than later-born children. The results of the mechanism analysis reveal that the main factors contributing to the negative nutritional effects of the BH conflict on child nutrition are the utilization of healthcare services and maternal healthcare. The estimates are not affected by the endogeneity resulting from selective survival or from how the BH conflict affects the level of bargaining power held by mothers. The conclusions of the study remain unchanged for alternative definitions of exposure to the conflict and are not affected by shocks in rainfall patterns.

Overall, this study highlights the importance of considering women's bargaining power when studying children's nutritional status, as it is a source of heterogeneity and an effective tool in improving children's nutrition especially in conflict-affected areas. The evidence suggests that policies and interventions designed to mitigate the negative impact of armed conflict on children's nutrition can utilize progress in the level of women's bargaining power alongside other protective measures.

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Appendix

A Descriptive statistics

Table 9: Summary statistics on the characteristics of the children's sample.

Characteristics of children	**Baseline**, N = 35339			**Sibling**, N = 22180		
	No conflict 10 km around N = 33,766[1]	**At least one conflict 10 km around** N = 1,573[1]	**p-value**[2]	**No conflict 10 km around** N = 21,167[1]	**At least one conflict 10 km around** N = 1,013[1]	**p-value**[2]
Nbr events related to BH	_	18.724 (36.207)	_	_	20.782 (38.876)	_
- Fatality	_	145.736 (330.301)	_	_	167.005 (360.802)	_
Type of childbirth			0.4			0.3
- Single	32,769 (97%)	1,533 (97%)		20,242 (96%)	976 (96%)	
- Twin	997 (3.0%)	40 (2.5%)		925 (4.4%)	37 (3.7%)	
Sexe			0.7			0.2
- Male	16,861 (50%)	777 (49%)		10,522 (50%)	487 (48%)	
- Female	16,905 (50%)	796 (51%)		10,645 (50%)	526 (52%)	
Birth order			0.3			0.009***
- 1	7,046 (21%)	325 (21%)		2,856 (13%)	172 (17%)	
- 2	6,769 (20%)	303 (19%)		5,023 (24%)	228 (23%)	
- 3	5,637 (17%)	256 (16%)		4,103 (19%)	186 (18%)	
- 4	4,481 (13%)	192 (12%)		3,013 (14%)	119 (12%)	
- 5 and more	9,833 (29%)	497 (32%)		6,172 (29%)	308 (30%)	
Age	1.909 (1.422)	2.288 (1.358)	< 0.001***	2.016 (1.474)	2.369 (1.405)	< 0.001***
Child anthropometric						
- WAZ	-0.993 (1.357)	-1.435 (1.452)	< 0.001***	-0.999 (1.341)	-1.435 (1.444)	< 0.001***
- HAZ	-1.293 (1.925)	-1.424 (1.955)	0.009***	-1.286 (1.906)	-1.390 (1.959)	0.10
- WHZ	-0.345 (1.524)	-0.893 (1.686)	< 0.001***	-0.351 (1.505)	-0.906 (1.705)	< 0.001***
Vaccination status[3]			< 0.001***			< 0.001***
- No	5,934 (26%)	345 (32%)		3,835 (26%)	235 (34%)	
- Yes	17,275 (74%)	721 (68%)		10,644 (74%)	454 (66%)	

* *Note* : [1]n (%); Mean, [2]Fisher's Exact Test for Count Data; Welch Two Sample t-test. [3]The vaccination status information is collected for children aged between 3 and 5 years old, which corresponds to a total of 24,275 children and 15,168 siblings. The vaccines include diphtheria, tetanus, polio (DTP), measles, BCG, and vitamin A. WAZ : Weight for Age Z-score; HAZ : Height for Age Z-score; WHZ : Weight for Height Z-score. For categorical variables, the number of occurrences is provided and the proportion in parentheses. For numeric variables, the average values along with the variance in parentheses are provided.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Table 10: Summary statistics on the characteristics of the women in the sample.

