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Blood Lead Levels in Minority Children: A Case of Environmental Racism

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BLOOD LEAD LEVELS IN MINORITY CHILDREN: A CASE OF ENVIRONMENTAL RACISM

by

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ABSTRACT

BLOOD LEAD LEVELS IN MINORITY CHILDREN: A CASE OF ENVIRONMENTAL RACISM

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Racial minorities in the United States have suffered from being disadvantaged. Among these disadvantages is environmental racism. This includes minority communities being ‘sacrifice zones’ for toxic waste and being exposed to lead poisoning. The purpose of this study is to examine differences in blood levels between white children and children of color. This research will follow a bivariate model for the first research question, “Do youth of color (under the age of 18) have higher BLLs than white children?” The bivariate model will look at the relationship between ethnoracial group and BLLs. Specifically, an analysis of variance (ANOVA) will be run to test for statistically significant difference in BLLs between groups. A multilinear regression model will be run to answer the second question, “Do poor youth of color have higher BLLs than their white counterparts?”

Findings from the data support this study’s first research question. The data shows Blacks and Asians have higher BLLs than whites. The second research question is answered, but the answer is not what was expected because Asians are the wealthiest group according to the data, but also have the highest BLL average. Further research would need to be done on Asian communities to understand the phenomenon of having high BLLs, while also being the wealthiest race overall.

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CHAPTER I

INTRODUCTION

Racial minorities have suffered numerous disadvantages in the United States because of racist laws and policies. Chattel slavery, the seizure of Native lands, and the forced relocation of Japanese are three of the most egregious examples of formal discrimination. However, we also see racist policy currently in citizenship laws such as Arizona's SB 1070 (the strictest anti-illegal immigration law) that disproportionately targeted Latinx people. Many of our institutions are powered by racist policies. Since the death of Trayvon Martin, media attention has been placed on the policies and culture that support the overly aggressive stance that local law enforcement has towards black Americans. There are racist policies in education; non-white school districts receive $23 billion less in funding than white school districts (Mervosh, 2019).

One disadvantage that minorities must overcome is that of their environment. Here, environment refers to one's neighborhood – one's home and immediate surroundings. Where one lives has an impact on one's life in a variety of ways. Consider this passage from the economist Thomas Shapiro:

> …those living in low-opportunity neighborhoods with poor-quality schools and high crime rates face challenge after challenge—less home-value appreciation, fewer physical and mental health services, lower educational outcomes—inhibiting their capacity to live well and move ahead. Students attending schools with high concentrations of poverty have worse educational outcomes. Residents of low-opportunity neighborhoods are likely to pay more for groceries and services, as well as higher auto insurance premiums and mortgage rates. Such neighborhoods generally provide fewer local job prospects, and many have poor transit connections to growing job centers. Finding better employment is also harder because neighbors all tend to work the same kind of jobs offering neither secure employment nor opportunities to move up the ladder (Shapiro, 2017:56).

Shapiro is summarizing many of the well understood links between environment and social outcomes. Shapiro's study goes on to document how families of color, particularly black and Latinx families, tend to live in neighborhoods with fewer resources. For the social scientist, it is imperative to look at how the environment one lives in shapes social outcomes.

People understand these links intuitively. Parents attempt to buy into better neighborhoods so that their children can have access to better schools and safer environments. Homeowners attempt to consolidate resources into neighborhoods they live by supporting or rejecting policies. For example, communities may reject the building of a mixed-income housing development because they fear it will bring in lower income families whom they fear will bring crime or deviant behaviors into their neighborhoods. As such, groups with more resources can leverage law and policy to improve their neighborhoods to the detriment of other groups. Shapiro is focusing primarily on a neighborhood's institutions and infrastructure. However, one's environment is also characterized by its ecology – the presence of toxins, pollutants, and biodiversity. In 1981, civil rights leader Dr. Benjamin Chavis Jr. observed that black families are more likely to live in neighborhoods that are polluted. Chavis (2020) states he coined the term 'environmental racism' in 1981 and that Black Americans still struggle today since 75% of Black Americans live near hazardous facilities. Since Chavis' comments, scholars and activists have been paying keen attention to the routing of pollutants into minority neighborhoods. This "environmental racism" is seen as another disadvantage for racial minorities.

Blood lead levels (BLL) is the amount of lead in blood. High BLL can cause irritability, learning disabilities, and delayed development. The purpose of this thesis is to hypothesize if higher BLL could be an indicator of environmental racism. Specifically, that black children would have the most lead exposure, with Mexicans and Hispanics being behind black children in

BLL and white children having the lowest BLLs. To that end, this thesis will look at one indicator of poor environment – BLL, and its association with race, by using Whites, Blacks, Hispanics, and Asians. Do racial minorities have higher BLLs than white Americans? The presence of higher lead levels in racial minorities could provide evidence of environmental racism.

ENVIRONMENTAL RACISM

This thesis will take a broad definition of environmental racism, supplied by Wright: "unequal distribution and disproportionate impact of waste and other toxins upon impoverished communities of colour [sic], chiefly Black communities." (2018:3). An example of environmental racism is using minority communities as "sacrifice zones" for toxic waste racce. Local, state, or federal governments either place toxins in the presence of communities of color (thereby routing those toxins away from white communities) or are slow to respond to environmental hazards in communities of color (freeing limited resources for other more valued projects). This unequal distribution is hypothesized to occur in two primary ways: (1) through the placing of unwanted waste and toxins in communities of color, which shifts the toxin burden away from white communities; and (2) the failure of government to protect communities of color from identified waste and toxins. Addressing environmental pollution requires an investment in resources to correct the sources of the problem. Governments may wish to invest limited financial resources in projects that are perceived as being higher priority (i.e., business, and economic interests). Through these mechanism, communities of color are disproportionately impacted.

Examples of placing environmental hazards in a community are many. Landfills and sewage treatment plants near residential areas place those residents in greater proximity to waste.

The placing of airports or train and bus depots near residential neighborhoods increases the level of pollutants in the air. Pipelines running through neighborhoods are at risk of leaking or breaking, spilling pollutants into the nearby water or land, with the recent example being the Flint Michigan Water Crisis.

Another pipeline example is illustrative. In 2016, members of the Standing Rock Reservation protested the building of an oil pipeline through their native lands:

“A project of Energy Transfer Partners, the $3.8 billion, 1,172-mile pipeline was designed to move shale oil from North Dakota to refineries in Illinois. After the initial plan of crossing the Missouri River just north of Bismarck was rejected, in a stark act of environmental injustice it was re-routed to cross near the Standing Rock Reservation, threatening the reservation’s drinking water” (Steinman, 2018:1070).

