EXPOSURE TO TERRORISM AND BIRTHWEIGHT

OUTCOMES IN NIGERIA

by

James Philip Matonte

A thesis submitted in partial fulfillment
of the requirements of the degree

of

Master of Science

in

Applied Economics

MONTANA STATE UNIVERSITY
Bozeman, Montana

April, 2018

ACKNOWLEDGEMENTS

I would like to thank my thesis committee members, Dr. Mark Anderson, Dr. Joe Atwood, Dr. Sarah Janzen, and my committee chair Dr. Brock Smith. Their mutual excitement and passion for my project provided invaluable motivation and support. Above all else, I would like to thank them for their seemingly unlimited patience, as well as their willingness to provide insight and assistance at a moment's notice. I would also like to thank all of the faculty and staff in the Montana State University Agricultural Economics and Economics department for providing the time and resources necessary to aid students through this program. Lastly, I would like to thank all my friends, fellow cohort members, and family for always providing unconditional support and guidance.

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

LIST OF TABLES

LIST OF TABLES CONTINUED

Table Page

LIST OF FIGURES

ABSTRACT

Using readily available vitality and GPS data from the Nigerian Demographic and Health Survey, in conjunction with terrorism data from the open sourced Global Terrorism Database, I estimate the effect of in-utero exposure to terrorism within three kilometers of individuals in Nigeria on the likelihood of an infant to be born low-birthweight. Previous economic studies have explored the similar impacts to birthweight from arguably exogenous violent shocks to fetuses in-utero, however, no previous study has yet performed such an analysis of in-utero violence exposure within such a defined geographic area. I claim that previous studies' inability to perform their analysis on a smaller geographic scale has likely underestimated the effects of in-utero violence exposure. Additionally, I exploit detailed information on each terrorism event to address varying degrees of violence severity. I find that exposure to a Boko Haram civilian targeted terrorism related fatality, anywhere within Nigeria and within three kilometers of an individual, as well as within the first trimester of pregnancy, is associated with an approximate 3.2 percentage point increase in the likelihood that a child is born less than or equal to 2500 grams. There is also evidence to suggest that exposure to terrorist events greater than three kilometers away and outside of the first trimester increase the likelihood of an infant being born low birthweight as well.

INTRODUCTION

Nigeria has been devastated with thousands of terrorist incidents since 2010 and has subsequently experienced 20,000 military, police, and civilian causalities; Figure 1 offers an illustration of the rapid proliferation of terrorism in Nigeria since 2010 (Beri, 2017).[1] The Nigerian government is struggling to contain the spread of terrorism within its borders and millions of Nigerians have been impacted by rampant property destruction, displacement, food shortages, and exposure to extreme forms of violence (Knoope, 2017).[2] While the death and physical destruction associated with terrorism in Nigeria is measurable, this study focuses on the impacts of terrorism on an extraordinarily sensitive and non-visible population, in-utero fetuses. The exact nature of this study is to analyze the effect that exposure to terrorism in-utero has on the likelihood of an infant being born low-birthweight. Low-birthweight in infants is associated with detriments in post-natal cognitive, behavioral, and motor skill development, as well as detriments to later-in-life academic performance (Behrman & Rosenzweig, 2004; Figlio et al., 2014; Talge et al., 2007).

[1] Coincidentally, and unrelated to the terrorist uprising in Nigeria, since 2009, Africa has experienced a 750% increase in the number of terrorist attacks resulting in casualties and deaths (Beri, 2017). This recent proliferation of terrorism in Africa is associated with an ever-growing presence of radical terror organizations in Northern Africa and north Sub-Saharan Africa. The recent rise of terrorist activities in Africa is associated with an influx of ISIS and Al-Qaeda affiliated groups that have fled the Middle East due to their recent defeats in Syria and in Iraq (Wirtshafter & Gadiaga, 2017). Due to the government destabilization effects of the Arab-Spring in 2011, the North-African countries of Tunisia, Libya, and Egypt have become a gateway for terrorists to enter into Africa (Beary, 2015). Libya and Tunisia's unpatrolled coastlines have facilitated the majority of this migration, an estimated 6,500 ISIS and Al-Qaeda fighters entered through Tunisia alone in 2017 (Wirtshafter & Gadiaga, 2017). To establish a following within Africa, terrorist groups exploit the current high unemployment rates, corrupt governments, and deteriorating living conditions to attract individuals in economic despair. Most recruits are young men unable to find work

[2] Corrupt security forces and government officials have severely hampered the Nigerian government's ability to effectively curb the terrorist activities of Boko Haram (Human Rights Watch, 2018).

Terrorist attacks are an ideal exogenous violence shock to in-utero fetuses because in the eyes of a victim, a terrorist attack is random and arguably unpredictable. Even if an individual was cognizant of an impending terrorist attack, there is little that one could do to limit the impact of exposure to an attack, or prevent the after math of an attack. Additionally, given that terrorist attacks vary in degree of destruction and death, it is unlikely that each terrorist attack delivers a constant effect and predictable level of violence.

Exposure to the violence of terrorist attacks causes physiological and psychological stress for both victims and bystanders. A litany of medical studies find that exposure to maternal stress hormones in-utero, early in gestation, can positively influence the likelihood that an infant is born low-birthweight (McLeans et al. 1996; Weinstock, 2005). In addition to stress hormones influencing the development of a fetus, terrorist attacks could affect a pregnant woman's ability to access nutrition, hospitals, and prenatal care through the interruption of food production, distribution, and the destruction of healthcare facilities. Additionally, terrorist attacks could facilitate elevated levels of physical exertion and exhaustion from fleeing the site of an attack or relocating from a destroyed area. These alternative factors are especially salient within Nigeria, as terrorist activities, especially those of Boko Haram, have completely razed entire towns causing millions to flee, as well as cut off access to vital resources and medical services (Beri, 2017; Mbachu, 2018).

In the past decade, there has been a multitude of studies exploring the relationship between in-utero violence exposure and infant health outcomes. This study contributes to the preexisting literature by exploiting unique datasets that allow for the reduction in the geographic area of analysis to within the direct proximity of subjects, as well as allowing for the identification of the exact time that an individual is at risk of exposure to a terrorist attack.[3] Previous studies inability to analyze the effects of in-utero exposure to violent events within the direct proximity of subjects, as well as inability to identify the exact moment of exposure, has likely underestimated the effects of in-utero violence exposure. Furthermore, I add to the preexisting literature by differentiating terrorist attacks by their varying degrees of violence, e.g. number of casualties in each attack, as well as by who is the targeted population in each attack, in particular whether civilians are targeted. Additionally, performing my analysis within Nigeria allows for the analysis of an active and rapidly growing terrorist organization, Boko Haram. Given that Boko Haram is still very much active in Nigeria, as well as spreading into surrounding countries, this study is particularly topical and provides insight to the impact of Boko Haram terrorist attacks on unborn infants.

In my analysis, I find evidence to suggest that exposure to a Boko Haram civilian targeted fatality in the first trimester and within three kilometers of an individual result in a 3.2 percentage point increase in the likelihood that an infant is born low-birthweight. The magnitude of this estimate is considerably larger than any previous economic study's

---

[3] Mansour and Rees's (2012) study on the impacts of al-Aqsa intifada fatalities on infant health outcomes in Palestine utilizes within district fatality data that limits their analysis to within Palestinian districts. These districts range in area from 24 square miles to over 350 square miles. This restrictive data prevents Mansour and Rees (2012) from analyzing a subject's exposure to a fatality within their direct proximity. Additionally, Mansour and Rees (2012) only possess monthly fatality data and cannot explicitly designate the exact instance or location of a fatality.
Koppensteiner and Manacorda's (2015) study on birthweight impacts from exposure to homicides committed in the public-way performs their analysis on small municipalities within Brazil. The typical small Brazilian municipality is 22KM x 22KM. However, they are able to run their analysis on an even smaller geographic area, neighborhoods, on only one particular municipality, Fortaleza. This particular analysis is performed within a 1.6KM x 1.6KM area.

findings examining in-utero violence exposure and birthweight outcomes. I also find that only Boko Haram civilian targeted terrorist events generate statistically and economically significant impacts to all respondents within Nigeria. Additionally, controlling for prenatal care visits and hospital access reinforces this estimated association.

The data that allows me to perform my analysis within the direct proximity of subjects comes from the 2003, 2008, and 2013 rounds of the Nigerian Demographic and Health Survey (NDHS), as well as the richly detailed Global Terrorism Database (GTD) that contains information for all terrorist attacks that occurred in Nigeria from 1970 to 2013. The NDHS provides information on the weight of infants at birth, date of birth, mother and infant characteristics, survey location characteristics, and the longitude and latitude of survey respondents.[4] The GTD provides information on terrorist attacks regarding how many casualties are in each attack, the targets of attacks, date of attacks, as well as the longitude and latitude of each attack.

[4] The GPS coordinates provided by the NDHS are for survey clusters. Survey cluster are where multiple surveys were conducted at once. The number of respondents in each cluster vary from cluster to cluster.

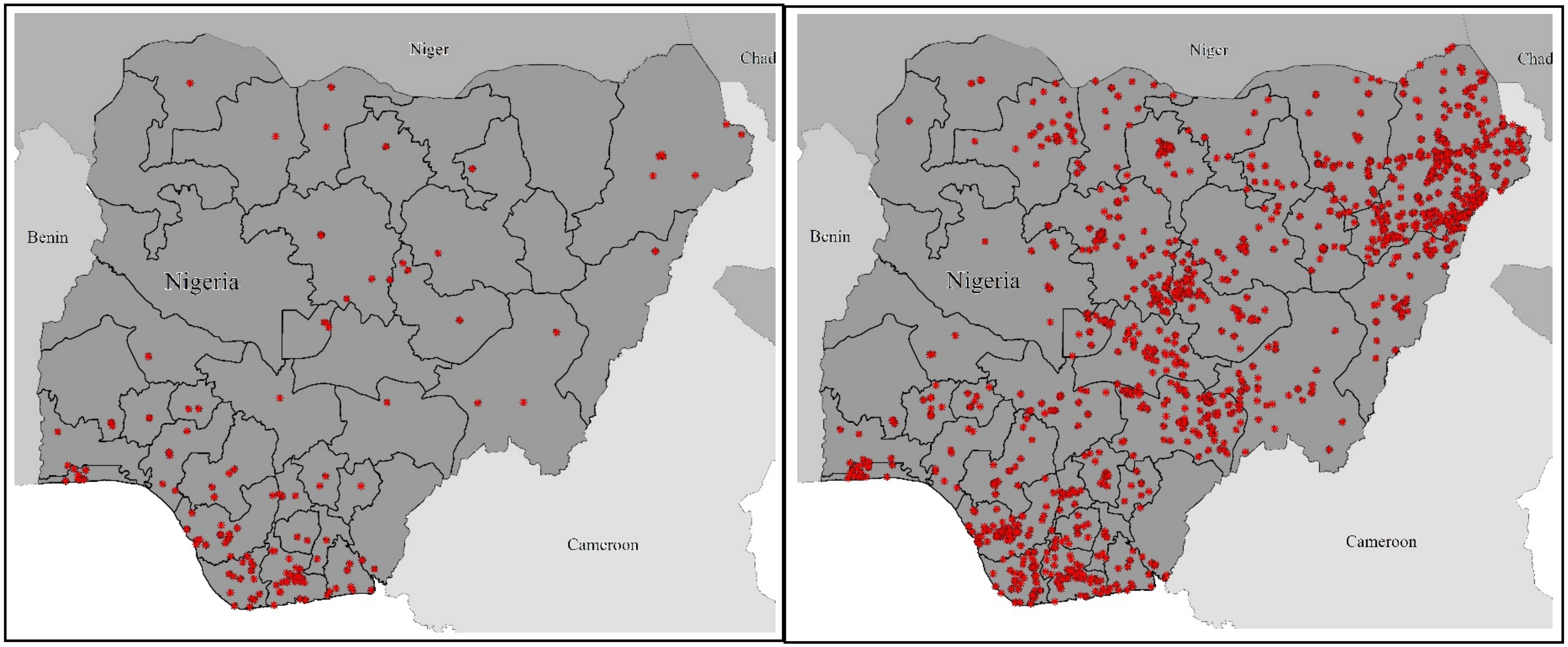

Figure 1: Comparison of Terrorist Events in Nigeria 1970 - 2010 and 1970 – 2016

Note: This figure illustrates the rapid inundation of terrorist attacks in Nigeria in the previous decade. The map on the left are all terrorist attacks registered by the GTD to have occurred in Nigeria from 1970 to 2010. The map on the right is all terrorist attacks registered by the GTD to have occurred in Nigeria from 1970 to 2016. From 1970 to 2010 there are 400 attacks in the 40 year period. From 1970 to 2016 there are 3,417 recorded attacks, an additional 3,017 attacks in just a six year period. Each red point on the maps indicates an individual terrorist event.

Data: Global Terrorism Database

BACKGROUND

Terrorism in Nigeria, while more rampant and impactful today, is not a new phenomenon, and neither is exposure to extreme forms of violence. Nigeria has a long-standing history of terrorist attacks directed at oil industries, such as the bombing of oil pipelines and the execution of oil industry workers (Kleinpeter, 2016). Additionally, Nigeria has one of the highest violent crime and homicide rates in the world (The World Bank, 2018). Nigeria is also the most populous country in Africa, as well as the largest economy and during durations of higher oil prices, Nigeria has experienced double-digit economic growth (Kleinpeter, 2016). However, with the global fall of commodity prices in the early 2010's, Nigerians have experienced rapidly increasing unemployment, especially amongst youths, and deteriorating living conditions, especially in northern regions (Ighorbor, 2017).[5]

Since 2009, Nigeria has experienced a rapid increase in violent terrorist activities (Beri, 2017). As of 2015, The World Atlas's Global Terrorism Index designates Nigeria as the third most terrorized country in the world, following Iraq and Afghanistan (Dillinger, 2015).[6] This recent increase in terrorism is associated with the ISIS aligned terrorist group Boko Haram and its affiliated offshoots (Knoope, 2017). In recent years, Boko Haram has grown in membership and financial resources and now not only resides in Nigeria, but in neighboring countries as well; Table 1 presents Boko Haram membership size and

[5] Nigeria is demographically split in half with a wealthier Christian south and a poorer Muslim north. Nigeria's demographic split stems from its British colonial past (Harvard Divinity School, 2018). Additionally, unemployed youths, especially men, are prime targets for recruitment into terrorist organizations (Matfess, 2016).

[6] The data used to generate this claim is from the Global Terrorism Database, the same data source I use in my analysis.

occupied countries. There are a litany of other terrorist organizations operating within Nigeria, however, during the temporal duration of my analysis, none are as destructive, lethal, and rampant as Boko Haram.[7]

The origins of Boko Haram begin in 2002 with Mohammed Yusuf, an extremist Muslim cleric, who founded the Islamic offshoot organization in Maiduguiri, the capital of the Nigerian state of Borno (BBC News, 2016).[8] In its infancy, Boko Haram remained relatively non-violent, with only a few hostile interactions with police. Several years into its operation, Boko Haram affiliated itself with al-Qaeda and claimed northeastern Nigeria an Islamic State (Knoope, 2017). Shortly thereafter, in early 2009, altercations between government authorities and Boko Haram became increasingly frequent until eventually the government of Nigeria responded with a large military operation in Maiduguri (BBCNews, 2016). Boko Haram's founder, Mohammed Yusuf, was captured during the operation and executed without trial.

Boko Haram, lacking its leader and deemed 'defeated' by the Nigerian government, went immediately into hiding but reemerged in 2011 to start a violent insurgency. Initial Boko Haram terrorist activities were revenge attacks on police and military but civilians quickly became the main targets of attacks (Wilson, 2018).[9] As Boko Haram's membership base and financial assets grew, its attacks became increasingly sophisticated and deadly,

---

[7] Other active terrorist organizations in Nigeria are the Fulani Militants, The Movement for the Emancipation of the Niger Delta, and The Joint Revolutionary Council. There are many more that can be listed but these three organizations have committed the most attacks outside of Boko Haram in my time duration of analysis. However, since 2015 the Fulani Extremists have become an increasingly imposing force in south central Nigeria and rival Boko Haram terrorist activities. (Global Terrorism Database, 2016)
[8] Boko Haram roughly translates to "Western Education is Sin".
[9] In 2017, over half of all attacks were directed at civilian entities (Wilson, 2018)

thus turning Boko Haram into a full terrorist organization.[10] Since its insurgence in 2011, the World Bank has estimated 20,000 people killed by Boko Haram attacks, two million civilians displaced, 80% of structures in northeastern Nigeria razed, and a total cost of damage of 5.9 billion U.S. dollars (News24, 2016).[11]

Due to the remarkable scale of destruction in northeastern Nigeria from Boko Haram, hundreds of thousands of civilians unable to flee are corralled into densely populated refugee camps in Maiduguri and other urban centers (Beary, 2015). Boko Haram, while significantly less active in northeastern Nigeria than it was in 2015, has continued attacking these refugee camps with suicide bombings, shootings, and kidnappings. Boko Haram attacks occur on a daily basis in northeast Nigeria and thousands more have been killed since the Nigerian government's military campaign against Boko Haram in 2015 (Beri, 2017).[12] Frequent occurrences of extreme attacks with armed gunman and explosives, resulting in numerous deaths, has placed large amounts of psychological and physiological stress on those who survive attacks or witness them. As

[10] Fearing Boko Haram's ties with al-Qaeda, the U.S. Government officially labeled Boko Haram a terrorist organization in mid-2013 (BBCNews, 2012). Boko Haram's preferred method of attack is the use of gunmen on motorcycles to perform a drive-by on their target(s) (BBCNews, 2016).