Characteristics of women and husbands	**Baseline**, N = 23521			**Sibling**, N = 11599		
	No conflict 10 km around N = 22,013[1]	**At least one conflict 10 km around** N = 1,508[1]	**p-value**[2]	**No conflict 10 km around** N = 10,837[1]	**At least one conflict 10 km around** N = 762[1]	**p-value**[2]
Women's decision making						
- aut. maj. hh purch. (Yes = 1, No = 0)	9,861 (45%)	467 (31%)	< 0.001***	4,621 (43%)	200 (26%)	< 0.001***
- aut. own earn. (Yes = 1, No = 0)	11,922 (54%)	834 (55%)	0.4	5,737 (53%)	405 (53%)	> 0.9
- aut. on husb. earn. (Yes = 1, No = 0)	7,242 (33%)	342 (23%)	< 0.001***	3,447 (32%)	148 (19%)	< 0.001***
- earn. more than husb. (Yes = 1, No = 0)	1,604 (7.3%)	77 (5.1%)	0.001***	730 (6.7%)	31 (4.1%)	0.003***
Nbr events related to BH	_	26.032 (62.376)	< 0.001***	_	29.348 (66.680)	< 0.001***
Woman's ethnicity			< 0.001***			< 0.001***
- Other	15,599 (71%)	681 (45%)		7,356 (68%)	308 (40%)	
- Hausa	4,586 (21%)	571 (38%)		2,458 (23%)	309 (41%)	
- Kanuri/Beriberi	327 (1.5%)	97 (6.4%)		201 (1.9%)	60 (7.9%)	
- Fulani	1,501 (6.8%)	159 (11%)		822 (7.6%)	85 (11%)	
Woman's religion			< 0.001***			< 0.001***
- Muslim	9,792 (44%)	1,129 (75%)		5,051 (47%)	608 (80%)	
- Christian	11,884 (54%)	372 (25%)		5,618 (52%)	152 (20%)	
- Other	337 (1.5%)	7 (0.5%)		168 (1.6%)	2 (0.3%)	
Woman work in agri. (Yes = 1, No = 0)	3,688 (17%)	64 (4.2%)	< 0.001***	1,825 (17%)	29 (3.8%)	< 0.001***
Woman's nbr yrs of educ	6.262 (5.455)	6.717 (5.819)	0.003***	5.810 (5.380)	6.157 (5.741)	0.11
Woman's age	29.304 (6.985)	29.044 (7.038)	0.022**	28.939 (5.944)	28.588 (6.158)	0.011**
Woman's age sqr.	907.482 (433.798)	893.085 (436.690)	0.040**	872.786 (364.799)	855.148 (378.393)	0.037**
Husband work in agri. (Yes = 1, No = 0)	7,941 (36%)	259 (17%)	< 0.001***	4,081 (38%)	128 (17%)	< 0.001***
Husband's nbr yrs of educ	7.658 (5.684)	8.743 (6.135)	< 0.001***	7.256 (5.639)	8.433 (6.201)	< 0.001***

Migrant (Yes = 1, No = 0)[3]	1,910 (8.7%)	169 (11%)	0.001***	837 (7.7%)	87 (11%)	< 0.001***
Woman received maternal[4] care (Yes = 1, No = 0)	16,186 (74%)	1,251 (83%)	< 0.001***	7,106 (66%)	590 (77%)	< 0.001***
Woman face barriers to health (Yes = 1, No = 0)	12,539 (57%)	602 (40%)	< 0.001***	6,384 (59%)	300 (39%)	< 0.001***

* *Note* : [1]n (%); Mean, [2]Fisher's Exact Test for Count Data; Welch Two Sample t-test. [3] Migrant women or households are defined as those who leave their usual place of residence after the start of the BHI in 2009. I also consider women who are visitors to their current place as migrants. [4] Maternal care refers to the healthcare and support provided to women during pregnancy, childbirth and the postpartum period. It takes the value of 1 if at least one prenatal or postnatal care was sought by the woman and 0 otherwise. For categorical variables, I provide the number of occurrences and the proportion in parentheses. For numeric variables, we give the average values along with the variance in parentheses.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Table 11: Summary statistics on the characteristics of households in the sample.

