Political Violence and Child Height: Evidence from the 2003 Casablanca Bombings

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Abstract

This research examines how in-utero exposure to political violence affects early childhood health within the context of the 2003 Casablanca Bombings in Morocco. Exploiting the variation across districts and birth months-years within a difference-in-differences framework, we uncover the detrimental association between in-utero exposure to the bombings and child height. Prenatally exposed children are 0.743 standard deviations shorter for their age. Children that were prenatally exposed to the bombings are 0.743 standard deviations shorter for their age. When examining the relative importance of exposure timing, we find that being exposed to the bombings during the first trimester had the most impact on a child's height.

Keywords: Child Height; Political Violence; Casablanca Bombings; Morocco

1 Introduction

The number of cases of political violence in the world has tripled in the previous ten years, posing a threat to global peace and prosperity [1]. Political violence cost the world 14.3 trillion dollars in 2016, accounting for 12.6 percent of the global GDP [2]. Morocco, in particular, was hit by the 2003 Casablanca Bombings, which were the deadliest terrorist attacks in the country's history. The attacks were a series of suicide bombings in Casablanca leading to 45 people being killed (33 victims and 12 suicide bombers).

In the setting of the 2003 Casablanca Bombings, this study investigates how in-utero exposure to political violence affects the height outcome of children. The study contributes to the literature in two ways. First, we examine the less visible but critical impact of political violence on early human health, whereas most research focuses on individuals with immediate humanitarian needs. Second, the study adds to our understanding of the intergenerational effects of political violence, as the effects on a mother who is directly affected can be passed down to her child. In this regard, we focus on the outcome in early childhood of those being prenatally exposed to the bombings, thereby providing evidence of the long-term effects of negative prenatal shocks.

To examine the impacts of in-utero exposure to political violence on child's height, we draw from the Morocco Demographic and Health Surveys and the Uppsala Conflict Data Program Geo-referenced Event Dataset. The former provides information on Moroccan child's height and other attributes, as well as their mothers' characteristics. The latter contains a record of the bombing locations where each incident of conflict is documented with the date and geo-referenced location of occurrence. In terms of identification, we employ the difference-in-differences framework, which compares the outcomes of children born to mothers who experienced the bombings during pregnancy to the outcomes of children born to mothers who did not experience the bombings

during pregnancy within the same district, in comparison to the analogous differences for mothers living in a different district.

Our study reaches the following findings. First, we find that fetal exposure to the bombings has a negative influence on child's height. The height-for-age z-score of prenatally exposed children is 0.743 standard deviations lower than that of unexposed children. Second, while exposure to any of the three trimesters is hazardous, we found that bombing exposure in the first trimester has the greatest influence on a child's height. The results are consistent across a variety of model settings and outcome measurements.

Our research shed light on the less visible but catastrophic effects of political violence on human health in the early stages of life. Consequently, political violence obstructs progress toward not only SDG-16 (peace, justice, and strong institutions) but also SDG-3 (good health and wellbeing). Thus, our findings call for additional efforts on the prevention and mitigation of political violence. Mitigation actions should be implemented quickly and effectively. Food and medical attention for pregnant mothers facing political violence can assist to mitigate the negative consequences on their newborns. Post-violence reconstruction initiatives are also crucial. Children who have been affected by political violence should receive immediate aid from the government.

2 Literature Review

Our quantitative analysis is guided by the theory of Corman et al. in which infant health is modeled as an argument of the utility maximization problem faced by parents during the prenatal period [3]. The solution to the utility maximization problem is infant health stated as a function of maternal health and health inputs during the prenatal period (e.g. medical services, nutrients, etc.). The bombings in our context could have an impact on both maternal health and health inputs

throughout pregnancy. Exposure to the bombings, for example, is a stressful event that can put pregnant women under a lot of stress. Stress hormones like norepinephrine and cortisol, which are released during pregnancy, may be particularly damaging to fetal development, compromising child health after birth [4, 5]. The bombings may also lower present living standards, such as overcrowding and lack of access to clean water and sanitation, raising the risk of infectious and communicable diseases [6, 7]. Such complications of diseases during pregnancy can harm fetal development, thus early childhood health [8]. If the bombings cause damage to infrastructure and buildings, food supplies and healthcare services may be affected. During pregnancy, nutritional restriction and insufficient prenatal care have been proven to reduce fetal growth and poor delivery outcomes [9, 10].

