2022

Lead Toxicity, Attention–Deficit Hyperactivity Disorder, and Gun Violence Among Young African American Men

Gwendolyn Hooker-McIntosh
Walden University

Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral dissertation by

Gwendolyn Hooker-Mcintosh

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Vasileios Margaritis, Committee Chairperson, Public Health Faculty
Dr. Zin Htway, Committee Member, Public Health Faculty
Dr. Scott McDoniel, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2022

Abstract

Lead Toxicity, Attention–Deficit Hyperactivity Disorder, and Gun Violence Among Young African American Men

by

Gwendolyn Hooker-Mcintosh

MS, Walden University. 2015

BSN, Howard University 1981

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

May 2022

Abstract

Violence among adolescents and young adults is a major public health concern in the United States, but it disproportionally affects African Americans. This racial disparity is especially concerning in New Orleans, Louisiana, where fatal and nonfatal shootings have been consistent since 2010 for young African American men. Also, Louisiana ranks third in the nation in prevalence of attention–deficit hyperactivity disorder (ADHD) among children. African Americans in New Orleans have lived in areas known to have greater concentrations of lead in the soil, and African American children and their parents have a lower level of awareness of lead toxicity. The purpose of this study was to investigate an association between lead toxicity, ADHD, and attitudes towards gun violence among young African American men in New Orleans. The health belief model provided the theoretical framework for this study. Between June 13, 2021, and August 1, 2021, 142 participants were recruited using an online platform and the instrument used was The Attitudes Towards Violence Questionnaire. The data were analyzed using Mann Whitney U, binary logistic regression, simple linear regression, and multiple linear regression. The findings indicated a significant association between ADHD and attitudes towards gun violence. The results of this study have implications for positive social change because they can lead to interventions that focus on addressing ADHD symptoms early in childhood, that may prove effective in preventing or reducing gun violence among young African American men in New Orleans.

Lead Toxicity, Attention–Deficit Hyperactivity Disorder, and Gun Violence Among Young African American Men

by

Gwendolyn Hooker-Mcintosh

MS, Walden University. 2015

BSN, Howard University 1981

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

May 2022

Dedication

I am dedicating this study to the Black youth of New Orleans who continue to be both victims and perpetrators of gun violence. I also dedicate this to the families and communities of New Orleans who have been devastated by the loss of their loved ones.

Acknowledgment

Never give up, no matter how easier it may be than to continue! I would like to praise and thank God, the Almighty, who gave me the strength to write this dissertation. I humbly and sincerely want to thank Dr. Vasileios Margaritis for his willingness to be my dissertation chair and for providing me with expert guidance and support throughout this process. I also want to express my heartfelt gratitude to Dr. Zin M. Htway, who initially supported me as a statistic tutor and later as a committee member. I want to especially thank my husband, Trevor McIntosh, who has always supported me and comforted me throughout this journey. Also, I would be remiss if I did not thank my children and grandchildren, who bear with me while I put off family functions and gatherings to meet classwork and dissertation deadlines. Finally, I want to express my appreciation to Chetan Desai, whose guidance, support, and encouragement have been invaluable throughout this process.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

New Orleans, Louisiana, and Atlanta, Georgia, are both located in the southern United States and are similar in terms of population (390,711 and 463,479, respectively) and poverty level (27.7% and 25.2%, respectively), but they have starkly different trends in the number of murders committed on average (*The New Orleans Advocate* [NOLA], 2016). While the average number of homicides in New Orleans from 2000 to 2002 was 46.8 per 100,000 population compared to 41.2 per 100,000 population from 2013 to 2015 representing a 12% decrease, the average number of homicides in Atlanta from 2000 to 2002 was 33.5 per 100,000 population compared to 17.6 per 100,000 population from 2013 to 2015, representing a 47.3% decrease (Paliwal et al., 2016). Also attesting to the complex nature of the underlying problem, Hurricane Katrina, one of the worst environmental disasters in U.S. history, did not appear to have an impact on this alarming trend of gun violence in New Orleans (Fagan & Richman, 2017). This resistance to improvement in the homicide rate in the 10-year period between 2003 and 2012, which appears to be unique to New Orleans, may be indicative of an interaction between deeper social, mental health, and environmental factors beyond population size and poverty level (Fagan & Richman, 2017).

In addition, Louisiana has among the highest rates in the nation for number of residents diagnosed with attention-deficit hyperactivity disorder (ADHD) according to the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*; Holland & Riley, 2018; Kumar & Gleason, 2019; Peveto, 2014). Specifically, as presented in Appendix E,

Louisiana ranks third in terms of the prevalence of ADHD among children (Centers for Disease Control and Prevention [CDC], 2019a).

ADHD is characterized by persistent inattention with or without hyperactivity and impulsivity that interferes with functioning or development (Modesto-Lowe et al., 2015). In addition, Saylor and Amann (2016) found that more than 50% of children with ADHD displayed clinically significant levels of aggression. Also, Al Osman et al. (2019) found an association between ADHD and symptoms of conduct disorder such as poor impulse control and aggressive behavior. The association between environmental neurotoxins and brain function is well documented in the literature and will be discussed in subsequent chapters. Further, between 1970 and 2005, the residents of New Orleans, including children, lived, worked, and played on or near sites known to contain toxic levels of lead (U.S. Environmental Protection Agency [EPA], 2019a). This potentially dangerous phenomenon has resulted from a combination of a lack of public awareness of the harmful effects of lead, neglect or complicity by the public officials, and a dire need for public housing in New Orleans (EPA, 2019a). Children in New Orleans remain especially vulnerable to lead toxicity from exposure to lead in the soil in certain areas pre- and post-Hurricane Katrina (Mielke et al., 2017). Consistent with this finding, researchers have found an association between ADHD and gun violence, between lead and ADHD, and between lead and gun violence (Boutwell et al., 2017; Daneshparvar et al., 2016). At the time of this writing, there have been no studies conducted to explore the effect of lead on the association between ADHD and the attitudes toward gun violence in New Orleans among young African American men. Therefore, this study has potential implications for

positive social change by providing insights into the role that lead toxicity may play in the association between ADHD and gun violence, which can lead to policies and processes for improving public safety.

Background of the Study

The intent of this study was to explore the relationship between lead toxicity, ADHD as defined by the *DSM-5*, and attitudes toward gun violence in young African American men in New Orleans. Goodlad et al. (2013) explored the relationship between lead and ADHD in children in their metanalysis study and found an association between environmental lead exposure and inattention and hyperactivity. Furthermore, the current scientific consensus can denote no safe level of lead; even low levels of lead exposure in children is a cause for concern (Goodlad et al., 2013). In a hospital case-control study, researchers found that even a low blood lead level (BLL) of less than 5 mcg/dl was a risk factor for ADHD in children (Park et al., 2016). In a cross-sectional study of the relationship between environmental exposure to lead in terms of BLL and impulse control symptoms in ADHD in school-age children, researchers found a significant association between low BLL and hyperactivity and between low BLL and impulsivity, but not inattention (Hong et al., 2015). Additionally, in a systematic review of studies focusing on children (birth to 18 years of age), researchers found a positive association between lead levels of less than 5 mcg/dL and ADHD (Daneshparvar et al., 2015). In comparing the neurotoxic effects of inorganic lead, aluminum, and mercury in Romanian children, Nicolescu et al. (2010) found significant associations between lead and all three symptom groups of ADHD, inattention, hyperactivity, and impulsivity. Additionally, the

association between each of these symptoms of ADHD and lead was the strongest, compared to the other two metals, mercury and aluminum, that were examined (Nicolescu et al., 2010). Linab et al. (2019) found that children ages 3 to 15 were at an increased risk of ADHD with increased lead exposure.

In addition, because ADHD is associated with aggressive behavior (Saylor & Amann, 2016), exploring the potential relationship between ADHD and violent behavior characterized by aggression is useful. Saylor and Amann (2016) found that over half of the preadolescents participating in their study who presented with clinically significant levels of aggression were diagnosed with ADHD. Furthermore, González et al. (2013) found a significant association between some components of ADHD and criminally violent behavior. Specifically, while there was a significant moderate association between hyperactivity and acts of violence, there was no significant association between inattention and violent behavior (González et al., 2013). In considering the effect of violent behavior and, specifically, criminally violent behavior on individuals and communities at large, its prevalence and intensity may make it a public health concern. Also, due to socioeconomic and historic factors, criminal violence may affect certain racial–ethnic communities to a greater extent than other communities.

Violence among adolescents and young adults is a major public health concern in the United States in general, but it disproportionally affects African Americans (Masho et al., 2016). According to Murphy et al. (2018), homicides from violence with a firearm occur at a higher rate with African Americans than Caucasians in the United States. The rate of death by homicide in 2015 for African American men between ages 15 and 24

(adolescents and young adults) in the United States was 74.9 per 100,000 population compared to 7.3 per 100,000 population for Caucasian men in the same age range (National Center for Health Statistics, 2017).