Equally damaging are the occasions when an environmental hazard has been identified, but that hazard is not addressed in communities of color. The Flint Water Crisis that began in 2014 is an example of this neglect. Laura Polido (2016) writes:

“Flint was abandoned by capital decades ago, and as it became an increasingly poor and Black place, it was also abandoned by the local state. This abandonment can be seen in shrinking services, infrastructure investment, and democratic practices. Such treatment, including deliberate poisoning, is reserved for those who are not only racially devalued but considered incapable of contributing to [capital] accumulation” (2016).

The primary linkages in environmental racism are the ecological environment (pollutants) and the people of color that must navigate that environment. However, this relationship is usually mediated by a regulatory agency. Thus, conflict is rarely observed as directly between whites and non-whites. Instead, conflict tends to be between agents of the state, who tend to be overwhelmingly white and target enforcement of laws against communities of color and individuals in communities of color. The Standing Rock protests are an example of this dynamic.

As will be discussed in the literature review, there is a lack of empirical evidence showing the "unequal distribution and disproportionate impact" suggested by Wright (2018: 3). It is one thing to theorize a link between race and environmental hazards, and observe landfills, sewage plants, or toxic waste dumps located near communities of color. It is another to show empirical evidence of toxins being absorbed by people of color at greater rates than whites, and to link this increase in exposure to the proximity of such facilities to communities of color. This study will look for this evidence through the presence of lead at a national level.

LEAD POISONING

The effects of lead on the human body are well documented by the Center for Disease Control (CDC). The information in this section, unless otherwise referenced, comes from this organization. Lead enters the body through the breathing in of lead fumes, ingesting lead dust, or being absorbed through one's skin. In 1971, the Lead Poisoning Prevention Act was passed, which prevented lead paint from being used in new housing and considered lead chips to be a health hazard and in 1978, the federal government banned the consumer uses of lead paint. Two major ways that a person can come into contact with lead is through one's place of employment or through houses. Houses built before 1978 may have used lead-based paint.

Some of the effects of short-term exposure to lead are abdominal pain, loss of appetite, and memory loss. Long-term exposure to lead for children can cause the development of encephalopathy, which is a disease that affects brain development and function symptoms, depression, forgetfulness, nausea, and irritability.

The CDC considers children as a population at higher risk for lead poisoning. This is especially so for children under the age of six because they are at an accelerated stage of development. According to the CDC, “No safe blood lead level in children has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement” (Blood Lead Levels in Children | Lead | CDC, 2021). Moreover, the effects of lead poisoning are permanent.

While lead paint was banned in 1978, lead poisoning is still a serious concern. Benfer (2017) found that one in three families with children under the age of six (the age group most sensitive to lead poisoning) live in houses with a significant amount of lead paint.

LINKING ENVIRONMENTAL RACISM AND LEAD POISONING

Environmental racism is understood to mean broadly “unequal distribution and disproportionate impact of waste and other toxins upon impoverished communities of colour” [sic] (Wright, 2018:3). This unequal distribution and disproportionate impact are achieved through government agencies and policies. Local, state, or federal governments either place toxins in the presence of communities of color (thereby routing those toxins away from white communities) or are slow to respond to environmental hazards in communities of color (freeing limited resources for other more valued projects) (Johnson et al., 2008). Communities of color are thus disproportionately impacted.

We see this process play out with lead poisoning. An example is offered by Benfer (2017). Benfer describes the decisions made by the East Chicago, Indiana, Housing Authority in 1966 to place public housing in undesirable areas – including two sites that were former lead paint factories. Twenty years later in 1986, a lead test was conducted and revealed that children with high BLL were living in these undesirable areas (Benfer, 2017: 508). Further illustrating the racist nature of these decisions, Benfer writes: “Despite clear evidence of lead poisoning and other disabilities among residents, in 1996 the East Chicago Housing Authority used a $1.5 million modernization grant to *keep* the complex open in the same location” (508).

Neoliberalism promotes free market and protects private property (i.e., the police) to ensure free market functions (Benz, 2017). To protect the free market, states under neoliberalism must discontinue its historical duty of protecting against employment discrimination and social welfare programs. Neoliberalism cloaks racial inequality and racism with meritocracy (ruled by individuals with education and skills). Neoliberalists believe if one fails under neoliberalism, it is because of their lack of skills or education, rather than structural racism. This regime ‘mutes’ “race by deflecting attention away from racism and onto the individual is important to the discussion here regarding environmental racism and injustice” (Benz, 2017). Neoliberalism is seen in the state of Michigan.

Federal and State governments have attempted to cleanse environmental racism and injustice. Michigan’s Department of Environmental Quality (MDEQ) commands environmental regulation, including detecting health hazards. Neoliberal policies (i.e., reducing government spending) has forced MDEQ to take extreme budget cuts. The MDEQ was unable to operate fully since the agency had their funds cut, so it was unable to hire and train new employees. Older employees were forced to fill vacant roles.

Flint, Michigan is mostly populated by Blacks, with the one of the highest poverty rates in Michigan. In April 2014, Flint, Michigan’s water source was changed from the water in Lake Huron to the Flint River. This change was appointed by an emergency financial manager to save money, but it ultimately backfired because the Flint River is so polluted, it corroded Flint’s plumbing foundation and caused the drinking water to have high levels of lead (Benz, 2017).

Lead levels of the drinking water "were as high as 13,200 parts per billion, an unthinkable 880 times the actionable federal level of 15 parts per billion" (Benz, 2017). Despite activism and social media outcry, Flint still sourced its water from the Flint River.

General Motors (GM) ended the use of Flint River's toxic water because the water was corroding the auto parts in their factory. The neoliberal city was able to accommodate GM and GM was able to use water from Lake Huron, while the citizens of Flint were still using the contaminated water from Flint River. Marathon Oil runs ten polluting factories in Southwest Detroit and emit large quantities of toxic chemicals in the air (Benz, 2017). Southwest Detroit is considered the most toxic area in the state of Michigan. The pollutants increase the risk of cancer, asthma, and neurological disorders. Like Flint, Michigan, Southwest Detroit's population is mostly black (Boynton ranges between 92 and 94 percent black (Benz, 2017)).

Neoliberalist policies run the government like a business because of the policies favoring agencies such as Marathon Oil and General Motors, over the people of Boynton and Flint. People of color suffer daily from government greed, yet neoliberalism considers the plight of minorities to be their own fault and not because of the system neoliberalism created. Neoliberalism serves to create business, rather than value human health. Corporate interested is at the top and the poor minorities are at the bottom and the neoliberal system is designed to keep it this way.