Our work is empirically tied to two lines of research. The first set of studies examines how vulnerable child's health is to extreme occurrences. Extreme weather, in particular, has been shown to have a negative impact on child's health. Extreme rainfall and temperature events, for example, have been shown to affect a child's weight and height [11, 12, 13, 14]. Furthermore, prior evidence suggests that children exposed to economic downturns have poorer health and nutrition outcomes as a result of the decline in household living standards [15, 16]. Other events such as famine and air pollution have also been reported to be harmful to child's health [17, 18]. By exploring the influence of political violence as an extreme event on the height outcome of young children, our research contributes to this body of knowledge. Our study also falls into the second line of studies focusing on the cost of political violence to human health. Previous studies have shown that mothers from underdeveloped nations who have experienced political violence during their pregnancy are more likely to have light-weight and slow-growing children [19, 20, 21, 22]. Terrorism in developed countries has also been linked to adverse birth outcomes [23]. We add to

the body of knowledge by looking at the consequences of in-utero exposure on outcomes not occurring immediately right after birth. As a result, the study adds to our understanding of the long-term impacts of negative shocks during pregnancy, such as the bombings, on later health outcomes.

3 Data

3.1 Data on children

Data on children are drawn from the Morocco Demographic and Health Surveys (DHS). We mainly utilize the DHS child file which focuses on Moroccan children under the age of five (0-59 months old) whose mothers are between the ages of 15 and 49 at the time of the survey. To measure a child's height, the anthropometric metric height-for-age is utilized. This anthropometric z-score indicates how many standard deviations a child's height is below or above the reference population median value from the National Center for Health Statistics/World Health Organization. The DHS also provides information on a variety of maternal and child characteristics, including maternal education, mother's age, child's month-year of birth, child's birth order, among others.

We also limit our sample to wave 4 of the Morocco DHS because this wave not only covers the bombing period but is also supplemented with the Global Positioning System (DHS-GPS). In the DHS-GPS, participating households are georeferenced by a pair of latitude and longitude that can be used to determine the residential district in which the child's household is located. Such detailed spatial information enables us to combine the child data with the bombing data.

3.2 Data on the Bombings

Information on the 2003 Casablanca Bombings is retrieved from the Uppsala Conflict Data Program Geo-referenced Event Dataset (UCDP-GED), which is compiled and managed by the

Department of Peace and Conflict Research of Uppsala University. Since 1989, the UCDP-GED has kept track of political violence around the world. The date and location of occurrence are recorded for each bombing incident. A pair of longitude and latitude coordinates can be used to pinpoint the location of the attack.

Using spatial data from the DHS-GPS and the UCDP-GED, we can determine whether the mothers' district of residence was affected by the bombings. Because the child's month-year of birth is known via the DHS-GPS, the prenatal period can be backed out. Then we can tell if a child was exposed to the bombings throughout his or her prenatal period. Consider the case of a child born in September of 2003. If the bombings occurred in his or her mother's district between January and September 2003, the child was exposed to the bombings during the in-utero period. Our explanatory variable is an indicator, *Exposed to the Bombings (EB)*, which takes a value of one if the child was prenatally exposed to the bombings and zero otherwise. Returning to the preceding example, *EB* has a value of one when bombings occur between January and September 2003, and zero otherwise.