Various interventional approaches, including shock and awe and community-based relationship building, have been proposed to address the disproportionately higher rate of shootings and homicides among the African American population (Jones et al., 2015; Milam et al., 2016). Specifically, Milam et al. (2016) used a community-based approach involving outreach workers to build relationships and trust among young African American men living in communities with high rates of gun violence in Baltimore, Maryland. Milam et al. (2016) captured participants' attitudes toward guns and violence by using the valid and reliable attitudes toward guns and violence questionnaire (AGVQ) before and after the intervention compared to the control community without the intervention. The researchers found that participants on a small scale showed improvement in attitudes toward guns and shootings postintervention (Milam et al., 2016).

Additionally, African American adolescents and young adults are the usual participants in incidents involving gun violence in New Orleans, both as victims and as perpetrators (Fagan & Richman, 2017). In fact, pre- and post-Hurricane Katrina homicide rates for New Orleans per capita remained persistently elevated compared to Houston, Texas; New York, New York; Los Angeles, California; and Chicago, Illinois (Fagan & Richman, 2017). Additionally, the results from a study conducted by the EPA and the Louisiana Department of Environmental Quality found that the lead in the soil in New

Orleans was comparable pre- and post-Katrina (Rabito et al., 2012). Zahran et al. (2010) compared the soil lead level (SLL) and BLL in New Orleans based on the soil data from the same 46 census tracts after Hurricanes Katrina and Rita (HKR) in 2006 and that from those pre-HKR in 2000 based on the 1990 census tract borders. The BLL data used in Zahran et al. (2010) were provided by the Louisiana Office of Public Health and the Louisiana Childhood Lead Poisoning Prevention Program for children who were six years of age or younger. Zahran et al. (2010) found a positive association between SLL and BLL both pre- and post-HKR, and the SLL and BLL post-HKR were lower than pre-HKR. However, the BLLs post-HKR were still above the CDC's established guidelines (Zahran et al., 2010). In addition, in 2003 prior to Katrina, the CDC rated Louisiana as having the third highest number of ADHD diagnoses for ages 4 to 17 in the nation; the state remained at the same place after Katrina in 2007 and 2011 (CDC, 2019a).

This study is pertinent for several reasons. Although other studies have demonstrated an association between ADHD, violent behavior, and lead separately, no single study has examined the effect of lead on the association between ADHD and gun violence in young African American men in New Orleans before and after Hurricane Katrina. In addition, the outcomes of this study can provide community leaders in New Orleans with an innovative viewpoint in combatting gun violence by significantly adding to the foundation of knowledge in addressing its potential association with SLL. This newfound knowledge can help promote further studies that could lead to the development of effective legislative measures addressing lead exposure at the community level. Additionally, Hurricane Katrina impacted the city of New Orleans by displacing almost

one third of the residents facilitating gentrification (Holm & Wyczalkowski, 2018). Gentrification occurs when a neighborhood's socioeconomic status rises dramatically, usually promoted by a back-to-the-city movement (Holm & Wyczalkowski, 2018), and can occur due to the socioeconomic changes in the city. Hurricane Katrina appears to have contributed to gentrification in its immediate aftermath due to greater damage suffered by low-income neighborhood houses where a disproportionately greater number of African Americans resided. The effect of this disparity in the extent of damage to the houses between the African American and the Caucasian residents meant that fewer African American residents were able to return, creating the right conditions for gentrification to take place, resulting in a change in the racial–ethnic composition of the census tracts (Holm & Wyczalkowski, 2018). Therefore, the concern with elevated BLL that was once mostly limited to African American communities in New Orleans may become a wide-reaching problem in the future with the potential to affect other racial–ethnic communities.

Problem Statement

Homicide and nonfatal shootings have been constant in New Orleans for the past 20 years among young African American men (Fagan & Richman, 2017). New Orleans experienced the highest number of murder rates per capita compared to the national average (Fagan & Richman, 2017). In 2012, metro New Orleans had 53 murder victims per 100,000 population, which was 10 times the national average (NOLA, 2013; U.S. Department of Justice, 2016). Juveniles, as well as young adults, are the usual participants in gun violence in New Orleans, both as victims and as perpetrators (Fagan

& Richman, 2017). In 2010, 42% of murder victims in New Orleans were younger than 25, and 9% were under 18 (Fagan & Richman, 2017). Post-Katrina murder rates for New Orleans remained persistently elevated and consistent with pre-Katrina levels (Fagan & Richman, 2017). The city of New Orleans has experienced more murders than other urban cities of similar geography, population, and level of impoverishment, such as Atlanta (Paliwal et al., 2016; Webster & Bullington, 2017). At the time of this writing, there had been no study conducted to examine the association between lead, ADHD, and gun violence among young African American men in New Orleans before and after Hurricane Katrina. An adequate requirement for the prevention of violence is to know the determinants of the violence (Fagan & Richman, 2017).

Historically, African Americans in New Orleans have lived in areas known to have greater concentration of lead in the soil, and African American children and their parents have a lower level of awareness of lead toxicity (Mielke et al., 2013). Because the effectiveness of any solution depends on the level of understanding of the problem, I aimed to provide insights into factors associated with gun violence to help in designing effective intervention. The findings of this study can contribute to positive social change by addressing lead as a risk factor for ADHD and possibly associating ADHD with gun violence with the anticipation of implementing effective and wide-reaching preventive public health policies and programs, such as education on decreasing the ingestion of lead among children. Such efforts will increase safety and improve well-being and could reduce the mortality rate in young African American men living in New Orleans.

Purpose of the Study

The purpose of this quantitative study was to explore an association between lead toxicity, ADHD, and attitudes toward gun violence among young African American men in New Orleans. In this study, I investigated the effect of lead on the association between a self-reported ADHD diagnosis and gun violence among young African American men in New Orleans.

Research Questions and Hypotheses

This research reflects the following quantitative research questions and hypotheses:

RQ1: Is there a significant association between self-reported ADHD diagnoses and the attitudes toward gun violence among young African American men living in New Orleans?

$H_0$1: There is no significant association between self-reported ADHD diagnoses and the attitudes toward gun violence among young African American men living in New Orleans.

H_a1: There is a significant association between self-reported ADHD diagnoses and the attitudes toward gun violence among young African American men living in New Orleans.

RQ2: Is there a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans?

$H_0$2: There is no significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

H_a2: There is a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

RQ3: Is there a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans?

H_03: There is no significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

H_a3: There is a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

RQ4: Is there an effect of SLL on the association between ADHD and attitudes toward gun violence among young African American men living in New Orleans?

H_04: There is no effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence in young African American men living in New Orleans.

H_a4: An effect was found of SLL on the association between self-reported ADHD diagnoses and attitudes towards gun violence in young African American men living in New Orleans.

Theoretical Framework

The health belief model (HBM) was the theoretical framework for this research study. HBM can be used to forecast the adoption of health-related behaviors by identifying predictive paradigms (Glanz et al., 2015). Expanding parents' knowledge and perceptions of children's susceptibility to the effects of lead toxicity can help avoid the risk of developing ADHD and its association with gun violence. HBM has been in use

since 1952 and is one of the most widely employed theories of health behavior (Glanz et al., 2015). Hochbaum et al. (1952) developed the HBM in response to the unsuccessful implementation of free screening for tuberculosis (TB). Researchers discovered that a person's belief and susceptibility are directly related to the acceptance of an action, such as taking a chest X-ray for TB diagnosis (Glanz et al., 2015). HBM has been demonstrated to be an effective model for addressing an individual's defensiveness against a specific preventive health action and is useful for helping them in understanding a disease and its prevention (Glanz et al., 2015).

Compared to other conceptual frameworks, the HBM provides informed intervention to alter health behavior leading to the hypothesis that a belief in the avoidance of an adverse outcome of a particular health behavior by performing a promoted action will help an individual to act (Jones et al., 2015). Further, the HBM will cause governments to act. Governments are responsible to provide and protect the well-being of its citizens. If evidence indicates that environmental and community exposure to lead leads to gun violence, local, state, and federal governments will have to act to protect the people and communities of New Orleans. Therefore, by applying the HBM theory to lead toxicity, the theoretical benefit would be the potential reduction in the risk of ADHD and gun violence in African American youths in New Orleans.

Nature of the Study

In this cross-sectional study, the grouping variable was a self-reported diagnosis of ADHD, which was a binary variable with two groups: *diagnosed with ADHD* and *not diagnosed with ADHD*. The dependent variable is the scale score on the AGVQ, which

was a continuous variable with higher scores representing a greater level of acceptance or comfort with gun violence. A predictor variable was the SLL based on the census tract data provided in Mielke et al. (2017); this variable was ordinal with higher numerical ranges representing greater concentration of lead in the soil.

Definitions

The following are definitions of important terms used in this research.

African American: Used interchangeably with terms *Black American* and *Black* to indicate race, ethnicity, and skin color.

Attention deficit hyperactivity activity (ADHD): A pattern characterized by persistent inattention with or without hyperactivity–impulsivity that interferes with functioning or development (Modesto-Lowe et al., 2015).

Attitudes toward gun violence: Gun violence is physical aggression involving guns against a victim with or without the intent to harm them (Wormith et al., 2020). Attitudes toward gun violence represents the attitudinal or emotional orientation toward guns as a means of violence. Specifically, in this study attitudes toward gun violence were operationalized as the scale score on the AGVQ, in which a higher score represented a more positive attitude toward gun violence.