Characteristics of households	**Baseline**, N = 23264			**Sibling**, N = 11559		
	No conflict 10 km around N = 21,763[1]	**At least one conflict 10 km around** N = 1,501[1]	**p-value**[2]	**No conflict 10 km around** N = 10,801[1]	**At least one conflict 10 km around** N = 758[1]	**p-value**[2]
Hh. head sex			0.2			0.088**
- Male	19,690 (90%)	1,375 (92%)		9,891 (92%)	708 (93%)	
- Female	2,073 (9.5%)	126 (8.4%)		910 (8.4%)	50 (6.6%)	
Total nbr of individuals in the hh.	5.554 (2.267)	5.785 (2.490)	< 0.001***	6.075 (2.187)	6.317 (2.435)	0.008***
Nbr of children under five in the hh.	1.715 (0.784)	1.733 (0.754)	0.4	2.290 (0.656)	2.278 (0.617)	0.6
Wealth quintile of the hh.			< 0.001***			< 0.001***
- Poorest	4,314 (20%)	121 (8.1%)		2,321 (21%)	56 (7.4%)	
- Poorer	4,273 (20%)	184 (12%)		2,200 (20%)	104 (14%)	
- Middle	4,249 (20%)	300 (20%)		2,157 (20%)	157 (21%)	
- Richer	4,394 (20%)	446 (30%)		2,119 (20%)	234 (31%)	
- Richest	4,533 (21%)	450 (30%)		2,004 (19%)	207 (27%)	

* *Note* : [1]n (%); Mean, [2]Fisher's Exact Test for Count Data; Welch Two Sample t-test. WAZ : Weight for Age Z-score; HAZ : Height for Age Z-score; WHZ : Weight for Height Z-score. For categorical variables, the number of occurrences is provided and the proportion in parentheses. For numeric variables, the average values is provided along with the variance in parentheses.*Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

B Results

Table 12: The estimated effect of the BH conflict on the WAZ.

	Specification:							
	Baseline				Sibling			
	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.
	Outcome : Weight for Age Z-Score (WAZ)							
Nbr events	−0.33***	−0.25**	−0.31**	−0.31***	−0.67***	−1.14***	−0.73***	−0.67***
	(0.11)	(0.12)	(0.13)	(0.12)	(0.26)	(0.30)	(0.23)	(0.23)
Nbr events * High bargaining	0.03	−0.17	−0.08	−0.34	0.34	1.02***	0.71**	0.90**
	(0.18)	(0.20)	(0.16)	(0.23)	(0.34)	(0.31)	(0.31)	(0.37)
High bargaining	4.61**	−4.26**	0.45	−0.74				
	(1.82)	(1.73)	(1.82)	(3.09)				
Twin	−44.36***	−44.15***	−44.23***	−44.22***	−48.76***	−48.68***	−48.94***	−48.92***
	(5.19)	(5.19)	(5.19)	(5.19)	(8.83)	(8.83)	(8.83)	(8.83)
Child sexe (ref. category: male)								
-Female	9.98***	10.02***	9.98***	9.97***	9.87***	9.96***	9.86***	9.88***
	(1.40)	(1.40)	(1.40)	(1.40)	(2.00)	(1.99)	(2.00)	(2.00)
Child birth order (ref. category: 1)								
- 2	−1.39	−1.21	−1.36	−1.36	−18.73***	−18.82***	−18.73***	−18.69***
	(2.09)	(2.09)	(2.09)	(2.09)	(3.43)	(3.43)	(3.43)	(3.43)
- 3	−4.79*	−4.47*	−4.70*	−4.71*	−34.41***	−34.54***	−34.42***	−34.35***
	(2.50)	(2.49)	(2.49)	(2.49)	(5.66)	(5.65)	(5.65)	(5.65)
- 4	−10.14***	−9.71***	−10.05***	−10.05***	−54.96***	−55.17***	−54.98***	−54.90***
	(2.88)	(2.88)	(2.88)	(2.88)	(7.82)	(7.79)	(7.80)	(7.79)
- 5 and over	−12.40***	−11.84***	−12.28***	−12.28***	−72.89***	−73.06***	−72.88***	−72.75***
	(3.21)	(3.21)	(3.21)	(3.21)	(10.54)	(10.51)	(10.52)	(10.51)
Child age	22.65***	22.61***	22.62***	22.59***	20.46***	20.53***	20.53***	20.57***
Survey year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Cluster fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
woman fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	35,339	35,339	35,339	35,339	22,180	22,180	22,180	22,180
R^2	0.22	0.22	0.22	0.22	0.74	0.74	0.74	0.74

* *Note* : the estimated model is an OLS model. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head, the number of household members and under five children and the NDHS poverty quintile. The birth month and year of the child and interview's month FE are included in all regressions. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Table 13: The estimated effect of the BH conflict on the HAZ.