3.3 Summary Statistics

Over 5,000 Moroccan children under the age of five make up our final estimation sample. Descriptive statistics for dependent and independent variables are shown in Table 1. In our sample of Moroccan children, the average height-for-age z-score is around -0.704 standard deviations. Furthermore, we can observe that around 1 percent of Moroccan children were prenatally exposed to the bombings. Mothers were on average 30.5 years old at the time of the survey and 28.4 years old when giving birth. The average length of time the mothers have been educated is 2.4 years. Rural mothers account for 57.1 percent of all mothers, and 52.6 percent of all mothers are classified as poor. Male children make up around 50.3 percent of the total number of children in the sample.

Children are 29.9 months old on average. The average birth order is 3.1. A total of 1.3 percent of children were born as a plural birth.

Table 1: Summary Statistics

	Mean (1)	SD (2)	Observations (3)
Height-for-Age Z-scores	-0.704	1.622	5,269
Exposed to the Bombings	0.010	0.100	5,269
Mother's Age	30.50	6.758	5,269
Mother's Age at Birth	28.45	6.594	5,269
Mother's Education	2.430	4.141	5,266
Residing in Rural Areas	0.571	0.495	5,269
Classified as Poor	0.526	0.499	5,269
Male Child	0.503	0.500	5,269
Child's Age in Months	29.97	17.22	5,269
Child's Birth Order	3.120	2.198	5,269
Being a Plural Birth	0.013	0.115	5,269

4 Empirical Methodology

To explore the effects of in-utero exposure to the bombings on child height outcomes, we estimate the difference-in-differences (DiD) model given by,

$$Y_{ijt} = \beta_0 + \beta_1 EB_{jt} + \delta_j + \theta_t + X'_{ijt}\Omega + \epsilon_{ijt}$$

where the subscripts *i*, *j*, and *t* indicate child, district, and birth month-year, respectively. The variable Y_{ijt} denotes the outcome of interest which is child's height-for-age z-score. The main explanatory variable is EB_{jt} taking the value of one if the child was prenatally exposed to the bombings and zero otherwise. We also denote by δ_j and θ_t district and birth month-year fixed effects, respectively. The vector X'_{ijt} represents mother and child characteristics, namely: (i) mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in the rural area, and whether the household is classified as poor, and (ii) child's

age in months, child's age in months squared, gender, birth order, and whether the child is plural birth. Finally, the term ϵ_{ijt} is the error term. Standard errors throughout the paper are clustered at the residential district level. To overcome the issue of endogenous sampling, survey sampling weights are used in all regressions.

The coefficient of interest is β_1, which captures the effects of in-utero exposure to political violence on child's height. Within this DiD framework, we compare the height outcome of children born to mothers who experienced the bombings during pregnancy with the height outcome of children born to mothers who did not experience the bombings during pregnancy within the same district, relative to the analogous differences for mothers living in a different district. The identifying assumption is that the timing of the bombings is independent of within-district unobserved characteristics that could potentially affect child's height.

5 Results

5.1 Main Results

Table 2 reports the estimated effects of in-utero exposure to the bombings on a child's height-for-age z-score. Column 1 shows the simplest specification, which only controls for the main explanatory variable (Exposed to the Bombings). In Column 2, we include birth month-year and district fixed effects. In Column 3, we add the mother's characteristics to the specification in Column 2 (mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in the rural area, and whether the household is classified as poor). Column 4 contains our most extensive specification, which further includes the child's characteristics (child's age in months, child's age in months squared, gender, birth order, and

whether the child is plural birth) in addition to the characteristics of the mother, birth month-year fixed effects, and district fixed effects.

The estimation results in Table 2 imply that in-utero exposure to the bombings reduces Moroccan children's height-for-age z-score. Those prenatally exposed to the bombings have a 0.264 standard deviation inferior height-for-age z-score, according to the most conservative specification (Column 1). However, without proper controls that could influence both exposure status and child's height, these estimates just show the correlation between child's height and in-utero exposure to the bombings.