Diagnostic and Statistical Manual of Mental Disorders (*DSM*): Approved by the American Psychiatric Association (APA), the *DSM* is a complete classification of recognized, accepted diagnostic criteria for mental disorder to ensure uniformity of diagnoses (Clark et al., 2017). The *DSM* does not discuss any of the causes of disorders;

it only describes symptoms (Clark et al., 2017). The *DSM-5* is the most recent edition published in 2013 (Clark et al., 2017)

Homicide: In this study *homicide* was used interchangeably with *murder* to mean the killing of an individual or individuals by intentional or unintentional actions of another individual or individuals (Alvarez & Bachman, 2020).

Hyperactivity: Poor motor control causing excessively moving about constantly in socially inappropriate situations (National Institute of Mental Health, 2019).

Impulsivity: Inability to make intentional carefully thought-out decisions

Mental Health, 2019). Also, impulsivity involves an insufficient level of regard for the consequences of actions that may carry a high potential for harm (National Institute of Mental Health, 2019).

Inattentive ADHD: Manifests as distractibility, forgetfulness, disengagement, carelessness, distractibility, or difficulty in organizing (Modesto-Lowe et al., 2015).

Lead concentration: In this study, *lead concentration* was operationally defined as the SLL in the particular census tract pre- and post-Katrina as measured by Mielke et al. (2017).

Nonfatal shooting: In this study, *nonfatal shooting* was defined as an incident involving a firearm that did not result in a fatality (Webster & Bloomberg, 2019).

Pre-Katrina: Includes the period from January 1990 to August 2005, prior to the occurrence of Hurricane Katrina in August 2005.

Post-Katrina: In this study, *Post-Katrina* includes the period from September 2005 to June 2015.

Assumptions of the Study

An assumption in this study was that the participants' responses to the survey questions would be truthful. Specifically, I assumed that participants would report their diagnoses of ADHD or lack thereof and would respond to the questions on the AGVQ truthfully. Moreover, the self-reported absence of a diagnosis of ADHD was assumed to indicate the lack of ADHD symptoms rising to clinical significance. Also, I assumed that the ward or the neighborhood of residence identified by the participants would map exactly onto the SLL heat map in Mielke et al. (2017). Additionally, I assumed the accuracy of the SLL ranges based on the census tract data presented in Mielke et al. (2017).

Scope and Delimitations

This study was limited to African American men, ranging in age from 19 to 29, who lived in New Orleans. A strength of this study stems from the fact that the data were collected from the members of the target population in the specific New Orleans communities where they reside. This allowed for a relatively greater level of external validity in applying the results of the study to the target population.

Limitations

This study was limited by the specific timeframe in which it was completed. The time constraints and resources limited the sample size and the depth at which the potential confounding factors could be examined. Therefore, I was not able to comprehensively account for all potential confounding variables. In past studies, researchers have demonstrated a direct association between BLL and gun violence.

Finally, because this was a cross-sectional study, I was not able to demonstrate causality between the independent and the dependent variables.

Significance of the Study

The objective of this study was to investigate the relationship between lead toxicity, ADHD, and attitudes toward gun violence in New Orleans among young African American men. Many incidences of impulsive mass shootings in the history of New Orleans have involved young African American men. Unfortunately, these incidences have indicated wanton disregard by the perpetrator for the safety of innocent bystanders. This extreme impulsivity in accomplishing a momentary goal could provide insight into the origins of the resulting criminally violent behavior. To this end, understanding the potential effect of neurotoxins, such as lead, on impulsivity and gun violence is indispensable in addressing this public health concern. Indeed, with the high prevalence of morbidity and mortality among young African American men in New Orleans, exploring effective and innovative approaches to address criminally violent behavior in this population group was imperative.

The findings of this study could have implications for positive social change by providing insights into the role of lead toxicity, ADHD, and gun violence. Advocating for action against lead toxicity can help with addressing gun violence in the most violent neighborhoods, which can improve public safety in New Orleans. Moreover, the results of this study could also fill a gap in the literature regarding lead toxicity, ADHD, and gun violence. Social change within the African American community is needed to end the gun violence perpetrated by African American men against African American men. This

study contributes to social change through the identification of heavy metal Pb, an environmental factor associated with increased incidence of ADHD and gun violence in New Orleans. Therefore, this study's findings can be used to educate the African American community in New Orleans about the benefits of early childhood screening for lead, how to avoid lead exposure, and the importance of treating ADHD.

Summary

There is a disproportionately high rate of mortality because of gun violence among young African American men compared to their Caucasian counterparts (Noonan et al., 2016). According to Noonan et al. (2016), young African American men are at 60% greater risk of being involved in fatal or nonfatal incidences involving gun violence as either the victim or perpetrator compared to young Caucasian men. These statistics become especially acute in New Orleans, which experienced the highest number of gun-related murders per capita compared to the national average, and where African Americans make up 59% of the population (Data Center Research, 2019a, 2019b; Fagan & Richman, 2017). This is an alarming trend in the number of homicides among young African American men living in New Orleans (Paliwal et al., 2016). Louisiana is also among the highest states in the nation in number of children diagnosed with ADHD (Holland & Riley, 2018). In addition, lead in the soil has been found to a disproportionately greater extent in African American neighborhoods of New Orleans.

In this study, I investigated whether the exposure to lead moderated the association between ADHD and gun violence among young African American men in New Orleans. The high mortality rate among young African American men in New

Orleans necessitates innovative approaches to address gun violence in this population. The study of the association between lead exposure, ADHD, and gun violence could help create public awareness about the neurotoxic effects of lead and how to handle lead safely. The findings from this study could also add to the knowledge base about the association between lead toxicity, ADHD, and gun violence. Moreover, using the HBM toward prevention of lead toxicity may help reduce the risk of ADHD, which in turn may help reduce fatal and nonfatal gun violence among young African American men in New Orleans.

In Chapter 2, a discussion of lead toxicity and how it leads to damage to the prefrontal cortex (PFC), according to the literature is presented. In Chapter 2, I also discuss how damage to the PFC can lead to a decrease in dopamine levels and affect a person's executive functioning (EF) toward the presentation of symptoms of ADHD. Specifically, I provide an explanation on how difficulties with impulsivity and goal-directed behavior in ADHD can lead to or exacerbate gun violence. Finally, I emphasize the gaps in the literature regarding the potential effects of lead toxicity on the association between ADHD and gun violence among young African American men in New Orleans.

Chapter 2: Literature Review

Introduction

The purpose of this study was to investigate the association between lead exposure, ADHD, and attitudes toward gun violence. Specifically, the goal of this study was to examine whether lead-contaminated soil is a risk factor for the association between ADHD and attitudes toward gun violence. In this study, I focused on SLL, BLL, ADHD diagnosis, and attitudes toward gun violence in young African American men ages 18 to 29, living in New Orleans. The results of the study may show that lead was an issue pre-Katrina and persists today for those who live in the inner city of New Orleans (Mielke et al., 2017). Additionally, children five years old and younger are especially vulnerable to the adverse effects of lead because their bodies are quickly developing, and they place their hands and objects in their mouths, increasing possible contamination of lead dust soil (CDC, 2019b).

In this literature review, I highlight the findings from studies supporting a possible association between lead toxicity, ADHD, and attitudes toward gun violence. Establishing such an association will emphasize the need for early prevention of lead poisoning and will support the provision of policies to promote lead-free soil for children's safety. Two ways to reduce lead contamination in the soil include, first, promoting compliance with EPA guidelines requiring contractors to implement lead-safe restoration practices in renovation, such as power sanding with an attached high-efficiency particulate absorbing filter to collect dust so that lead does not get scattered and settle in soil (EPA, 2011). Second is to remove contaminated heavy metals from soil,

such as lead, using biosurfactants, which have been proven efficient and environmentally friendly (Qi et al., 2018).

Literature Search Strategy

The articles used for the review of the literature supporting this study are peer-review publications obtained by searching the following databases: Medline, Cochrane, EBSCO, the DeepDyve Library, and Google Scholar. The keywords employed in the search were *ADD, attention deficit disorder, ADHD, attention deficit hyperactivity disorder, dopamine, executive function, juvenile delinquency, Hurricane Katrina, lead, lead toxicity, New Orleans, prefrontal cortex, Superfund site, gun violence, violent behavior, African American,* and *young Black men* over the period from 1998 to 2020. The starting point for this search period was determined by the year the first census tract-based study on SLLs in New Orleans was published. The literature search yielded more than 10,000 total results. After further analysis of the scope of my study, I reviewed approximately 450 articles, eventually narrowing down to the 74 studies included in this literature review.

Theoretical Framework

Health Belief Model

The HBM was the theoretical framework used for this research study. HBM can be used to forecast the adoption of health-related behaviors by identifying predictive paradigms (Glanz et al., 2015). For example, expanding parents' knowledge and perceptions of children's susceptibility to the effects of lead toxicity and developing ADHD and its association with gun violence could influence their health-related

behaviors. HBM has been in use since 1952 and is one of the most widely employed theories of health behavior (Glanz et al., 2015). Hochbaum et al. (1952) developed the HBM in response to the unsuccessful implementation of free screening for TB. Researchers discovered that a person's belief and susceptibility are directly related to accepting an action, such as taking a chest X-ray for TB diagnosis (Glanz et al., 2015).