[11] Attacks escalated to the point that, in May 2013, the Nigerian government declared a state of emergency in the northeastern states of Borno, Yobe, and Adamawa. In 2014, Boko Haram declared a caliphate in regions under Boko Haram control and swore allegiance to ISIS, separating Boko Haram from its previous alliance with al-Qaeda (Beary, 2015). ISIS accepted the allegiance and claimed all Boko Haram territory under its control, as well as provided additional financial and weapons support for Boko Haram (Smith, 2017).[11] Boko Haram garnered international attention for the first time in April of 2014 when it kidnapped 276 schoolgirls from a local Nigerian school in Chibok, Borno (BBCNews, 2016).

[12] In 2015, Nigeria generated a coalition with neighboring countries, as well as hired a private military company, to regain control of its northeastern region (U.S. Department of State, 2017; Barlow, 2017).[12] The military operation was successful and Boko Haram was driven out from the urban areas of northeastern Nigeria into the surrounding jungle and mountains. After the campaign, the Nigerian government claimed Boko Haram "technically defeated" but the United States Central Intelligence Agency estimates that there are still thousands of active members in Nigeria, as well as in neighboring countries. Boko Haram is still well armed and well finance and its membership base continues to grow. Many experts warn of a Boko Haram resurgence (U.S. Department of State, 2017)

Boko Haram spreads into surrounding countries, it is imperative to understand how all those exposed to a Boko Haram attack are impacted.

Table 1: Terrorist Groups in Africa

Group	Number of Members	Occupied Countries
Al-Qaeda in the Islamic Maghreb (AQIM)	Approximately 1,000	Algeria, Chad, Libya, Mali, Mauritania, and Tunisia
Al-Shabaab	7,000 – 9,000	Djibouti, Kenya, Somalia, and Uganda
Boko Haram	Approximately 9,000	Cameroon, Chad, Niger, and Nigeria
Islamic State (ISIS or ISIL)	N/A	Egypt, Libya, Algeria, and Tunisia
Lord's Resistance Army (LRA)	Hundreds	Central African Republic and Democratic Republic of Congo

All information and table compiled by Brian Beary of CQPress

Sources: Council on Foreign Relations group profiles; Al-Shabaab figure estimates from "Who are Somalia's Al-Shabaab?" BBC April 3, 2015, http://tinyurl.com/klml38f; Boko Haram membership estimate from Farouk Chothia, "Who are Nigeria's Boko Haram Islamists?" BBC, May 4, 2016, http://tinyurl.com/l8ka4tm; Lord's Resistance Army information from Alexis Arieff and Lauren Ploch, "The Lord's Resistance Army: The U.S. Response," Congressional Research Service, May 15, 2014, http://tinyurl.com/pf2ml45; Max Fisher, "The Bizarre and Horrifying Story of the Lord's Resistance Army," *The Atlantic*, Oct. 17, 2011, http://tinyurl.com/o98o88d

MECHANISM AND LITERATURE DISCUSSION

A litany of medical studies have explored the relationship between exposure to violence in-utero and birthweight outcomes. Collins and David (1997) find an association between community violent crime rates and low-birthweight offspring amongst African American women. They find that African American mothers who reside in the most violent communities, holding socioeconomic factors constant, had a higher incidence of low-birthweight offspring. However, without identifying an exogenous source of stress, Collins and David (1997) are not able to identify a mechanism that fully explains their derived association.

A girth of the previous literature contends that maternal stress hormones interacting with fetal development explain the association between prenatal violence exposure and low birthweight infants (Copper et al., 1996; Dye et al., 1995; Glynn et al., 2001; Latendresse 2009). Diego et al. (2006), explores the relationship between exposure to the stress hormone cortisol during pregnancy and birthweight outcomes. Diego et al. (2006) examine 98 women mid-gestation, and find, via ultrasound biometry, that woman who report higher levels of stress, and have subsequent elevated levels of cortisol, have smaller and lighter babies than that of their less stressed counterparts. Additionally, they find an association between women with prolonged elevated levels of cortisol and shorter gestation lengths, as well as more rapid fetal development later in gestation (Copper et al., 1996; Latendresse, 2009; Mancuso et al., 2004; Newton & Hunt, 1984; PD Padwah et al., 2004).[13] [14]

In addition to maternal stress impeding on the development of a fetus, there are several other potential mechanisms associated with terrorism exposure in Nigeria that could influence birthweight. Boko Haram attacks in particular resulted in the mass destruction of public health facilities and hospitals, farmland, the ability for aid to enter the region, as well as the mass internal displacement of millions in the region, which could place exorbitant physical stress on pregnant women (Knoope, 2017; Olukayode, 2017; Reuters, 2018).

The destruction of public health facilities and hospitals could impede a mother's ability to obtain prenatal care. Access to prenatal care services has been shown to influence birthweight outcomes, especially access to prenatal care later in gestation (Jewell &

[13] The biological mechanics behind cortisol's effect on birthweight and gestation length is attributed to the mother's physiological reactions to cortisol. Cortisol initiates what is commonly referred to as the "fight-or-flight" response, which increases heartrate and causes blood vessels within muscles to dilate (Mulder et al. 2002). This response prevents normal blood flow to vital organs and increases metabolism, which is hypothesized to effect fetuses by restricting access to nutrition, thus ultimately causing intrauterine growth retardation (IUGR) (Vinkelsteijn et al., 2010).[13] Davis and Sandman (2010) find similar effects to Diego et al., (2006) in their study of cortisol exposure during pregnancy. They also find that the impacts of maternal cortisol on fetus development is most evident early in gestation.

[14] Another potential theory linking maternal stress exposure to fetal outcomes is one recognizing the relationship between maternal corticotrophin releasing hormone (CRH), a glucocorticoid that is released by the hypothalamus in response to stress, and placental CRH (McLean et al., 1995). McClean et al. (1995) have deemed placental CRH the "Placental Clock" because its role in gestation is associated with increasing the rate of fetal development and subsequent birth timing. Placental CRH is always present in the placenta and as gestation progresses, placental CRH levels naturally become elevated. However, excessive amounts of placental CRH can cause spontaneous premature birth (McLean et al., 1995). Thus, when a gravid woman experiences an abnormal amount of stress, excess levels of maternal CRH are produced which enters the mother's plasma. As the elevated maternal CRH concentrations in the plasma reach the placenta, placental CRH levels prematurely increase, which in turn triggers preterm fetal organ development, and subsequently premature birth occurs (Dole et al., 2003; Hobel & Culhane 2003; Mancuso et al., 2004; McLean et al., 1995; Wadwa et al., 2004;). Additionally, medical theory suggests that the effects of these interactions will be most evident early in gestation as a sort of evolutionary stopgap measure to prevent maternal investments in what the body would perceive as a probable failed pregnancy (McClean et al., 1995; Hobel & Culhane 2003).

Triunfo, 2006). Additionally, access to nutrition has also been shown to influence the birthweight of infants as well as excess physical exertion (Almond & Mazunder, 2011; Dwarkanath et al., 2007; Hobel, 2003; Stephenson & Symonds, 2002). Bisson et al., (2016) find an inverted u-shape association between physical exertion in the first trimester and birthweight outcomes, where moderate physical activity increases birthweight but excessive exertion decreases birthweight.

In the past decade, there has been a burgeoning of economic literature analyzing the impacts of exposure to exogenous shocks of violence on infant health outcomes. Examples of exogenous violence shocks utilized in previous studies are deaths from landmines, earthquakes, publicly viewable homicides, 9/11, and armed conflict (Camacho 2008; Glynn et al., 2001; Koppensteiner and Manacorda 2015; Lauderdale, 2006; Mansour & Rees, 2012). While many of these studies are able to identify arguably exogenous violence shocks, few are able to identify the precise mechanism that drives their results.

Camacho (2008) utilizes the shock of landmine fatalities in municipalities within Columbia to examine the impacts of maternal stress on infant birthweight. Camacho (2008) argues that, despite the already tumultuous environment within certain districts in Columbia at the time of landmine fatalities, the sudden and unexpected timing of a landmine fatality will supersede the already stressful environment resulting in an exogenous shock to stress. The results of the study estimate that exposure to a landmine fatality, in the first trimester, translates into an approximate 8.7-gram reduction in the birthweight of an infant, with no significant effects seen in trimester two or three. Camacho (2008) reinforces these results by lagging exposure to landmines by two periods and finds that the effect holds. Camacho (2008) suggests that this robustness check confirms that the impact to birthweight is from stress. If the result did not hold, Camacho (2008) argues impacts to nutrition later in gestation would be a more likely explanation of the estimated effect on birthweight. However, critics contend that Camacho's (2008) identifying assumption, that landmine fatalities are exogenous shocks, is rather weakly correlated with casualties during her time period of analysis due the simultaneous occurrence of aerial bombardments and massacres also causing death (Mansour and Rees, 2012; Restrepo and Spagat, 2004).

Mansour & Rees (2012) find similar results in their study analyzing in-utero violence exposure from al-Aqsa Intifada fatalities on subsequent birthweight outcomes. Utilizing Palestinian Demographic and Health Survey data, in conjunction with monthly district level al-Aqsa Intifada fatality data, Mansour and Rees (2012) find that an additional fatality nine to six months before birth is associated with a modest increase in the probability of a child being born low-birthweight, an approximate increase of 4 to 10 out of 1,000 children. Mansour and Rees (2012) fortify their results by ruling out other potential mechanisms that are associated with low-birthweight infants and are possible consequences of the al-Aqsa intifada. Such other potential mechanism include access to prenatal care, nutrition, and excessive physical exertion while pregnant. By continually ruling out other potential mechanisms that could have influenced birthweight during the duration of the al-Aqsa Intifada, Mansour and Rees (2012) provide robust evidence of the causal link of maternal stress hormones influencing infant birthweight outcomes, however, fall short of totally associating maternal stress as the mechanism driving their estimated effects.

To further compliment this growing body of literature, Koppensteiner and Manacorda (2015) examine the impact of in-utero violence exposure on infant outcomes from a mother witnessing a publicly viewable homicide in Brazil. Koppensteiner and Manacorda (2015) introduce a rare level of geographic acuteness in their analysis by incorporating the precise place where the birth occurred, as well as the mother's place of residence.[15] This additional information allows for the control of potential mechanisms not previously accountable for in prior studies, such as weather, precipitation, government funding for health programs, wealth, access to nurses, and availability of supplemental nutrition programs. By utilizing detailed microdata vitality statistics on births, deaths from the Brazilian Ministry of Health, detailed crime data, and a bevy of municipality level controls, they find that exposure to a publicly viewable homicide, in the first trimester of pregnancy, results in an increased probability of low-birthweight. Using a differences-in-differences model within siblings, Koppensteiner and Manacorda (2015) approximate that each additional exposure to a homicide committed in the public way results in a 0.5-gram reduction in birthweight and 1.05 children out of 1000 being born low-birthweight, less than 2500 grams. Koppensteiner and Manacorda (2015) also know the exact date of conception and are able to rule out premature birth as another mechanism for low birthweight, a feat not yet performed by any other previous study. Koppensteiner and

[15] While Koppensteiner and Manacorda (2015) have the exact location of the mother, they possess homicide data at the municipality level. Thus, their analysis is performed at the municipality level, except for one city, Fortaleza, where analysis is conducted on the neighborhood level.

Manacorda (2015), providing the most robust evidence of any similar study to date, attributing the estimated effects they derive on maternal stress hormones interacting fetal development.

Previous literature contends that the first trimester of pregnancy is when fetuses are most susceptible to the detriments of in-utero violence exposure through psychological stress. The purposed mechanism driving this impact are maternal stress hormones interacting with fetal development. However, there is a bevy of other potential mechanisms, such as access to prenatal care, nutrition, or excess physical exertion, which could have detrimental effects to birthweight in the first trimester as well. The magnitudes of the impacts of maternal stress on infant birthweight outcomes vary mildly from study to study. This is due to a medley of possible factors such as proximity to a violent incident, intensity of violence of an incident, geographical level of analysis in the empirical model, and socioeconomic and physical demographics of the exposed population.

DATA

Nigerian Demographic and Health Survey

I utilize the Nigerian Demographic and Health Survey (NDHS) conducted in the years 2003, 2008, and 2013 for my analysis.[16] The NDHS collects nationally representative data from households in Nigeria via large-scale surveys. The typical NDHS survey includes a household questionnaire, as well as separate questionnaires for men and women. For my analysis, I utilize the household questionnaire, which contains individual birth record information from the previous five years of the survey year. For instance, if the survey is from 2013, there is individual-level birth record data going back to 2008.

Overall, the birth record information for Nigeria spans the period 1998 to 2013 and the three surveys combined have approximately 250,000 individual birth records within them. However, not every birth record provides the necessary information for analysis. After eliminating non-viable observations, I observe 9,347 individual birth records with the first birth record occurring April 13, 1998 and the last birth occurring June 11, 2013.[17] Based on the summary statistics reported in Table 2, approximately 13.1% of newborns within this sample are considered low-birthweight, less than or equal to 2500 grams.[18]

---

[16] There is an earlier Nigeria survey conducted in 1990, however, that survey lacks key control variables, and cannot be utilized for my desired analysis.

[17] Non-viable observations are observations that lack a recorded birthweight, date of birth, or the corresponding GPS coordinates for the survey cluster.

[18] The World Health Organization (WHO) defines a low-birthweight infant as one that weighs less than 2500 grams. However, due to what Blanc and Wardlaw (2005) call “heaping” or “bunching”, a phenomenon common in data from developing nations where birthweight is heaped into categories of 500 grams, approximately half of all infants designated as weighing exactly 2500 grams should be deemed as low-birthweight. This same categorization of low-birthweight, being less than or equal to 2500 grams, is utilized in Mansour and Rees’s (2012) study as well.

In addition to infant characteristics, I also obtain the following characteristics of the mother from the NDHS: wealth, education, religion, status of health card, and urban status. In the NDHS, there are two indicators of wealth, a wealth index and a wealth index factor. I utilize the wealth index that places survey respondents into one of five wealth quantiles.[19] This means that all of the respondents in a survey are equally divided amongst five wealth bins, poorest, poor, rich, richer, and richest. However, the respondents within my sample are not equally divided amongst wealth quantiles. The respondents that I utilize are much wealthier than that of the nationally representative sample with 93% of my selected population being rich, richer, or richest. I attribute this phenomenon to fact that these respondents have the birthweight of their children recorded which means they must have access to a medical professional. The ability to have access to a medical professional would be indicative of a wealthier individual.

Of my selected sample, 6.8% of respondents have no education, 17.3% have at least a primary education, 51.7% have a secondary education, and 24.1% have higher than a secondary education. The samples religious composition is as follows: 17% Catholic, 53.4% some Christian denomination, 26.9% Muslim, and 2.8% traditionalist[20]. Additionally, 67% of the surveyed population lives in an urban setting.

---

[19] The wealth index in the NDHS is created by utilizing household asset data via a principal components analysis. The wealth index takes into urban-rural differences in scores and indicators of wealth and is nationally representative by adjusting for area-specific factors. The combined wealth index has a mean of zero and a standard deviation of one. Scores represent which of five wealth quintiles a respondent lies in (NPC Nigeria and ICF International, 2014). An example of assets that are taken into consideration for development of the wealth index are access to electricity, television, refrigerator, bank account, and in-house plumbing. Assets taken into consideration by the Demographic and Health Survey Program are country specific and the assets taken into consideration in Nigeria may not be the same as any other country.

[20] The majority of my sample being Christian makes intuitive sense for Nigeria is demographically and culturally split between a southern Christian population that is wealthy, and a northern Muslim population that is considerably poorer.

The inclusion of a health card indicator variable is to combat the possibility that exposure to a terrorist attack might have rattled or confused the respondent leading them to incorrectly recall the birth weight of their child. The health card variable indicates whether the respondent replied to the question about child's birthweight with a health card that had the birthweight written down by a medical professional, or if they had a health card but, not on them, and recalled the birthweight from memory. Two other options for health card are "lost health card" and "never had health card".

In addition to providing infant, mother, and survey location characteristics, the NDHS also contains the longitudinal and latitudinal coordinates for many of their survey cluster locations. All of individuals in my sample are associated with a survey cluster that has latitudinal and longitudinal coordinates. Figure 2 illustrates the precise location of each survey cluster within Nigeria.

One major caveat of NDHS GPS data is that the GPS coordinates are scrambled. If the survey was conducted in an urban area then cluster coordinates are scrambled up to two kilometers in any direction from their actual location. If the survey was conducted in a rural area, then coordinates are scrambled up to four kilometers and 1% of rural cluster locations are scrambled up to 10km in any direction. The NDHS does this to preserve the confidentiality of its respondents. This scrambling of survey cluster GPS coordinates will introduce spatial noise into my estimates. Additionally, due to this data being utilized for my explanatory variables, this associated measurement error will cause attenuation to occur making my estimated effects more conservative.