In Column 2, unobserved factors that may be associated with child's height and exposure status simultaneously are accounted for by adding birth month-year and district fixed effects. For example, children in places with high-quality health experts and infrastructure may be better equipped to withstand the potential health consequences of the bombings. After accounting for time and location fixed effects, we still find that prenatal exposure to the bombings has a detrimental and significant influence on a child's height-for-age z-score.

In Column 3, we further account for the mother's attributes that may be linked to both exposure and child's height, thus biasing our results. For example, given the importance of a mother's education, those born to highly educated mothers are more likely to have better health and less likely to face unfavorable shocks than those born to less educated mothers [24]. As shown in Column 3, prenatal exposure to the bombings is associated with a 0.758 standard deviation decrease in child's height-for-age z-score, respectively.

Finally, in the most extensive specification (Column 4), we further control for child’s characteristics in addition to the characteristics of the mother, birth month-year fixed effects, and

district fixed effects. We find that Moroccan children exposed to the bombings during pregnancy are 0.743 standard deviations shorter for their age. The estimates remain statistically significant.

Table 2: Exposed to the Bombings and Child Height

	Y = Height-for-Age Z-scores			
	(1)	(2)	(3)	(4)
Exposed to the Bombings	-0.264	-0.740***	-0.758***	-0.743***
	(0.259)	(0.266)	(0.269)	(0.270)
Observations	5,269	5,269	5,266	5,266
Child Characteristics	.	.	.	X
Mother Characteristics	.	.	X	X
Fixed Effects	.	X	X	X

Note: *p<0.1, **p<0.05, ***p<0.01. Robust standard errors are clustered at the residential district level. Each column represents the coefficients in a separate regression. The column headings indicate dependent variables. Mother Characteristics include mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in rural areas, and whether the household is classified as poor. Child Characteristics include child's age in months, squared-age in months, gender, birth order, and whether the child is plural birth. Fixed Effects include birth month-year and residential district fixed effects.

5.2 Trimester Analysis

So far, we have discovered that in-utero exposure to the bombings has a deleterious impact on child's height. While the majority of the literature agrees that negative shocks during pregnancy are hazardous to the health of the children, the relative importance of exposure timing remains a subject of disagreement. While some studies claim that negative shocks in the first trimester have the most influence [14, 21, 23], others believe that second-trimester exposure is just as essential [25, 26]. However, several studies have found that the effects are mainly concentrated in the third trimester [11, 18].

The relative importance of exposure timing is examined in this section. In other words, we examine which trimester of violence exposure has the greatest impact on child's height. To do so, we substitute three dummy variables for the single *Exposed to the Bombings* indicator. These variables include *1st Trimester Exposed*, *2nd Trimester Exposed*, and *3rd Trimester Exposed*, which take the value of one if the mother was exposed to political violence during the first, second, or third trimesters of pregnancy, and zero otherwise.

Table 4 summarizes the estimation results. We find that exposure to any of the three trimesters has a negative impact on a child's height. However, violence exposure in the first trimester has the greatest effect on child's height. Particularly, experiencing the bombings in the first trimester reduces child's height-for-age z-score by 1.724 standard deviations. As a result, our findings are in line with studies supporting the relative importance of first-trimester exposure [14, 21, 23].

Table 3: Exposed to the Bombings and Child Height - Trimester Analysis

	Y = Height-for-Age Z-scores
	(1)
1st Trimester Exposed	-1.724***
	(0.401)
2nd Trimester Exposed	-0.471
	(0.438)
3rd Trimester Exposed	-0.333
	(0.316)
Observations	5,266
Mother Characteristics	X
Child Characteristics	X
Fixed Effects	X

Note: *p<0.1, **p<0.05, ***p<0.01. Robust standard errors are clustered at the residential district level. Each column represents the coefficients in a separate regression. The column headings indicate dependent variables. Mother Characteristics include mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in rural areas, and whether the household is classified as poor. Child Characteristics include child's age in months, squared-age in months, gender, birth order, and whether the child is plural birth. Fixed Effects include birth month-year and residential district fixed effects.