The six components of the HBM (Appendix F) can help initiate social change in New Orleans communities for the prevention of violence among young African American men. The first component is *perceived severity*, which is what an individual perceives as the risk of the disease and whether they believe that lead can hurt their child (Jones et al., 2015). The second component is *perceived susceptibility*, which provides the caretaker with the perception that lead toxicity can harm their child (Jones et al., 2015). This perception can influence a caretaker's decision toward taking actions about their child's health by having them screened for lead toxicity (Jones et al., 2015). A third component is *a benefit to action*, which is how a person's action can help prevent disease contraction; a fourth element is *perceived barriers*, which signifies how one feels about the obstacles in performing a health action (Jones et al., 2015). Perceived barriers can help a caretaker develop an understanding of how to prevent or decrease the chances of their child experiencing lead toxicity by taking a preventive measure; perceived benefits help the caretaker understand the benefits of their child avoiding the effects of lead toxicity (Jones et al., 2015). The fifth element is *self-efficacy* which refers to an individual's confidence in performing the behavior, and the sixth and last component of

the HBM is *cues to action* which is the ability of the person to accept the recommendation to achieve the desired behavior (Jones et al., 2015).

The HBM has been used widely and fits nicely as a theoretical framework in health behavior research (Jones et al., 2015). Also, according to Glanz et al. (2015), HBM, compared to other theoretical frameworks, provides informed intervention to alter health behavior, leading to the hypothesis that a belief in the avoidance of an adverse outcome of a particular health behavior by performing a promoted action will help that individual to act (Jones et al., 2015). Specifically, self-efficacy in this research context meant the caregiver will have the confidence to perform the health action needed to have their child screened for lead, preventing or reducing the chances of their child being exposed to lead in the soil. However, to ensure self-efficacy among caretakers, cues to action need to be implemented for the HBM theory to be effective (Jones et al., 2015). For example, awareness of an association between ADHD, gun violence, and lead toxicity raised among New Orleans residents can empower them to act by avoiding or lessening contact with lead in the soil toward reducing gun violence over time.

The HBM has shown to be an effective model for addressing an individual's defensiveness against a specific health risk and helping them devise ways to reduce the health problem. Various researchers have found success in using HBM to effect health-related behaviors in certain populations. Bates et al. (2020) used the HBM to promote a reduction in triatomine bug infestation. The study's results were significant when applying the HBM to prevent triatomine bugs in the home by emphasizing a person's self-efficacy in enacting instead of emphasizing the risk (Bates et al., 2020). Additionally,

according to Kegler and Malcoe (2004), the application of HBM helped reduce childhood BLLs of rural Native Americans living in a Superfund site, by adopting preventive behaviors to reduce lead exposure.

Literature Review

Lead is an element denoted by the symbol *Pb* derived from the Latin *plumbum* (Agency for Toxic Substances and Disease Registry [ATSDR], 2017). Lead is a bluish-gray metal with an atomic weight of 207.2 atomic mass units; lead's density is 11.34g/cm3 and the melting point is 327.46 centigrade (ATSDR, 2017). Lead is a dense, soft, and moldable metal with excellent stability, naturally resistant to corrosion (ATSDR, 2017). Regarding lead's interaction with biological organisms, lead is a heavy metal, a category that refers to metallic chemical elements with relatively high density that are toxic or poisonous at low concentrations. Other heavy metals include mercury, cadmium, arsenic, chromium, and thallium.

Lead Toxicity

CDC defines lead toxicity as a BLL higher than 5.0 micrograms per deciliter (mcg/dL) in the blood (Mielke et al., 2017). There is no difference in the toxic effects of lead inhaled or ingested (EPA, 2018a). The legal opinion on the concentration of lead in the blood that should be considered a health risk to children has evolved over time as new scientific evidence has emerged (Mielke et al., 2017). In the 1960s, the maximum acceptable BLL was 60.0 mcg/dL; in the 1970s and 1980s it was decreased to 30.0 mcg/dL; in the early 1990s it was 25.0 mcg/dL; and by 2012, it was reduced to 10.0 mcg/dL (Mielke et al., 2017). The current guidelines were changed to display the word

reference value point and reduced the level to 5.0 mcg/dL, suggesting there are no widely accepted and consistent safe levels of exposure to lead (Mielke et al., 2017). There are no identified safe levels of lead because adverse effects on children's cognition have been found to occur at the lowest recognized lead concentration of less than 5.0 mcg/dL (EPA, 2018a). The latest research findings suggest that lead levels even below 3.0 mcg/dL could affect cognitive functioning associated with impulsiveness and a related diagnosis of ADHD (Nigg et al., 2008).

Public Health Response to Lead

In the early 1990s, the EPA proclaimed the Lead and Copper Rule to make water safer by reducing the amount of lead permitted in drinking water with the understanding that there was no safe level of lead (EPA, 2019b). In addition, Rabin (2008) writes that as early as the late 1800s, there were accounts of poisonings from drinking water passing through the lead pipes which was the most preferred material for plumbing. The use of lead to manufacture pipes provided two advantages over using iron in that lead was more durable and pliable (Rabin, 2008). By the late 1800s, the Massachusetts State Board of Health advised discontinuing the use of lead pipes, and by the turn of the century there was little doubt in the public health community that lead pipes needed avoidance by the turn of the century. By the 1920s, the health risks of using lead in pipes surpassed the advantages that it provided (Rabin, 2008). Therefore, most cities in the US prohibited or limited the use of lead pipes in local and state plumbing codes (Rabin, 2008).

In 1960s and 1970s reports of severe poisoning resulting in convulsions, arrested mental development, coma, and even death in children became common (Rabin, 2008).

The frequent occurrence of these tragic events necessitated involvement of public health agencies at the federal level leading to the Lead Contamination Control Act of 1988 (Ettinger et al., 2019). Among the major features of this act included criminal penalties for the use of lead in drinking water containers and an allotment of funding to CDC to be distributed to state and local public health agencies towards programs to eliminate childhood lead poisoning (Ettinger et al., 2019). Under the mandate of this act, CDC became committed to protecting children from lead poisoning by eliminating the exposure of lead in young children (Ettinger et al., 2019). Also, CDC provides recommendations to state and local public health agencies in cooperation with other Federal agencies to achieve the Healthy People 2020 objective of eliminating childhood lead exposure (Ettinger et al., 2019). These efforts contribute to CDC's primary goal of removing lead contamination from the environment before exposure throughout the United States (Ettinger et al., 2019).

How Lead Is Introduced Into the Body

One way lead enters the child's body is through inhalation, and as it is deposited in the lungs it circulates to other parts of the body by the circulatory system that distributes it to the soft tissues and the organs (Jarvis et al., 2018). Children can also absorb lead through drinking water by way of lead-contaminated plumbing connections and accessories (Jarvis et al., 2018). Water pipes in old homes were made of lead and copper waterlines were braised together with lead solder (Jarvis et al., 2018). Another source of lead entering the human body, and a means of childhood lead exposure, is from the contamination of surface soil (Clay et al., 2019). Lead can contaminate the soil for

years from exterior lead-based paint deterioration and from the use of leaded gasoline in automobiles; the lead introduced into the environment in such a way can be absorbed by children playing in contaminated soil (Clay et al., 2019**).** In addition, lead can transfer from the soil to the root of the plant contaminating the plant surfaces (Rai et al., 2019). Therefore, lead can also enter the body through the consumption of crops grown in lead polluted soil (EPA, 2017).

Lead Absorption

Once introduced into the environment, lead can enter the body depending on its relevant physical and chemical properties, the route of exposure, and the extent to which the body can protect itself (Wani et al., 2015). The ATSDR reported that the intake of lead depends on different factors, such as the particle size, exposure route, the nutritional status, age, and health of the person (ATSDR, 2019). Specifically, lead inhaled as dust particles is absorbed into the body at a greater rate than the lead that may have been ingested as paint chips (ATSDR, 2019). Additionally, since the lead in the paint chips is too large to be inhaled, children of ages less than six usually contract lead from the soil via hand to mouth soil ingestion (Clay et al., 2019; Mielke et al., 2017; Sripada, 2017). The hand to mouth habit in children is a primary motor neurological component of the human nervous system (Desmurget et al., 2014). After the lead is ingested, the amount of lead absorbed into the tissue depends on whether the children were on full or empty stomach. Children who are on empty stomach absorbed 100 percent of the ingested lead compared to children on full stomach who absorbed only 50 percent of the ingested lead (ATSDR, 2019).

In addition, infants are a vulnerable group because they can receive a toxic level of lead in-utero during pregnancy, which can continue during infancy if the mother breastfeeds (Wani et al., 2015). Lead also has a bioaccumulation effect due to its absorption being faster than its excretion, especially in children, since they store two-thirds of lead in their bodies while eliminating only a third (Wani et al., 2015). The excretion of lead is through the kidneys or the biliary system (ATSDR, 2019).