Global Terrorism Database

The GTD provides detailed data on every terrorist attack to have occurred within Nigeria 1970 to 2016, and is updated annually.[21] The GTD designates a violent incident as an act of terrorism if it satisfies two of the following three criteria:

1. The violent act was aimed at attaining a political, economic, religious or social goal
2. The violent act included evidence of an intention to coerce, intimidate, or convey some other message to a large audience (or audiences) other than the immediate victims
3. The violent act was outside the precepts of International Humanitarian Law

These listed criteria are somewhat broad in definition and may lead to the inclusion of events that may not traditionally be thought of as terrorist events.[22]

The GTD includes location of the attack, number of individuals killed in each attack, number of wounded individuals in each attack, and what terrorist organization, if any, committed the attack. While the NDHS survey data that I use is from April 13, 1998 to June 11, 2013, I utilize GTD attack data from July 13, 1997 to June 11, 2013. This is

[21] The National Consortium for the Study of Terrorism and Response to Terrorism (START) collects data for the GTD. The GTD has been widely utilized for data analysis in studies published in the British Journal of Criminology, Journal of Quantitative Criminology, Journal of Policy Modeling, and Journal of Peace Research. For an econometric application of the GTD, see Kollias et al. (2009)

[22] The GTD openly addresses that the algorithms it uses to collect data on terrorist attacks from electronic news sources and articles are not perfect and is liable to include events not traditionally viewed as terrorism. In an attempt to combat this issue, the GTD has a variable within its dataset that indicates whether the GTD doubts the recorded incident as a terrorist event. In my analysis, 147 of the 1,496 attacks are flagged by the GTD for not fully be characteristic of a terrorist event.

because a mother whose child was born in early 1998 had the potential for exposure to attacks in mid to late 1997 during the infant's early gestation.

Summary statistics for the GTD in Nigeria from 1997 to 2013, as presented in Table 3, identifies 5,179 individuals killed and 2,816 individuals wounded within this period. Of the 1,496 attacks, 961 of them involve at least one individual killed. Additionally, Boko Haram committed 807 of the 1,496 attacks, or 53% of all attacks, all of which occurred post 2008.

In addition to providing detailed attributes of attacks, the GTD also contains the exact longitudinal and latitudinal coordinates of most of the listed terrorist incidents, in this sample 1,460 of the 1,496 attacks, or 97.6%, possess GPS coordinates. Figure 3 illustrates the precise location of every listed GTD terrorist incident within Nigeria in the duration of analysis. By utilizing the coordinates from both the NDHS and GTD, I can generate distance relationships between GTD listed terrorist incidents and mothers in the NDHS who may have been pregnant during the time of an attack. Figure 4 illustrates an overlay of both NDHS cluster points and terrorist incidents within Nigeria.

Table 2: Descriptive Statistics for Nigerian Demographic and Health Survey Data

	Nigeria		**North East**	
	Mean	S.D.	Mean	S.D
Birth Outcomes				
<= 2500 grams	.131	.337	.159	.366
Infant Characteristics				
Twin	.056	.300	.017	.171
Male	.505	.499	.528	.499
Mother Characteristics				
Wealth				
Richest	.530	.499	.292	.455
Richer	.280	.448	.318	.466
Rich	.124	.330	.174	.379
Poor	.053	.224	.157	364
Poorest	.012	.113	.059	.235
Education				
No-Education	.068	.252	.179	.384
Primary	.173	.379	.182	.386
Secondary	.517	.500	.388	.489
Higher	.241	.428	.250	.433
Religion				
Catholic	.170	.375	.032	.177
Other Christian	.534	.498	.285	.451
Muslim	.269	.443	.625	.484
Traditionalist	.028	.164	.057	.232
Urban Dweller	.669	.470	.637	.481
Health Card				
Showed Health Card	.528	.499	.499	.500
Has Health Card	.357	.479	.358	.480
Lost Health Card	.049	.216	.026	.160
No Health Card	.065	.247	.117	.322
First trimester exposure within three kilometers				
Exposed to at least one attack	.013	.115	.029	.168
Attack exposure	.025	.424	.060	.414
Afflicted exposure	.095	2.012	.238	2.038
Observations		9,347	648	

Data is from the Nigerian Demographic and Health Survey phases 4b, 53, and 6a.

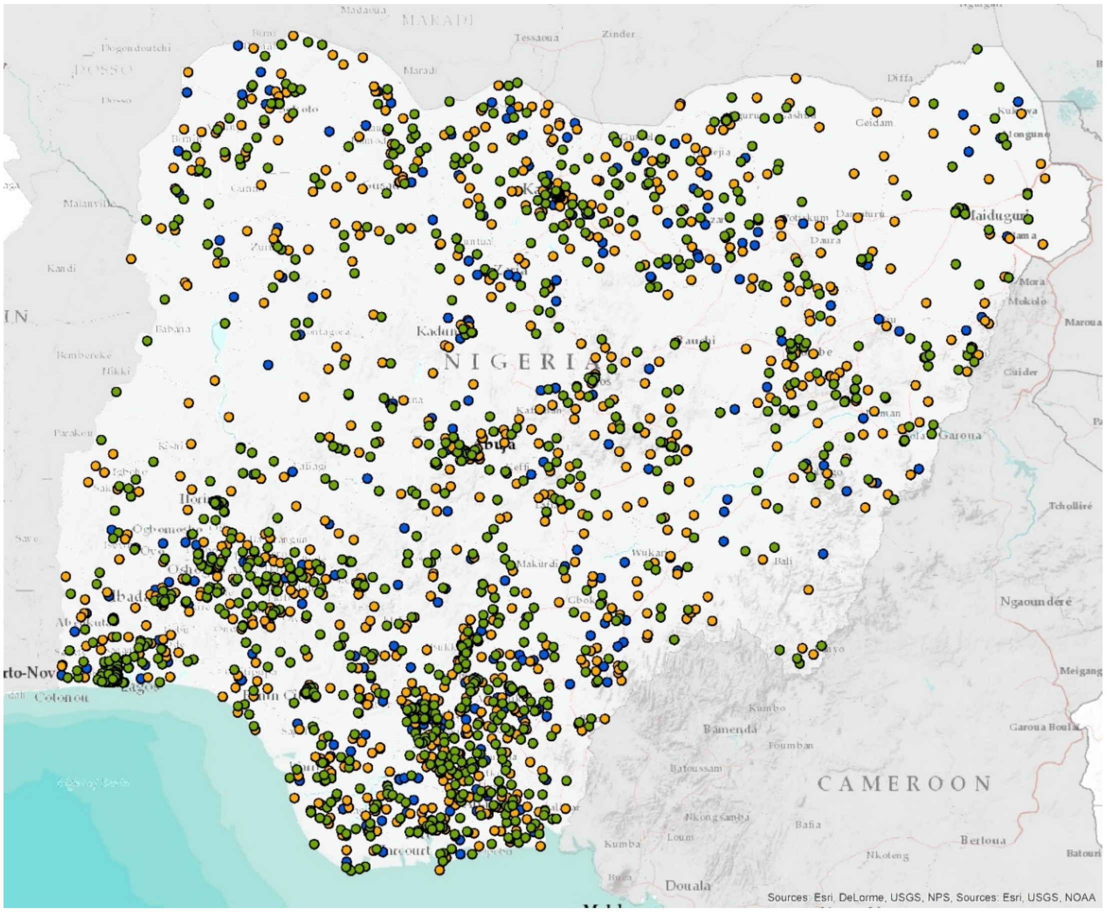

Figure 2: Map of NDHS Survey Cluster Locations

Note: This map illustrates the location of NDHS survey cluster areas. These points are used to calculate the distances between NDHS survey respondents and terrorist attacks. The blue points represent the 2003 survey, the orange points the 2008 survey, and the green points are the 2013 survey.

Data: Nigerian Demographic and Health Survey

Table 3: Descriptive Statistics for Global Terrorism Database in Nigeria 1997 - 2013

	Mean	S.D.	Min	Max
All Attack Characteristics				
Fatalities	3.639	9.799	0	200
Wounded	2.163	9.192	0	200
Afflicted	4.867	13.378	0	300
Citizen Targeted	.215	.411	0	1
Fatal Attacks	.642	.479	0	1
Total Number of Attacks	1,496			
Civilian Targeted Attack Characteristics				
Fatalities	5.465	11.413	0	142
Wounded	3.83	14.586	0	200
Afflicted	8.316	21.602	0	300
Fatal Attacks	.783	.413	0	1
Total Number of Attacks	322			
Boko Haram Attack Characteristics				
Fatalities	4.764	10.041	0	142
Wounded	2.564	9.094	0	100
Afflicted	8.258	13.513	0	112
Citizen Targeted	.200	.400	0	1
Fatal Attacks	.762	.426	0	1
Total Number of Attacks	807			
Boko Haram Civilian Targeted Attacks				
Fatalities	6.639	13.127	0	142
Wounded	3.346	8.490	0	74
Afflicted	8.239	14.738	1	114
Fatal Attacks	.888	.316	0	1
Total Number of Attacks	133			
Non-Boko Haram Attack Characteristics				
Fatalities	2.297	9.333	0	200
Wounded	1.698	9.291	0	200
Afflicted	8.373	27.384	0	300
Citizen Targeted	.234	.423	0	1
Fatal Attacks	.502	.500	0	1
Total Number of Attacks	689			

Data is from the Global Terrorism Database for Nigeria within years 1997-2013

Table 4: Descriptive Statistics for Global Terrorism Database in North East Region 1997 - 2013

	Mean	S.D.	Min	Max
All Attack Characteristics				
Fatalities	4.527	10.621	0	142
Wounded	2.073	10.165	0	200
Afflicted	5.196	15.203	0	300
Citizen Targeted	.212	.409	0	1
Fatal Attacks	.751	.433	0	1
Total Number of Attacks		735		
Civilian Targeted Attack Characteristics				
Fatalities	6.671	15.120	0	142
Wounded	3.968	18.886	0	200
Afflicted	9.008	28.200	0	300
Fatal Attacks	.891	.313	0	1
Total Number of Attacks		149		
Boko Haram Attack Characteristics				
Fatalities	4.841	10.708	0	142
Wounded	1.759	6.485	0	99
Afflicted	4.977	9.969	0	107
Citizen Targeted	.209	.406	0	1
Fatal Attacks	.777	.417	0	1
Total Number of Attacks		623		
Boko Haram Civilian Targeted Attacks				
Fatalities	6.685	14.124	0	142
Wounded	1.865	5.139	0	40
Afflicted	6.456	9.663	0	54
Fatal Attacks	.931	.254	0	1
Total Number of Attacks		130		
Non-Boko Haram Attack Characteristics				
Fatalities	2.747	9.984	0	100
Wounded	3.723	20.635	0	200
Afflicted	6.350	30.506	0	300
Citizen Targeted	.232	.424	0	1
Fatal Attacks	.607	.491	0	1
Total Number of Attacks		689		

Data is from the Global Terrorism Database for Nigeria within years 1997-2013

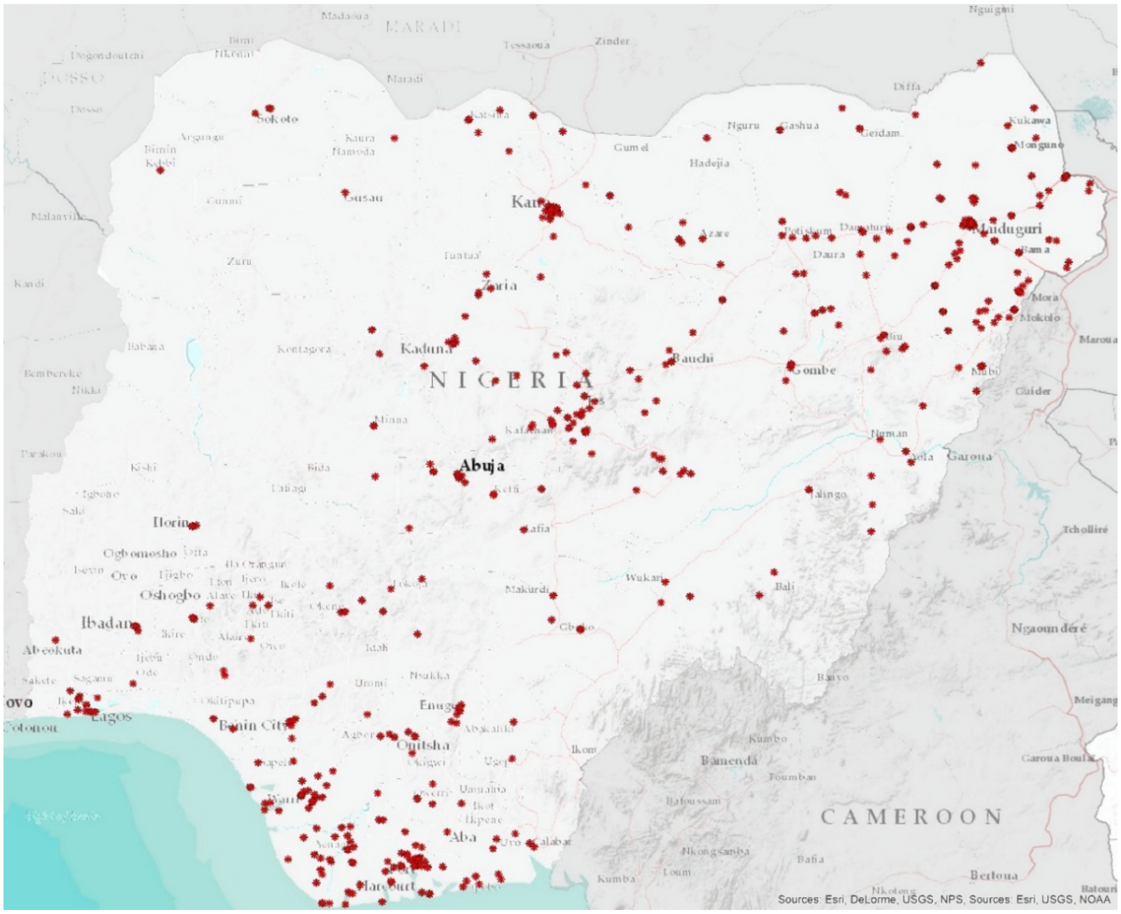

Figure 3: Map of Terrorist Incidents in Nigeria 1997-2013

Note: This map illustrates the location of every terrorist incident to have occurred in Nigeria from 1997-2013 as represented by the red points

Data: Global Terrorism Database

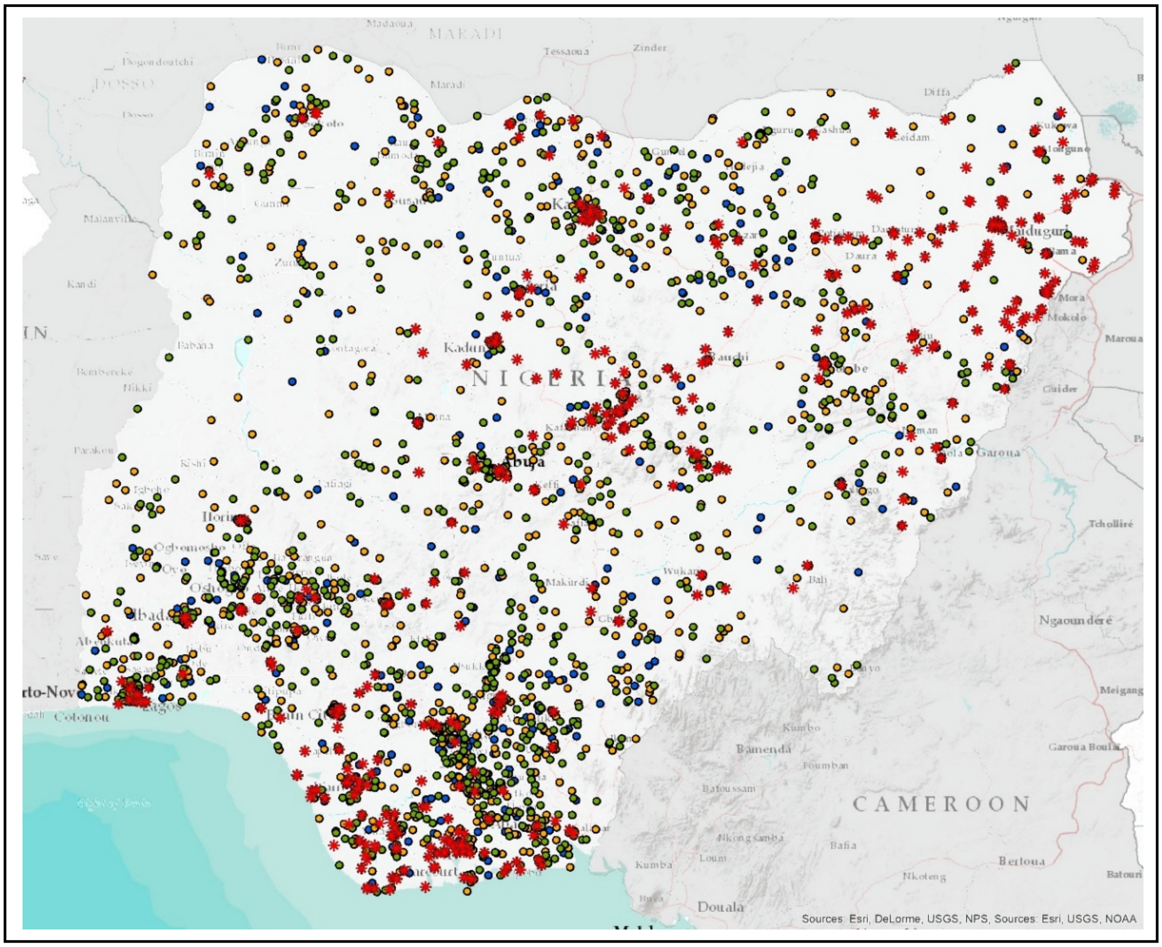

Figure 4: Map of NDHS survey locations and GTD terrorist incidents 1997 - 2013

Note: This map includes every single NDHS survey location from survey periods 2003, 2008, and 2013, as represented by the white points. The red points illustrate every GTD terrorist incident that occurred between 1997 and 2013.

