Violence in the United States and Birth Weights: Evidence of differing effects between White and Black Mothers[1]

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Ottawa, Ontario

December 2020

[1] This Major paper is presented to the Department of Economics of the University of Ottawa in partial fulfillment of the requirements of the M.A. Degree

This project is part of a larger project on the impact of violence on health and human capital which Prof. Yazbeck is currently working.

1 Introduction

In the United States of America, black mothers are at a much higher risk of giving birth to a baby that is of low birthweight (LBW), when compared to white mothers. This fact is true even when comparing black and white mothers within similar educational, and income levels (Lhila & Long, 2012).

The weight of a newborn can be a key determinant to the infant's lifetime income and human capital attainment. The adverse health effects of being born LBW can be detrimental to the child's future human capital potential (Baguet & Dumas, 2019). If a child's health is affected adversely by being born with LBW, then it can affect their educational attainment, and consequently, their human capital potential (Almond & Currie, 2011). Those who experience a health insult at a young age may be unable to work or pursue education due to poorer health, their lifetime income will be affected, through both the loss in potential earnings and the direct costs of health care services (Petrou, 2003).

A natural question that arises due to this possibility is: What causes LBW? Studies have found that maternal stress during pregnancy increases the probability of having a child with LBW (Nkansah-Amankara et al. 2010). A well-known cause of stress is the risk of violence. Pregnant women who have been exposed to terrorist attacks and homicides experience stress and fear that can negatively affect the birthweight of their in-utero child (Camacho, 2008; Kane, 2011; Mansour & Rees, 2012; Koppensteiner & Manacorda, 2016; Brown, 2018).

Moving past just the lifetime of a child born with LBW, there is also evidence that people with LBW are at a higher risk to have children of their own who are of LBW and may have poorer health as a result (Currie & Moretti, 2007; Kreiner & Sievsersten, 2020). This intergenerational result implies that a group that experiences many LBWs will have their educational attainment severely curbed, which truncates potential earnings as a result. This relationship serves as the motivation for this paper. If there exists an intergenerational transmission of low birthweights and there is an impact of birthweight on education and earnings, then a community who is suffering from a high proportion of babies born with LBWs would see its social mobility affected. In a context where black mothers have a much higher chance of giving birth to LBW than white mothers, racial disparity in birthweights between white and black mothers could be seriously affecting the black community's human capital potential.

To investigate this possibility, we utilize 1989-1991 Linked Birth/Infant Death Data from the U.S. Department of Health and Human Services, National Center of Health Statistics and 1988-1991 Uniform Crime Reporting (UCR) Program Data, Supplementary Homicide Reports from the U.S. Department of Justice Federal Bureau of Investigation. Our measure of violence in this case is homicides that occurred in counties during a woman's pregnancy.

By regressing homicide intensity in each trimester of pregnancy on birthweight, we find that an increase in homicide intensity during a pregnancy's first trimester is associated with an increase in birthweight, while an increase in homicide intensity during the second trimester is associated with a decrease in birthweight. The positive effect in the first trimester may be due to exposed mothers believing that the first trimester is essential in their child's health and subsequently, seeking out additional, unobserved, protective measures to remedy the adverse effects. Our results in the second trimester are stronger for black mothers than white mothers, suggesting that black mothers may be more stressed about homicides than white mothers. We also obtain that this effect only holds among mothers who are married, presenting the possibility that black mothers may be more stressed that their spouse will fall victims to a homicide. This points to future research into how homicides affect women from different neighbourhoods within counties.

This paper proceeds as follows: Section 2 is a review of previous literature, Section 3 presents our data, Section 4 lays out our model specifications, Section 5 presents our results, and Section 6 concludes.

2 Literature Review

This paper contributes to two growing, and related, literatures within health economics. First, we contribute to literature related to the fetal origin hypothesis, that *in utero* exposure to adverse events, such as violence, can affect the human capital potential of the child. Second, we add to the literature concerning the health disparities between white and black mothers, and their children.

What influences birth weights and the lasting effects of an infant being born with a low weight has been studied extensively. The fetal origin hypothesis is one of the main topics that is touched upon in health economics. The fetal origin hypothesis looks at how *in utero* exposure to harmful events, such as a mother's tobacco and alcohol consumption, maternal stress, and malnutrition, can affect the health of fetuses (Karp et al. 1995; Nkansah-Amankra, 2009; Almond & Mazumder, 2011; Almond et al. 2011). All of these harmful events have been linked to the probability of LBW, which is one way these events affect the infant's health.

The health production function is a main driver of a person's potential educational attainment and future earnings. LBWs are proven to be linked with lower educational attainment, and future earnings (Black et al., 2007). The adverse event that we will focus on is maternal stress.

Specifically, we are interested in how stress that is caused by exposure to violent crime, such as homicides, can negatively affect birthweights.

Below, we will look into other papers that examine how violence while *in utero* may cause adverse birth outcomes. We will begin by solidifying the negative relationship between violence and birthweights, then highlighting that the effect is more pronounced among women of lower socioeconomic status, and finally showing that this finding also holds in more developed nations, such as the United States, giving us a basis for this study.

Mansour and Rees (2012) look at the relationship between physical violence, and birth weights. This study focuses on women living in the West Bank and Gaza who were pregnant during the time of this Intifada. The non-combatants during this conflict were subject to large amounts of stress due to the nature of how violence occurred, i.e., mainly random guerilla attacks that were difficult to predict. Civilians were also subject to low nutrition, due mainly to roadblocks and border closures during the conflict. Finally, pregnant mothers located in Gaza and the West Bank had extremely limited access to prenatal care due to checkpoints, roadblocks, and curfews imposed during this conflict (Mansour & Rees, 2012, p. 191-2). These three factors have been proven to significantly increase the likelihood of an infant being born with LBW. The authors use data from the 2004 Palestinian Demographic and Health Survey (PDHS), which has information about education, marital status, residence location, birthdates, and birthweight, measured in grams. The sample included 1 224 childbirths from April 2001 to June 2004, with 65% of the respondents living in the West Bank, and the remaining 35% living in Gaza. To quantify violence during the Intifada, the authors used fatality data from B'Tselem, the Israeli Information Center for Human Rights in the Occupied Territories, which has monthly information on the number of Palestinians who were killed by Israeli security forces, broken down by district (p. 192). With this data, the authors were able to assign conflict intensity, measured by the number of fatalities, that was experienced during each trimester of each mother's pregnancies during the Intifada. The authors then regressed birthweight on the three trimester conflict intensities, as well as various control variables that account for maternal health and socioeconomic status. A notable limitation to this model, as stated by the authors, is that the data used does not have income or wealth data, which has been shown to have a large influence on birthweights (p. 193). The authors find that an increase in fatalities during the first trimester of pregnancy leads to a decrease in birthweight, and an increase in the probability of giving birth to a child with LBW (p. 198). The authors attribute this finding mainly to the psychological stress that is caused by an increase in conflict intensity. Although this finding is interesting and relevant for our hypothesis, the authors also acknowledge that their result may be skewed by the prevalence of malnutrition during the Intifada (Mansour & Rees, 2012, p. 193). Since the data used in this study only had limited information about nutrition, the results my be biased downwards.