Lead Absorption in the Blood

Even though blood is responsible for a small fraction of the total lead burden, it does distribute the absorbed lead by circulating it throughout the body and making it available to tissues (ATSDR, 2019). In the adult human blood, it takes the absorbed lead an estimated 28 to 36 days to reach half of its original amount (ATSDR, 2019). Although BLL is most reflective of circulating blood or a recent exposure and not total body burden of lead such as lead stored in tissues or bones, it is the most commonly used measurement for lead exposure (ATSDR, 2019). In support of the argument for prevention rather than treatment of lead toxicity, the reduction in BLL to a safe level once exposed takes relatively long period of time. Specifically, on average, the reduction in BLLs from ≥10.0 mcg/dL to <10.0 mcg/dL for children enrolled in case management requires slightly more than a year (ATSDR, 2019).

Lead and the Blood–Brain Barrier

In addition to the mode of exposure, stomach contents and age, dietary intake has a critical impact on lead absorption and retention. For example, a child with a deficiency in calcium has an increased risk of lead absorption and retention (Kordas, 2017). Sripada

(2017) found that since lead ions mimic the electro-chemical properties of calcium, they can cross the blood brain barrier by competing for the calcium transporters. Radulescu & Lundgren (2019) also suggest that since lead can compete with calcium, it can replace it in the body resulting in adverse health outcomes which can become more likely in children with a low calcium diet. Also, since children have an underdeveloped brain, even a very low exposure to lead can result in extreme cognitive deficiencies (Radulescu & Lundgren, 2019).

Lead and Bones and Soft Tissues

After entering the body, lead accumulates nonuniformly into the bones and teeth, and will usually accumulate in areas of the bone that is undergoing the most calcification when exposure occurs (ATSDR, 2019). Lead can become stored in the bones for years and can reenter the blood stream at any time (ATSDR, 2019). There are different time frames for the half-life of lead: When lead is in the blood, the half-life is about a month, it is 1 to 1.5 months when the lead is in the soft tissue, and the half-life of lead when it is in the bone is about 25-30 years (ATSDR 2012). The chances that lead will leave the bone and go to the blood increases during lactation and pregnancy (ATSDR, 2019). Additionally, Kordas (2017) found that zinc deficiency influences increased lead absorption into the bone.

Attention Deficit Hyperactivity Disorder

The *DSM* provides, evidence-based guidelines produced by the American Psychiatric Association (APA) towards establishing a clinical standard for an informed diagnosis. Therefore, the *DSM* provides empirically based criteria for diagnosing

neurodevelopmental disorders such as ADHD. Reflective of the challenges associated with diagnosing neuropsychiatric disorders, classification scheme for ADHD has changed over the last 32 years as documented across five editions of the *DSM* (Singh et al., 2015). According to the *DSM-5*, ADHD is a childhood psychiatric disorder characterized by symptoms of inattention, hyperactivity, and impulsivity (Singh et al., 2015). Currently, the classification for ADHD requires clinical presentation of at least six out of nine symptoms of inattention or hyperactivity/impulsivity for children up to age 16 years, or five or more for adolescents aged 17 years and older and adults. Additionally, symptoms of inattention must have been present for at least six months and deemed inappropriate for the developmental level. Also, there must be impairment from symptoms in at least two settings such as school and home, and an apparent significant impairment in social, school, or work functioning (Singh et al., 2015). Furthermore, the *DSM* allows two sub-classifications: Predominantly inattentive, where the child only meets criteria for inattention and predominantly Hyperactivity-impulsive, where the child only meets criteria for hyperactivity-impulsivity (Singh et al., 2015). The APA first described ADHD in 1968 in the *DSM-II* as a hyperkinetic reaction of childhood, focusing on an excessive motor activity (Epstein & Loren, 2013). In 1980, the *DSM-III* further narrowed down the hyperkinetic reaction of childhood to a focus on attention, impulsivity, and hyperactivity, and re-classified it as attention deficit disorder (ADD) with or without hyperactivity (Epstein & Loren, 2013). Eventually, in 1987, the revised third edition of the *DSM-III-R* eliminated ADD without any hyperactivity (Epstein & Loren, 2013). Published in 1994, the *DSM-IV* combined ADD and ADHD into a single disorder with three subtypes—(a)

predominantly inattentive, (b) predominantly hyperactivity–impulsive, and (c) combined—and the symptoms must be present prior to seven (Epstein & Loren, 2013; Magnus et al., 2019).

Lead Exposure and Attention Deficit Hyperactivity Disorder

Chronic, and acute exposure to environmental toxins such as lead has been shown to be a risk factor for the behavioral symptoms of ADHD in children (Singh et al., 2015). Cecil et al. (2008) found that men were more vulnerable to the consequences of lead on the behavioral symptoms of ADHD, and antisocial behavior. Additionally, Park et al. (2016) concluded that even a low BLL (< 5.0 mcg/dL) is a risk factor for ADHD. Once the lead is absorbed into the children's blood stream, it can disrupt brain development, placing a child at risk for ADHD (Wani et al., 2015). Also, BLL was found to be strongly associated with ADHD, specifically, with the hyperactivity and impulsivity, but not with inattentiveness (Hong et al., 2015; Lee et al., 2018;).

Neuropathogenesis of Attention Deficit Hyperactivity Disorder

The Prefrontal Cortex, the Executive Functioning and ADHD. Gharamaleki et al., (2018) stated that the PFC is in the front part of the frontal lobe of the brain, and it is related to a person's EF such as decision making, solving problems, and self-control. The PFC oversees the brain's EF and critically controls cognitive functions such as rule switching and making decisions (Ott & Nieder, 2019). Also, findings by Mace et al., (2018) suggested that EF is related to cognitive actions such as coordinating, planning, and regulating behavior, and the inability to suppress responses.

According to Cecil et al. (2008) childhood exposure to lead is associated with an increased loss of brain volume concentrated in the PFC. Since EF including impulse control is associated with PFC, those with childhood exposure to lead are more likely to have a diagnosis of ADHD (Cecil et al., 2008; Gharamaleki et al., 2018). Kofler et al. (2018) found almost 100 percent of children diagnosed with ADHD showed a deficit in EF. Dovis et al., (2019) based their study on the theory that a deficit in EF is the nucleus of ADHD. Therefore, with lead causing damage to the PFC which in turns leads to deficits in the EF correlate with the diagnosis ADHD (Langer et al., 2019; Ledochowski et al., 2019; Sjowall & Thorell, 2018). Cecil et al. (2008) found that men were more vulnerable to the consequences of lead on the executive function, and they found that the greater the exposure to lead the higher the incidence of ADHD and antisocial behaviors. In addition, Mead et al., (2010) found that an altered dopamine functioning in the PFC could also contribute to an impairment in EF**.**

Dopamine. According to Goodlad, Marcus, and Fulton (2013), disruption of dopamine can be caused by neurotoxin such as lead which affects the operation of the nervous system by interfering with proper neurotransmitters. Specifically, lead can lessen the levels of key proteins in the brain involved in neurotransmitter signaling such as those in the dopaminergic system (Goodlad et al., 2013). Additionally, lead targets the PFC affecting changes in the dopaminergic system that innervate this region, and such an imbalance is thought to lead to increased reaction to and association of rewards with irrelevant stimuli which are known to be symptoms of ADHD (Goodlad et al., 2013). Also, autoradiography receptor binding studies have found that the effect of this

imbalance in the dopaminergic system varies with the dose of lead, the age of the child, and the duration of lead exposure (Nigg et al., 2008). Mokobane et al. (2019) explored EF and its affiliation with the dopamine system that is critical to a person's cognitive ability and showed that an optimized level of dopamine is vital for proper PFC functioning (Mokobane et al., 2019). Clark and Noudoost (2014) explored the function of dopamine in the PFC classifying it as a catecholamine that affects the PFC in its essential role in cognitive functioning. The PFC controls cognitive function such as impulse control and dopamine plays a vital role in modulating its function for optimal activity (Clark & Noudoost, 2014). Specifically, dopamine modulates the transmission of messages between different functional groups of PFC neurons and is synthesized by dedicated neurons in the midbrain that send axons to many brain regions, including the PFC (Ott & Nieder, 2019). The wide range of the effects of dopamine on the PFC neurons is due to its broad release by the firing of the neurons where it is synthesized (Ott & Nieder, 2019). Prehn-Kristensen et al. (2018) also found that the symptoms of ADHD, inattention, and hyperactivity with impulsivity, are thought to be the result of a disruption of the dopaminergic neurotransmitter system and dysfunction of PFC. Specifically, since the prefrontal brain circuitry has been found to control the cognitive skills its disruption is thought to be associated with impulse control and related to a diagnosis of ADHD (Morris et al., 2016). Clark and Noudoost (2014) declared that those with ADHD have an imbalance in the PFC of catecholamines such as dopamine that mediates prefrontal activities. Additionally, according to Vaidya and Stollstorff (2008) regulation of dopamine is thought to be associated with the function of prefrontal brain circuitry since

the axonal networks of dopaminergic neurons innervate frontal cortex. Curatolo et al., (2010) also found that the pathophysiology of ADHD produced an interference of the dopamine process that decreases the available dopamine receptors and the amount of dopamine disrupting the dopaminergic neurotransmitter system indicating the cause of ADHD. Mokobane et al. (2019) stated that there is a lack of social inhibition with ADHD, and their study accept that ADHD is a neurocognitive deficit associated with an abnormal functioning of the PFC.