Data: Nigerian Demographic and Health Survey Data; Global Terrorism Database

EMPIRICAL STRATEGY

To analyze the effect of in-utero exposure to a terrorist attack on the likelihood of an infant being born low birthweight, I utilize an ordinary least squares (OLS) model. I run this model at both the Nigeria-wide level, as well as within the North East NDHS region of Nigeria.[23] To generate the variables of interest that designate terrorism exposure in-utero, I aggregate individual terrorist attacks that an infant has been exposed to during its gestation into trimester exposure bins. Although I have the date of birth of each infant, I do not have the date of conception. The exact date of conception is critical for knowing the precise duration that an in-utero fetus could be exposed to a terrorist event. In lieu of conception date data, I generalize gestation to 40 weeks and designate trimesters as follows: trimester one as week 0 through 12 of pregnancy, trimester two as week 13 through 27, and trimester three as week 28 through 40, with the last day of week 40 being the birthday. The identifying assumption that provides causality in my model is that the timing and location of terrorist attacks are random, conditional on any controls or fixed effects, and that the attacks themselves are unpredictable.

Given the availability of GPS coordinates for both NDHS respondents and terrorist events, I am able to generate my own geographic area of analysis, as opposed to being constrained to a predefined area such as a district or larger administrative zone. For my model, I concentrate my area of analysis to within three kilometers of a survey cluster location and aggregate all terrorist attacks there within to corresponding trimester bins,

---

[23] The NDHS has created six administrative regions within Nigeria for the purposes of conducting surveys. These regions are a compilation of Nigerian states. Figure 8 illustrates how survey cluster locations correspond with all NDHS regions.

Figure 5 illustrates this strategy. While the selection of three kilometers as the area of analysis is borderline arbitrary, my justification is that given the scrambling of GPS coordinates of NDHS respondents, I try to incorporate the area of the actual unscrambled NDHS GPS coordinates, to ensure I incorporate the respondent, while simultaneously ensuring all relevant attacks are included within trimester exposure bins. If I make my geographic area too large, I will include irrelevant attacks. If I make my geographic area too small, I risk not addressing the scrambling of NDHS GPS coordinates and not capturing terrorist events that are on the border of the circumference of the scrambled zone.[24] With the inclusion of these distance bins, one would expect attacks that occur closer to the individual to have larger estimated effects than those that occur further away.

The Model

The Nigeria-wide model estimates the average weighted effect of terrorism exposure on the likelihood of being low-birthweight for all individuals in the sample throughout Nigeria. Equation (1) illustrates my OLS model under this specification.

$$LowBirthweight_{iry} = \beta_0 + \sum_{\alpha=1}^{3} \bar{\beta}_\alpha \left(AttackTri\alpha \sum_{\delta=1}^{2} DistanceBin\delta_i\right) + \beta' \boldsymbol{X}_i + y_y + r_r + \varepsilon_{iry} \quad (1)$$

[24] One might be interested in the effect that terrorist attacks have on birthweight as the distances outside of the geographic area of analysis are further parsed out. I perform such an analysis and the results are available in Appendix Table 1. In this analysis, I generate three-kilometer distance bands that extend out to nine kilometers. In other words, there is a zero to three kilometer distance band, a three to six kilometer distance band, a six to nine kilometer band, and a greater than nine kilometer distance area. Figure 7 offers an illustration of this specification. While the results within the three-kilometer bin in this model closely parallel the results in my desired specification, the other bins provide inconclusive and ambiguous results. I attribute this to both spatial noise and limited number of terrorist attack observations available in each distance bin..

I examine the effect of in-utero exposure to terrorist attacks on birthweight by estimating the propensity to be low-birthweight, below or at 2500 grams, as indicated by the binary variable *LowBirthweight* in equation (1). Because my model utilizes a binary dependent variable, this OLS model is a linear probability model. The vector $\bar{\beta}$ contains the three trimesters during gestation multiplied by two distance bins, zero to three kilometers and greater than three kilometers, resulting in six total variables of interest. *AttackTri* is the aggregate of all terrorist attacks that occur within each *i*'s trimesters of gestation and *Distbin* are dummy variables indicating whether an attack occurred within three kilometers of *i* or greater than three kilometers away. The vector $\boldsymbol{X}$ contains infant and mother controls such as gender of infant, whether or not the infant is a twin, a wealth indicator of the mother, education of mother, religion of mother, whether the mother lives in a rural or urban area, and the health card indicator . The variable y_y represents year fixed effects and r_r represents region fixed effects; ε is the error term.

In addition to running my analysis within all of Nigeria, I also focus on the North East region of Nigeria. I focus on this particular region due to the heavy inundation of terrorist events within this region during the duration of years that my analyses addresses.[25]

Attack Heterogeneity

To account for the varying intensity of terrorist attacks, I utilize data in the GTD that provides the number of killed and wounded in each terrorist event. In addition to aggregating all terrorist attacks within three kilometers of a survey cluster, I also

[25] The summary statistics for the GTD in the North East NDHS region are presented in Table 3.

aggregate total deaths from terrorist attacks, as well as total killed and wounded, within three kilometers of a survey cluster. I deem the sum of total killed and wounded as total number of afflicted individuals. I also aggregate attacks where at least one person was killed and deem these events as fatal attacks. My justification for generating a fatal attack category is that I expect attacks where no one is killed to be less traumatizing and impactful than an event where a person is killed thus, excluding plausibly less stressful non-fatal attacks should yield a larger estimated effect than that of all attacks.[26] Figure 6 illustrates the average number of attacks, fatal attacks, deaths, and afflicted individuals that a pregnant woman is exposed to, within three kilometers and within the first trimester, by year, within Nigeria and the North East NDHS region.

[26] I also ran a specification where I aggregated attacks contingent on the number fatalities within each attack. In other words, I aggregated all attacks where there were no fatalities, at least one fatality, two to five fatalities, six to 10 fatalities, 11 to 15 fatalities, 16 to 20 fatalities, 21 to 25 fatalities, and greater than 25 fatalities. The results for this specification are presented in Appendix Table 2. This specification yields inconclusive and ambiguous results. I attribute this outcome to the dearth of attacks that fall under the higher fatality bins.

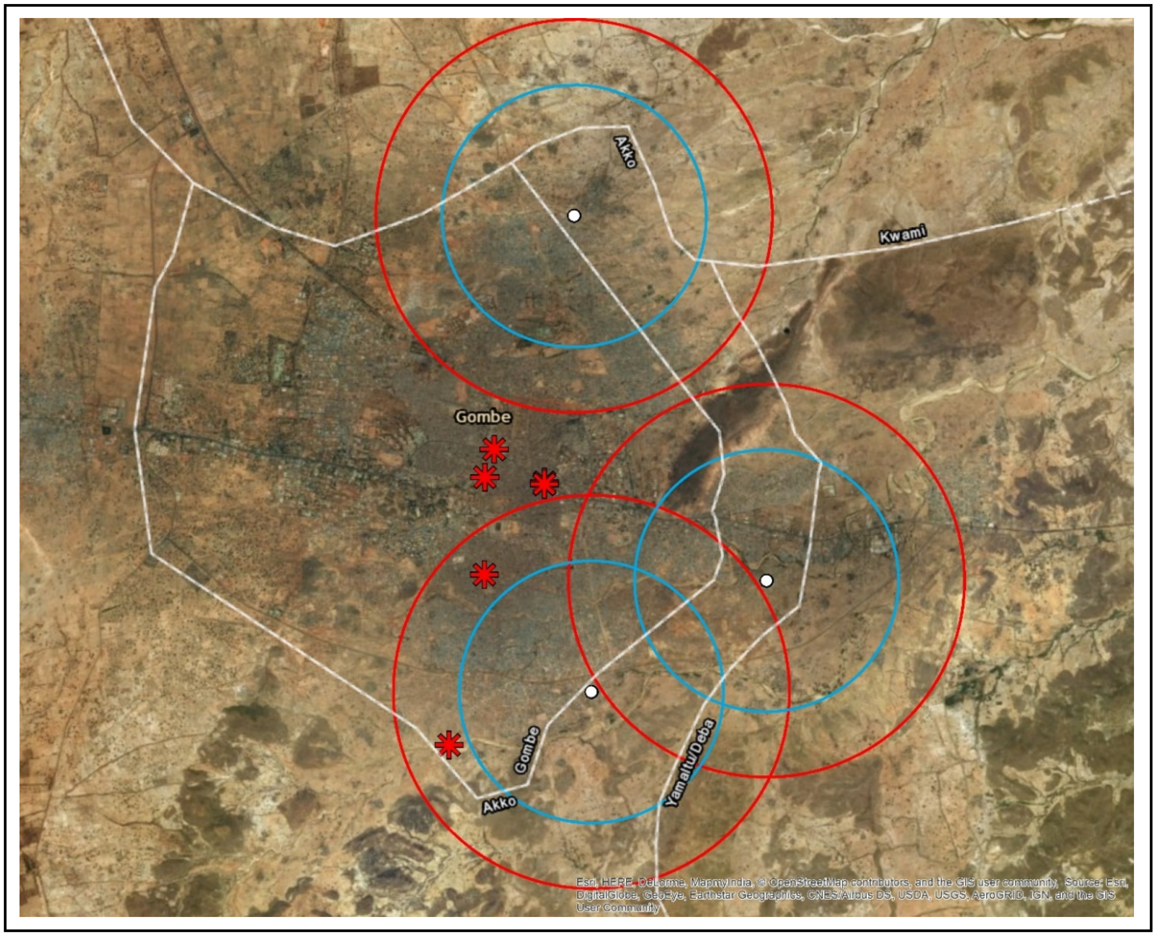

Figure 5: Illustration of Three-Kilometer Distance Buffer

Note: This map illustrates my analysis. The white points on the map are NDHS survey cluster locations from the 2013 round of the NDHS. The red points are the locations of terrorist attacks within the 2013 survey duration range. Because this is an urban area, the blue two-kilometer buffer designates the possible location of the actual unscrambled survey cluster location. The red buffer represents the zero to three-kilometer area of analysis. All attacks within the red circle are aggregated into corresponding trimester bins.

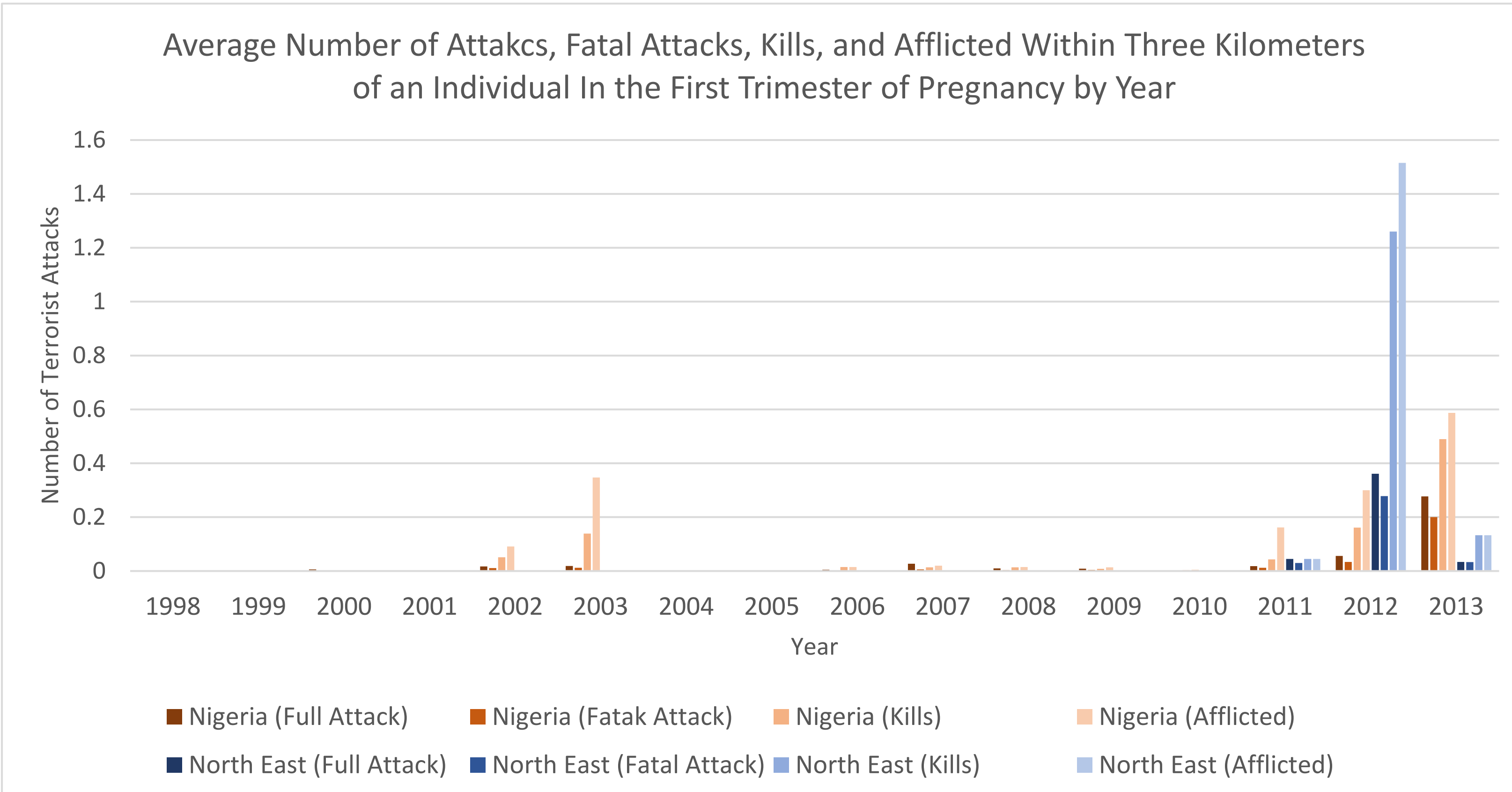

Figure 6: Average number of attacks, kills, and afflicted within the three kilometers of respondents in the first trimester of pregnancy by year

Data: Global Terrorism Database, Nigerian Demographic and Health Survey

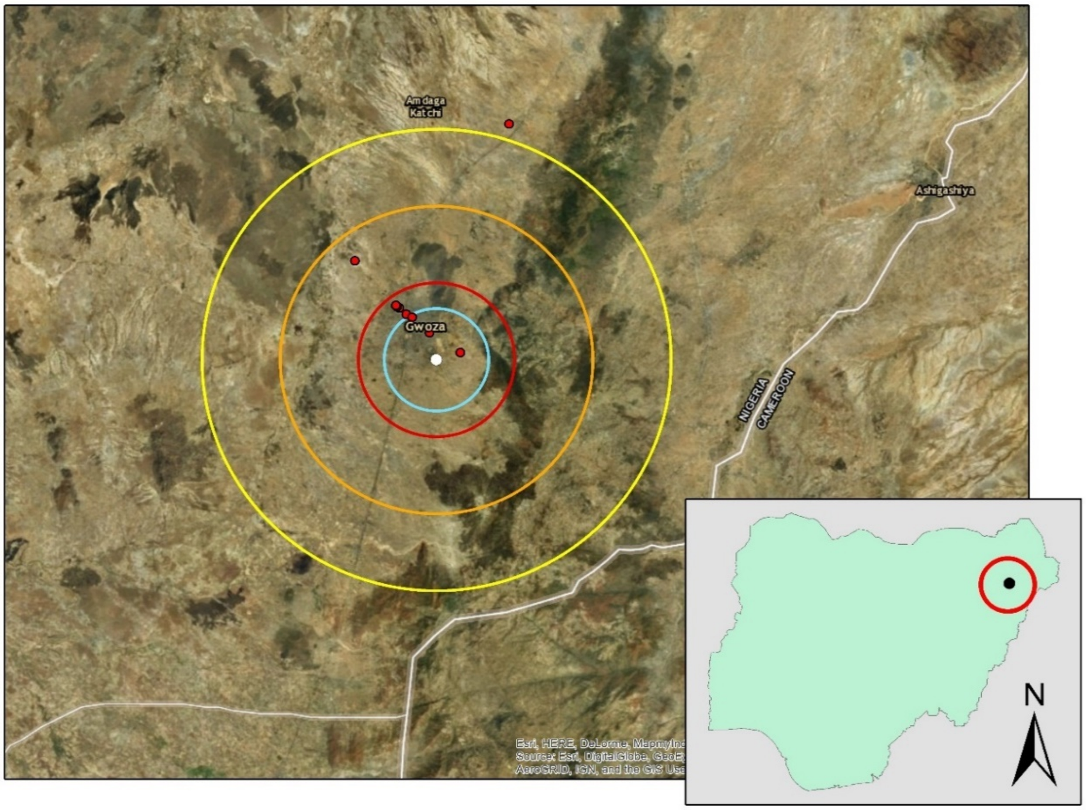

Figure 7: Illustration of Additional Distance Buffers and Terrorist Attacks

Note: This map illustrates my analysis when additional distance buffers are used. The white point in the middle of the map is a NDHS survey cluster location from the 2013 round of the NDHS. The red points are the locations of terrorist attacks within the 2013 survey duration range. Because this is an urban area, the blue two-kilometer buffer designates the possible true exact location of the NDHS survey. The red buffer represents the zero to three-kilometer area of analysis, the area between the red and orange buffer the three to six-kilometer area of analysis, and the orange to yellow buffer the six to nine-kilometer area of analysis.