5.3 Other Specifications and Measures

In this section, we perform robustness checks to demonstrate that our main findings are unaffected by alternative specifications. In the first robustness check, the mother fixed-effects model is utilized so that identification is based on a comparison of the height measure of children born to the same mother, one of whom has been prenatally exposed to the bombings and the other has not. The advantage of this model is that it can account for unobserved family endowments that may influence children's violence vulnerability through a within-mother comparison. The drawback is that the sample size is reduced by more than 60% since mothers with only one child are excluded, thus biasing our estimates. Nonetheless, we continue to observe that exposure to the bombings has a detrimental and significant impact on a child's height (Column 1, Table 4).

Remember that in our baseline regressions, sample weight is used. Next, we re-run our main model (same as Column 4 in Table 2) without the sampling weight and present the estimates in Column 2 of Table 4. We continue to observe the detrimental and statistically significant effect on child's height from prenatal exposure to the bombings. Specifically, children that have been exposed to the bombings prenatally are 0.725 standard deviations shorter for their age. While the statistical significance level is maintained, the magnitude of the estimates decreases slightly when compared to the main estimates (the one in Column 4 of Table 2).

Because early pregnancy is connected to poor newborn and child health, it is possible that the negative impacts of the bombings found in our study are due to teenage mothers. To address this issue, we remove teenage mothers from the sample and re-estimate our model. As indicated in Column 3 of Table 4, in-utero exposure to the bombings results in a 0.784 standard deviation lower height-for-age z-score in early childhood. The estimate is statistically distinct from zero and

slightly larger than the main estimates (the one in Column 4 of Table 2), thus suggesting that early pregnancy is not an issue in our analysis.

Table 4: Exposed to the Bombings and Child Height - Other Specifications

	Y = Height-for-Age Z-scores		
	Mother Fixed Effects	Unweighted Regressions	Excluding Teen Mothers
	(1)	(2)	(2)
Exposed to the Bombings	-1.022**	-0.725***	-0.784***
	(0.503)	(0.263)	(0.286)
Observations	1,967	5,266	4,860
Mother Characteristics	X	X	X
Child Characteristics	X	X	X
Fixed Effects	X	X	X

Note: *p<0.1, **p<0.05, ***p<0.01. Robust standard errors are clustered at the residential district level. Each column represents the coefficients in a separate regression. The column headings indicate dependent variables. Mother Characteristics include mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in rural areas, and whether the household is classified as poor. Child Characteristics include child's age in months, squared-age in months, gender, birth order, and whether the child is plural birth. Fixed Effects include birth month-year and residential district fixed effects (mother fixed effects for Column 1).

We also conduct robustness checks on our child's height measures. So far, we have utilized the anthropometric z-score as the measure for child height. Here, we proceed to replace the z-score measure of child's height with other variants and re-estimate the main model. First, in Column 1 of Table 5, we show the estimation using the percentile system. Height-for-Age Percentiles is the outcome variable, which indicates where the child's anthropometric measure ranks within the reference population. Second, we report the estimate using the nutritional status in Column 2 of Table 5. The outcome variable Being Stunt is a zero-one indicator taking the value of one if the

height-for-age z-score is less than -2, according to WHO recommendation. Overall, our findings on the link between in-utero exposure to the bombings and child height-for-age are robust to various measures of child height.

Table 5: Exposed to the Bombings and Child Height - Other Measures

	Height-for-Age Percentiles	Being Stunt
	(1)	(2)
Exposed to the Bombings	-11.200**	0.162***
	(4.831)	(0.053)
Observations	5,266	5,266
Mother Characteristics	X	X
Child Characteristics	X	X
Fixed Effects	X	X

Note: *p<0.1, **p<0.05, ***p<0.01. Robust standard errors are clustered at the residential district level. Each column represents the coefficients in a separate regression. The column headings indicate dependent variables. Mother Characteristics include mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in rural areas, and whether the household is classified as poor. Child Characteristics include child's age in months, squared-age in months, gender, birth order, and whether the child is plural birth. Fixed Effects include birth month-year and residential district fixed effects.