	Specification:							
	Baseline				Sibling			
	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.
	Outcome : Height for Age Z score (HAZ)							
Nbr events	0.15	0.09	0.33	0.23	0.37	0.33	0.29	0.33
	(0.32)	(0.40)	(0.29)	(0.28)	(0.56)	(0.69)	(0.60)	(0.53)
Nbr events * High bargaining	0.04	−0.35**	0.44**	0.01	1.07**	1.49**	1.27	1.91**
	(0.19)	(0.16)	(0.17)	(0.28)	(0.52)	(0.62)	(0.83)	(0.79)
High bargaining	2.92	−6.04***	−1.44	0.75				
	(2.18)	(2.02)	(2.29)	(3.42)				
Twin	−18.56***	−18.37***	−18.47***	−18.49***	−22.22**	−22.28**	−22.68**	−22.66**
	(6.00)	(6.00)	(6.00)	(6.00)	(10.01)	(10.02)	(10.05)	(10.05)
Child sexe (ref. category: male)								
-Female	2.45	2.50	2.44	2.44	4.66*	4.79*	4.64*	4.69*
	(1.62)	(1.62)	(1.62)	(1.62)	(2.49)	(2.48)	(2.48)	(2.48)
Child birth order (ref. category: 1)								
- 2	4.03	4.25*	4.05	4.04	11.90***	11.75***	11.89***	11.98***
	(2.48)	(2.48)	(2.48)	(2.48)	(4.28)	(4.28)	(4.28)	(4.29)
- 3	4.44	4.82*	4.49	4.49	22.01***	21.78***	21.96***	22.12***
	(2.88)	(2.88)	(2.88)	(2.88)	(7.19)	(7.16)	(7.18)	(7.17)
- 4	−0.03	0.52	0.04	0.02	24.00**	23.55**	23.85**	24.05**
	(3.26)	(3.26)	(3.26)	(3.26)	(9.98)	(9.94)	(9.96)	(9.95)
- 5 and over	2.03	2.74	2.14	2.10	26.36**	25.90**	26.22**	26.53**
	(3.86)	(3.85)	(3.86)	(3.86)	(13.22)	(13.18)	(13.20)	(13.20)
Child age	15.30***	15.26***	15.28***	15.27***	12.61***	12.69***	12.72***	12.82***
	(3.00)	(3.01)	(3.00)	(3.01)	(4.77)	(4.77)	(4.78)	(4.78)
Survey year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Cluster fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
woman fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	35,339	35,339	35,339	35,339	22,180	22,180	22,180	22,180
R^2	0.12	0.12	0.12	0.12	0.69	0.69	0.69	0.69

* *Note* : the estimated model is an OLS model. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head, the number of household members and under five children and the NDHS poverty quintile. The birth month and year of the child and interview's month FE are included in all regressions. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Table 14: The estimated effect of the BH conflict on the WHZ.

	Specification:							
	Baseline				Sibling			
	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.	(1) aut. maj. hh purch.	(2) aut. own earn.	(3) aut. on husb. earn.	(4) earn. more than husb.
	Outcome : Weight for Height Z-Score (WHZ)							
Nbr events	−0.80***	−0.72***	−0.92***	−0.83***	−1.34***	−1.88***	−1.33***	−1.26***
	(0.20)	(0.18)	(0.20)	(0.19)	(0.36)	(0.49)	(0.40)	(0.35)
Nbr events * High bargaining	0.04	−0.35**	0.44**	0.01	1.07**	1.49**	1.27	1.91**
	(0.19)	(0.16)	(0.17)	(0.28)	(0.52)	(0.62)	(0.83)	(0.79)
High bargaining	2.92	−6.04***	−1.44	0.75				
	(2.18)	(2.02)	(2.29)	(3.42)				
Twin	−18.56***	−18.37***	−18.47***	−18.49***	−22.22**	−22.28**	−22.68**	−22.66**
	(6.00)	(6.00)	(6.00)	(6.00)	(10.01)	(10.02)	(10.05)	(10.05)
Child sexe (ref. category: male)								
-Female	2.45	2.50	2.44	2.44	4.66*	4.79*	4.64*	4.69*
	(1.62)	(1.62)	(1.62)	(1.62)	(2.49)	(2.48)	(2.48)	(2.48)
Child birth order (ref. category: 1)								
- 2	4.03	4.25*	4.05	4.04	11.90***	11.75***	11.89***	11.98***
	(2.48)	(2.48)	(2.48)	(2.48)	(4.28)	(4.28)	(4.28)	(4.29)
- 3	4.44	4.82*	4.49	4.49	22.01***	21.78***	21.96***	22.12***
	(2.88)	(2.88)	(2.88)	(2.88)	(7.19)	(7.16)	(7.18)	(7.17)
- 4	−0.03	0.52	0.04	0.02	24.00**	23.55**	23.85**	24.05**
	(3.26)	(3.26)	(3.26)	(3.26)	(9.98)	(9.94)	(9.96)	(9.95)
- 5 and over	2.03	2.74	2.14	2.10	26.36**	25.90**	26.22**	26.53**
	(3.86)	(3.85)	(3.86)	(3.86)	(13.22)	(13.18)	(13.20)	(13.20)
Child age	15.30***	15.26***	15.28***	15.27***	12.61***	12.69***	12.72***	12.82***
	(3.00)	(3.01)	(3.00)	(3.01)	(4.77)	(4.77)	(4.78)	(4.78)
Survey year fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
Cluster fixed effects	Yes	Yes	Yes	Yes	No	No	No	No
woman fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Observations	35,339	35,339	35,339	35,339	22,180	22,180	22,180	22,180
R^2	0.12	0.12	0.12	0.12	0.69	0.69	0.69	0.69