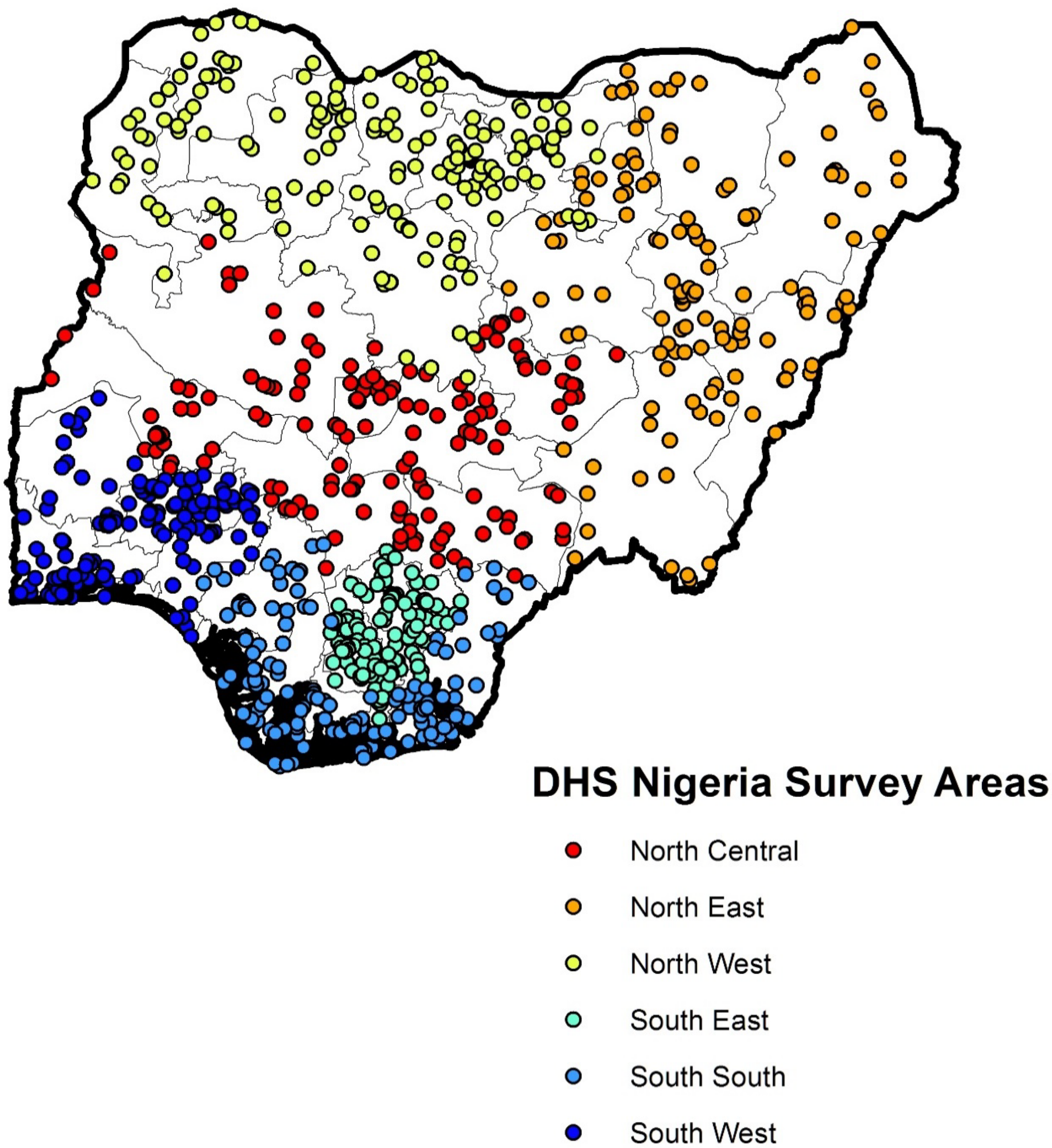

Figure 8: Map of NDHS Survey Clusters in Relation to NDHS Regions

Note: This figure illustrates NDHS survey location points and how they correspond to their corresponding NDHS survey region.

RESULTS

All Attacks

Column one of Table 5 presents the OLS estimates of the effect of exposure to all terrorist attacks, within any distance, in all of Nigeria. Without the inclusion of controls, fixed effects, or distance bins, exposure to a terrorist attack within the second trimester is associated with a 0.1 percentage point increase in the likelihood of an infant being born low-birthweight, significant at the 1% level. This is a very small effect when compared to previous economic studies. This effect runs contrary to previous medical and economic literature, however, with the absence of controls and fixed effects, this model experiences significant omitted variable bias.

When controls and fixed effects are added, the magnitudes of coefficients do not change and the second trimester remains statistically significant. Columns three and four of Table 5 present the estimates under the same specification as columns one and two but, utilizing only respondents in the North East NDHS region. No estimates are significant but magnitudes are similar to column one and two in that they are very small when compared to previous literature. In hopes of generating a more accurate analysis, I introduce distance bins so as to only observe attacks within the direct proximity, three kilometers, of respondents.

Table 6 presents the estimates of my OLS model, fully saturated with controls and corresponding fixed effects, as well as the inclusion of previously designated distance bins. In column one through four, the effects of exposure to all terrorist attacks, fatal attacks, deaths, and afflicted individuals are observed, respectively, when all respondents within Nigeria are utilized in analysis. Compared to Table 5, the magnitudes on estimates for terrorist attacks are much larger when only attacks within three kilometers are utilized for analysis. Under these specifications, there is evidence to suggest that exposure to an attack a fatal attack in the second trimester greater than three kilometers away is associated with a .1 percentage point increase in the likelihood that an infant is born low birthweight. However, the magnitude of this estimate is still very small when compared to previous literature. The lack of more precisely estimated and larger in magnitude results can be attributed to unaddressed heterogeneity of populations within Nigeria, as well as unaddressed heterogeneity in terrorist attacks across Nigeria.

In columns five through eight of Table 6, the estimates for exposure to all attacks, fatal attacks, deaths, and afflicted are presented, respectively, when only respondents in the North East NDHS region are utilized. Exposure to an attack in the first trimester, within three kilometers, is associated with a 10.8 percentage point increase in the likelihood that an infant is born low-birthweight, significant at the 5% level. Exposure to fatal attacks in the first trimester, within three kilometers, is associated with an 11.4 percentage point increase in the likelihood that an infant is born low-birthweight, significant at the 5% level. When attack exposure is parsed out even further to the aggregation of total deaths experienced, the size of estimates greatly decrease from that of exposure to an entire attack and estimates are more precisely estimated. Column seven of Table 6 presents estimates that suggest exposure to a fatality in the first trimester within three kilometers is associated with a 2.6 percentage point increase in the likelihood of an infant being born low-birthweight, significant at the 1% level. The magnitudes of estimated effects for exposure to a kill being smaller than that of an entire attack makes intuitive sense because full attacks usually have multiple deaths within them. Column 8 of Table 6 presents estimates that suggest exposure to any afflicted individual, killed or wounded, in the first trimester, within three kilometers, is associated with a 2.5 percentage point increase in the likelihood of an infant being born low-birthweight.

The inclusion of distance bins into my analysis generated more precisely estimated results with larger estimated effects. By focusing my analysis to within the direct proximity of respondents, three kilometers, I have increased the chances of omitting attacks further away that are not likely directly experienced by the respondent. Additionally, terrorism events that occurred more than three kilometers away from an individual consistently have smaller magnitudes for estimated effects than of those that occurred within three kilometers. This holds for all specifications in all trimesters.

Civilian Targeted Attacks

In an effort to generate increasingly accurate estimates of the full effects of terrorism exposure on the likelihood of having low-birthweight offspring, I parse out terrorist attacks by whether they are targeted at civilians. Attacks targeted at civilians are arguably more likely to be experienced by respondents and civilian targeted attacks are more than likely going to inflict more trauma on respondents as they are the direct victims of attacks. I would expect the impacts from civilian targeted terrorist attacks to be larger than the effect of all terrorist attacks and non-civilian targeted terrorist attacks.

Table 7 presents the estimates for civilian targeted attacks. Columns one through four of Table 7 present the estimated effects of exposure to attacks, fatal attacks, kills, and afflicted individuals on the likelihood of having low-birthweight offspring when all respondents in Nigeria are utilized in analysis. The magnitudes of estimates in the first trimesters, while imprecisely estimated, are much larger than when all attacks are aggregated. The absence of more precisely estimated results could be attributed to unaddressed heterogeneity in populations, as well as unaddressed heterogeneity of attacks under this specification.

Columns five through eight of Table 7 present the estimates when only respondents in the North East NDHS region are utilized. Column five presents estimates that suggest exposure to a civilian targeted terrorist attack in the first trimester, within three kilometers, is associated with a 20.5 percentage point increase in the likelihood of an infant being born low-birthweight, significant at the 1% level. When compared to Table 6, where the specification is all attacks, the magnitude on civilian targeted attacks is almost 90% larger. There is also statistically significant estimates for exposure to civilian targeted attacks in the third trimester, greater than three kilometers away. However, the coefficient on this estimate is much smaller than the first trimester estimate.

Column six, where exposure is to fatal attacks, presents an estimate that suggests exposure to a fatal civilian targeted terrorist attack in the first trimester and within three kilometers, is associated with a 21.8 percentage point increase in the likelihood that an infant is born low-birthweight, at the 1% level. When compared to the corresponding estimate in Table 6, this estimate is 91.2% larger.

Columns seven and eight of Table 7 present estimates that suggests exposure to a civilian targeted death or afflicted individual is associated with a 3.4 percentage point increase and 3.0 percentage point increase in the likelihood that an infant is born low-birthweight, respectively. These estimate are 29.5% and 19.3% larger, respectively, than the corresponding estimates in Table 6 where deaths and afflicted individuals from all types of attacks are included in analysis.

Table 8 presents the estimates for the counterfactual of civilian targeted attacks, non-civilian targeted attacks. In columns one through four, where a within Nigeria analysis is performed, all estimates for attacks, fatal attacks, deaths, and afflicted individuals, in the second trimester and greater than three kilometers away, are associated with a positive effect on the likelihood that infant is born low-birthweight, at the 1% significance level. However, these estimates are very small and offer no significant economic interpretation. All other estimates are statistically insignificant and much smaller in magnitude than the corresponding civilian targeted counter estimates.

Columns five through eight, where only respondents in the North East NDHS region are utilized, all estimates are now much less precisely estimated and the magnitude of effect from attacks and fatal attacks is much smaller. However, while much less precisely estimated, the estimates for exposure to kills and afflicted individuals, in the first trimester and within three kilometers, are much larger than there civilian targeted counterpart estimates. Columns five and six present estimates that suggest exposure to a non-civilian targeted fatality or afflicted individual results in a 4.3 percentage point and 4.4 percentage point increase in the likelihood of an infant being born low-birthweight.

Boko Haram Attacks

Given that my analysis is within Nigeria, I parse out attacks by whether an attack was committed by Boko Haram or not. Boko Haram has committed 54% of all attacks in Nigeria during my time period of analysis and has committed 85% of all attacks in the North East NDHS region. Boko Haram is a notoriously deadly and tenacious terrorist organization that performs especially lethal attacks in quick succession.[27] I hypothesize that exposure to a Boko Haram attack will have a greater impact than that of a non-Boko Haram attack due to their extraordinary lethality.

Table 9, columns one through four, present the estimated effects of exposure to a Boko Haram terrorist attack, fatal attack, kill, or afflicted individual, using all respondents within Nigeria. In all four columns, exposure to a Boko Haram related event, in the second trimester, at greater than three kilometers, is associated with a very small, but precisely estimated positive association with the likelihood that an infant is born low-birthweight. These results parallel that of all attacks and non-civilian targeted attacks.

Column five presents estimates that suggest exposure to a Boko Haram attack, in the North East NDHS region, in the first trimester, and within three kilometers of an individual results in a 13.6 percentage point increase in the likelihood of a low-birthweight infant. Column six presents estimates that suggest exposure to a fatal Boko Haram attack, in the North East NDHS region, in the first trimester, and within three kilometers of an individual results in a 13.8 percentage point increase in the likelihood of a low-birthweight

[27] The United Nations Office for the Coordination of Humanitarian Affairs has claimed that the Boko Haram insurgency in Nigeria has led to widespread displacement, violations of international humanitarian and human rights laws, protection risks and a deepening humanitarian crisis. (UNOCHA, 2017)

child. When compared to corresponding non-Boko Haram estimates in Table 10, Boko Haram attacks are many times larger in magnitude, as well as actually statistically significant. However, in column five, six, and eight of Table 10, there are statistically significant estimates in the second trimester suggesting that exposure to a non Boko Haram attack, fatal attack, or afflicted individual, within three kilometers is positively associated with increasing the likelihood that an infant is born low-birthweight.

Civilian Targeted Boko Haram Attacks

In the early operations of Boko Haram, most attacks were committed on local police or the Nigerian military. Only 20% of the roughly 800 Boko Haram terrorist attacks in Nigeria during my period of analysis were civilian targeted. In attempt to estimate the full impact of Boko Haram terrorist activities on the likelihood that an infant is born low-birthweight, I run my analysis using only Boko Haram civilian targeted terrorist events. Because this specification utilizes frequent attacks from an extreme terrorist organization directed towards civilians, this is my choice specification for I believe that these attacks will expose individuals to the most amount of trauma possible, thus revealing the maximum effect of terrorism exposure on the likelihood for an infant to be born low-birthweight.

Table 11 presents the estimates of Boko Haram civilian targeted terrorist events. Columns one through four present the estimates associated with exposure to Boko Haram civilian targeted attacks, fatal attacks, kills, and afflicted individuals, respectively. Column one presents estimates that associates exposure to a Boko Haram civilian targeted attack anywhere in Nigeria, in the first trimester and within three kilometers, with a 18.8

percentage point increase in the likelihood that an infant is born low birthweight, significant at the 5% level. Column two presents estimates that associate exposure to a Boko Haram civilian targeted fatal attack, within three kilometers and in the first trimester, with a 22.3 percentage point increase in the likelihood of an infant being born low-birthweight. There is also evidence to suggest that exposure to a Boko Haram civilian targeted death within three kilometers and in the first trimester is associated with a 3.2 percentage point increase in the likelihood that an infant is born low birthweight, significant at the 1% level. No other specification so far has resulted in statistically significant estimates within all of Nigeria, in the first trimester and within three kilometers.

Columns five through eight of Table 11 present the estimates for exposure to civilian targeted Boko Haram attacks, fatal attacks, kills, and afflicted, in the North East NDHS region. All associated estimates, in the first trimester and within three kilometers, are statistically significant, albeit at varying levels of significance. When compared to Table 9, all Boko Haram attacks, the associated magnitudes of estimates are much larger for all measures. When compared to Table 7, all civilian targeted attacks, estimates are similar in magnitude but less statistically significant.

When compared to Table 12, where the counterfactual Boko Haram non-civilian targeted specification estimates are illustrated, the Boko Haram civilian targeted estimates for all individuals within Nigeria, in the first trimester and within three kilometers, become much smaller in magnitude and statistically insignificant. However, columns one through four of Table 12 present estimates that associate exposure to a Boko Haram non-civilian targeted attack, fatal attack, death, or afflicted individual, in the second trimester and greater than three kilometers away, with a small and positive, statistically significant, effect on the likelihood that an infant is born low-birthweight. The within North East NDHS region estimates for Table 12 display varying results. Column five presents estimates that associate exposure to a Boko Haram non-civilian targeted attack, in the first trimester and within three kilometers, with a 20.1 percentage point increase in the likelihood that an infant is born low birthweight. While smaller in magnitude than the corresponding estimate in Table 11, this estimate is more precisely estimated. Columns six, seven, and eight present estimates that are larger in magnitude than the corresponding estimates in Table 11. The results from Table 12 suggest that Boko Haram attacks in the North East NDHS region do not need to be targeted at civilians to have an impact. It would appear that some kind of Boko Haram factor is driving the impacts to low-birthweight in the first trimester within three kilometers.

Table 13 presents the estimates of non-Boko Haram civilian targeted terrorist incidents. All estimates for all attack indicators in the first trimester are statistically insignificant, asides from exposure to a non-Boko Haram civilian targeted afflicted individual in the first trimester within three kilometers having a small and negative effect on the likelihood that an infant is born low-birthweight, as indicated by column 4. There is also evidence to suggest that exposure to a non-Boko Haram attack in the North East NDHS region, in the second trimester within three kilometers is associate with a 3.16%

increase in the likelihood that an infant is born low birthweight, significant at the 1% level.[28]

Expanding Distance Bins

A portion of my contribution to the preexisting in-utero violence exposure and birthweight outcome literature is my ability to focus my analysis on a much smaller geographic area. I claim that the previous literature's inability to perform an analysis at a smaller geographic area has likely underestimated the effects of in-utero violence exposure on infant birthweight outcomes. To fortify this claim, I run an analysis, using my choice specification of Boko Haram civilian targeted attacks, with expanding distance bins in both all of Nigeria and the North East NDHS region. Table 14 presents the first trimester results of this analysis.