CHAPTER II

LITERATURE REVIEW

This chapter will provide an overview of literature examining environmental racism and environmental racism's relationship with minority children, with a focus on lead exposure. One major negative outcome for lead exposed children is the development of encephalopathy, which is a disease that affects brain development and function and generations of poverty. Finally, this chapter will conclude with a summary and critique of the literature.

SOCIAL POLICY AND ENVIRONMENTAL RACISM

Environmental racism is distributing a disproportionate amount of waste in impoverished communities, specifically Black communities (2018:3). These policies benefit whites, while shifting costs to people of color (Bullard, 1994). An example of environmental racism is using minority communities as "sacrifice zones" for toxic waste (Johnson et al., 2008).

Environmental racism is not only tied to toxic waste and lead poisoning, it is also tied to housing segregation, using policies like racial zoning and redlining. Racial Zoning keeps whites and minorities in their own neighborhoods (Shertzer et al., 2016: 217). Minorities are forced into high crime and impoverished communities, which denies them from gaining wealth and attending properly funded schools. Redlining is when housing companies deny minorities housing loans (Holmes and Horvitz, 1994:81). Redlining keeps minorities in impoverished communities because they are denied housing loans. Minority families that are denied housing loans are forced to raise their children in communities in high crime and old housing, which will have lead paint. Also, housing companies may raise prices to attract wealthier families, which forces minorities to leave their homes since they cannot pay for them anymore.

Whites would often leave their communities once minorities would move in. This term is called "White Flight." White flight occurs when white people left their urban communities as POC (People of Color) became upwardly mobile and began moving in to "nicer" neighborhoods predominantly occupied by whites, which ultimately became minority neighborhoods as whites fled to build new homes in the suburbs. (Rothstein, 2017). The results of white flight are lower property values, companies leaving the community because of the lack of income (this also results in many residents losing their jobs), and the communities becoming unhealthy because of pollution and/or companies placing toxic waste the communities.

Studies have found that race is more correlated to environmental racism than class. The Third National Health and Nutrition Examination Survey (NHAMES III) shows that 8.9 percent of all children ages 1-9 have BLLs of at least 10 µg/dL (Bullard, 1994). This data was collected between 1988-1991 and ethnoracial group[1] was the only factor in predicting BLLs. The survey showed that African American children at all income levels had higher BLL rates than white children. About 28.4 percent of poor African American children were lead poisoned compared to the 9.8 percent of poor white children (Bullard, 1994).

BLOOD LEAD LEVELS AND CHILDREN (BLL)

Research done by Gould (2009) discusses the BLL of 194,000 American children ≤ 6 years of age between 2003-2006 and examines recent research of the cost range of lead paint hazard control ($1-$11 billion), the benefits of lead paint reduction for health care ($11-$53 billion), lifetime earnings ($165-$233 billion), and special education ($30-$146 billion) (Gould, 2009). The purpose of Gould`s study is to examine the social and economic costs to lead poisoning.

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[1] Ethnoracial group is used because the data has information Mexicans (ethnicity) and Other Hispanics (race), as well as White, Black, and Asian.

The results of Gould`s study is that children with BLLs of at least 10 μg/dL will lose out on thousands of dollars in their lifetimes because of lack of education/low-income occupations. Gould (2009) concludes with stating that the government is slow on addressing the lead poisoning risks. Also, investing in lead poisoning control is worth expense because the cost-benefit for common vaccines for children is saving $5.30 and $16.50 for every dollar spent on immunization (Gould, 2009).

Albert et al. (1974) research wondering if lead exposure is linked to children developing encephalopathy, by conducting a report on 371 children and educational problems appeared around the third grade. The subjects age range with a follow up are between ages 5 and 15 (Albert et al., 1974). The average age of children who were blood lead tested is 2.3 and the follow up was between 3 and 11 years (Albert et al., 1974). These children were put into five groups. The first group are children with encephalopathy. The second group are children who are treated of lead poisoning. The third group are children with high BLLs that are untreated. The fourth group are children with high tooth leads and low BLLs. The fifth are children with low tooth leads and low blood levels. Albert et al. (1974) reported that the majority of African Americans can be placed in all 5 groups.

The children in the fourth and fifth groups (the ones with low BLLs) were in normal classes, while children in the first group (the children with encephalopathy) and the third group (children with high BLLs who were untreated) were in special educational programs because they had psychiatric problems and/or they were mentally challenged (Albert et al., 1974). Even though the children in the second group were treated of their lead poison, they, along with the first and third groups had problems paying attention in class (Albert et al., 1974).

Children were not tested until the age of 7 because test scores in children younger are unreliable (Albert et al., 1974). Albert et al. (1974) analyzed their data by doing four intelligence tests and these tests are:

(1) Verbal and nonverbal intelligence, Wechsler Intelligence Scale for Children (WISC) (Wechsler, 1949).

(2) Reading and spelling achievement, Wide Range Achievement Test (WRAT) (Schaie and Roberts, 1970).

(3) Perceptual-motor performance, Bender Gestalt Test, Koppitz scoring figure drawing test, Harris scoring (Koppitz n.d.).

(4) Fine motor coordination, Purdue Pegboard Test (Siegel and Hirschhorn, 1958).

Albert et al. (1974) conclude that children exposed to lead did very poorly in school (low IQ, low attention span/concentration, mentally challenged). Even some children that were asymptomatic (those who were not sick from lead exposure) at the time of high BLL have health problems (Albert et al., 1974). Albert et al. (1974) believe that children should go through chelation therapy[2], regardless of if they are asymptomatic and/or have symptoms of lead exposure.

Research done by Bellinger (2012) examines the impact lead poisoning has on children`s cognitive abilities. An analysis done in 2005 by Bellinger involved 1,300 children who had 2.4-30 µg/dL, with a loss of 3.9 Full Scale Intelligence Quotient (FSIQ) points (Bellinger, 2012). It was found that the increase of BLLs of 10-20 µg/dL resulted in a loss of 1.9 FSIQ points (Bellinger, 2012). The loss of FSIQ is significant because stated previously (Gould, 2009), children exposed to lead lack of education and have low-income occupations.