Neuropathogenesis of Violent Behavior

Pirau and Lui (2018) found that the frontal lobe has three critical areas, which are the supplementary and premotor cortex, the primary motor cortex, and the PFC. When a person has a weakness or impaired performance with the motor skills, they will present with damage to the primary, premotor, and supplementary motor cortex, and damage or impaired function of the PFC could affect a person ability to plan, decrease their motivation, alter their speech, and influence their social behavior. Lane et al., (2011) alluded that any damage to the pre-frontal cortex regions harms a person's memory, his perception, and how he processed his emotions, which results in difficulties with the control of inhibition and consequently can produce disruptive and aggressive behavior. Seiden (2004) also suggested that any damage to the frontal lobes causes inappropriate social behavior, and a person can lose his ability to control deviant impulses making it more likely for them to commit an act of crime. Pirau and Lui (2018) wrote that the frontal lobes oversee managing one's emotions, how an individual socially interact, and the frontal lobe affects a person's personality and they also affirmed that the frontal lobes

are responsible for an individual's behavior and how they make decisions. Therefore, a person with an altered behavior can present with impulsivity and poor judgment (Pirau & Lui, 2018). Al Osman et al. (2019) reported that children exposed to lead have an increased chance of developing ADHD, which showed a connection to the impairment of PFC. A dysfunction in the PFC is associated with damage to the dopamine neurotransmitters, and dopamine is vital to cognitive abilities. Therefore, deficits in PFC lead to the inability to self-regulate one's behavior, increased aggression, and antisocial and criminal behavior which proceeds into adulthood and higher incidences of increased violence (Al Osman et al., 2019). Cristofori et al. (2016) affirmed a connection between the maladaptive aggressive behavior and violence with the dysfunction in the prefrontal and temporal cortex. Specifically, Cristofori et al. (2016) confirmed that the executive functions mediate implicit attitudes toward violence and aggression. The AGVQ was used to access participants' attitudes on guns and their beliefs related to violent versus nonviolent conflict resolution (Cristofori et al, 2016).

Lead, Attention Deficit Hyperactivity Disorder, and Violent Behavior

Seiden (2004) discussed the role of PFC in mediating socially appropriate behavior to explain the association between its damage or disruption and criminal activity. Liu et al. (2014) found an association between BLLs and socially inappropriate or deviant behavior at various stages in life such as problematic behavior in children, delinquency in adolescents, and criminal acts in adults. Radulescu and Lundgren (2017) identified the association between the exposure of lead in children and neurobehavioral effects such as ADHD and antisocial behavior. Also, Sripada (2017) linked elevated

BLLs in children with higher chances of committing a violent crime as a young adult. Additionally, Emer et al. (2020) found that elevated childhood BLL substantially contributed to the perpetration of gun violence during adulthood in Milwaukee, Wisconsin. According to Raine (2018), since there is a relationship between the PFC and antisocial personality disorders (ASPD), it should be considered a neurodevelopmental disorder. The *DSM-5* lists impulsivity, aggression, violence, and criminal behavior as features for ASPD. Given these symptoms, it is not surprising that Raine (2019) linked early exposure to lead with violent behavior and crime in those diagnosed with ASPD and found it to be comorbid with ADHD (Raine, 2019). In addition, the neurotoxic damage due to lead in the PFC has been found to be more common and significantly greater in men than women (Raine, 2019).

Lead in New Orleans Pre- and Post-Hurricane Katrina

The natural source of lead in the Metropolitan New Orleans has been the trace amounts found in the alluvial soil from the sediments of the Mississippi River (Mielke et al., 2007). However, the greater concentration of lead in the United States can be traced back to anthropogenic sources with the use of lead as a commodity in products starting in the 20th century such as cans used for processed goods, synthetic paints, plumbing, and gasoline (Zahran et al., 2013; Datko-Williams et al., 2014). Nationally, lead-based paint and leaded gasoline have contributed an estimated twelve million metric tons of lead to the soil (Zahran et al., 2013). Locally, Battelle Memorial Institute (1998) traced the elevated soil-lead levels in New Orleans to the lead-based paint. The lead in the paint made its way into the soil in two ways: (a) Weathering of the chalk-like composition of

the exterior lead-based paint can get peeled or crumbled resulting in paint chips that infect the surrounding soil, (b) Scraping or sandblasting without an attached collecting tool may result in the lead in the dust integrating into the soil (Battelle Memorial Institute, 1998; Zahran et al., 2013). However, the lead paint particles in the dust in old homes settled in the ground from power sanding (Mielke et al., 2007). Also, the decline in use of tetraethyl (TEL) in gasoline for enhancement of octane in 1986 with a complete phase-out of the lead in gasoline implemented in 1995 helped with the reduction of lead in the soil (Datko-Williams et al., 2014). However, since lead can stay in the soil for hundreds of years without soil remediation, lead dust continued to accumulate in the soil in the inner-city of New Orleans (Datko-Williams et al., 2014).

The EPA's standard required SLL not exceeding 400 ppm (parts per million) for lead in bare soil in activity play areas and not exceeding 1200 ppm in non-play areas (Clay et al., 2019). EPA's concern was that every 1000 ppm increase in SLL concentration will increase BLLs approximately one to five mcg /dL in children below six years old (Clay et al., 2019). Before Hurricane Katrina, Zahran et al. (2010) found a significant positive association between SLL and BLL in New Orleans based on the results from mapping studies and associated surveys completed in 1991. Specifically, children living in the census tracts with SLL greater than the EPA standard (Clay et al., 2019) had BLL of 10.0 mcg/dL (Mielke et al., 1998; Zahran et al., 2010) which was double that of the CDC reference value and more than triple that of the BLL known to affect cognitive functioning (Clay et al., 2019; Nigg et al., 2008). CDC adopted the reference value for BLL of 5 mcg/dL to identify children with higher BLL than most U.S.

children (CDC, 2020). The blood lead reference value is based on the National Health and Nutrition Examination Survey (NHANES) data of the 97.5th percentile of the estimated BLL distribution in children aged 1-5 years (CDC, 2020).

In the research literature the terms “community” and “census tract” are used interchangeably (Mielke et al., 2019). Mielke et al. (2007) also studied the relationship between SLL and the exposure of children to lead in metropolitan New Orleans based on the dataset collected in 1995 and then from 2000 to 2005. There was a significant positive association between the level of lead-contamination of the soil and the level of lead exposure in children in both datasets, but the levels of lead exposure in the 1995 dataset were more extreme than those in the 2000-2005 datasets (Mielke et al., 2007). Both datasets measured lead exposure in terms of the BLL of children who were less than six years of age and included SLL data collected from predetermined census tracts (Mielke et al., 2007). However, while the BLL data in the 1995 dataset were aggregated by the Louisiana Office of Public Health based on the data collected from public health clinics, the BLL data in the 2000-2005 dataset were obtained from the Louisiana Department of Health and focused on the general population (Mielke, 2007). This discrepancy in the level of lead exposure between the two datasets can be explained by the fact that greater proportions of African Americans and the poor used public health clinics as their primary source of care compared to the general population resulting in a bias toward these population groups in the 1995 dataset (Mielke et al., 2007). The relatively higher level of lead exposure in children in these communities reflect the documented health disparities in African American children (Mielke, et al., 2007). One of the factors behind these

health disparities is environmental since African American children as a group lived in the most contaminated areas of New Orleans (Mielke et al., 2007).

Hurricane Katina made a landfall in New Orleans on August 29, 2005, and it brought a storm surge that caused a failure of the levee system which flooded 80 percent of New Orleans that caused over 1400 persons to lose their lives (Zahran et al., 2010). In the wake of the destruction inflicted by Hurricane Katrina, Hurricane Rita made a landfall on September 23, 2005, resulting in rising waters once again breaching the compromised levees and flooding the ninth ward and the surrounding Gentilly community of New Orleans (Zahran et al., 2010).

Zahran et al. (2010) compared the SLL and BLL in New Orleans based on the soil data from the same 46 census tracts post hurricanes Katrina and Rita (HKR) in 2006 as that from those pre-HKR in 2000 based on the 1990 census tract borders. The Louisiana Office of Public Health and the Louisiana Childhood Lead Poisoning Prevention Program provided the BLL data for children who were six years of age or younger (Zahran et al., 2010). The results showed a positive association between SLL and BLL both pre and post HKR (Zahran et al., 2010). However, there were lower SLL and BLL post-HKR than that pre-HKR (Zahran et al., 2010). Additionally, Mielke et al. (2017) studied the SLL and BLL using the same census tracts and the same research team ten years post-hurricane Katrina as that pre-Katrina. The pre-Katrina survey was conducted from January 1998 to January 2001 while the post-Katrina survey was conducted from June 2013 to June 2015 (Mielke et al., 2017). While the SLL and BLL were found to be lower post-Katrina than that pre-Katrina, the BLL of children post-Katrina who were living in the census tracts

with higher SLL remained higher than those living in the census tracts with lower SLL (Mielke et al., 2017). Also, Mielke et al. (2019) conducted three surveys examining SLL and BLL in six years old or younger children who visited clinics throughout metropolitan New Orleans. These BLL data were aggregated by the Louisiana Office of Public Health's Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program that followed the collection, preparation and the analysis protocol established by the Center for Disease Control and Prevention (CDC) (Mielke et al., 2019). The first survey was completed five years before Katrina in 2001 based on 46 predetermined census tracts; the second survey was completed nine months after Katrina based on the same census tracts as those used in the first survey; the third survey was completed in 2017 based on 44 of the 46 census tracts included in the first survey (Mielke et al., 2019). The comparison of the SLL and BLL data from these three different surveys was justified since the census tracts in all three surveys were based on the same 1990 census tract borders (Mielke et al., 2019). Although there was a decrease in BLL with a decrease in SLL in all three studies, the SLL and BLL post Katrina were lower than that pre-Katrina but remained above the lead toxicity levels recommended by the EPA and CDC (Mielke et al., 2019). However, since comparable amounts of reduction in SLL and BLL post-Katrina were observed in both flooded and unflooded communities, flooding was not likely to be the only factor responsible for the reduction in SLL and BLL post-Katrina pointing to other regulatory changes such as the complete phase-out of lead in gasoline in 1995 (Mielke, 2019).