The within Nigeria analysis in Table 14 shows that as the area of analysis increases, the estimated effects of attacks decreases and eventually become statistically insignificant. Column one of the within all of Nigeria analysis presents an estimate suggesting that exposure to a Boko Haram civilian targeted fatality increases the likelihood of a low-birthweight infant by 4 percentage points, however, this estimate is imprecisely estimated. As the total area of analysis increases, the magnitudes of effects decrease yet, become more precisely estimated. This pattern holds up to five kilometers of analysis, an area of 78.54

[28] I also performed an analysis using only non-Boko Haram non-civilian targeted attacks, however, due to a very limited number of observations in the North East NDHS region, results provided inconclusive and ambiguous results.

square kilometers, where estimates are statistically insignificant and are comparatively much smaller in magnitude.

Results for the North East NDHS region of analysis in Table 14, column one presents an estimate that suggests exposure to a Boko Haram civilian targeted fatality in the first trimester and within one kilometer, is associated with a 3.7 percentage point increase in the likelihood of having a low-birthweight infant. This estimated effect is smaller than that of the within all of Nigeria analysis in the same distance bin, as well as less precisely estimated. I attribute this fact to the sample size differential in number of respondents between the within Nigeria and with North East NDHS region analysis. The within Nigeria sample is approximately 14 times larger than the North East NDHS region sample size which, gives it more statistical power. However, as area is added in each progressing distance bin, the North East NDHS region magnitudes begin to parallel the within Nigeria estimates, albeit with slightly larger estimates. Estimates remain significant up to a five-kilometer radius of analysis. One perplexing result is the estimated effect from going from a four-kilometer radius of analysis, to a five-kilometer radius of analysis, becoming larger and more precisely estimated.

Mansour and Rees (2012) perform their analysis of the effects of in-utero exposure to al-Aqsa intifada fatalities on birthweight outcomes on the Palestinian district level. Palestinian districts range in area from approximately 58 square kilometers (a circle with a radius of 4.2 kilometers) to approximately 997 square kilometers (a circle with a radius of 17 kilometers), with the average area of a Palestinian district being 376 square kilometers (a circle with a radius of 11 kilometers). Column 9 of Table 14 presents estimates for when

I extend my area of analysis to include all terrorist activities within 11 kilometers of survey clusters. While not precisely estimated, the magnitudes for the within Nigeria analysis, within three kilometers and in the first trimester, more closely parallel the estimates Mansour and Rees' (2012) derive in their study.

Table 5: Effect of Exposure to All Attacks on Likelihood to be Low Birthweight

	(1) Nigeria (Attacks)	(3) Nigeria (Attacks)	(4) North East (Attacks)	(6) North East (Attacks)
1st Trimester Attack	-0.000	-0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.001)	(0.001)
2nd Trimester Attacks	0.001***	0.001***	0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)
3rd Trimester Attacks	-0.000***	-0.000	-0.000	0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Year Fixed Effects	No	Yes	No	Yes
Cluster Fixed Effects	No	Yes	No	Yes
Observations	9,329	9,271	648	648
R-squared	0.001	0.026	0.002	0.080

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect of Exposure to All Attacks within Distances on the Likelihood of Low Birthweight

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.007	0.024	0.006	0.000	0.108**	0.114***	0.026***	0.025***
	(0.015)	(0.020)	(0.005)	(0.001)	(0.046)	(0.041)	(0.008)	(0.007)
1st Trimester (> 3KM)	-0.000	-0.000	0.000	-0.000	-0.001	-0.001	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
2nd Trimester (0 to 3 KM)	-0.003	-0.016	-0.000	-0.000	0.009	0.005	-0.005	-0.000
	(0.009)	(0.013)	(0.003)	(0.000)	(0.042)	(0.038)	(0.005)	(0.003)
2nd Trimester (> 3KM)	0.000***	0.001***	0.000***	0.000***	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
3rd Trimester (0 to 3 KM)	0.005	0.005	0.001	0.001	-0.013	-0.034	-0.006	0.003
	(0.009)	(0.013)	(0.001)	(0.001)	(0.034)	(0.039)	(0.006)	(0.007)
3rd Trimester (> 3KM)	-0.000	0.000	0.000	0.000	0.000	0.002	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.025	0.025	0.095	0.097	0.102	0.101

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Effect of Exposure to Civilian Targeted Terrorist on the Likelihood of Low Birthweight

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.0234	0.078	0.014	0.000	0.205***	0.218***	0.034***	0.030***
	(0.041)	(0.056)	(0.010)	(0.003)	(0.077)	(0.077)	(0.007)	(0.008)
1st Trimester (> 3KM)	0.000	0.001	0.000	-0.000	-0.002	-0.003	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.005)	(0.001)	(0.000)
2nd Trimester (0 to 3 KM)	0.00700	0.013	0.001	0.001	0.019	-0.033	-0.008	0.003
	(0.045)	(0.067)	(0.009)	(0.002)	(0.088)	(0.068)	(0.009)	(0.003)
2nd Trimester (> 3KM)	0.002***	0.003***	0.000**	0.000	0.002	0.005	0.001	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)	(0.004)	(0.001)	(0.000)
3rd Trimester (0 to 3 KM)	0.0621	0.050	0.010	0.005*	-0.052	-0.088	-0.008	-0.007
	(0.0489)	(0.056)	(0.008)	(0.003)	(0.076)	(0.083)	(0.009)	(0.007)
3rd Trimester (> 3KM)	0.000	-0.000	0.000	0.000	0.010**	0.011**	0.002**	0.001
	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.005)	(0.001)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.025	0.025	0.025	0.024	0.098	0.102	0.105	0.099

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 8: Effect of Exposure to Non-Civilian Targeted Terrorist Attacks on the Likelihood of Low Birthweight

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.008	0.027	0.005	0.001	0.137	0.159	0.043**	0.044**
	(0.020)	(0.027)	(0.006)	(0.002)	(0.088)	(0.098)	(0.021)	(0.018)
1st Trimester (> 3KM)	-0.000	-0.000	0.000	0.000	-0.001	-0.002	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
2nd Trimester (0 to 3 KM)	-0.004	-0.019	-0.003	-0.001	0.046	0.062	0.002	0.001
	(0.011)	(0.016)	(0.004)	(0.001)	(0.070)	(0.075)	(0.013)	(0.013)
2nd Trimester (> 3KM)	0.001***	0.002***	0.000***	0.000***	0.001	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
3rd Trimester (0 to 3 KM)	0.005	0.005	0.001	0.001	-0.006	-0.039	-0.011	0.010
	(0.010)	(0.015)	(0.002)	(0.002)	(0.061)	(0.081)	(0.013)	(0.007)
3rd Trimester (> 3KM)	-0.000	-0.000	0.000	0.000	0.000	0.003	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.025	0.025	0.093	0.093	0.091	0.097

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Effect of Exposure to Boko Haram Terrorist Attacks

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.057	0.074	0.013*	0.003	0.136***	0.138**	0.026***	0.026***
	(0.038)	(0.047)	(0.007)	(0.003)	(0.051)	(0.054)	(0.009)	(0.008)
1st Trimester (> 3KM)	0.000	-0.000	0.000	0.000	-0.002	-0.002	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
2nd Trimester (0 to 3 KM)	-0.042	-0.049	-0.006	-0.001	-0.021	-0.012	-0.004	-0.003
	(0.031)	(0.038)	(0.005)	(0.001)	(0.038)	(0.037)	(0.006)	(0.003)
2nd Trimester (> 3KM)	0.001***	0.001***	0.000***	0.000***	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
3rd Trimester (0 to 3 KM)	0.002	0.003	0.001	0.001	-0.040	-0.045	-0.008	0.003
	(0.009)	(0.013)	(0.002)	(0.001)	(0.034)	(0.037)	(0.006)	(0.008)
3rd Trimester (> 3KM)	-0.000	-0.000	0.000	0.000	-0.000	0.002	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.026	0.025	0.010	0.010	0.010	0.010

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Effect of Exposure to Non Boko Haram Terrorist Attacks

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	-0.020	0.001	-0.005	-0.003***	-0.020	-0.117	-0.017	-0.010
	(0.018)	(0.028)	(0.007)	(0.001)	(0.134)	(0.157)	(0.055)	(0.048)
1st Trimester (> 3KM)	-0.000	-0.001	-0.000	-0.000	-0.002	-0.007	-0.000	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.002)	(0.005)	(0.000)	(0.000)
2nd Trimester (0 to 3 KM)	0.007	0.006	-0.000	0.002	0.206**	0.230**	0.015	0.038***
	(0.016)	(0.031)	(0.005)	(0.003)	(0.080)	(0.099)	(0.027)	(0.007)
2nd Trimester (> 3KM)	0.001**	0.003***	0.000	0.000	-0.001	0.000	0.001*	0.001
	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)	(0.004)	(0.001)	(0.000)
3rd Trimester (0 to 3 KM)	0.060**	0.050	0.015	0.005	0.027	0.016	0.014	-0.003
	(0.027)	(0.043)	(0.010)	(0.003)	(0.038)	(0.089)	(0.031)	(0.010)
3rd Trimester (> 3KM)	0.000	0.000	-0.000	0.000	0.006**	0.012**	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.002)	(0.006)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.025	0.025	0.024	0.024	0.100	0.103	0.087	0.096

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 11: Effect of Exposure to Boko Haram Civilian Targeted Terrorist Attacks

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1^{st} Trimester (0 to 3 KM)	0.188**	0.223**	0.032***	0.017	0.214*	0.214*	0.033***	0.030***
	(0.094)	(0.105)	(0.010)	(0.012)	(0.114)	(0.111)	(0.009)	(0.010)
1^{st} Trimester (> 3KM)	0.002	0.002	0.000	-0.000	-0.003	-0.004	-0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.006)	(0.006)	(0.001)	(0.000)
2^{nd} Trimester (0 to 3 KM)	-0.083	-0.065	-0.007	-0.003*	-0.094	-0.105*	-0.011	-0.002
	(0.052)	(0.044)	(0.008)	(0.001)	(0.062)	(0.062)	(0.010)	(0.002)
2^{nd} Trimester (> 3KM)	0.003***	0.003***	0.001**	0.000*	0.005	0.007	0.002	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
3^{rd} Trimester (0 to 3 KM)	0.018	0.031	0.003	0.003	-0.081	-0.083	-0.010	-0.006
	(0.059)	(0.061)	(0.009)	(0.005)	(0.087)	(0.088)	(0.009)	(0.008)
3^{rd} Trimester (> 3KM)	-0.002	-0.002	0.000	0.000	0.007	0.008	0.002**	0.001*
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.026	0.024	0.095	0.097	0.106	0.100

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 12: Effect of Exposure to Boko Haram Non Civilian Targeted Terrorist Attacks

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1^{st} Trimester (0 to 3 KM)	0.054	0.071	0.009	0.001	0.201**	0.276**	0.047**	0.046***
	(0.051)	(0.064)	(0.009)	(0.002)	(0.089)	(0.110)	(0.021)	(0.018)
1^{st} Trimester (> 3KM)	0.000	-0.000	0.000	0.000	-0.002	-0.002	-0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.003)	(0.000)	(0.000)
2^{nd} Trimester (0 to 3 KM)	-0.039	-0.051	-0.004	-0.001	0.001	0.031	0.001	0.002
	(0.041)	(0.055)	(0.006)	(0.001)	(0.069)	(0.079)	(0.013)	(0.012)
2^{nd} Trimester (> 3KM)	0.001***	0.002***	0.000***	0.000***	0.000	-0.001	-0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
3^{rd} Trimester (0 to 3 KM)	0.003	0.004	0.001	0.001	-0.083	-0.079	-0.016	0.009
	(0.011)	(0.016)	(0.002)	(0.002)	(0.053)	(0.067)	(0.012)	(0.008)
3^{rd} Trimester (> 3KM)	-0.000	-0.000	0.000	0.000	-0.001	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)	(0.003)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.025	0.025	0.100	0.099	0.093	0.098

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Effect of Exposure to Non Boko Haram Civilian Targeted Terrorist Attacks

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	-0.022	0.024	-0.002	-0.002**	0.050	0.091	0.012	0.017
	(0.040)	(0.056)	(0.008)	(0.001)	(0.236)	(0.250)	(0.059)	(0.061)
1st Trimester (> 3KM)	0.001	0.004	0.000	0.000	0.004	-0.000	-0.000	-0.001
	(0.002)	(0.003)	(0.000)	(0.000)	(0.008)	(0.012)	(0.002)	(0.001)
2nd Trimester (0 to 3 KM)	0.062	0.161	0.018	0.008	0.172	0.171	-0.007	0.032***
	(0.066)	(0.113)	(0.019)	(0.009)	(0.109)	(0.181)	(0.026)	(0.008)
2nd Trimester (> 3KM)	0.001	0.001	-0.000	-0.000	-0.009*	-0.007	0.002	0.000
	(0.001)	(0.002)	(0.000)	(0.000)	(0.005)	(0.008)	(0.002)	(0.001)
3rd Trimester (0 to 3 KM)	0.130**	0.134*	0.026**	0.006*	0.038	-0.032	-0.003	-0.008
	(0.057)	(0.081)	(0.011)	(0.004)	(0.049)	(0.123)	(0.033)	(0.006)
3rd Trimester (> 3KM)	0.003*	0.005*	0.000	0.000	0.013*	0.024**	0.001	0.000
	(0.002)	(0.003)	(0.000)	(0.000)	(0.007)	(0.012)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.025	0.025	0.024	0.024	0.090	0.089	0.081	0.087

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 14: Effect of Exposure to Boko Haram Civilian Targeted Fatalities on the Likelihood of Low-birthweight: Expanding Distance Bins

	(1) Nigeria (0 to 1 KM)	(2) Nigeria (0 to 2 KM)	(3) Nigeria (0 to 3 KM)	(4) Nigeria (0 to 4 KM)	(5) Nigeria (0 to 5 KM)	(6) Nigeria (0 to 6 KM)	(7) Nigeria (0 to 7 KM)	(9) Nigeria (0 to 11 KM)
1^{st} Trimester (0 to X KM)	0.040	0.033***	0.032***	0.027***	0.014	0.005	0.005	0.004
	(0.026)	(0.010)	(0.010)	(0.006)	(0.010)	(0.008)	(0.005)	(0.005)
1^{st} Trimester (> X KM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Second and Third Trimester	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	9,271	9,271	9,271	9,271
R-squared	0.025	0.026	0.026	0.026	0.025	0.025	0.025	0.025

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 14 Continued: Effect of Exposure to Boko Haram Civilian Targeted Fatalities on the Likelihood of Low-birthweight: Expanding Distance Bins

	(1) North East (0 to 1 KM)	(2) North East (0 to 2 KM)	(3) North East (0 to 3 KM)	(4) North East (0 to 4 KM)	(5) North East (0 to 5 KM)	(6) North East (0 to 6 KM)	(7) North East (0 to 7 KM)	(9) North East (0 to 11 KM)
1st Trimester (0 to X KM)	0.037	0.035***	0.033***	0.033***	0.035***	0.007	0.008	0.008
	(0.024)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.007)	(0.007)
1st Trimester (> X KM)	0.000	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Second and Third Trimester	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	648	648	648	648	648	648	648	648
R-squared	0.096	0.109	0.106	0.106	0.113	0.101	0.111	.110

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

ROBUSTNESS

Health Cards

Respondents may have had their ability to recall the birthweight of their child from memory impacted from exposure to a terrorist attack. To combat the potential measurement error associated with this issue, I utilize the health card variable in the NDHS. This limits my observations to only include individuals who had the birthweight of their child recorded off a health card generated by a medical professional. Performing this check reduces the number of observations by about half in both the within Nigeria and the within North East NDHS region of analysis.

Table 15 presents the estimates for my choice specification, Boko Haram civilian targeted attacks, using only individuals who had their birthweight recorded from a health card. The estimates in columns one and two, where total attacks and fatal attacks are aggregated by trimester using all respondents in Nigeria, are less statistically significant and marginally smaller in effect than Table 11, where both health card and non-health card birthweights are included in analyses. The same holds for the corresponding North East NDHS estimates in column five and six. However, the estimates in columns three and four, where total kills and afflicted individuals are aggregated by trimester, have become more precisely estimated, as well as larger in magnitude.

In addition to the first trimester estimates changing, the estimates in Table 15 in the second trimester, within three kilometers, have all become negative, relatively large in magnitude, and mostly significant, for all attack specifications, excluding afflicted individuals in the North East NDHS region.

Table 15: Effect of Exposure to Civilian Targeted Boko Haram Terrorist Attacks on the Likelihood of Being Low-birthweight Only Using Respondents with Health Cards

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.160	0.220	0.035***	0.034***	0.177	0.181	0.030***	0.028**
	(0.131)	(0.154)	(0.011)	(0.012)	(0.153)	(0.148)	(0.010)	(0.011)
1st Trimester (> 3KM)	0.002	0.001	0.000	-0.000	-0.002	-0.003	-0.001	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.006)	(0.007)	(0.001)	(0.000)
2nd Trimester (0 to 3 KM)	-0.133***	-0.120***	-0.018***	-0.005**	-0.154**	-0.162**	-0.021**	-0.003
	(0.015)	(0.022)	(0.005)	(0.002)	(0.064)	(0.067)	(0.011)	(0.003)
2nd Trimester (> 3KM)	0.003*	0.003**	0.001**	0.000*	0.003	0.004	0.001	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
3rd Trimester (0 to 3 KM)	0.002	0.017	0.008	0.002	-0.110	-0.120	-0.009	-0.003
	(0.101)	(0.107)	(0.019)	(0.010)	(0.101)	(0.100)	(0.021)	(0.016)
3rd Trimester (> 3KM)	-0.002*	-0.002*	-0.000	0.000	0.003	0.004	0.001	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.007)	(0.007)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,904	4,904	4,904	4,904	323	323	323	323
R-squared	0.039	0.040	0.039	0.051	0.189	0.191	0.197	0.192

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

OTHER POTENTIAL MECHANISMS

Boko Haram Effect

Boko Haram civilian targeted attacks is the only specification that yields statistically and economically significant impacts to birthweight when my analysis is conducted using all individuals in Nigeria. However, the exact aspect of a Boko Haram civilian targeted attack that drives my results is unknown. Boko Haram is a notoriously lethal and tenacious group that regularly commits heinous attacks that inflict copious amount of physiological and psychological stress. [29] Boko Haram's insurgence is associated with the mass internal displacement of millions of Nigerians and the physical exertion that pregnant women expend fleeing Boko Haram could explain all or some of the estimated effects seen in the first trimester (Bisson et al., 2016; Mbachu, 2018).