[2] Removing metal from the body

The method used in this study is looking at the total number of FSIQ points lost among United States children ages 0-5 that were exposed to lead (Bellinger, 2012). Bellinger (2012) has *risk factors*, or contributions to a child`s cognitive health, which includes neurodevelopmental disorders, socioeconomic risks, and psychosocial risks. Bellinger (2012) concludes that it was possible to evaluate FSIQ loss in United States children ages 0-5 for the myriad of risk factors, with one of them being lead (the second most impactful risk factor). A critique of this method is that IQ tests are not completely accurate. There are many forms of intelligence such as logical intelligence (critical thinking), verbal-linguistic (diction), and intrapersonal (self-reflection) that one number cannot classify how intelligent one is (Gardner, 2006).

LEAD EXPOSED MINORITY CHILDREN

Aelion and Davis (2019) collected data from 140,000 urban and rural children between the ages of at least age 1 to age 6 in South Carolina between 2011-2016. The variables examined are population by ethnorace, households below the poverty line, median year homes built, and urban/rural classification. (Aelion and Davis, 2019).

The mean BLL average for all the children in the population between 2011-2016 was 2.19 µg/dL, with urban children having 2.21 µg/dL, which is higher than the rural children at 2.11 µg/dL (Aelion and Davis, 2019). The data uses about the same number of white and black children (44% and 42%, respectively), with at least 22,000 records missing (Aelion and Davis, 2019). The other 14% are children of other race groups and had lower BLL than white and black children. Aelion and Davis (2019) found that urban black children had a higher BLL average (2.20 µg/dL) than urban white children (2.19 µg/dL) and rural white children (2.19 µg/dL). The reason this is because lead exposure is more prominent in urban, black populations (Aelion and Davis, 2019).

Limitations of this study include not being able to randomly select children from the South Carolina population because only children enrolled in Medicaid and children who are at risk for lead exposure could have their records reviewed (because of the law). Ethnorace was missing from many lead exposure tests as well. The data also did not have the sources of the lead exposure either (i.e., water and inhaling lead paint).

Bernard and McGeehin (2003) analyze the socioeconomic and demographic characteristics of 5787 American children between the ages of 1-5 with BLLs of ≥5 µg/dL who engaged in housing interviews and physical evaluations. The data was gathered by the Center for Disease Control and Prevention using the National Health and Nutrition Examination Survey (NHANES III).

Only 25.6% of children between the ages of 1-5 had BLLs of ≥5 µg/dL with 76% of them having BLLs of <10 µg/dL from 1988-1994. The ethnorace of children with ≥5 µg/dL include black (46.8%), Mexican (27.9%), whites (18.7%); 42.5% of these children live in housing built between 1946 and 1973 and 14.1% of children live in housing built after 1973 have BLLs of ≥5 µg/dL (Bernard and McGeehin, 2003). Comparing black and white children, black children are 3 times more likely to have BLLs of ≥5 µg/dL, 7 times more likely to have BLLs between 10-20 µg/dL, and 13.5 times more likely to have BLL ≥20 µg/dL (Bernard and McGeehin, 2003).

Housing, age, and poverty are leading variables in the differences in BLLs between black and white children because these variables were partially controlled in the study conducted by Bernard and McGeehin (2003). Compared to children living in newer housing, children living in houses built before 1946 were 4.4 times more likely to have BLLs between 5 and 10 µg/dL; 5.1 times more likely to have BLLs between 10 and 20 µg/dL; 15 times more likely to have BLLs of 20 µg/dL (Bernard and McGeehin, 2003).

Limitations in this study include being unable to analyze other Hispanics, Asians, and Native Americans because of the small sample size. The data is unable to analyze non-Mexican Hispanics, who may have a high chance of elevated lead exposure because of living in urban communities and/or living in poverty (Hun et al., 2009). There was also a high nonparticipation rate at 21% in BLL laboratory analysis. Data was most likely to be missing from children living in the Northeast, who may have high BLLs than the children analyzed in this study (Bernard and McGeehin, 2003).

Between April 25, 2014-October 15, 2015, about 99,000 Flint, Michigan residents were affected by the quality of drinking water (Kennedy et al., 2016). Flint residents switched from the Detroit Water Authority (DWA) (water resources coming from Lake Huron) to Flint Water System (FWS) (coming from the Flint River). There was no control for corrosion when switching to FWS, so the water was infected with high amounts of lead. This led to several Flint children ages <5 having BLLs of ≥5 μg/dL. On October 16, 2015, Flint, Michigan switched back to DWA and children ages <5 were instructed to drink bottled water.

The analysis of Kennedy et al. (2016) seeks to understand if the odds of having BLLs of ≥5 μg/dL before the switch to FWS differ from during the switch to FWS, and after switching back to DWA. There were 9,422 BLL tests on children younger than the age of 6 and 3.1% of them had BLLs of ≥5 μg/dL during April 25, 2013-March 16, 2016. There were 5,519 tests related to African American children and 2,474 tests related to white children. The other 1,429 tests were related to other, unspecified races. Kennedy et al. (2016) controlled for children living under the poverty line. Based on the tests conducted, one can see that African Americans are suffering the most from Flint, Michigan's water crisis.

The probability of having ≥5 μg/dL after switching from DWA to FWS is 46% (Kennedy et al., 2016). During the switch from DWA to FWS, the proportion of elevated BLLs rose to 5.0%, compared to the 3.1% that was before the switch to FWS.

The first limitation with the study of Kennedy et al. (2016) is that they observe only to the changing of Flint's water source. This means the researchers are unable to analyze other factors that may change the BLLs of children at least age 5. The second limitation is other factors that could increase BLLs were not examined (i.e., consuming lead via inhaling or eating). The third limitation is being unaware if switching to DWA or children consuming bottled water was the reason why BLL declined.

CRITIQUE OF THE LITERATURE

Outside of the study done by Bernard and McGeehin (2003) there is a lack of studies that analyze rural areas. Studies on lead exposure generally observe urban communities with economic segregation. The reason for the lack of rural areas being observed could be because of the lack of literature that focuses on rural children (Bernard and McGeehin, 2003).

Another limitation is some studies mention race/ethnicity, but do not connect it with institutional racism or environmental racism. This might be because some of the studies are somewhat dated, so the term "environmental racism" would not be discussed. Outside of Bellinger (2012), none of the other studies looked at other factors that could influence child neurodevelopment. Bellinger (2012) states that other risk factors that include stress and lack of opportunities can also affect children`s neurodevelopment.