Another notable study done was by Koppensteiner and Manacorda (2016). The authors look at how municipal homicide rates in Brazil affect a variety of birth outcomes, such as birthweight, gestation length, miscarriage, fertility, and choice of abortion. The data used in this study are from the Brazilian Ministry of Health between 2000 and 2010. These are microdata that have information about birth date and location, birthweight, socioeconomic status, race of the newborn, and maternal health (p. 19). The mortality data that the authors used were death certificates from DATASUS that were collected during 2000-2010. These certificates had information about the location, date, and cause of death. Using this information, the authors were able to construct homicide rates during each mother's pregnancy, based on the homicides that occurred in their municipality whilst they were pregnant, separated by trimester. In an attempt to identify a causal relationship between homicides and birthweights, the authors use a difference-in-difference specification. The authors argue that there is a causal relationship if mothers in the same municipality have similar birthweights, except when being exposed to different rates of homicides during their pregnancy. The authors find that exposure to higher homicide rates during a mother's first trimester has a significant and negative effects on the birthweight of the newborn. An interesting aspect of these results are the differences in these effects between smaller municipalities and cities in Brazil. The effect in small municipalities is larger than the one seen in Fortaleza, a large city in Brazil (p. 29). The authors argue that this is because homicides are much rarer in small municipalities than in Fortaleza, which has one of the highest homicide rates in the world. As homicides are rarer in small municipalities, it is likely that they cause more stress to mothers when they do indeed happen. Although this argument does seem convincing, the different results between small municipalities and Fortaleza brings into question how different groups of people may be affected by violence more starkly than others.

Torche and Villarreal (2014) also looks at how homicides affect birthweights but is focused on Mexico. This study uses approximately 2 million singleton birth certificates in Mexico between January 2008 and December 2010, which has infant information, such as weight, gestation length, and date of birth. The certificates also have information about the mother, such as age and education. The homicide data that the authors used were from the Mexican National Institute for Statistics and Geography, which compiles all fatalities that occur in Mexico. The homicide data includes cause of death, date of death, and the municipality where the fatality occurred. These data enabled the authors to calculate the homicide rate during each trimester in each mother's municipality. The authors then regress birthweight on the homicide rates during each trimester, controlling for socioeconomic status, with month and municipality fixed effects. Contrary to what previous studies have found, the results of this study show that exposure to homicides in the first trimester of pregnancy led to an increase in birthweight, as opposed to a decrease that is generally seen in the literature. The authors argue that this result is due to mothers who are exposed to violence subsequently pursuing more prenatal care visits in order to offset potential adverse effects of exposure (p. 788). Other important aspects of these results are the differences between women from different socio-economic statuses. The authors found that women from a lower socioeconomic status, living in urban areas are affected more severely than other women, highlighting the possibility that these women are self-aware that they are more vulnerable to these exposures and change their behaviours in order to offset the potential risk.

Another study that was focused on Mexico is Brown (2018). This author used homicide data from the Mexican National Institute of Statistics and Geography (INEGI), and birth data from the Mexican Family Life Survey (MxFLS), which contained a sample size of 1 868 live births between 2002 and 2009. Using this data, the author was able to compute homicide rates in each municipality during each mother's various trimesters. Using this, the author regressed birthweight on each trimester's homicide rate, with municipality and time fixed effects, while also controlling for socioeconomic status, and maternal health. The authors found that an increased homicide rate during a mother's first and second trimester leads to a decrease in birthweight, which is aligned with the majority of the literature. The author argues that its results differ from Torch and Villarreal (2014), because he has included controls for maternal migration as homicides increase. A result that is also in line with the literature, and important for this paper, is that this effect is more pronounced for women of lower socioeconomic status, again highlighting the possibility that people who are less advantaged are more vulnerable to local violence (p. 335).

Up to now we have looked at studies that focus more on lower income economies. These results have mainly been that exposure to violence has a negative effect on birthweights, this effect being more pronounced during early stages of pregnancy, and to women who are of lower socioeconomic status. A possible problem with these findings is that people from lower socioeconomic status in lower income economies are much worse off than people who would be considered having a low socioeconomic status in a high-income economy, such as the United States. In order to examine this effect in the USA and give a foundation to our research question, we must look into studies that have been conducted within the USA.

Morenoff (2003) gives a good introduction to how the neighbourhood that a pregnant woman lives in can affect the birthweight of their child, in an American context. In this study, the author focuses on different neighbourhoods in Chicago and studies the various effects of violent crime, and social engagement within the community. This study also highlights the importance in socioeconomic status in birthweight but goes further into explaining why a lower socioeconomic status may affect birthweight. Specifically, the author states that lower socioeconomic status neighbourhoods have a higher rate of crime, which can cause a high amount of stress to mothers, not only because of personal risk, but risk to loved ones living in the same neighbourhood (p. 982). This risk of crime combined to a low level of social interaction and institutions can lead to an ever-higher amount of stress, which can negatively affect a fetus that is *in utero*, seen by lower birthweights. The data that the author uses in this study are from the 1995-1996 Chicago vital statistics, 1990 United States census, 1995 Chicago Police Crime Statistics, and the 1995 Project on Human Development in Chicago Neighborhoods. The sample excluded multiple births, and missing birthweights, which resulted in a sample of 101 662 births in the two years of data. To examine the effects of neighbourhood characteristics on birthweights, the author ran an OLS specification with birthweight being used the outcome, and another logit specification, with a binary outcome of LBW, where the outcome is equal to 1 if an infant is born with a weight below 2 500g, and 0 otherwise. The authors find that without violence included in their model, the most significant factors to low birthweights in a neighbourhood are the percentage of black people that make up the neighbourhood, poverty, and housing stability. Once the model adds violent crime and social capital, which are both highly significant, the significance of poverty and housing disappear but not the significance of the black population proportion. This result suggests at the possibility of black people being affected more than other racial groups by violent crime.