In addition to excess physical exertion, the mass displacement of millions of Nigerians also coincides with one of the worst food crises in modern times (Mbachu, 2018). Inadequate nutrition, during any stage of pregnancy, can result in low birthweight infants (Hobel & Culhane, 2003; Stephenson & Symonds, 2002). However, relevant as these mechanisms are, a dearth of data prevents the confirmation of the exact mechanism(s) that makes Boko Haram civilian targeted attacks so impactful.[30] In lieu of the necessary data to

[29] One hypothesized mechanism that I thought could explain the Boko Haram effect was the high frequency of attacks of Boko Haram. To test for this, I ran my choice specification, Boko Haram civilian targeted terrorist events, with quadratic terms on the aggregate of whole attacks and fatalities. The results did not present any evidence to suggest that there are marginally different impacts from exposure to multiple attacks. The results for this specification are in Appendix Table 3.

[30] Mansour and Rees (2012) test for nutrition impacts and physical exertion, although indirectly. They proxy self-reported anemia during pregnancy for nutrition and use the implementation of a curfew, which resulted in limited public transportation access, as an increased burden of physical exertion on pregnant women. They find that the inclusion of these controls do not influence their results.

explore all relevant mechanisms associated with Boko Haram civilian targeted attacks, I utilize what available data there is to analyze the impact of Boko Haram civilian targeted attacks on accessibility of prenatal care and ability for a mother to deliver in a hospital.

Access to Prenatal Care and Hospitals

A potential mechanism associated with terrorism exposure and birthweight is access to prenatal health services. It has been shown that access to prenatal care is associated with higher birthweight offspring (Jewell & Triunfo, 2006). The disruption and destruction associated with a terrorist attack could prevent pregnant women from accessing prenatal care and thus positively influence the likelihood that an infant is born low birthweight. Table 16 presents the estimates for the effect of exposure to Boko Haram civilian targeted terrorist events on number of prenatal care visits a respondent had during pregnancy. Table 16 presents estimates that suggest exposure to a Boko Haram civilian targeted terrorist attack greater than three kilometers away from a respondent and in the first trimester is associated with a decrease in .047 prenatal visits per attack, significant at the 5% level. Exposure to a Boko Haram fatal attack, under the same conditions, is associated with .052 less prenatal visits per attack, significant ta the 5% level. To put these estimate’s magnitudes into context, the median number of prenatal visits per individual is 10. This marginal reduction in prenatal care visits, while small, could explain some or all of the associated negative impacts to birthweight as a result of exposure to Boko Haram civilian targeted attacks. To see if prenatal care visits are pertinent to the estimated effects of Boko Haram civilian targeted attacks on the likelihood that an infant is born low-birthweight, I incorporate number of prenatal visits as a control into my analysis.

Table 17 presents the estimates from the effect of Boko Haram civilian targeted attacks on the likelihood to be low birthweight with the inclusion of prenatal visits as a control. All previously, statistically significant estimates in the first trimester, within three kilometers, remain statistically significant as well as present larger estimated effects. All other statistically significant estimates outside of the first trimester and within three kilometers remain significant as well.

Apart from prenatal care visits, another mechanism that could influence birthweight through exposure to terrorist attacks is the inability for pregnant women to access hospital services. Since Boko Haram's insurgency, approximately 267 hospitals and public health facilities have been destroyed in the North East NDHS region alone (Haruna, 2017). Table 18 presents estimates for when the binary low birthweight dependent variable is replaced with a binary variable indicating that a woman gave birth in a hospital or public health facility. Estimates in Table 18 indicate that exposure to a Boko Haram civilian targeted terrorist event in the second and third trimester of pregnancy, within three kilometers, is associated with an increased propensity to deliver in a hospital. I attribute these results to a lack of data; of the 9,347 births in my analysis, only 6.5% of them were born outside of a hospital setting.

Data limitations prevent me from properly estimating the impact of Boko Haram civilian targeted terrorist events on the likelihood to deliver in a hospital, nonetheless, I include hospital access in my analysis as a control to see if it explains some of the associated negative effect I estimate from exposure to Boko Haram civilian targeted terrorist events and low birthweight. Table 19 presents the estimates for the effect of exposure to Boko Haram civilian targeted attacks on the likelihood of an infant being born low birthweight with the inclusion of the binary hospital delivery variable as a control. Results remain almost completely unchanged compared to Table 11 where the hospital control variable is omitted from analysis.

Table 20 presents the estimates for the effect of exposure to Boko Haram civilian targeted terrorist events on the likelihood of an infant being born low birthweight with the inclusion of both number of prenatal care visits and the binary hospital delivery variable as additional controls. With the inclusion of these variables, all previously statistically significant results in Table 11 in the first trimester and within three kilometers, remain statistically significant, as well as become larger in magnitude. While there are other statistically significant results, they are comparatively much smaller in magnitude than the first trimester within three-kilometer estimates.

Table 16: Effect of Civilian Targeted Boko Haram Terrorist Attacks on Prenatal Care Visits

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.113	0.162	0.028	0.042	0.512	0.542	0.040	0.014
	(0.334)	(0.316)	(0.055)	(0.040)	(0.457)	(0.456)	(0.051)	(0.046)
1st Trimester (> 3KM)	-0.047**	-0.052**	-0.006*	-0.002	-0.095**	-0.103***	-0.011	-0.000
	(0.021)	(0.021)	(0.004)	(0.002)	(0.038)	(0.039)	(0.007)	(0.006)
2nd Trimester (0 to 3 KM)	0.484	0.354	-0.011	-0.024	-0.411	-0.395	-0.083	-0.026
	(0.541)	(0.518)	(0.082)	(0.022)	(0.620)	(0.600)	(0.078)	(0.021)
2nd Trimester (> 3KM)	0.000	0.003	-0.000	-0.001	-0.039	-0.043	-0.010	-0.006
	(0.021)	(0.023)	(0.004)	(0.003)	(0.037)	(0.037)	(0.008)	(0.006)
3rd Trimester (0 to 3 KM)	-0.107	-0.107	-0.013	-0.029	-0.393	-0.361	-0.065	-0.052
	(0.247)	(0.254)	(0.039)	(0.028)	(0.525)	(0.523)	(0.056)	(0.042)
3rd Trimester (> 3KM)	-0.023	-0.026	-0.003	-0.001	-0.022	-0.040	-0.008	-0.003
	(0.019)	(0.020)	(0.005)	(0.003)	(0.042)	(0.042)	(0.008)	(0.005)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,065	6,065	6,065	6,065	455	455	455	455
R-squared	0.034	0.034	0.033	0.033	0.127	0.129	0.123	0.119

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate OLS regression. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 17: Effect of Exposure to Civilian Targeted Boko Haram Terrorist Attacks on the Likelihood of Being Low-birthweight With Prenatal Care Control

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.209**	0.270***	0.030**	0.013	0.318***	0.314***	0.040***	0.038***
	(0.102)	(0.104)	(0.013)	(0.012)	(0.106)	(0.103)	(0.012)	(0.012)
1st Trimester (> 3KM)	0.001	0.001	0.000	-0.000	-0.004	-0.004	-0.001	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.004)	(0.001)	(0.000)
2nd Trimester (0 to 3 KM)	-0.078	-0.044	-0.004	-0.003*	-0.043	-0.046	-0.004	-0.002
	(0.053)	(0.036)	(0.007)	(0.001)	(0.051)	(0.051)	(0.009)	(0.002)
2nd Trimester (> 3KM)	0.003**	0.003**	0.001**	0.000	0.004	0.004	0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
3rd Trimester (0 to 3 KM)	0.040	0.056	0.005	0.005	-0.014	-0.018	-0.007	-0.002
	(0.054)	(0.055)	(0.008)	(0.005)	(0.075)	(0.077)	(0.008)	(0.008)
3rd Trimester (> 3KM)	-0.001	-0.001	0.000	0.000	0.003	0.004	0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prenatal Care	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,065	6,065	6,065	6,065	455	455	455	455
R-squared	0..024	0.024	0.023	0.021	0.108	0.111	0.122	0.118

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 18: Effect of Civilian Targeted Boko Haram Terrorist Attacks on Likelihood to Deliver in a Hospital

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1^{st} Trimester (0 to 3 KM)	0.011	0.015	0.006	0.002	-0.046	-0.044	0.003	0.003
	(0.040)	(0.051)	(0.005)	(0.004)	(0.057)	(0.058)	(0.007)	(0.007)
1^{st} Trimester (> 3KM)	-0.001	-0.001	-0.000	-0.000	0.009**	0.009**	0.001*	0.001*
	(0.001)	(0.001)	(0.000)	(0.000)	(0.004)	(0.004)	(0.001)	(0.000)
2^{nd} Trimester (0 to 3 KM)	0.052***	0.057***	0.011***	0.004***	0.104***	0.104***	0.017***	0.005***
	(0.020)	(0.020)	(0.003)	(0.001)	(0.032)	(0.032)	(0.004)	(0.002)
2^{nd} Trimester (> 3KM)	-0.002*	-0.002	-0.000	-0.000	-0.004	-0.004	-0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.003)	(0.003)	(0.001)	(0.000)
3^{rd} Trimester (0 to 3 KM)	0.057**	0.057**	0.007***	0.005**	0.097*	0.096*	0.016***	0.012**
	(0.022)	(0.022)	(0.003)	(0.002)	(0.051)	(0.050)	(0.005)	(0.005)
3^{rd} Trimester (> 3KM)	-0.002**	-0.002**	-0.000	-0.000	-0.003	-0.002	-0.001	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.003)	(0.004)	(0.001)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,182	9,182	9,182	9,182	646	646	646	646
R-squared	0.025	0.025	0.024	0.024	0.114	0.114	0.115	0.110

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 19: Effect of Exposure to Civilian Targeted Boko Haram Terrorist Attacks on the Likelihood of Being Low-birthweight With Delivery in Hospital Control

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.188**	0.223**	0.032***	0.017	0.210*	0.209*	0.033***	0.030***
	(0.094)	(0.105)	(0.010)	(0.012)	(0.117)	(0.114)	(0.009)	(0.011)
1st Trimester (> 3KM)	0.002	0.002	0.000	-0.000	-0.002	-0.003	-0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.006)	(0.006)	(0.001)	(0.000)
2nd Trimester (0 to 3 KM)	-0.083	-0.065	-0.007	-0.003*	-0.084	-0.095	-0.009	-0.002
	(0.051)	(0.044)	(0.008)	(0.001)	(0.058)	(0.059)	(0.009)	(0.002)
2nd Trimester (> 3KM)	0.003***	0.003***	0.001***	0.000*	0.004	0.006	0.002	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
3rd Trimester (0 to 3 KM)	0.019	0.032	0.003	0.003	-0.072	-0.074	-0.008	-0.005
	(0.059)	(0.061)	(0.009)	(0.005)	(0.085)	(0.087)	(0.010)	(0.008)
3rd Trimester (> 3KM)	-0.002	-0.001	0.000	0.000	0.007	0.008	0.002**	0.001*
	0.019	0.032	0.003	0.003	-0.072	-0.074	-0.008	-0.005
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,182	9,182	9,182	9,182	646	646	646	646
R-squared	0.026	0.026	0.026	0.025	0.099	0.102	0.111	0.106

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 20: Effect of Exposure to Civilian Targeted Boko Haram Terrorist Attacks on the Likelihood of Being Low-birthweight With Delivery in Hospital and Prenatal Care Control

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.210**	0.268***	0.034***	0.017	0.308***	0.304***	0.041***	0.039***
	(0.095)	(0.102)	(0.012)	(0.013)	(0.108)	(0.102)	(0.012)	(0.012)
1st Trimester (> 3KM)	0.002	0.002	0.000	-0.000	-0.009	-0.009*	-0.001	-0.001**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.006)	(0.005)	(0.001)	(0.000)
2nd Trimester (0 to 3 KM)	-0.058	-0.034	-0.003	-0.002	-0.071	-0.080	-0.008	-0.002
	(0.055)	(0.045)	(0.008)	(0.001)	(0.066)	(0.066)	(0.009)	(0.002)
2nd Trimester (> 3KM)	0.003**	0.003**	0.001**	0.000	0.001	0.002	0.001	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.005)	(0.001)	(0.001)
3rd Trimester (0 to 3 KM)	0.028	0.044	0.003	0.003	-0.120	-0.126	-0.014	-0.009
	(0.063)	(0.065)	(0.010)	(0.006)	(0.083)	(0.084)	(0.011)	(0.009)
3rd Trimester (> 3KM)	-0.002	-0.002	-0.000	0.000	0.006	0.007	0.002**	0.001*
	(0.001)	(0.001)	(0.000)	(0.000)	(0.005)	(0.006)	(0.001)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hospital Access	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prenatal Care	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,012	6,012	6,012	6,012	454	454	454	454
R-squared	0.026	0.026	0.025	0.023	0.159	0.161	0.168	0.167

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

The past decade of medical and economic literature has seen an increased effort towards identifying the infant health outcomes of in-utero violence exposure. There is evidence to suggest from previous economic studies that in-utero violence exposure can have detrimental effects to birthweight in newborns (Camacho, 2008; Koppensteiner and Manacorda, 2015; Mansour and Rees, 2012). This study contributes to the preexisting literature by analyzing in-utero exposure to terrorist attacks within the direct proximity of individuals, as well as analyzing the impacts of terrorism directed at respondents. Utilizing Nigerian Demographic and Health Survey vitality and GPS data, in conjunction with daily terrorism data and GPS coordinates of terrorist attacks from the Global Terrorism Database, I analyze the impacts to birthweight from in-utero exposure to civilian targeted terrorism in Nigeria within three kilometers of individuals.

I find that exposure to a Boko Haram civilian targeted terrorist attack or death, in the first trimester and within three kilometers of an individual, result in a large increase in the probability that a child is born low-birthweight. Preexisting literature, bolstered by ample medical theory and case studies, suggest that in-utero violence exposure influences infant health outcomes by stress hormones interacting with the fetus early in gestation (Collins and David, 1997; Dye et al., 1995; Hobel and Culhane, 2003). In my analysis, the persistence of a statistically and economically significant association between exposure to Boko Haram civilian targeted terrorist attacks in the first trimester of pregnancy and the increased likelihood of an infant being born low birthweight, would appear to parallel these previous study’s findings. However, given my inability to control for the birthweight impacts of nutrient deficiency or excess physical exertion, both of which are plausibly associated with exposure to a Boko Haram terrorist attack and are causes of low birthweight in the first trimester, I cannot provide a definite mechanism for my results.

As terrorism in Nigeria, and Africa as a whole, continues to propagate and affect the lives of thousands, it is imperative for researchers to identify the precise impacts of in-utero violence exposure so that policies can be implemented to counteract the associated negative effects. Almond et al., (2008) finds that by increasing the access of nutrition to impoverished pregnant women through food stamps, the birthweight of their offspring increases[31] Improving access to nutrition for pregnant women exposed to terrorism could potentially counteract any birthweight detriments. However, no study has explored such a policy in this context. Future research is required so that the precise mechanism driving the impacts from Boko Haram civilian targeted attacks can be identified. With the 2018 round of the NDHS being conducted in August of this year, as well as the GTD being updated annually, the necessary data to identify a mechanism may be available in the very near future.

[31] Reichman & Teitler (2003) call for similar interventions as Almond et al., (2008). They find that the implementation of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is associated with an increase in the mean birthweight in infants from poor mothers.

REFERENCES

Aizer, A., Stroud, L., & Buka, S. (2015). Maternal Stress and Child Outcomes: Evidence from Siblings. *Journal of Human Resources,51*(3), 523-555.

Almond, D., Hoynes, H., & Schanzenbach, D. W. (2008). Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes.

Almond, D. and Mazumder, B. (2011). Health Capital and the Prenatal Environment: The Effect of Ramadan Observance During Pregnancy. *American Economic Journal: Applied Economics*, 3(4), pp.56-85.

Barlow, E. (2017, February 01). The Rise, Fall, and Rise Again of Boko Haram. Retrieved January 17, 2018, from http://hir.harvard.edu/article/?a=14477
BBCNews. (2013, November 13). US names Nigeria's Boko Haram and Ansaru 'terrorists'. Retrieved January 17, 2018, from http://www.bbc.com/news/world-africa-24931684

BBC News. (2016, November 24). Who are Nigeria's Boko Haram Islamist group? Retrieved January 17, 2018, from http://www.bbc.com/news/world-africa-13809501

Beary, B. (2015, July 10). Terrorism in Africa. CQ Researcher, 25, 577-600. Retrieved from http://library.cqpress.com/

Beri, R. (2017, April 13). Rise of Terrorism in Africa. Retrieved January 12, 2018, from https://idsa.in/idsacomments/rise-of-terrorism-in-africa_rberi_130417

Bisson, M., Lavoie-Guénette, J., Tremblay, A., & Marc, I. (2016). Physical Activity Volumes during Pregnancy: A Systematic Review and Meta-Analysis of Observational Studies Assessing the Association with Infants Birth Weight. *American Journal of Perinatology Reports,06*(02). doi:10.1055/s-0036-1583169

Blanc, A. K., & Wardlaw, T. (2005). Monitoring low birth weight: an evaluation of international estimates and an updated estimation procedure. *Bulletin World Health Organization,83*(3), 178-185. Retrieved February 3, 2018.