Gun Violence in Young African American Men in New Orleans

In New Orleans, post-Katrina, many homes received severe damage from the hurricane, and by 2009, homes were either demolished, repaired, or renovated, causing additional sources for lead exposure (Rabito et al., 2012). Although power sanding was prohibited by the New Orleans city ordinance, it was prevalent during the renovations after Katrina due to poor regulatory implementation (Rabito et al., 2012). This allowed for the lead in the dust released from the power sanded lead paint to make its way into the atmosphere and contaminate the soil post-Katrina (Rabito et al., 2012). In fact, Rabito et al. (2012) found that the soil collected in New Orleans post-Katrina had SLL above the EPA guidelines. This problem was compounded in residential and commercial areas occupied pre-Katrina by former landfills that contained lead and other toxic chemicals (Bullard et al., 2007). The EPA's pre-Katrina response to this problem has been proven to be insufficient to withstand the damage inflicted by the hurricane induced flooding since lead and other toxic chemicals can rise through the permeable layer of soil laid down by the EPA (Bullard et al., 2007). Additionally, the sediment sludge in the hurricane-induced tidal surge brought lead and other toxic chemicals into the area from water body where they had been dumped over decades (Bullard et al., 2007).

Superfund Site

There are many sites contaminated with hazardous waste located throughout the United States, where processing plants and companies mismanaged waste and dumped them in landfills (EPA, 2018). The Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) came into existence designated by

the U.S. federal government and unofficially known as the Superfund to clean up these sites (EPA, 2018).

Superfund Site in New Orleans Pre- and Post-Katrina

From about 1910 to the 1950s, the Agriculture Street Landfill located in the upper ninth ward of New Orleans was a dumping site for both hazardous and nonhazardous waste. The 95 acres site was reclaimed in the 1970s continuing through the 1980s for the primary purpose of housing low-income residents in private and public homes (EPA, 2019a). The residential development consisted of single and multifamily dwellings where all residents were African American (EPA, 2019a). The site also contained a community center, an elementary school, retail businesses, an electrical substation, a recreation center, and an undeveloped portion that was unrestricted before 1994 (EPA, 2019a). Years of complaints from residents suffering from mysterious cancers and other illnesses prompted the EPA to undertake an environmental assessment and to place the former landfill on the National Priorities List (NPL) in 1994 as a superfund site (EPA, 2019a). The assessment by the EPA found high levels of contaminants such as lead, arsenic, and polycyclic aromatic hydrocarbons (PAH) in the soil at the site (Government Accountability Office, 2008). However, between 1997 and 2001, nearly 70,000 tons of material were removed by the EPA and replaced with clean material (EPA, 2019a). Nevertheless, post-Katrina, the soil under buildings, streets, and sidewalks on Agriculture Street Landfill was not addressed, resulting in only 10% of the land on Agriculture Street having been reclaimed with clean soil but after Hurricane Katrina the area was still contaminated with lead (Bergal, 2007). Leaving the surrounding areas contaminated with

lead (Bergal, 2007). In addition, those same contaminants lead, arsenic, and PAH were at elevated levels post-Katrina based on EPA inspection of the Agriculture Street superfund (Government Accountability Office, 2008).

Attention Deficit Hyperactivity Disorder Pre- and Post-Katrina

The CDC rated Louisiana in 2003 with the third highest ADHD diagnosis for ages 4 to 17 in the nation and stayed at the same position in 2007 and 2011 (CDC, 2019a). For those holding private insurance, Blue Cross Blue Shield Association (BCBSA) reported Louisiana, specifically, Baton Rouge and New Orleans with the highest rate of diagnosis for ADHD in children ages 2 to 18 from 2011 to 2017 compared nationally (Haefner, 2019). Furthermore, the Office of Inspector General (2019) found that in Louisiana more than half a million children with Medicaid were prescribed medication for ADHD but did not follow up with medical or behavioral health care treatment. Since currently there is no cure for ADHD, normal functioning depends on effective medication management and inconsistency can lead to worsening of symptoms (Lichtenstein et al., 2013).

Gun Violence in New Orleans Pre- and Post-Katrina

Although rates of violent crime have been on the decline in the United States, homicide and non-fatal shootings have been constant in New Orleans for the past 20 years for young African American men (Fagan & Richman, 2017). For the last 20 years, New Orleans experienced the highest murder rates per capita compared to the nation's average (Fagan & Richman, 2017). Juveniles, as well as young adults, are the usual participant of the gun violence in New Orleans, both as victims and as perpetrators (Fagan & Richman, 2017). In 2010, 42 percent of murder victims in New Orleans were

younger than 25 years old, and nine percent were under the age of 18 (Fagan & Richman, 2017). Post-Katrina murder rate for New Orleans remained persistently elevated and consistent with pre-Katrina levels (Fagan & Richman, 2017).

Summary and Conclusion

Over a weekend of gun violence in September 2019 in New Orleans, 14 African American men, ranging from ages 16 to 21 years, were shot resulting in three casualties (NOLA, 2019). Two of these shootings took place at the Desire area near Higgins Boulevard at the site of the former Agriculture Street Landfill (The New Orleans Advocate (NOLA, 2019). Unfortunately, gun violence involving African American men in this New Orleans neighborhood have become normalized due to their frequent occurrence.

This literature review explored the childhood exposure to lead in the environment, ADHD, and the attitudes toward gun violence among young African American men living in New Orleans. It focused on the Agriculture Street Landfill which sheltered the low-income African American children living in the Desire housing development community to illustrate the interplay of all these three factors in the context of Hurricane Katrina. The children who resided near the Agriculture Street Landfill have been found to have an average BLL of 6.0 mcg/dL (Mielke, 1998), which is over the current CDC reference value of 5.0 mcg/dL for children. However, other areas in New Orleans have higher BLL with an average of 9.0 mcg/dL (Mielke, 1998). In addition, CDC has not identified any BLL that it considers to be safe for children (CDC, 2019c). Because previous research demonstrated that a BLL at an early age is positively associated with

ADHD, lead exposure is an important contributary factor to consider for the treatment and prevention of ADHD in African American children living in New Orleans. Also, since children living with ADHD tend to commit gun violence at a higher rate as they get older, lead exposure during early childhood should be examined as an explanatory factor for the relationship between ADHD and gun violence in young African American men in New Orleans. Each of these individual factors were compared pre- and post-Katrina to gain greater insights into the effect of the hurricane on each of these three factors. However, there was no single study found that examined the effect of lead on the relationship between ADHD and gun violence in young African American men who lived in metropolitan New Orleans before and after Hurricane Katrina.

Chapter 3: Research Method

Introduction

In this study, I aimed to investigate a possible association between lead toxicity, ADHD, and attitudes toward gun violence in young African American men in New Orleans. In this chapter, I explain the relevance and rationale for the choice of the research design. The method and its components, including data collection, the instruments used, the data analysis, the target population, and the recruitment process strategy will be reviewed and described. Also, reliability, validity and ethical considerations will be addressed.

Research Design and Rationale

Quantitative and qualitative are two main methods for categorizing data in a research study. The qualitative research approach is best suited for studies conducted in the field or natural studies conducted to examine people's thoughts and feelings and how they might affect their behavior via observational techniques such as key informant interviews or surveys (Sutton & Austin, 2015). A researcher makes many field notes from taped interviews to identify relevant statements and introduce methods for coding the data (Sutton & Austin, 2015). In a quantitative study, the use of either descriptive or experimental measures is used. A descriptive study establishes only that associations exist between variables, while in an experiment, there is an effort to measure how the variables may explain outcomes to better try to measure variables that might explain the mechanism of the treatment. Quantitative research therefore can involve controlled experiments or surveys specifically designed to obtain and compile quantitative data

(Creswell & Creswell, 2018). Quantitative studies can include both observational and experimental data collection and analytical techniques. This study was a survey based on a correlational research design. Although this research design allowed for a higher degree of external validity indicating a greater level of confidence in applying the results of the study to the target population in its natural setting, it does not allow for the control of confounding variables (Norgaard et al., 2017). Therefore, the primary goal of this study was to explore the effect of the moderator on the association between the independent and the dependent variable without making any claims about casualty (Mackinnon, 2011).