Kane (2011) also investigates the relationship between neighbourhood violence and low birthweights but focuses solely on disadvantaged communities in the District of Columbia (DC). The author used data from 2000-2002 which contained 22 008 singleton births from the DC Department of Health (p. 1587). Using a model similar to Morenoff (2003), the author regressed a continuous birthweight variable, measured in grams, on violent crime rates and structural disadvantage, as well as controlling for many socioeconomic and health variables. The author measured structural disadvantage by the percentage of households who were in poverty, black, female-headed, received public assistance, and were above the age of 25 without a high school diploma. This measure resulted in an index variable increasing as structural disadvantage became stronger. The author's main finding is that violent crime, structural disadvantage, and the interaction between violent crime and disadvantage has a significant and negative effect on birthweights. More relevant to the present study, the author goes further into their analysis by separating their sample into three subsamples, separating white mothers, black mothers, and Hispanic mothers. The results previously found remained significant for black and Hispanic mothers but were rendered insignificant for white mothers (p. 1590). This result highlights that the impact of violent crime is felt more dramatically by black mothers and their children, than by white mothers. If this is the case, then violence may be directly affecting the birth outcomes of black infants, and subsequently damaging the human capital potential of the black population in a major way.

There is substantial evidence of a racial gap in birthweights between white mothers and black mothers, alluding to the fact that the black population's human capital could be negatively affected as a result. As seen in Lhila & Long (2012), black mothers, compared to white mothers, are 6.8 percentage points more likely to give birth to a baby that is characterised as having a low birthweight, that is, a new-born that weighs less than 2 500 grams. In this paper, the authors use an Oaxaca-Blinder method as the dependant variable in order to explain this disparity and identify the factors that drive this difference. In order to attempt to explain what drives the gap, the authors control for socioeconomic status, such as education, income, and marital status. The authors also control for maternal health, such as gestation length, birth order, and tobacco and alcohol use. Finally, they include community characteristics such as unemployment rate, population, and racial diversity. The data used in this study are Natality Detail Files from 1991 and 2001, limited to mothers who had single infant births, and live in a metropolitan statistical area. The rationale for doing this is because twin or multiple infant births are more likely to be LBW, and the Natality Files that the authors used do not have county identifiers for counties who have a population less than 100 00 people. These restrictions left the sample to be composed of 290 615 white births, and 257 131 black births. The authors found that the main factor that influences the racial gap in birthweights are socioeconomic factors, accounting for 21.4% of the difference. Specifically, the paper points to mother's education, marital status, father's age, and income, as being the main drivers. Although the authors do point to other factors such as prenatal care and maternal health as factors that explain the racial gap, the observable characteristics included in this study explain only 27% of the 6.8% difference in the birthweight gap between white and black mothers (p. 312). This paper gives a good insight into some potential reasons why black infants, on average, are born with a lower birthweight, but leaves most of the gap unexplained.

This gap in the literature brings us to our contribution. To our knowledge, no study has focused solely on the different effects that violent crime has on white and black birthweights. This study attempts to explain a previously unexplained portion of the racial birthweight disparity, and consequently, explain how black mothers and their children's human capital potential are more vulnerable to violent crime shocks than white mothers and their children.

3 Data

The birth data that are used in this study are county-level microdata from the U.S. Department of Health and Human Services, National Center of Health Statistics. The 1989-1991 Linked Birth/Infant Death Data was pulled online from the Inter-University Consortium for Political and Social Research (ICPSR). The birth data sets include approximately 4 million births per year, totaling 12 324 525 births over the three years of data. The data has information on the mother's and father's race and ethnicity. The data identifies mothers who are non-Hispanic white and non-Hispanic black. This data also includes various socioeconomic information, such as mother's and father's years of education, and age, and whether the mother is married or unmarried. These data also include maternal health variables such as length of gestation in weeks, mother birth order, and weight gain during pregnancy. A number of choice factors were also included, namely, the number of prenatal care visits and the month the care began, as well as if a mother smoked, or drank alcohol during pregnancy.

To focus on the differences between only white and black mothers, the sample was restricted to only include non-Hispanic white and non-Hispanic black mothers. In order to exclude outliers from our sample, infants that were born below 300g and infants born weighing more than 7 000g were both excluded from the sample. To follow the previous literature, only singleton births were included. This was done because births of twins, triplets, etc., tend to have lower birthweights. The sample was also restricted by county size. The county identifiers are only included for counties with a population that is over 200 000 people because counties with a population below that threshold are marked with a “999”, making it impossible to assign mothers in these smaller counties with a Federal Information Processing Standards (FIPS) geographic code. With the additional omission of missing values, these exclusions led to a sample of 2 013 812 white mothers and 370 019 black mothers, resulting in a repeated cross section of 2 383 831 births. The Linked Birth/Infant Death Data also includes the month and year of birth, making it possible to compute the months that a mother was pregnant. To do this, the birth month of each observation was subtracted by 1 to compute the last month pregnancy, by 2 to compute the eighth month of pregnancy, and so forth. As an example, a mother who gave birth in September of 1990 was likely in the second month of pregnancy in February of 1990. To compute this, the birth month of September 9, would be subtracted by 7 in order to find what month this mother was in her second month of pregnancy, February, or 2. This was done for each observation, and computed for all 9 months of pregnancy.

The homicide data used are the 1988-1991 Uniform Crime Reporting (UCR) Program Data, Supplementary Homicide Reports from the U.S. Department of Justice, Federal Bureau of Investigation, also pulled online from the ICPSR. The four years of data include information on 100 122 homicides that took place across the United States. These homicides include murders, non-negligent killings (manslaughter), negligent killings, and justifiable homicides. Unfortunately, the UCR does not use FIPS codes to identify each county, but they use a separate UCR county code. To overcome this, the UCR's successor, the 1991 National Incident-Based Reporting System administrative data, were used. This dataset has information about each law enforcement agency, and assigns both a FIPS code and a UCR code to identify the county that the agency is located in. Using this information, it was possible to merge the FIPS information with the UCR homicide data so that each homicide was assigned a FIPS code that can be matched to a mother's county of residence.

In order to obtain homicide counts per trimester, the UCR data was used to compute the number of homicides in each county, in each month. This variable was then merged with the Linked Birth/Infant Death Data, which resulted in having the number of homicides that occurred during each month of a mother's pregnancy. These numbers were then summed up to create homicides counts for each trimester. Specifically, the number of homicides that occurred in a mother's first month of pregnancy in their county of residence were added to the second and third month of a mother's pregnancy to end up with the number of homicides that occurred in a mother's county of residence during their first trimester. This was also done to compute the number of homicides in a mother's county of residence during their second and third trimester.