Asians are not represented in previous literature to a meaningful degree. One study, by Awata et al. (2017) research focuses on Asian children's exposure biomarkers. The biomarkers measured are (blood cadmium, blood lead, blood mercury, urinary total arsenic, and urinary dimethylarsinic acic. Asians examined in this study are ≥ 6 from the 2011-2012 National Health and Nutrition Examination Survey (NHANES). Asians, regardless of sociodemographic, physical, dietary, behavioral, or geographic characteristics, have the highest biomarker levels of all five metal biomarkers than other ethnoracial groups by a significant margin (Awata et al., 2017). Awata et al. (2017) found that birthplace is an important predictor of biomarker levels. Asians born outside of the United States have higher biomarker levels than Asians born in the United States.

There are multiple limitations in the study of Awata et al. (2017). One of the limitations is that the data NHANES has is cross-sectional, so the data only represents the biomarker levels of the day of examination. The data only reflects the living environment of the participants before the survey and does not represent long-term exposure. Another limitation is the uncertainty of the sample size to the Asian population. Asians usually have lower participation rates in national surveys than other ethnoraces and in 2011, NHANES reported that Asian response rate was 10-20% lower than other racial groups (Awata et al., 2017).

Asians in were the fastest growing racial between 2000 and 2010, with an increase of 43.2% (Awata et al., 2017). The researchers in this study recommend more studies to understand the health status of Asians because their population increase and having a lower response rate compared to other ethnoraces. This is especially important because the data being used for this thesis from the CDC`s National Health and Nutrition Examination Survey (NHANES) will analyze the lead exposure of Asian American children between the ages of 1-18. Asian children and BLLs will be further explored in the next chapters.

IQ as a measurement of intelligence has always been questioned. IQ tests are not completely accurate. There are many forms of intelligence such as logical intelligence (critical thinking), verbal-linguistic (diction), and intrapersonal (self-reflection) that one number cannot classify how intelligent one is (Gardner, 2006). A single number cannot measure multiple types of intelligence. IQ tests may also be biased against impoverished people, who lack education and may be unable to comprehend the test. Differences in opportunities, education, economic status, and surroundings make it difficult to measure intelligence without being culturally biased.

The sample size for the economic status of BLL ethnorace children is too small. Having a small sample size prevents the researchers from properly estimating the population that the researcher got the sample from. A small sample size reduces statistical power, which reduces the chance of discovering the answer to the research question.

The final critique for this section is that the US government definition of poverty has not kept up with inflation. The average household size in the dataset is 3.4 and the federal poverty level in American for a household of 3 is $21,960 (FEDERAL POVERTY LEVEL (FPL), 2021). The prices of goods increase, and the lower class's income cannot match with inflation, so they remain poor (Thelwell, 2021).

SUMMARY OF LITERATURE REVIEW

Based on the research presented in this literature review, various themes emerge on how minorities, especially minority children suffer from environmental racism and lead poisoning. Prior research has shown that waste companies specifically look for minority communities to dump their waste (Johnson et al., 2008).

Previous literature shows that minorities living in urban communities are most likely to be exposed to high levels of lead (Bernard and McGeehin, 2003; Aelion and Davis, 2019; Bullard, 2008). Rural children also suffer from lead exposure (Bernard and McGeehin, 2003), but outside of the study done by Bernard and McGeehin (2003), empirical evidence of the lead exposure and BLL in rural children is lacking.

Prior literature has shown that lead negatively affects minority education. Gould (2009) has shown that lead exposure leads to lower IQ, which develops into the person losing out on thousands of lifetime earnings. Research done by Albert et al. (1974) looked at school records and mostly minority children were exposed to lead and some were put in special education classes. Indeed, this study is old, but based on current research like Gould (2009) and Turner (2016), lead exposure is still prominent today and American society.

This chapter provided a review of research examining environmental racism and lead exposure and the relationship they have on minority children. The next chapter will present the research methodology and data that will guide this research.

CHAPTER III

METHODOLOGY

This chapter provides an overview of the research methodology that guides this study. The chapter begins by describing the two research questions that order the study. Next, the data used – from the National Health and Nutrition Examination Survey (NHANES) – is discussed. Specifically, the variables selected from that study are discussed and how they are operationalized (defined and measured). This chapter ends by discussing some limitations of the study and methodology used.

RESEARCH QUESTIONS

This thesis will focus on differences in blood levels between white children and children of color. The evidence presented in the first two chapters make a compelling argument that children of color are at increased risk of lead exposure and subsequent negative health and economic outcomes. Moreover, this problem has been understudied in the existing literature. To address this gap in the research, this study poses two research questions.

1. Do youth of color (under the age of 18) have higher BLLs than white children?
2. Do poor youth of color have higher BLLs than their white counterparts?

There is a lack of evidence of environmental racism in sociological literature. This lack of evidence is even more pronounced when exploring studies using nationally representative data. This study will look for this evidence through the presence of lead in the blood of youth of color.

DATA

The data for this thesis is supplied by the Center for Disease Control (CDC). The CDC is a United States federal agency with a mission to protect the nation's public health. The specific data used comes from the National Health and Nutrition Examination Survey (NHANES) conducted from 2017-2018. As the CDC website declares, "To accomplish our mission, CDC conducts critical science and provides health information that protects our nation against expensive and dangerous health threats, and responds when these arise" (Mission, Role and Pledge, 2021).

The CDC collects and analyzes public health data on a wide range of topics. Most of this data is made available to the public. This thesis will use data from the CDC`s National Health and Nutrition Examination Survey (NHANES). The NHANES is administered yearly and assesses the health of adults and children in the United States. The survey combines interviews and physical examinations (NHANES - About the National Health and Nutrition Examination Survey, 2021). The combination of interview data – socioeconomic background and lifestyle choices, and physical examinations – collecting body measurements, vital signs, and blood samples, makes it possible for this thesis' research questions to be addressed.

The data in the NHANES study represents the noninstitutionalized civilian population residing in the 50 states and the District of Columbia. The study employs a stratified sampling design with four stages. The primary statistical unit (PSU) is the county (sage 1). Within each county, census blocks are randomly sampled (stage 2), followed by household units (stage 3), and finally individuals within households (stage 4) (Madans, Branum, Paulose-Ram and Akinbami, 2020). One of the goals of this thesis is to contribute empirical evidence to claims of environmental racism at the national level, and the NHANES affords this opportunity.

VARIABLES IN THE STUDY

This section describes the variables used in this study. These are the initial variables and depending upon findings in the univariate and bivariate stages of analysis, these variables may be transformed to answer the research questions more adequately. A summary of the variables can be found in Table 1 and how the variables are measured can be found in Table 2.