5.4 Falsification Tests

In this section, we further strengthen our argument in the main analysis by performing falsification tests supporting the causal interpretation of our estimated effects. To do so, we turn the exposure dummy to one for children born before the bombings in the affected districts, and zero otherwise. We rerun our most extensive specification (similar to Column 4 of Table 2) with the new exposure variable, *Exposed to the Bombings (Falsification)*, and various height outcomes (i.e. *Height-for-Age Z-scores*, *Height-for-Age Percentiles*, and *Being Stunt*). If local unobserved characteristics are

uncorrelated with the probability of being exposed to the bombings, there should be no relationship between the health outcomes prior to the bombings and the placebo exposure status. In other words, if the bombings indeed have negative impacts on child height, we expect the placebo estimates to be statistically insignificant.

The results are provided in Table 6. The placebo estimates have opposite (wrong) signs and are statistically indistinguishable from zero. Taken together, the results from the falsification exercise suggest that our estimated impacts of in-utero exposure to the bombings on child height could be interpreted as causal.

Table 6: Exposed to the Bombings and Child Height - Falsification Tests

	Height-for-Age Z-scores	Height-for-Age Percentiles	Being Stunt
	(1)	(2)	(3)
Exposed to the Bombings (Falsification)	0.205	3.843	-0.017
	(0.161)	(3.265)	(0.032)
Observations	5266	5266	5266
Mother Characteristics	X	X	X
Child Characteristics	X	X	X
Fixed Effects	X	X	X

Note: *p<0.1, **p<0.05, ***p<0.01. Robust standard errors are clustered at the residential district level. Each column represents the coefficients in a separate regression. The column headings indicate dependent variables. Mother Characteristics include mother's age, squared-age, age at birth, squared-age at birth, years of education, whether the household lives in rural, and whether the household is classified as poor. Child Characteristics include child's age in months, squared-age in months, gender, birth order, and whether the child is plural birth. Fixed Effects include birth month-year and residential district fixed effects.

6 Discussion and Conclusion

In the context of the 2003 Casablanca Bombings in Morocco, we have discovered evidence indicating a negative relationship between in-utero exposure to political violence and child health. In particular, children prenatally exposed to the bombings tend to have height-for-age z-score

lower by 0.743 standard deviations compared to unexposed children. Furthermore, our trimester analysis suggests that it is the first-trimester exposure that has the most devastating repercussions. Our results hold up under a variety of model settings and outcome metrics.

There could be three pathways in which in-utero exposure to the bombings can impair a child's height. First, exposure to the bombings is a stressful event that can put pregnant women under a lot of stress. Stress hormones like norepinephrine and cortisol, which are released during pregnancy, may be particularly damaging to fetal development, compromising child health after birth [4, 5]. In terms of timing, fetal development is especially sensitive to maternal stress during the first trimester rather than the last two trimesters [27, 28]. Therefore, we observe the greatest impacts of first-trimester exposure to bombings.

The second pathway could be the health risks associated with the bombings. The bombings may also lower present living standards, such as overcrowding and lack of access to clean water and sanitation, raising the risk of infectious and communicable diseases [6, 7]. Such complications of diseases during pregnancy can harm fetal development, thus early childhood health [8]. Regarding exposure timing, disease contraction in the first trimester might aggravate the health outcomes of newborns thus child health because many important organs of the fetus are formed during this critical time [29]. As a result, first-trimester exposure to bombings produces the largest consequences.

The third potential pathway can be the lack of important health inputs. If the bombings cause damage to infrastructure and buildings, food supplies and healthcare services may be affected. During pregnancy, nutritional restriction and insufficient prenatal care have been proven to reduce fetal growth and poor delivery outcomes [9, 10]. Such deprivations could be particularly devastating if they occur in the first trimester rather than the remaining ones [30].