Finally, 1988-1991 U.S. census data was used to find yearly populations for each county, as well as the black population in each county. This information was merged using the year and FIPS code of each county. Table I shows summary statistics for each variable used in this analysis. Column 1 shows the mean and standard deviations for black mothers, while Column 2 shows the same for white mothers. Column 3 shows the difference in means between these two subgroups and the significance of the difference. It is clear that the differences between these two subgroups are significant for all of these variables. Column 3 specifically shows that black mothers, on average, give birth to infants that weigh 260.1g less than white mothers. Black mothers are exposed to slightly more homicides in each trimester of pregnancy. Black mothers have almost one year less of education than white mothers, and they tend to give birth about 2.3 years earlier than white mothers. The difference between fathers' age and years of education is roughly similar to the differences in the mothers, although a bit more pronounced in education, and less so in age. An exceptionally large discrepancy is in the marital status of the two subgroups. Only 61.4% of black mothers are married when they give birth, compared to 92.7% of white mothers. In terms of maternal health, white mothers have a longer length of gestation, on average, than black mothers, although both groups do come to full-term, on average (>36 weeks). Black mothers have also given birth to more children than white mothers, and do not gain as much weight during pregnancy as white mothers. White mothers begin prenatal care earlier, as well as have a higher number of prenatal visits than black mothers. It also shows that black mothers do not participate as heavily as white mothers in unhealthy behaviors, specifically smoking and drinking during pregnancy. Finally, black mothers tend to reside in counties with higher populations, and higher proportions of black populations than white mothers.

Table I - Descriptive Statistics of White and Black Mothers

	Black Mothers	White Mothers	Difference
	(1)	(2)	(3)
Birthweight (Grams)	3195.0	3455.0	260.1***
	(609.1)	(544.5)	(261.99)
# of Homicides in 1st Trimester	3.824	3.709	-0.115**
	(24.78)	(22.2)	(-2.85)
# of Homicides in 2nd Trimester	4.383	4.155	-0.228***
	(29.97)	(26.37)	(-8.88)
# of Homicides in 3rd Trimester	4.826	4.602	-0.224**
	(34.27)	(30.3)	(-4.05)
Exposed to a Homicide in any Trimester	0.282	0.315	0.0330***
	(0.45)	(0.464)	(39.97)
Mother's Years of Education	12.75	13.59	0.842***
	(2.042)	(2.222)	(214.46)
Mother's Age	25.94	28.24	2.301***
	(5.762)	(5.19)	(243.49)
Marital Status	0.614	0.927	0.314***
	(0.487)	(0.259)	(573.09)
Father's Age	28.63	30.56	1.923***
	(7.106)	(5.897)	(176.28)
Father's Years of Education	12.72	13.8	1.078***
	(1.991)	(2.333)	(264.04)
Length of Gestation (Weeks)	38.68	39.41	0.732***
	(3.014)	(2.209)	(173.95)
Mother's Birth Order	2.679	2.303	-0.377***
	(1.665)	(1.385)	(-147.07)
Mothers Weight Gain during Pregnancy	29.64	31.19	1.542***
	(13.02)	(11.05)	(75.76)
Number of Prenatal Visits	10.81	12.12	1.317***
	(4.493)	(3.542)	(198.73)
Month Prenatal Care Began	2.803	2.265	-0.538***
	(1.657)	(1.206)	(-233.87)
Infant is Male	0.509	0.514	0.00416***
	(0.5)	(0.5)	(4.65)
Smoke during Pregnancy	0.135	0.171	0.0362***
	(0.341)	(0.377)	(54.55)
Alcohol use during Pregnancy	0.029	0.0416	0.0126***
	(0.168)	(0.2)	(36.04)
County Population	1396574.4	1023641	-372933.4***
	(1406763)	(1059353.5)	(-186.10)
Black Population	362082.6	177750.6	-184332.0***
	(389977.8)	(300683.8)	(-325.93)
Black Population Proportion	0.256	0.139	-0.117***
	(0.149)	(0.116)	(-539.65)
Observations	370 019	2 013 812	2 383 831

Columns (1) and (2) present mean coefficient; standard deviations in parentheses. Column (3) presents difference in mean coefficient; t-statistics in parentheses. Column (3) *p<0.05, **p<0.01, ***p<0.001

4 Empirical Strategy

Our baseline estimation is the following:

$$(1)\ b_{ijt} = \beta_o + \beta_1 E_{ij(9-1\ months\ before\ t)} + \gamma_1 X_i + \gamma_2 Y_{it} + \delta_t + \theta_j + \varepsilon_{ijt}$$

b_{ijt} is the birthweight of a baby born to mother *i,* in county *j*, in month *t*. Parameter $E_{ij(9\text{-}1\ months\ before\ t)}$ is a dummy variable that is equal to one if a homicide occurred in mother *i*'s county of residence *j*, during any trimester of the mother's pregnancy. That is, $E_{ij(9\text{-}1\ months\ before\ t)}$ is equal to one if there was a homicide at any time during a mother's pregnancy. As for X_i, it is a vector of sociodemographic control variables to account for differences in a mother's and father's years of education and age, mother's marital status, and sex of the infant[2]. Also, we denote by Y_{it} the vector of maternal health variables that control the length of gestation, number of prenatal care visits, the month prenatal care began, a mother's total birth order, a mother's weight gain during pregnancy, and dummies for whether the mother smoke or drank alcohol during pregnancy. Finally, δ_t and θ_j denote year fixed effects and county fixed effects respectively, and ε_{ijt} is a random error term.

This specification will first be estimated separately by restricting the sample to non-Hispanic Black mothers, and then to non-Hispanic White mothers. This is done in order to see the different effects that homicides may have on Black and White babies' birthweight.

Our coefficient of interest is β_1 as it measures the effect of a homicide that occurs during a mother's pregnancy on the birthweight of babies born in month *t*. Based on the previous literature, we expect that β_1 will be negative, and larger in magnitude for black mothers than white mothers.

[2] The Linked Birth/Infant Death Data did not have information about income, this socioeconomic status indicator is captured through years of education.

Given that exposure to violence may impact the infant differently depending on the trimester in which the mother was exposed to stress, we disaggregate our baseline estimation (1) by separating our coefficient of interest into the three trimesters:

$$(2)\ b_{ijt} = \alpha_0 + \alpha_1 E_{ij(9-7\ months\ before\ t)} + \alpha_2 E_{ij(6-4\ months\ before\ t)} + \alpha_3 E_{ij(3-1\ months\ before\ t)} + \gamma_1 X_i + \gamma_2 Y_{it} + \delta_t + \theta_t + \varepsilon_{ijt},$$

where $E_{ij(9\text{-}7\ months\ before\ t)}$ is a dummy equal to one if there was a homicide in county j during the mother i's first trimester. The dummy variable $E_{ij(6\text{-}4\ months\ before\ t)}$ corresponds to a homicide occurring during mother i's second trimester in their county of residence j. Finally the dummy variable $E_{ij(3\text{-}1\ months\ before\ t)}$ corresponds to if a homicide occurred during the mother's third trimester. The control and fixed effects are the same as in equation (1). This specification will again be estimated separately for black and white mothers, in order to see the difference in effects. We expected that the parameters estimated for black mothers to be negative, and higher in magnitude than for white mothers.