Dependent Variable

The dependent variable for this study will be blood lead levels, or BLLs. The CDC measures BLLs as micrograms of lead per deciliter of blood (µg/dL). The method of finding one's BLL is by gaining a blood sample through drawing blood or a fingerstick. The blood sample is then measured in micrograms of lead per deciliter of blood.

Independent Variable

The independent variable is "ethnoracial group". The ethnoracial group combines traditional social science measures of race – White, Black, and Asian, with a traditional measure of ethnicity – Hispanic. There are six categories in total - Mexican, Other Hispanic, White, Black, Asian, and Multiracial[3].

Control Variables

The control variables for this study are household income, education, gender, and age. The reason for selecting household income over family income is because household income includes salaries, retirement income and government assistances. Family income is the total compensation the family receives. This includes social security and child support. Household income is an ordinal variable with twelve categories, measuring the income of the respondent's household from 0 dollars to over 100,000. The reason for not using a log-transformed continuous

[3] The sample size is too small to measure all multiracial individuals

variable is because the data in this research is not skewed in any way. The education of the adult respondent in the household is also measured. Education will be measured with categories ranging from "Less Than High School" to "College Degree and Greater". Gender is measured as "Male" or "Female". Finally, age is a continuous variable from 1 to 18. The full range of values for this variable are from 1 to 80. However, this thesis will focus on youth.

DATA ANALYSIS

General descriptive statistics are presented here, followed by a discussion of how each research question will be answered in the next chapter.

Descriptive Statistics

Table 1 shows the descriptive statistics of the independent variable ethnoracial group that will be used in this study. There are 6,884 children in total in the sample. Whites have the largest population at 33.3% and other Hispanics being the lowest at 9.2%. There are 2,352 children with recorded household income. Table 1 shows that Black children have the lowest household income at 6.78 (in the $25,000-$34,999 range), Mexican children near the same income range as Black children at 6.91 and other Hispanic children at 7.27 (in the $35,000-$44,999 range). Asian children have the highest household income at 9.72 (in the $55,000-$64,999 range) and white children behind them at 8.46 (in the $55,000-$64,999 range). These statistics show that three out of the four minority groups have at least $20,000 less household income than whites.

The average BLLs for each ethnoracial group are Whites (1.07), Hispanic (0.78), Mexican (1.07), Black (1.15), Asian (1.29). In Table 1, Black and Asian children suffer the most from lead exposure. Two out of the six ethnoracial groups have greater BLL averages than the total average BLL (1.08) amongst all children.

Table 1. Univariate Statistics*			
Categorical**			
Variable		**Variable**	
Ethnoracial Group	Income Average for Each Group***	Children's Gender	Percentage of Genders
White	8.46	Male	50.2
Black	6.78	Female	49.8
Other Hispanic	7.27	Total N	6884
Mexican	6.91		
Asian	9.72		
Total N for Household Income	2,352		
Ethnoracial Group	**Percentage of Race/Ethnicity**	Ethnoracial Group	Average BLLs (µg/dL)
White	33.3	White	1.07
Black	22.7	Black	1.15
Other Hispanic	9.2	Other Hispanic	0.78
Mexican	15.2	Mexican	1.07
Asian	13.2	Asian	1.29
Total N	6884	Total Average	1.08
Continuous			
Variable	**Range**	**Mean**	**SD**
Income***	(1 – 12)	7.89	3.31
Children's Age	(1-18)	8.95	5.18
BLLs	(0.05-42.48)	22.45	1.29

*based on weighs provided by the National Health and Nutrition Examination Survey (NHANES)
**number may not equal 100 due to rounding
***Income = 1 - 0-4,999, 2 – 5,000-9,999, 3 – 10,000-14,999, 4 – 15,000-19,999, 5 – 20,000-24,999, 6 – 25,000-34,999, 7 – 35,000-44,999, 8 – 55,000-64,999, 9 –55,000-64,999, 10 – 65,000-74,999, 11 –75,000-99,999, 12 – 100,000 and over.

Analytic plan for: Do youth of color (under the age of 18) have higher BLLs than white children?

This question will be addressed by first running a bivariate model looking at the relationship between ethnoracial group and BLLs. Specifically, an analysis of variance (ANOVA) will be run to test for statistically significant difference in BLLs between groups. Second, a regression model will be run that includes the control variables included in Table 2.

This analysis will answer the question of "Do youth of color (under the age of 18) have higher BLLs than white children?" by showing the relationship between ethnoracial group and BLLs while examining age, education, and gender.

The model is represented below:

The model is represented below: Ethnoracial Group of Child + Household Income of Parent + Gender of Child + Age of Child + Education of Parent -> BLLs

Analytic plan for: Do poor youth of color have higher BLLs than their white counterparts?

To answer this question, a new variable will be created that is a combination of income and ethnoracial group. The variable will divide youth into poor and not poor. The average number of people in a household in this dataset is 3.4, so the "poor" cut off for a household of three in the U.S. is $21,960 (Federal Poverty Level (FPL), 2021). The values for this new variable will be: (1) White Poor, (2) Hispanic Poor, (3) Mexican Poor, (4) Black Poor, (5) Asian Poor, (6) Other-Multiracial Poor, (7) White Not Poor, (8) Hispanic Not Poor, (9) Mexican Not Poor, (10) Black Not Poor, (11) Asian Not Poor, and (12) Other-Multiracial Not Poor.

This new variable will then be used in a bivariate ANOVA test for statistically significant difference in BLLs between the groups in the variable.

LIMITATIONS

There are several limitations of this study, primarily due to the quality of data. These limitations are linked to the CDC's interest in protecting their respondent's confidentiality. First, the CDC limits access to medical data on children below the age of six. To access this information, the scholar must submit a research proposal outlining the need for restricted-use data. Producing this research proposal was not feasible given the time constraints of thesis completion. This is a limitation because the most damaging impacts of lead poisoning are found in children six years and under.

Second, the CDC does not provide a geographical variable to link individual users to a particular location. This means that while it can be suggested that youth of color at a national level are being exposed to lead more than their white counterparts, this cannot be linked to a specific location.

Third, the sample size for the economic status of BLL children is small. Having a small sample size prevents the researchers from properly estimating the population that the researcher got the sample from. A small sample size reduces statistical power, which reduces the chance of discovering the answer to the research question.