Camacho, A. (2008). Stress and Birth Weight: Evidence from Terrorist Attacks. *American Economic Association,98*(2), 511-515.

Collins, J., Jr., & David, R. (1997). Urban violence and African American pregnancy outcome: an ecologic study. *PubMed,7*(3), 184-190.

Copper, R. L., Goldenberg, R. L., Das, A., Elder, N., Swain, M., Norman, G., . . . Meier, A. (1996). The preterm prediction study: Maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks gestation. *American Journal of Obstetrics and Gynecology,175*(5), 1286-1292.

Davis, E. P., & Sandman, C. A. (2010). The Timing of Prenatal Exposure to Maternal Cortisol and Psychosocial Stress Is Associated With Human Infant Cognitive Development. *Child Development,81*(1), 131-148.

Dillinger, J. (2015, December 09). The Global Terrorism Index. Retrieved January 12, 2018, from https://www.worldatlas.com/articles/the-global-terrorism-index-countries-most-affected-by-terrorist-attacks.html

Dwarkanath, P., Muthayya, S., Thomas, T., Mhaskar, A., R, M., Thomas, A., . . . Kurpad, A. (2007). The relationship between maternal physical activity during pregnancy and birth weight. *PubMed,16*(4), 704-710. Retrieved March 16, 2018.

Dye, T. D., Tolliver, N. J., Lee, R. V., & Kenney, C. J. (1995). Violence, pregnancy and birth outcome in Appalachia. *Paediatric and Perinatal Epidemiology,9*(1), 35-47.

Figlio, D., Guryan, J., Karbownik, K., & Roth, J. (2014). The Effects of Poor Neonatal Health on Childrens Cognitive Development. *American Economic Review,104*(12), 3921-3955.

Glynn, L. M., Wadhwa, P. D., Dunkel-Schetter, C., Chicz-Demet, A., & Sandman, C. A. (2001). When stress happens matters: Effects of earthquake timing on stress responsivity in pregnancy. *American Journal of Obstetrics and Gynecology,184*(4), 637-642.

Harvard Divinity School. (2018). *Nigeria*. *Rlp.hds.harvard.edu*. Retrieved 25 March 2018, from https://rlp.hds.harvard.edu/nigeria-overview

Haruna, A. (2017, August 10). Boko Haram destroyed 267 hospitals, clinics in Borno - Commissioner. Retrieved February 05, 2018, from https://www.premiumtimesng.com/health/health-news/239869-boko-haram-destroyed-267-hospitals-clinics-borno-commissioner.html

Hobel, C. & Culhane, J. (2003). Role of psychosocial and nutritional stress on poor pregnancy outcome. The Journal of nutrition. 133. 1709S-1717S.

Human Rights Watch. (2018). *Nigeria: Boko Haram Attacks Likely Crimes Against Humanity*. [online] Available at: https://www.hrw.org/news/2012/10/11/nigeria-boko-haram-attacks-likely-crimes-against-humanity [Accessed 16 Mar. 2018].

Ighorbor, K. (2017). *Commodity prices crash hits Africa | Africa Renewal Online*. *Un.org*. Retrieved 25 March 2018, from http://www.un.org/africarenewal/magazine/december-2016-march-2017/commodity-prices-crash-hits-africa

Jewell, R. and Triunfo, P. (2006). The impact of prenatal care on birthweight: the case of Uruguay. *Health Economics*, 15(11), pp.1245-1250.

Kleinpeter, M. (2016). *The Resource Curse in Nigeria: Comparing the Security of Offshore and Onshore Oil Production*. *Inquiries Journal*. Retrieved 25 March 2018, from http://www.inquiriesjournal.com/articles/1376/2/the-resource-curse-in-nigeria-comparing-the-security-of-offshore-and-onshore-oil-production

Kollias, C., Messis, P., Mylonidis, N., & Paleologou, S. (2009). Terrorism and the effectiveness of security spending in Greece: Policy implications of some empirical findings. *Journal of Policy Modeling,31*(5), 788-802.

Koppensteiner, M. F., & Manacorda, M. (2016). Violence and birth outcomes: Evidence from homicides in Brazil. *Journal of Development Economics,119*, 16-33.

Knoope, P. (2017, October 2). Nigeria: Northern discontent and the history of Boko Haram. Retrieved January 17, 2018, from https://www.africaportal.org/features/nigeria-northern-discontent-and-history-boko-haram/

Kramer, M.S. (1987). Determinants of low birth weight: methodological assessment and meta-analysis. *Bulletin of World Health Organization,65*(5), 663-737.

Latendresse, G. (2009). The Interaction Between Chronic Stress and Pregnancy: Preterm Birth from A Biobehavioral Perspective. *Journal of Midwifery & Womens Health,54*(1), 8-17.

Mancuso, R. A., Schetter, C. D., Rini, C. M., Roesch, S. C., & Hobel, C. J. (2004). Maternal Prenatal Anxiety and Corticotropin-Releasing Hormone Associated With Timing of Delivery. *Psychosomatic Medicine,66*(5), 762-769.

Mansour, H., & Rees, D. I. (2012). Armed conflict and birth weight: Evidence from the al-Aqsa Intifada. *Journal of Development Economics,99*(1), 190-199.

Matfess, H. (2016). *Here's why so many people join Boko Haram, despite its notorious violence*. *Washington Post*. Retrieved 25 March 2018, from https://www.washingtonpost.com/news/monkey-cage/wp/2016/04/26/heres-why-so-many-people-join-boko-haram-despite-its-notorious-violence/?utm_term=.8b045515afc4

Mbachu, D. (2016, September 09). Nigerias Borno Faces Worlds Worst Food Crisis, Unicef Says. Retrieved January 26, 2018, from https://www.bloomberg.com/news/articles/2016-09-09/nigeria-s-borno-facing-world-s-worst-food-crisis-unicef-says

Mclean, M., Bisits, A., Davies, J., Woods, R., Lowry, P., & Smith, R. (1995). A placental clock controlling the length of human pregnancy. *Nature Medicine,1*(5), 460-463.

Mulder, E., Medina, P. R., Huizink, A., Bergh, B. V., Buitelaar, J., & Visser, G. (2002). Prenatal maternal stress: effects on pregnancy and the (unborn) child. *Early Human Development,70*(1-2), 3-14.

News24. (2016, March 21). A Nigerian state reveals Boko Haram destruction. Retrieved January 18, 2018, from https://www.news24.com/Africa/News/a-nigerian-state-reveals-boko-haram-destruction-20160321

Newton, R., & Hunt, L. (1984). Psychological stress in pregnancy and its relation to low birth weight. *British Medical Journal,288*, 1191-1194.

Olukayode, M. (2017). *Boko Haram Burns Down Hospital, Houses in Northeastern Nigeria*. [online] Bloomberg.com. Available at: https://www.bloomberg.com/news/articles/2017-08-24/boko-haram-burns-down-hospital-houses-in-northeastern-nigeria [Accessed 9 Mar. 2018].

Reichman, N. and Teitler, J. (2003). Effects of Psychosocial Risk Factors and Prenatal Interventions on Birth Weight: Evidence From New Jersey's HealthStart Program. *Perspectives on Sexual and Reproductive Health*, 35(3), pp.130-137.

Restrepo, Jorge, Spagat, Michael, 2004. Civilian casualties in the Colombian conflict: a new approach to human security. Working Paper. Department of Economics Royal Holloway College, University of London. Available at: http://digirep.rhul.ac.uk/file/99b8c494-e242-fe6b-7105-cf0410f7b47b/1/HS_in_Colombia_Civil_Conflict.pdf.

Reuters (2018). *Boko Haram Militants Kill Aid Workers at Military Base in Nigeria*. [online] Nytimes.com. Available at: https://www.nytimes.com/2018/03/02/world/africa/boko-haram-nigeria.html [Accessed 16 Mar. 2018].

Stephenson, T. and Symonds, M. (2002). Maternal nutrition as a determinant of birth weight. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 86(1), pp.4F-6.

Talge, N. M., Neal, C., & Glover, V. (2007). Antenatal maternal stress and long-term effects on child neurodevelopment: how and why? *Journal of Child Psychology and Psychiatry,48*(3-4), 245-261.

The World Bank. (2018). *Intentional homicides (per 100,000 people) | Data*. *Data.worldbank.org*. Retrieved 25 March 2018, from https://data.worldbank.org/indicator/VC.IHR.PSRC.P5?locations=NG&view=map&year_high_desc=true

Todd Jewell, R. and Triunfo, P. (2006). The impact of prenatal care on birthweight: the case of Uruguay. *Health Economics*, 15(11), pp.1245-1250.

Unocha.org. (2017). *Nigeria | OCHA*. [online] Available at: http://www.unocha.org/country/nigeria [Accessed 16 Mar. 2018].

U.S. Department of State (2016). Country Reports on Terrorism: Africa. Retrieved January 16, 2018, from https://www.state.gov/j/ct/rls/crt/2016/272229.htm

Vinkesteijn, A. S., Struijk, P. C., Ursem, N. T., Hop, W. C., & Wladimiroff, J. W. (2004). Fetal heart rate and umbilical artery flow velocity variability in intrauterine growth restriction: a matched controlled study. *Ultrasound in Obstetrics and Gynecology*,*23*(5), 461-465.

Wadhwa, P. D., Garite, T. J., Porto, M., Glynn, L., Chicz-Demet, A., Dunkel-Schetter, C., & Sandman, C. A. (2004). Placental corticotropin-releasing hormone (CRH), spontaneous preterm birth, and fetal growth restriction: A prospective investigation. *American Journal of Obstetrics and Gynecology*,*191*(4), 1063-1069.

Wilson, M. (2018). *Nigeria's Boko Haram attacks in numbers - as lethal as ever*. [online] BBC News. Available at: http://www.bbc.com/news/world-africa-42735414 [Accessed 11 Mar. 2018].

APPENDIX

Table A.1: Effect of Exposure to All Attacks within Distances on the Likelihood of Being Low Birthweight (With Additional Distance Bins)

	(1) Nigeria (Attacks)	(2) Nigeria (Fatal Attacks)	(3) Nigeria (Kills)	(4) Nigeria (Afflicted)	(5) North East (Attacks)	(6) North East (Fatal Attacks)	(7) North East (Kills)	(8) North East (Afflicted)
1st Trimester (0 to 3 KM)	0.007	0.006	0.026	0.000	0.082	0.115***	0.024***	0.022***
	(0.015)	(0.005)	(0.021)	(0.002)	(0.052)	(0.041)	(0.008)	(0.007)
1st Trimester (> 3 to 6 KM)	-0.005	-0.003	-0.020	-0.001	0.024	0.014	-0.005	-0.000
	(0.009)	(0.004)	(0.013)	(0.001)	(0.040)	(0.037)	(0.006)	(0.003)
1st Trimester (> 6 to 9 KM)	0.006	0.001	0.006	0.001	-0.020	-0.046	-0.007	0.004
	(0.009)	(0.002)	(0.013)	(0.001)	(0.033)	(0.036)	(0.006)	(0.007)
1st Trimester (> 9 KM)	-0.013**	-0.002**	-0.023***	-0.001	-0.007	-0.018	-0.006***	-0.010***
	(0.006)	(0.001)	(0.008)	(0.001)	(0.006)	(0.013)	(0.001)	(0.003)
2nd Trimester (0 to 3 KM)	0.013*	0.002	0.019	0.001	0.027***	0.066***	0.014***	0.013***
	(0.008)	(0.002)	(0.013)	(0.001)	(0.010)	(0.014)	(0.003)	(0.003)
2nd Trimester (> 3 to 6 KM)	0.002	0.003*	0.006	0.001	-0.010*	-0.040**	-0.004**	-0.003
	(0.005)	(0.001)	(0.008)	(0.001)	(0.006)	(0.016)	(0.002)	(0.002)
2nd Trimester (> 6 to 9 KM)	-0.003	-0.000	-0.005	-0.000	0.028**	0.010	-0.001***	-0.001
	(0.005)	(0.000)	(0.007)	(0.000)	(0.013)	(0.010)	(0.000)	(0.001)
2nd Trimester (> 9 KM)	0.010	0.000	0.016	0.000	0.031	0.089	0.000	0.001
	(0.010)	(0.000)	(0.014)	(0.000)	(0.023)	(0.063)	(0.000)	(0.000)
3rd Trimester (0 to 3 KM)	-0.004	0.001	-0.006	0.001	-0.033	-0.076	-0.000	0.001
	(0.006)	(0.000)	(0.009)	(0.000)	(0.020)	(0.050)	(0.001)	(0.001)
3rd Trimester (> 3 to 6 KM)	-0.000	0.000	-0.000	0.000	-0.001	-0.002	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
3rd Trimester (> 6 to 9 KM)	0.001***	0.000***	0.001***	0.000***	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
3rd Trimester (> 9 KM)	-0.000	-0.000	-0.000	0.000	0.001	0.003*	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	648	648	648	648
R-squared	0.026	0.026	0.027	0.026	0.113	0.125	0.131	0.134

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table A.2: Effect of Exposure to Terrorist Attacks Binned by Number of Deaths per Attack

	(1) Nigeria (No Deaths)	(2) Nigeria (One)	(3) Nigeria (2 to 5)	(4) Nigeria (6 to 10)	(5) Nigeria (11 to 15)	(6) Nigeria (16 to 20)	(7) Nigeria (21 to 25)	(8) Nigeria (25+)
1st Trimester (0 to 3 KM)	-0.016	-0.006	0.061*	0.135	-0.150***	0.253	-0.127***	-
	(0.030)	(0.062)	(0.036)	(0.100)	(0.055)	(0.324)	(0.019)	
1st Trimester (> 3KM)	0.000	0.000	-0.000	0.005**	0.001	0.003	-0.033**	-0.001
	(0.000)	(0.001)	(0.001)	(0.002)	(0.006)	(0.003)	(0.016)	(0.005)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Second and Third Trimester	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,271	9,271	9,271	9,271	9,271	9,271	9,271	9,271
R-squared	0.026	0.025	0.026	0.025	0.025	0.025	0.024	0.024
	North East (No Deaths)	North East (One)	North East (2 to 5)	North East (6 to 10)	North East (11 to 15)	North East (16 to 20)	North East (21 to 25)	North East (25+)
1st Trimester (0 to 3 KM)	0.158	-0.036	0.195**	0.224*	-	0.820***	-	-
	(0.177)	(0.129)	(0.084)	(0.132)		(0.111)		
1st Trimester (> 3KM)	-0.001	-0.005*	-0.005*	0.001	-0.011	0.007	0.018	-0.002
	(0.001)	(0.003)	(0.003)	(0.007)	(0.017)	(0.009)	(0.064)	(0.021)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Second and Third Trimester	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	648	648	648	648	648	648	648	648
R-squared	0.073	0.104	0.079	0.076	0.075	0.075	0.072	0.063

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Effect of Exposure to Boko Haram Civilian Targeted Attacks on the Likelihood of having a Low Birthweight Infant (quadratic)

	(1) Nigeria (Attacks)	(2) Nigeria (Kills)	(3) North East (Attacks)	(4) North East (Kills)
1^{st} Trimester (0 to 3 KM)	-0.476	0.017	-1.142***	0.032
	(0.332)	(0.046)	(0.218)	(0.041)
1^{st} Trimester (0 to 3 KM)^2	0.351*	0.001	0.700***	0.000
	(0.190)	(0.002)	(0.128)	(0.002)
1^{st} Trimester (> 3KM)	-0.000	0.000	-0.010	0.002
	(0.004)	(0.001)	(0.012)	(0.002)
1^{st} Trimester (> 3KM)^2	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
2^{nd} Trimester (0 to 3 KM)	0.066	0.014	0.002	0.025
	(0.137)	(0.030)	(0.323)	(0.064)
2^{nd} Trimester (0 to 3 KM)^2	-0.097	-0.002	-0.090	-0.003
	(0.066)	(0.002)	(0.176)	(0.005)
2^{nd} Trimester (> 3KM)	0.000	0.000	-0.016	-0.001
	(0.004)	(0.001)	(0.012)	(0.002)
2^{nd} Trimester (> 3KM)^2	0.000	0.000	0.001**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
3^{rd} Trimester (0 to 3 KM)	0.476	0.006	0.814*	-0.002
	(0.357)	(0.024)	(0.456)	(0.030)
3^{rd} Trimester (0 to 3 KM)^2	-0.247	-0.000	-0.482**	-0.000
	(0.184)	(0.001)	(0.218)	(0.001)
3^{rd} Trimester (> 3KM)	0.005	0.001*	-0.019	-0.002
	(0.004)	(0.001)	(0.014)	(0.003)
3^{rd} Trimester (> 3KM)^2	-0.000	-0.000**	0.001**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Controls	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Cluster Fixed Effects	Yes	Yes	Yes	Yes
Observations	9,271	9,271	648	648
R-squared	0.027	0..026	0.124	0.112

Notes: Based on the recorded Global Terrorist Database terrorism data. Each column represents results from a separate linear probability model. Standard errors are clustered on the NDHS level and are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1