A limitation of using a dummy for exposure to one or more homicide says nothing about the intensity of violence that a mother is exposed to. This is problematic, as a higher level of homicides is likely to have a different, and larger impact on maternal stress and birthweights. In counties with relatively higher populations, a mother may not even be aware of one homicide taking place within their county of residence. To investigate how different levels of homicide intensity affects birthweights, we repeat our baseline specification, but now use the homicide rate per thousand people as our exposure variable. This intensity variable was constructed by dividing the number of homicides during a mother's pregnancy by their county of residence's population, and scaling this decimal by 1000. Equation 3 presents this specification.

$$(3)\ b_{ijt} = \emptyset_o + \emptyset_1 P_{ij(9-1\ months\ before\ t)} + \gamma_1 X_i + \gamma_2 Y_{it} + \delta_t + \theta_j + \varepsilon_{ijt}$$

$P_{ij(9\text{-}1\ months\ before\ t)}$ is the homicide intensity that mother *i* was exposed to in county of residence j, during pregnancy. The vector of controls and fixed effects are the same as in the previous equations. We hypothesize that the coefficient of interest, $\emptyset_1$, will be negative. Since equation (3) will also be estimated separately for black and white mothers, we expect that the coefficients estimated for black mothers will be higher in magnitude than the one estimated for white mothers.

As we did for our first baseline estimation, we further disaggregate our independent variable by trimesters in order to obtain more information about the effect of homicide intensity that a mother is exposed to throughout pregnancy on infant birthweight.

$$(4)\ b_{ijt} = \pi_0 + \pi_1 P_{ij(9-7\ months\ before\ t)} + \pi_2 P_{ij(6-4\ months\ before\ t)} + \pi_3 P_{ij(3-1\ months\ before\ t)} + \gamma_1 X_i + \gamma_2 Y_{it} + \delta_t + \theta_t + \varepsilon_{ijt}$$

$P_{ij(9-7\ months\ before\ t)}$, $P_{ij(6-4\ months\ before\ t)}$, and $P_{ij(3-1\ months\ before\ t)}$ is the homicide rate per thousand people that occurred in mother *i*'s county of residence *j*, during the mother's first, second, and third trimester, respectively. The vector of controls and fixed effects are the same as in the previous specifications. Based on the previous literature, we expect the coefficient π_1 to be negative and higher in magnitude than the other pi's. That is, exposure to higher intensity of homicides in the first trimester most adversely affects birthweights. We also expect this effect to be higher in magnitude for black mothers than for white mothers.

5 Empirical Results

The results of the estimation of equation (1) are presented in Table II. Columns 5 and 10 show the ideal specification for black and white mothers respectively, with all controls and fixed effects included. As seen by the estimated coefficient on the homicide exposure dummy, the sign of the estimate is in the opposite direction of the hypothesized result for black and white mothers. Interestingly, giving birth to an infant that is male has a strong, positive effect on birthweight. Not surprisingly, smoking during pregnancy is related strongly to a decrease in birthweight.

It is important to note that the results in Table II have the independent variable of interest as a dummy equal to one if a mother is exposed to one homicide or more at any time during their pregnancy. This is potentially problematic, as effects can differ in each trimester, and with differences in the intensity of exposure; exposure to a high number of homicides likely has a larger impact on maternal stress than only one homicide.

Table II - Effect of Exposure to Homicides on Birthweight (Grams)

VARIABLES	(1) Black Mothers	(2) Black Mothers	(3) Black Mothers	(4) Black Mothers	(5) Black Mothers	(6) White Mothers	(7) White Mothers	(8) White Mothers	(9) White Mothers	(10) White Mothers
Exposed to a Homicide in any Trimester	6.926	6.873	6.860**	7.191**	5.170*	1.039	-2.170	-0.814	-0.643	1.215
	(8.934)	(4.657)	(3.429)	(3.438)	(2.751)	(5.380)	(5.480)	(5.169)	(5.188)	(1.633)
Smoke during Pregnancy		-181.0***	-175.9***	-176.2***	-173.8***		-234.3***	-209.3***	-209.4***	-213.5***
		(4.138)	(4.834)	(4.871)	(4.427)		(4.223)	(4.187)	(4.195)	(3.453)
Infant is Male			119.3***	119.3***	119.4***			137.9***	137.9***	137.8***
			(1.568)	(1.567)	(1.577)			(0.755)	(0.754)	(0.757)
Constant	3,193***	-1,069***	-1,314***	-1,311***	-1,313***	3,455***	-986.7***	-1,332***	-1,330***	-1,308***
	(9.184)	(29.61)	(38.50)	(38.46)	(36.84)	(4.412)	(33.82)	(34.68)	(34.85)	(33.42)
Observations	370,019	370,019	370,019	370,019	370,019	2,013,812	2,013,812	2,013,812	2,013,812	2,013,812
R-squared	0.000	0.338	0.351	0.351	0.353	0.000	0.261	0.280	0.280	0.285
Socio-Demographic Controls	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	Yes	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Exposure Dummy is equal to 1 if a mother was exposed to any homicides in any trimester
Standard errors are clustered at the county level

To investigate this possibility, Table III presents results of being exposed to homicides, disaggregated by trimester. As in Table II, columns 5 and 10 present the results of our preferred specification for black and white mothers, respectively. Consistent with Table II, white mothers are not significantly affected by an exposure to homicides. Surprisingly, an exposure to a homicide in the third trimester significantly increases the birthweight of infants born to black mothers, while exposure in the other two trimesters were not statistically significant. We have looked at the possibility of mothers who gained more weight during pregnancy driving these results by running this specification in subsamples of various weight gains. We found that contrary to our expectations, women who gained less weight are in fact driving these results. At this point, we do not have an interpretation or explanation of these results and we would like to remain cautious by not interpreting them.