Our findings are consistent with earlier studies on child health's vulnerability to extreme events. Negative shocks such as famine, economic difficulty, and extreme weather are just a few examples of negative shocks that can stunt a child's growth and raise their risk of malnutrition [11, 12, 13, 14, 15, 16, 17]. Our findings are also consistent with past research on political violence's health effects. For example, mothers who have experienced political violence during their pregnancy are more likely to have light-weight and slow-growing children [19, 20, 21, 22].

Unfortunately, our study is subject to several limitations. First, due to data limitations, we could not conduct empirical analyses on the mechanisms through which the bombings affect child height. Therefore, we can only provide suggestions for the potential channels based on prior studies. Second, if there exist unobserved characteristics that could jointly affect child height and bombings, our estimates would be biased. Since it is impossible to control for every potential factor, we must follow a common approach in the literature by conducting falsification tests (see Section 5.4). While the results from the tests suggest that local unobserved characteristics are unlikely to be uncorrelated with being exposed to the bombings, we are not entirely certain and the counterfactual can never be observed.

Our research shed light on the less visible but catastrophic effects of political violence on human health in the early stages of life. Consequently, political violence obstructs progress toward not only SDG-16 (peace, justice, and strong institutions) but also SDG-3 (good health and wellbeing). Thus, our findings call for additional efforts on the prevention and mitigation of political violence. Mitigation actions should be implemented quickly and effectively. Food and medical attention for pregnant mothers facing political violence can assist to mitigate the negative consequences on their newborns. Post-violence reconstruction initiatives are also crucial. Children who have been affected by political violence should receive immediate aid from the government.

References

1. Dupuy, K., & Rustad S. A. (2018). Trends in Political violence, 1946-2017. Peace Research Institute Oslo Conflict Trends, pp. 5.
2. United Nations Office for the Coordination of Humanitarian Affairs. (2017). World Humanitarian Data and Trends 2017.
3. Corman, H., Joyce, T. J., & Grossman, M. (1987). Birth outcome production function in the United States. *Journal of Human Resources*, 22: 339-360.
4. Copper, R. L., Goldenberg, R. L., Das, A., Elder, N., Swain, M., Norman, G., ... & National Institute of Child Health Human Development Maternal-Fetal Medicine Units Network. (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.
5. Nkansah-Amankra, S., Luchok, K. J., Hussey, J. R., Watkins, K., & Liu, X. (2010). Effects of maternal stress on low birth weight and preterm birth outcomes across neighborhoods of South Carolina, 2000–2003. *Maternal and Child Health Journal*, 14(2), 215-226.
6. Gessner, B. D. (1994). Mortality rates, causes of death, and health status among displaced and resident populations of Kabul, Afghanistan. JAMA, 272(5), 382-385.
7. Stark, L., Plosky, W. D., Horn, R., & Canavera, M. (2015). 'He always thinks he is nothing': The psychosocial impact of discrimination on adolescent refugees in urban Uganda. *Social Science & Medicine*, 146, 173-181.
8. Silasi, M., Cardenas, I., Kwon, J. Y., Racicot, K., Aldo, P., & Mor, G. (2015). Viral infections during pregnancy. *American Journal of Reproductive Immunology*, 73(3), 199-213.
9. Belkacemi, L., Nelson, D. M., Desai, M., & Ross, M. G. (2010). Maternal undernutrition influences placental-fetal development. *Biology of Reproduction*, 83(3), 325-331.
10. Ramakrishnan, U., Grant, F., Goldenberg, T., Zongrone, A., & Martorell, R. (2012). Effect of women's nutrition before and during early pregnancy on maternal and infant outcomes: a systematic review. *Paediatric and Perinatal Epidemiology*, 26, 285-301.
11. Deschênes, O., Greenstone, M., & Guryan, J. (2009). Climate change and birth weight. *American Economic Review*, 99(2), 211-17.