* *Note* : the estimated model is an OLS model. The baseline regressions include controls for woman ethnicity, her age and age squared, woman and husband number of years of education, their working in agriculture sector binaries, the sexe of the head, the number of household members and under five children and the NDHS poverty quintile. The birth month and year of the child and interview's month FE are included in all regressions. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.

Table 15: The estimated effect of the BH conflict on the probability of being missing.

	Outcomes variables (1 = ≪Yes≫ and 0 = ≪No≫)											
	Weight for Age Z-scores (WAZ) is missing				Weight for Height Z-scores (WHZ) is missing				Height for Age Z-scores (HAZ) is missing			
	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.	aut. maj. hh purch.	aut. own earn.	aut. on husb. earn.	earn. more than husb.
Nbr Events	−0.00	−0.01	−0.00	−0.01	−0.00	−0.01	−0.00	−0.01	−0.00	−0.01	−0.00	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Nbr Events * High bargaining	−0.13	−0.01	−0.18	−10.01***	−0.13	−0.01	−10.02***	−0.18	−0.13	−0.01	−0.18	−10.02***
	(0.09)	(0.02)	(0.13)	(0.19)	(0.09)	(0.02)	(0.13)	(0.19)	(0.09)	(0.02)	(0.13)	(0.19)
High bargaining	0.14	−0.21**	0.12	−0.00	0.13	−0.20**	0.11	−0.00	0.14	−0.21**	0.12	−0.00
	(0.08)	(0.07)	(0.08)	(0.16)	(0.08)	(0.07)	(0.08)	(0.16)	(0.08)	(0.07)	(0.08)	(0.16)
Twin	−0.69*	−0.68*	−0.69*	−0.69*	−0.68*	−0.68*	−0.69*	−0.68*	−0.69*	−0.68*	−0.69*	−0.69*
	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)
Child sexe (ref. category: male)												
- Female	−0.01	−0.00	−0.01	−0.01	0.00	0.00	−0.00	0.00	−0.00	−0.00	−0.01	−0.00
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Child birth order (ref. category: 1)												
- 2	0.04	0.05	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05	0.04	0.04
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
- 3	−0.05	−0.04	−0.05	−0.05	−0.05	−0.04	−0.05	−0.05	−0.05	−0.04	−0.05	−0.05
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
- 4	−0.12	−0.11	−0.12	−0.12	−0.12	−0.11	−0.12	−0.12	−0.12	−0.11	−0.12	−0.12
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
- 5 and over	−0.28	−0.27	−0.28	−0.29	−0.29	−0.27	−0.29	−0.29	−0.28	−0.27	−0.28	−0.29
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Child age	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.21
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Survey year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53964	53964	53964	53964	53964	53964	53964	53964	53964	53964	53964	53964
Pseudo R^2	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

* *Note* : the estimated model is a logit model. The regressions incorporate controls for mother's ethnicity, her age and age squared, woman and husband's number of years of education, their working status in the agriculture sector (binary), the sex of the head of the household, the number of household members, the number of under-five children and the NDHS poverty quintile. Standard errors in parentheses are clustered at the NDHS cluster level. *Significant at the 0.1 level, **Significant at the 0.05 level, ***Significant at the 0.01 level.