Table III - Effect of Exposure to Homicides on Birthweight (Grams)

VARIABLES	(1) Black Mothers	(2) Black Mothers	(3) Black Mothers	(4) Black Mothers	(5) Black Mothers	(6) White Mothers	(7) White Mothers	(8) White Mothers	(9) White Mothers	(10) White Mothers
Exposure in 1st Trimester	5.144	2.705	1.273	1.402	3.189	-3.327	-3.802	-3.098	-3.042	-0.389
	(5.475)	(2.807)	(2.550)	(2.522)	(2.345)	(2.898)	(3.113)	(2.915)	(2.918)	(1.706)
Exposure in 2nd Trimester	-0.750	0.607	-0.0608	-0.0114	1.156	1.019	-1.610	-1.022	-0.972	0.374
	(4.707)	(3.423)	(3.231)	(3.197)	(3.117)	(2.923)	(2.929)	(2.744)	(2.746)	(1.537)
Exposure in 3rd Trimester	12.31**	8.007**	6.935**	6.846**	7.088**	1.088	-0.800	-0.452	-0.517	0.922
	(5.509)	(3.303)	(2.983)	(3.037)	(3.122)	(3.040)	(2.994)	(2.848)	(2.854)	(1.836)
Smoke during Pregnancy		-180.8***	-175.8***	-176.1***	-173.8***		-234.3***	-209.4***	-209.5***	-213.5***
		(4.154)	(4.826)	(4.868)	(4.425)		(4.213)	(4.180)	(4.189)	(3.453)
Infant is Male			119.3***	119.3***	119.3***			137.9***	137.9***	137.8***
			(1.570)	(1.569)	(1.579)			(0.755)	(0.755)	(0.757)
Constant	3,192***	-1,069***	-1,313***	-1,311***	-1,320***	3,455***	-986.1***	-1,331***	-1,329***	-1,308***
	(9.150)	(29.60)	(38.49)	(38.39)	(36.34)	(4.260)	(33.85)	(34.75)	(34.94)	(33.28)
Observations	370,019	370,019	370,019	370,019	370,019	2,013,812	2,013,812	2,013,812	2,013,812	2,013,812
R-squared	0.000	0.338	0.351	0.351	0.353	0.000	0.261	0.280	0.280	0.285
Socio-Demographic Control	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Exposure Dummies are equal to 1 if a mother was exposed to any homicide in the respective trimester
Standard errors are clustered at the county level

As stated above, a notable limitation to this specification is the fact that the dummy variables are equal to one if a mother is exposed to one or more homicides in the respective trimester. Table IV presents the results of specification (3). Columns 5 and 10 present the effect that homicide intensity has on birthweights. As hypothesized, black mothers are negatively impacted by an increase in the homicide intensity in their county of residence. Specifically, an increase of one in the homicide rate per thousand people, while a black mother is pregnant, is associated with a decrease in infant birthweight by approximately 17.23 grams. White mothers are also negatively impacted by an increase in homicide intensity, but as predicted, are affected less severely, although a decrease of 13.6 grams is still a large effect. Table IV verifies that black mothers are affected at an overall higher magnitude by violent crime during pregnancy than white mothers.

Table IV - Effect of Homicide Intensity on Birthweight (Grams)

VARIABLES	(1) Black Mothers	(2) Black Mothers	(3) Black Mothers	(4) Black Mothers	(5) Black Mothers	(6) White Mothers	(7) White Mothers	(8) White Mothers	(9) White Mothers	(10) White Mothers
Homicide Intensity	24.30**	5.099	-2.132	-1.430	-17.23**	26.31*	17.55	19.46*	20.02*	-13.60**
	(11.33)	(5.010)	(3.437)	(3.375)	(8.018)	(14.12)	(12.34)	(10.09)	(10.25)	(5.964)
Smoke during Pregnancy		-181.0***	-176.0***	-176.3***	-173.8***		-234.2***	-209.3***	-209.3***	-213.5***
		(4.154)	(4.857)	(4.898)	(4.421)		(4.236)	(4.207)	(4.215)	(3.453)
Infant is Male			119.3***	119.3***	119.3***			137.9***	137.9***	137.8***
			(1.568)	(1.566)	(1.578)			(0.755)	(0.755)	(0.757)
Constant	3,194***	-1,067***	-1,312***	-1,310***	-1,305***	3,455***	-987.5***	-1,333***	-1,331***	-1,304***
	(7.934)	(29.79)	(38.59)	(38.47)	(36.91)	(3.532)	(33.62)	(34.48)	(34.67)	(33.72)
Observations	370,019	370,019	370,019	370,019	370,019	2,013,812	2,013,812	2,013,812	2,013,812	2,013,812
R-squared	0.000	0.338	0.351	0.351	0.353	0.000	0.261	0.280	0.280	0.285
Socio-Demographic Controls	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Standard errors are clustered at the county level

To obtain more precise results, we disaggregate this specification by trimester and estimate specification (4). Columns 5 and 10 of Table V presents the results of equation (4). Interestingly, there is a positive and significant increase in birthweight when a black mother is exposed to a higher intensity of homicides in the first trimester. Similar to Torche & Villareal (2014), this could be the case of mothers believing that first trimester conditions are indicative to birth outcomes, so those who are exposed to high amounts of homicides seek additional protective care that we have not controlled for. Since these mothers are living in the United States, care would be much more easily accessed than previous study locations, providing merit to this possibility. Conversely, we see a negative and significant decrease in birthweight as a black mother is exposed to a higher intensity of homicides in the second trimester, decreasing birthweight by approximately 86.98

grams with a one unit increase in the homicide rate per thousand people. Mothers exposed in the second trimester may not believe that adverse events in the second trimester are as likely to affect birthweights, and so do not seek additional care. This second trimester effect is also larger than the positive effect we observe in the first, suggesting that the results found in Table IV are driven by the second trimester. The coefficient corresponding to the third trimester is positive, but not significant. For white mothers, we observe results where there is a positive and significant result in the first trimester, but a negative and significant effect in the second. White mothers also see a negative and marginally significant effect in the third trimester.

Table V - Effect of Homicide Intensity on Birthweight (Grams)

VARIABLES	(1) Black Mothers	(2) Black Mothers	(3) Black Mothers	(4) Black Mothers	(5) Black Mothers	(6) White Mothers	(7) White Mothers	(8) White Mothers	(9) White Mothers	(10) White Mothers
1st trimester Homicide Intensity	177.2***	97.08***	81.32***	74.57***	48.71**	95.15**	91.05***	102.6***	98.43***	25.66***
	(36.66)	(18.14)	(11.15)	(11.60)	(22.46)	(36.80)	(25.94)	(21.89)	(21.23)	(7.860)
2nd trimester Homicide Intensity	-105.0***	-87.36***	-86.93***	-90.06***	-86.98***	-34.31*	-26.66***	-31.03***	-32.28***	-29.00***
	(19.56)	(16.06)	(20.78)	(20.20)	(20.72)	(19.02)	(10.24)	(8.635)	(8.950)	(7.523)
3rd trimester Homicide Intensity	32.37**	23.00**	14.95	24.26*	15.19	31.07***	4.434	5.019	10.54	-17.25*
	(14.61)	(11.07)	(13.04)	(14.18)	(20.87)	(11.89)	(12.56)	(11.80)	(12.16)	(9.883)
Infant is Male			119.3***	119.3***	119.3***			137.9***	137.9***	137.8***
			(1.568)	(1.566)	(1.578)			(0.755)	(0.755)	(0.757)
Smoke during Pregnancy		-181.0***	-176.0***	-176.3***	-173.8***		-234.2***	-209.3***	-209.3***	-213.5***
		(4.155)	(4.857)	(4.898)	(4.421)		(4.236)	(4.207)	(4.215)	(3.453)
Constant	3,194***	-1,067***	-1,312***	-1,310***	-1,307***	3,455***	-987.6***	-1,333***	-1,331***	-1,305***
	(7.935)	(29.79)	(38.60)	(38.48)	(36.91)	(3.536)	(33.61)	(34.47)	(34.65)	(33.69)
Observations	370,019	370,019	370,019	370,019	370,019	2,013,812	2,013,812	2,013,812	2,013,812	2,013,812
R-squared	0.000	0.338	0.351	0.351	0.353	0.000	0.261	0.280	0.280	0.285
Socio-Demographic Controls	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	No	No	Yes