12. Lazzaroni, S., & Wagner, N. (2016). Misfortunes never come singly: structural change, multiple shocks and child malnutrition in rural Senegal. *Economics & Human Biology*, 23, 246-262.
13. Le, K., & Nguyen, M. (2021). In-utero Exposure to Rainfall Variability and Early Childhood Health. *World Development*, 144, 105485.
14. Le, K., & Nguyen, M. (2021). The Impacts of Temperature Shocks on Birth Weight in Vietnam. *Population and Development Review*.
15. Maluccio, J. A. (2005). *Coping with the "coffee crisis" in Central America: The role of the Nicaraguan Red de Proteccion Social* (No. 583-2016-39624).
16. Page, M., Schaller, J., & Simon, D. (2019). The effects of aggregate and gender-specific labor demand shocks on child health. *Journal of Human Resources*, 54 (1), 37-78.
17. Kiros, G. E., & Hogan, D. P. (2001). War, famine and excess child mortality in Africa: the role of parental education. *International Journal of Epidemiology*, 30 (3), 447-455.
18. Currie, J., Neidell, M., & Schmieder, J. F. (2009). Air pollution and infant health: Lessons from New Jersey. *Journal of Health Economics*, 28(3), 688-703.
19. Bundervoet, T., Verwimp, P., & Akresh, R. (2009). Health and civil war in rural Burundi. *Journal of Human Resources*, 44 (2), 536-563.
20. Mansour, H., & Rees, D. I. (2012). Political violence and birth weight: Evidence from the al-Aqsa Intifada. *Journal of development Economics*, 99(1), 190-199.
21. Le, K., & Nguyen, M. (2020). Political violence and birth weight. *Economics & Human Biology*, 39, 100921.
22. Le, K., & Nguyen, M. (2020). Aerial bombardment and educational attainment. *International Review of Applied Economics*, 34(3), 361-383.
23. Camacho, A. (2008). Stress and birth weight: evidence from terrorist attacks. *American Economic Review*, 98(2), 511-15.
24. Le, K., & Nguyen, M. (2020). Shedding light on maternal education and child health in developing countries. *World Development*, 133, 105005.
25. Field, T., & Diego, M. (2008). Cortisol: the culprit prenatal stress variable. *International Journal of Neuroscience*, 118(8), 1181-1205.

26. Guendelman, S., Lang Kosa, J., Pearl, M., Graham, S., & Kharrazi, M. (2008). Exploring the relationship of second-trimester corticotropin releasing hormone, chronic stress and preterm delivery. *The Journal of Maternal-Fetal & Neonatal Medicine*, 21 (11), 788-795.
27. Schneider, M. L., Roughton, E. C., Koehler, A. J., & Lubach, G. R. (1999). Growth and development following prenatal stress exposure in primates: an examination of ontogenetic vulnerability. *Child Development, 70*(2), 263-274.
28. Van den Bergh, B. R., Mulder, E. J., Mennes, M., & Glover, V. (2005). Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: links and possible mechanisms. A review. *Neuroscience & Biobehavioral Reviews, 29*(2), 237-258.
29. Silasi, M., Cardenas, I., Kwon, J. Y., Racicot, K., Aldo, P., & Mor, G. (2015). Viral infections during pregnancy. *American Journal of Reproductive Immunology, 73*(3), 199-213.
30. Rodriguez-Bernal, C. L., Rebagliato, M., Iniguez, C., Vioque, J., Navarrete-Munoz, E. M., Murcia, M., ... & Ballester, F. (2010). Diet quality in early pregnancy and its effects on fetal growth outcomes: the Infancia y Medio Ambiente (Childhood and Environment) Mother and Child Cohort Study in Spain. *The American Journal of Clinical Nutrition, 91*(6), 1659-1666.