Table 2. Measurement of Variables

	Operationalization	**Coding**
Dependent Variables		
Blood lead levels (BLL)	Micrograms of lead per deciliter of blood (µg/dL)	Scale
Independent Variables		
Ethnoracial Categories	Reported race and Hispanic origin information, with Non-Hispanic Asian Category	1 = Mexican 2 = Other Hispanics 3 = Whites 4 = Blacks 5 = Asians 6 = Multiracial
Household Income	Total household income (reported as a range value in dollars)	1 – "0 – 4999" 2 - 5000 - 9999" 3 - "10000 - 14999" 4 - "15000 - 19999", 5 - "20000 - 24999" 6 - "25000 - 34999" 7 - "35000 - 44999" 8 - "45000 - 54999" 9 - "55000 - 64999" 10 - "65000 - 74999" 11 – "75,000 - 99,999" 12 – "100,000 and Over"
Control Variables		
Gender	Gender of the participant	1 = Male 2 = Female
Age	Age in years of the participant at the time of screening.	Continuous variable from 1 - 18
Education	"What is the highest grade or level of school you completed or the highest degree you received?"	1 - "Less Than HS" 2 - "HS" 3 - "Some College" 4 - "College Degree or Higher

This chapter provided the research design, research questions, data source, how the variables will be operationalized, the descriptive statistics, and the limitations of the study. The next chapter will discuss the findings from the data analysis and what tests will be run to answer this study's research questions.

CHAPTER IV

DATA ANALYSIS

This chapter discusses the findings from the data analysis. Two questions will be answered. The first being "Do youth of color (under the age of 18) have higher BLLs than white children?" An analysis of variance (ANOVA) will be run to answer this question. The second question is "Do poor youth of color have higher BLLs than their white counterparts?" A multilinear regression model will be run to answer this question.

RESEARCH QUESTION 1

Do youth of color (under the age of 18) have higher BLLs than white children?

Analysis of Variance of Children by BLLs

This question will be addressed by first running a bivariate model looking at the relationship between ethnoracial group's economic status and BLLs. Specifically, an analysis of variance (ANOVA) will be run to test for statistically significant difference in BLLs. The ANOVA table shows the relationship between ethnoracial group and BLLs with a significance of ($P<.001$), which is below the 95% ($P<.05$) confidence interval. This means that the relationship between ethnoracial group and BLL is statistically significant. The data presents Asian, Mexican, and Black children as the groups that are most exposed to lead poisoning, while white and other multiracial children are less likely to be exposed to lead poisoning.

Table 3. ANOVA			
Ethnoracial Group	Average BLLs (µg/dL)	95% Confidence Interval (Lower Bound)	95% Confidence Interval (Upper Bound)
White Poor	0.54	0.49	0.60
White Not Poor	0.64	0.56	0.71
Other-Multiracial Poor	0.48	0.39	0.57
Other-Multiracial Not Poor	0.54	0.47	0.61
Asian Poor	0.77	0.66	0.88
Asian Not Poor	0.73	0.54	0.92
Hispanic Poor	0.45	0.37	0.52
Hispanic Not Poor	0.42	0.35	0.50
Black Poor	0.58	0.52	0.63
Black Not Poor	0.49	0.45	0.53
Mexican Poor	0.67	0.44	0.90
Mexican Not Poor	0.41	0.37	0.44
Average BLL	0.57		
F-Test	Sig.		
3.59	<0.001		
	Sum of Squares	df	Mean Square
BLL Between Groups	15.40	11	1.40
Within Groups	606.03	1552	0.39
Total	621.42	1563	
		Intercept	
		1	
		Total	
		1564	

Multivariate Regression Model

Second, a regression model will include the control variables included in Table 2. The control variables will be measured against BLLs, the dependent variable. The statistics in the "Coefficients to BLLs" table shows BLLs increasing for minorities outside of other Hispanics. BLLs increase the most for Asians, followed by multiracial children. As household income and education increases, BLLs lower for children as well. As one ages, their BLLs increases, and males have increased BLLs. All these demographics have a significance level of 0.000 which is below the 95% (0.05) confidence interval. This means that the relationship between demographics and BLL are statistically significant. In other words, the results between demographics and BLL is caused by something other than chance.

Table 4. Coefficients to BLLs		
Demographics	Unstandardized B	Sig.
Hispanic	-0.21	0.000
Mexican	0.09	0.000
Black	0.07	0.000
Asian	0.47	0.000
Multiracial	0.17	0.000
Household Income	-0.01	0.000
Male	0.33	0.000
Age	0.02	0.000
Education	-0.14	0.000

RESEARCH QUESTION 2

Do poor youth of color have higher BLLs than their white counterparts?

Analysis of Variance of Children by BLLs

To answer this question, a new variable is created with a combination of income (poor/not poor) and ethnoracial group creating 12 groups, and an analysis of variance is run comparing BLL amongst the groups. The F-test for the resulting ANOVA is significant, meaning that there are significant differences between groups by race and income.

As shown in Table 5, poor children with the highest BLL average are Asians (0.77 µg/dL) and the lowest are Hispanics (0.45 µg/dL). Asian children who are not poor also have the highest BLLs (0.73 µg/dL) and Mexican children have the lowest (0.41 µg/dL). One of the statistics that stands out is white children who are not poor (also the only ethnoracial that the poor children have lower BLLs than the children who are not poor) have higher BLLs than white children who are poor. The reason this statistic stands out is because previous literature points to poor children having higher BLLs (Bullard, 1994; Nicholson et al., 2010). Poor Black, Mexican, Hispanic, and Asian have higher BLLs than their higher income counterparts. This is to be expected based on the literature, but not whites who are more well off to have higher BLLs than whites who are poor.

However, using a Bonferroni test, (not shown) we see that although the model is significant, only certain groups present significantly different values. Mexican children who are poor have BLL levels of 0.67, significantly higher than Mexican children who are not poor, who have levels of 0.41. Meanwhile Asian poor children have BLL level of 0.77, which is significantly higher than Mexican children who are not poor (0.41) and black children who are not poor (0.49).

These findings suggest that some children of color have significantly higher levels of lead in their blood than others. These are Asian and Mexican poor children. It is worth noting that it is not that these subpopulations are significantly different than white children, but instead *other children of color* who are not poor.