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Standard errors are clustered at the county level

It is important to note that black mothers and their children are more affected by homicides than white mothers, the negative effects in the second trimester is almost 3-fold higher for black mothers than white mothers. Since only counties with populations above 200 000 people are included in this study, it is likely that there is variation of homicide intensity within counties, or variation at the neighborhood level. It could be the case that the majority of homicides that occur in a county occur in neighborhoods that have a higher proportion of black people making up the population. If this is the case, then black mothers are more likely to be acquainted with a homicide victim than white mothers, who may not be aware of homicides occurring in other neighborhoods, which in turn would cause a higher amount of stress to black mothers than white mothers. Unfortunately, we do not have neighborhood level data, so we cannot validate this argument. Although we do not have neighborhood level data, we do have information about the marital status of each mother. By separating our sample by marital status, we investigate the possibility that exposure to more homicides affect birthweight more severely for married women, as they become increasingly stressed that their spouse will become a victim of homicide, or increasingly stressed that they themselves could become a victim.

The results presented in Table VI support the previous argument. Column 5 and 10 show the effect of homicide percentage on birthweights for married black mothers and married white mothers, respectively. Once again, we see positive and significant results in the first trimester for both black and white mothers, and negative, significant results for both black and white mothers in the second trimester. Interestingly, the positive effect in the third trimester is significant for married black mothers. Once again, the magnitude of the effect on black mothers is around 3 times the size of the effect on white mothers for the first and second trimesters. Columns 15 and 20 of Table VI present the results for not married black and white mothers, respectively. The coefficients for black mothers are negative in all trimesters, but are insignificant. White mothers have negative effects in the first and second trimester, and a positive in effect in the third, but are also all insignificant.

Table VI - Effect of Homicide Intensity on Birthweight (Grams), separated by marital status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Married Mothers									
VARIABLES	Black Mothers	Black Mothers	Black Mothers	Black Mothers	Black Mothers	White Mothers	White Mothers	White Mothers	White Mothers	White Mothers
1st trimester Homicide Intensity	64.79***	64.71***	91.55***	86.40***	85.92***	81.97**	88.06***	106.8***	103.0***	28.76**
	(22.54)	(15.29)	(13.83)	(13.98)	(15.87)	(39.56)	(27.24)	(22.59)	(21.96)	(11.64)
2nd trimester Homicide Intensity	-92.88***	-92.64***	-103.9***	-106.7***	-106.4***	-28.61	-25.94***	-32.30***	-33.54***	-30.61***
	(15.72)	(19.31)	(24.34)	(23.83)	(24.11)	(18.47)	(8.670)	(8.312)	(8.228)	(7.408)
3rd trimester Homicide Intensity	32.45***	25.13*	26.36*	33.79**	34.71*	26.44*	3.211	4.793	9.865	-18.25
	(11.08)	(13.36)	(15.91)	(17.06)	(17.61)	(13.71)	(14.16)	(12.52)	(12.88)	(11.68)
Infant is Male			122.2***	122.2***	122.2***			138.7***	138.7***	138.6***
			(1.965)	(1.964)	(1.971)			(0.802)	(0.802)	(0.807)
Smoke during Pregnanc		-196.8***	-196.0***	-196.2***	-192.3***		-228.8***	-210.9***	-210.9***	-215.3***
		(4.502)	(4.505)	(4.513)	(4.204)		(4.560)	(4.587)	(4.594)	(3.768)
Constant	3,237***	-1,229***	-1,524***	-1,523***	-1,511***	3,465***	-1,034***	-1,336***	-1,335***	-1,303***
	(3.635)	(40.08)	(38.97)	(39.26)	(38.82)	(3.609)	(36.53)	(37.02)	(37.20)	(36.16)
Observations	227,127	227,127	227,127	227,127	227,127	1,867,743	1,867,743	1,867,743	1,867,743	1,867,743
R-squared	0.000	0.332	0.345	0.345	0.347	0.000	0.256	0.274	0.274	0.279
Socio-Demographic Co	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	No	No	Yes

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	Not Married Mothers									
VARIABLES	Black Mothers	Black Mothers	Black Mothers	Black Mothers	Black Mothers	White Mothers	White Mothers	White Mothers	White Mothers	White Mothers
1st trimester Homicide Intensity	255.8***	84.05**	78.16***	69.15**	-35.16	76.79**	13.34	38.25	29.31	-11.88
	(45.65)	(34.01)	(29.74)	(31.21)	(70.14)	(33.06)	(42.55)	(39.16)	(39.70)	(78.69)
2nd trimester Homicide Intensity	-72.84	-43.60	-35.70	-38.46	-49.43	-70.26	-17.41	-21.76	-21.82	-10.35
	(71.79)	(35.28)	(40.03)	(40.75)	(39.76)	(53.60)	(68.58)	(66.05)	(68.39)	(79.85)
3rd trimester Homicide Intensity	-55.79	-23.15	-29.77	-18.09	-57.57	94.48***	24.96	17.86	27.19	9.208
	(39.99)	(21.68)	(26.35)	(27.59)	(35.80)	(30.16)	(20.22)	(19.51)	(18.96)	(35.13)
Infant is Male			114.8***	114.9***	114.9***			128.0***	128.0***	127.6***
			(2.262)	(2.261)	(2.269)			(2.347)	(2.344)	(2.320)
Smoke during Pregnanc		-147.9***	-152.3***	-152.7***	-151.4***		-199.6***	-190.6***	-190.8***	-192.9***
		(5.419)	(6.422)	(6.558)	(6.084)		(3.381)	(3.371)	(3.373)	(3.255)
Constant	3,128***	-829.6***	-979.2***	-976.2***	-1,245***	3,322***	-633.6***	-903.0***	-897.9***	-785.1***
	(7.499)	(30.96)	(34.83)	(34.02)	(29.16)	(4.248)	(31.30)	(34.14)	(34.37)	(33.06)
Observations	142,892	142,892	142,892	142,892	142,892	146,069	146,069	146,069	146,069	146,069
R-squared	0.000	0.342	0.352	0.352	0.354	0.000	0.300	0.314	0.314	0.318
Socio-Demographic Co	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Health Controls	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	No	No	No	Yes	Yes
County fixed effect	No	No	No	No	Yes	No	No	No	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Standard errors are clustered at the county level

These results provide some merit to the possibility that black women are affected more severely by homicides because of the possibility that they are more likely to be worried about their loved ones. Since black and white mothers who are not married are not significantly affected, it seems that married women are driving the results, as an increase in homicide percentage increases maternal stress due to the possibility of losing their spouse to a homicide.

It is also important to note that smoking during pregnancy has been consistently a negative, significant, and higher in magnitude effect for white mothers than black mothers. Interestingly, if an infant is male has also been a positive and significant effect on birthweight, with this effect being larger for white mothers than black mothers. Although many other controls had significant effects, these two were presented as they were more peculiar than the others. Both of these results are left to be investigated further in the medical literature.

6 Conclusion

The effect of violence on birth outcomes has been studied thoroughly through the lens of the fetal origin hypothesis. The main channel in which violence affects birthweight is through maternal stress. Specifically, there is evidence that women of lower socioeconomic status are more stressed about violence than other women (Brown, 2018). In the context of the United States, it has been seen that non-Hispanic black women are more stressed about violence, usually represented by violent crime, than non-Hispanic white women. With the presence of a largely unexplained birthweight racial disparity between black and white women (Lhila & Long, 2012), this vulnerability that black women face in the United States could be part of the explanation for this birthweight disparity.

In this paper we investigate the relation between violence and birthweight of black children. We use 1989-1991 Linked Birth/Infant Death Data from the U.S. Department of Health and Human Services, National Center of Health Statistics and 1988-1991 Uniform Crime Reporting (UCR) Program Data, Supplementary Homicide Reports from the U.S. Department of Justice Federal Bureau of Investigation. We find mixed results in how violence impacts the birthweights of black children. As homicide intensity increases in a black mother's county of residence during their first trimester, we see a positive effect on birthweights. This could be due to unobserved protective measures that a mother seeks out in order to counter the adverse effect of stress due to homicides. In the second trimester we observe a significant decrease in birthweights as homicide intensity increases. It is possible that mothers do not believe that stress in the second trimester have significant effects on birth outcomes, so additional protective measures are not undertaken.

Since our results were much stronger for black women than white women, we argued that this could be due to black mothers being more aware of homicides that occur in their county. Black women may live in municipalities or neighbourhoods with high rates of homicides, so there may be a higher chance that the mother be acquainted with the victims and thus fear for her partner. To investigate this possibility, we separated our sample between married and not married women and found that the results are not significant for not married women, while the magnitude of effects are much larger for married women. This result does not validate our argument that black women may live in higher-crime neighbourhoods, but provides future avenues of research that investigates this issue on a more micro scale, such as neighbourhood level analyses that further explains how black women are impacted differently and more severely than white women by violent crime.

Another important note to make is how different homicides can affect mothers differently. Specifically, many homicides gain much more media attention than others, which would cause more maternal stress to black mothers. Whether those homicides are driving these results is another interesting and meaningful avenue of future research with sufficient data.

Bibliography

Almond, D., & Currie, J. (2011). Killing Me Softly: The Fetal Origins Hypothesis. *The Journal of Economic Perspectives*, *25*(3), 153–172.

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

Baguet, M., & Dumas, C. (2019). How does birth weight affect health and human capital? A short- and long-term evaluation. *Health Economics*, *28*(5), 597–617. https://doi.org/10.1002/hec.3864

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2007). From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes. *The Quarterly Journal of Economics*, *122*(1), 409–439.

Brown, R. (2018). The Mexican Drug War and Early-Life Health: The Impact of Violent Crime on Birth Outcomes. *Demography*, *55*, 319–340.

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

Currie, J., & Moretti, E. (2007). Biology as Destiny? Short- and Long-Run Determinants of Intergenerational Transmission of Birth Weight. *Journal of Labor Economics*, *25*(2), 231–264. https://doi.org/10.1086/511377

Inter-university Consortium for Political and Social Research. (2001, August). U.S. Department of Health and Human Services, National Center of Health Statistics. Linked Birth/Infant Death Data 1989-1991 Birth Cohorts. Ann Arbor, MI.

Inter-university Consortium for Political and Social Research. (2004, September). U.S. Department of Justice Federal Bureau of Investigation. Uniform Crime Reporting (UCR) Program Data, Supplementary Homicide Reports 1988-1991. Ann Arbor, MI.

Inter-university Consortium for Political and Social Research. (2009, July 27). United States Department of Justice. Federal Bureau of Investigation. National Incident-Based Reporting System, 1991. Ann Arbor, MI.

Kane, R. J. (2011). The ecology of unhealthy places: Violence, birthweight, and the importance of territoriality in structurally disadvantaged communities. *Social Science & Medicine*, *73*, 1585–1592.

Karp, R. J., Qazi, Q. H., Moller, K. A., Angelo, W. A., & Davis, J. M. (1995). Fetal Alcohol Syndrome at the Turn of the 20th Century: An Unexpected Explanation of the Kallikak Family. *Archives of Pediatrics & Adolescent Medicine*, *149*(1), 45–48.

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

Kreiner, C. T., & Sievertsen, H. H. (2020). Neonatal health of parents and cognitive development of children. *Journal of Health Economics*, *69*, 102247. https://doi.org/10.1016/j.jhealeco.2019.102247

Lhila, A., & Long, S. (2012). What is driving the black–white difference in low birthweight in the US? *Health Economics*, *21*, 301–315.

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

Morenoff, J. D. (2003). Neighborhood Mechanisms and the Spatial Dynamics of Birth Weight. *American Journal of Sociology*, *108*(5), 976–1017.

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*, 215–226.

Petrou, S. (2003). Economic consequences of preterm birth and low birthweight. *BJOG: An International Journal of Obstetrics & Gynaecology*, *110*, 17–23. https://doi.org/10.1046/j.1471-0528.2003.00013.x

Population Estimates Program. (2016, August 25). Population Division, U.S. Census Bureau 1980-1999. Washington, DC.

Torche, F. (2014). Prenatal Exposure to Violence and Birth Weight in Mexico: Selectivity, Exposure, and Behavioral Responses. *American Sociological Review*, *79*(5), 966–992.