Table 5. BLLs For Ethnoracial Groups and Children's Economic Status*			
Poor/Not Poor Youth	Population	Average BLLs (µg/dL)	Standard Deviation
White Poor	277	0.54	0.47
White Not Poor	205	0.64	0.30
Other-Multiracial Poor	88	0.48	1.46
Other-Multiracial Not Poor	76	0.54	0.37
Asian Poor	101	1.29	0.55
Asian Not Poor	60	0.73	0.42
Hispanic Poor	62	0.45	0.56
Hispanic Not Poor	46	0.42	0.25
Black Poor	187	0.58	0.22
Black Not Poor	162	0.49	0.26
Mexican Poor	162	0.67	0.74
Mexican Not Poor	138	0.41	0.32
Total	1564	0.57	0.63
*F-test – SS 15.39, df – 11, F – 3.58, Sig. .001			

CHAPTER V

DISCUSSION

This chapter provides further discussion on the results of this study, which provide empirical evidence to the assertion that race and poor environments are related. The chapter will begin with the significance of the study, implications of the findings, then the limitations, the possibilities of future research, and concluding what the government can do to combat lead exposure.

SUMMARIZING FINDINGS

The hypothesis for this research is that black children would have the most lead exposure, with Mexicans and Hispanics being behind black children in BLL average, but the data from NHANES shows that Asians, both poor and not poor have the highest BLL with blacks having the second highest BLL average. Table 4 shows having higher household income decreases BLL, but Asians are the wealthiest group, yet they have the highest BLL. Education is correlated with income and Table 4 shows having an education reduces BLLs as well. In Gould's study, she explains how BLLs decreases IQ, which results in lead exposed individuals losing out on thousands of dollars in their lifetimes (Gould, 2009), which partially contradicts this study because in this study, Asians have high BLLs, but have the highest income amongst all ethnoracial. There is a slight contradiction because the data in this study displays Black children being the poorest group and having the second highest BLLs behind Asians children. More research would need to be conducted to understand this phenomenon because several empirical studies show that the higher one's BLLs are, the less likely that person will have higher education and wealth.

Findings from the data support this study's research questions. The first question is, "Do youth of color (under the age of 18) have higher BLLs than white children?" A multivariate analysis was run to determine if youth of color have higher BLLs than white children. The data shows Blacks and Asians have higher BLLs than whites. Previous literature shows minorities, specifically blacks have higher BLLs than white (Aelion and Davis, 2019; Bernard and McGeehin, 2003; Kennedy et al., 2016). Mexican children have the same BLL average as white children and other Hispanics have the lowest amongst all ethnoraces, which is surprising to know before conducting this study.

The second question is "Do poor youth of color have BLLs than their white counterparts?" An analysis of variance (ANOVA) was run to determine if poor youth of color have higher BLLs than white youths. Table 3 displays black, Asian, and Mexican children having higher BLL averages than white children. Table 1 shows Blacks having lower income than whites, while having higher BLLs and Mexican children having the same BLLs as whites, while having lower income. The research question is answered, but the answer is not what was expected because Asians are the wealthiest group according to the data, but also have the highest BLL average. Further research would need to be done on Asian communities to understand the phenomenon of have high BLLs, while also being the wealthiest race overall.

LIMITATIONS

There are five limitations of this study. First, is the National Health and Nutrition Examination Survey (NHANES) does not provide a geographical variable to link individual users to a particular location. The data collected could be slightly skewed depending on what neighborhoods the children came from. For example, NHANES could have gathered most of the black children in their research from urban communities. If the geographical location was known for the sample size, then it might be possible to understand why Asians have high BLLs and also higher income and education.

Second, the CDC limits access to medical data on children below the age of six. To access this information, the scholar must submit a research proposal outlining the need for restricted-use data. Producing this research proposal was not feasible given the time constraints of thesis completion. This is a limitation because the most damaging impacts of lead poisoning are found in children six years and under.

Third, is the lack of literature on rural communities. Rural children suffer from lead exposure (Aelion and Davis, 2019) but outside of the study done by Aelion and Davis (2019), it is hard to find literature examining rural children's relationship to lead exposure. Findings in the Aelion and Davis (2019) show white rural children having higher BLLs than black rural children, albeit the BLLs are close (2.08 μg/dL vs. 2.19 μg/dL, respectively). Since most impoverished whites live in rural communities, their houses may be lead infested like urban communities, but there is a lack of research on whites struggling with lead poisoning affects.

Fourth, is previous literature does not closely examine other ethnoraces (i.e., Asians, Hispanics, and Multiracial) the way black and whites are examined. Possibly, in previous literature, the Asian population is too small to discuss their relationship to lead exposure. If that is not one of the reasons why, then there needs to be more studies on Asians and lead exposure. It would be easier to understand why poor and more well-off Asians have high BLLs, while also being the wealthiest ethnorace.

Fifth, because this study is using a very large data set, practically any change will appear to be statistically significant, this is evidenced in the output, where extremely small Beta coefficients (as small as 0.01) are shown to be statistically significant.

FUTURE RESEARCH AND GOVERNMENT INVOLVEMENT

These recommendations for future research are based on the findings and limitations of the study. In references to the limitations, more research needs to be conducted on rural communities. The research conducted by Aelion and Davis (2019) displays rural communities having high levels of lead exposure, but there is a lack of literature on rural communities. The highest recommendation though is more research on Asian communities because both poor and not poor Asians have the highest BLLs. This phenomenon should have more exploration since there is a lack of literature on Asian communities and lead exposure. Sometimes, Asians are mentioned in literature, but they are usually an afterthought, so the research can focus on black and white communities because of population size. Have several Asians in this dataset recently immigrate to America, where their housing had lead paint? Looking at other NHANES in different years, outside of Awata et al. 2017 (between 2011-2012) and the data for this study (2017-2018), could show these two datasets are outliers and Asians normally do not have high lead exposure. More research would need to be done on Asian communities and their relationship to lead exposure. As previously stated in the critique of the literature section, Awata et al. (2017) also recommends more research on Asians and their health status because Asians were the fastest growing racial group in the United States between 2000 and 2010.

Possibly, this research study is better suited for a dissertation than a thesis because the scholar must submit a research proposal outlining the need for restricted-use data. Producing this research proposal is impossible because of the time constraints of completing the thesis.

The American government can start by banning toxic waste companies from dumping waste in colored communities and being more responsive to environmental hazards. A solution to lead exposure is removing lead paint in houses. This is easier said than done because landlords say that it costs thousands of dollars to remove the lead in these houses (Wakefield, 2002; 580). The cost of lead removal would range between $192-$270 billion dollars and what is included in the costs are lead removal, medical treatment, tax revenue, special education, lost earnings, cases of ADHD related to lead, and criminal activity (Gould, 2009). The net benefit for lead control, though is $181-$269 billion dollars, which would result in a return of $17-$21 for each dollar invested (Gould, 2009). Children have been suffering from the effects of lead poisoning for years and it is time to end that suffering for the children today and future generations.

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