In this study, the participants were African American men between ages 18 and 29 who had grown up and lived in New Orleans for at least 1 year. The independent variables included SLL and the self-reported diagnosis of ADHD, and the dependent variable was participants' attitudes toward gun violence. Because the values or categories of the independent variables and dependent variables were self-reported and not manipulated in any way, this was an observational study. I used a retrospective approach because, in this study, the ranges for one of the independent variables, SLL, were based on the census track data collected from 1998 to 2001 before Hurricane Katrina and from 2013 to 2016 after Hurricane Katrina (Mielke et al., 2017). The dependent variable self-reported diagnosis of ADHD was also based on historical data (Appendix G).

This study's primary goal was to explore the potential effect of SLL on the association between self-reported diagnoses of ADHD and attitudes toward gun violence. Specifically, self-reported diagnosis of ADHD is binary with two groups: diagnosed with

ADHD by a physician or not diagnosed with ADHD by a physician; the SLL is the potential moderator based on the census tract data provided in Mielke et al. (2017), and it is ordinal with higher numerical values representing a higher range of lead levels (mg/kg). The AGVQ scale score measures participants' attitudes toward gun violence and is continuous with higher scores representing more receptive attitudes toward guns and violence.

Methodology

Population

The target population was African American men between ages 18 and 29 who have lived in New Orleans between birth and 11 years of age for at least 1 year (Wani et al., 2015). Potential participants were excluded if they were women or did not know the area in which they resided. The potential participants fell in one of two categories regarding self-reported ADHD diagnosis: (a) never diagnosed with ADHD or (b) diagnosed with ADHD by a licensed mental health or medical provider. Power analysis was conducted in G*power to calculate the sample size required to achieve the designated statistical power at the given significance level with the specified variability from the given population to analyze each research question (Fugard & Potts, 2015).

Sampling and Sampling Procedures

Sampling is used to select a manageable number of participants from a predefined population so the subset is a suitable representation of the population (Champion et al., 2018). In broad terms, sampling techniques can be divided into probability based and nonprobability based (Champion et al., 2018). Convenience sampling is a nonprobability

type of sampling where members of the target group meet specific criteria, easy accessibility, geographical proximity, and availability at a given time or the willingness to participate (Etikan, 2016). Due to the imprecise nature of data collection in convenience sampling, it is also known as *haphazard sampling* or *accidental sampling* (Etikan, 2016). For this study, the participants were recruited using targeted ads on the social media website Facebook. In alignment with the goals of the study, participants who were not African American men, who were not in the age range of 18 to 29, and who did not live in New Orleans for at least 1 year between birth and 11 years of age were not eligible to participate in the study. Therefore, convenience sampling was appropriate for this study as it allowed for the easy recruitment of participants at any given time who met the inclusion criteria toward achieving the target sample size.

Sample Size

The a priori power analysis was conducted to determine the target sample size needed for each of the four research questions using G*Power 3.1.9.6. The inputs in G*Power for the first research question were as follows: t test for the test family; means: difference between two independent means (two groups) for the statistical test; a priori: compute required sample size-given α, power, and effect size for the type of power analysis; 0.50 for the effect size d (American Statistical Association, 2020); 0.05 for α probability of error; 0.80 for power (1-β err prob); and 1 for allocation ratio N_2/N_1 (American Statistical Association, 2020). Using these input settings in G*power, the sample size was calculated as $n = 128$.

The inputs in G*Power for the second research question were as follows: Z test for the test family; logistic regression for the statistical test; a priori: compute required sample size-given α, power, and effect size for the type of power analysis; two for the tail(s); ratio, 0.22 for the Pr (Y = 1 | X = 1) H_1; 0.12 for the Pr (Y = 1 | X = 1) H_0 (Kumar & Gleason, 2019); 0.05 for α probability of error; 0.80 for power (1-β err prob); 0 for R^2 other X, Normal for X distribution; 0 for X parm μ and 1 for X parm σ; F test for the test family; linear multiple regression: fixed model, R^2 deviation from zero for the statistical test; a priori: compute required sample size-given α, power, and effect size for the type of power analysis; 0.15 for the effect size f^2 (Selya et al., 2012); 0.05 for α probability of error, 0.80 for Power (1-β err prob); and one for the number of predictors. Using these input settings in G*power, the sample size was calculated as $n = 142$.

The inputs in G*Power for the third research question were as follows: F test for the test family; linear multiple regression: fixed model, R^2 deviation from zero for the statistical test; a priori: compute required sample size-given α, power, and effect size for the type of power analysis; 0.15 for the effect size f^2 (Selya et al., 2012); 0.05 for α probability of error; 0.80 for power (1-β err prob); and one for the number of predictors (American Statistical Association, 2020). Using these input settings in G*power, the sample size was calculated as $n = 55$.

The inputs in G*Power for the fourth research question were as follows: F test for the test family; linear multiple regression: fixed model, R^2 deviation from zero for the statistical test; a priori: compute required sample size-given α, power, and effect size for the type of power analysis; 0.15 for the effect size f^2 (Selya et al., 2012); 0.05 for α

probability of error; 0.80 for power (1-β err prob); and two for the number of predictors (American Statistical Association, 2020). Using these input settings in G*power, the sample size was calculated as $n = 68$ (see more details under Data Analysis).

Data Collection

According to Cheng and Phillips (2014), primary data collection can be through surveys, and because the data are being collected for the first time, the information collected is specifically for that study. Secondary data are those collected previously by someone else for another purpose but can be appropriate for a new study. An advantage to using secondary data is that doing so saves time and resources (Cheng & Phillips, 2014). In this quantitative study, I analyzed primary data collected with an online survey questionnaire (see Appendix C). The survey was the primary method of data collection for this study. The participants were between ages 18 and 29, had lived in New Orleans for at least 1 year between birth and 11 years of age, and identified their ward and their street nearest to where they resided (Matt, 2012).

Recruitment and Participation

The study was promoted across Facebook with an online flyer (see appendix A) to increase exposure and was targeted to men between ages 18 and 29. Also, the study was limited to users whose residence was identified on Facebook as within a 50-mile radius of New Orleans to increase the representation of different wards across New Orleans. If a Facebook user who came across the ad was interested in participating, they were able to click on the survey link provided within the ad that led them to a secure online survey. The first page of the survey consisted of the informed consent form, and by completion of

the survey their consent was given to participate in the study. The average time to complete the survey was about 20 minutes.

Instrumentation and Operationalization of Constructs

Shapiro (2000) developed the AGVQ manual. SLL, the independent and moderator variable, was used for operationalizing lead toxicity. Because ADHD, the independent variable, is a condition of symptoms, diagnosis of ADHD had to have been made by a licensed clinician. Therefore, for a self-reported diagnosis of ADHD, participants were asked if they had been diagnosed with ADHD by a licensed clinician or doctor, and they could answer yes or no.

The dependent variable was attitudes toward gun violence and was operationalized by participant responses to the AGVQ. This questionnaire was appropriate for my study because it has been found to be a valid and reliable tool. The AGVQ was tested with African Americans, who constituted 38% of the participants. The majority were men (58%) compared to women (37%), and the ages ranged from 6 years to 29 years. Therefore, the samples on which the AGVQ were tested contained participants matching those included in this study in terms of race, age, and gender, as determined by the exclusion criteria.

License for the use of the AGVQ in each copy of the study survey was granted by the publisher Western Psychological Services (see Appendix D). The AGVQ measures attitudes toward guns and violence among youth and young adults. This instrument has been tested for validity and reliability on a normative sample of youth (ages 6–18) and young adults (ages 19–29) that were ethnically and socioeconomically diverse (Shapiro,

2000). Additionally, the participants were drawn from all geographical regions of the United States to ensure the sample captured American youths and young adults (Shapiro, 2000).

The AGVQ has 23 items, and each response is measured on a three-point Likert scale with the options *agree, not sure,* and *disagree* (Shapiro, 2000). Each item in the instrument was validated from a pilot version using a two-step process. First, each item had to meet a part–whole correlation criterion, and second, each item had to be similar to its correlation with a validation item in the set (Shapiro, 2000). The instrument was found to have good reliability (Cronbach's alpha of .88) for the total scale as assessed on a standardized sample (Shapiro, 2000). Finally, for each of the 23 survey items, Shapiro (2000) included a statement related to some aspect of guns and violence divided into four subscales based on factor analysis. All four subscales were found to have acceptable to good reliability: *aggressive response to shame* (Cronbach's alpha = .83), *excitement* (Cronbach's alpha = .79), *comfort with aggression* (Cronbach's alpha =.81), and *power/safety* (Cronbach's alpha = .72).

Data Analysis Plan

The online survey consisted of pre-defined, multiple-choice questions and open-ended text responses (area of residence) that was collected confidentially using the online survey platform SurveyMonkey. Each item in each of the four subscales in the AGVQ was scored from 0 to 2 where 0 corresponded to the response, "Disagree," 1 corresponded to the response, "Not Sure," and 2 corresponded to the response, "Agree." Also, Aggressive Response to Shame subscale consists of eight items, Excitement

subscale consists of five items, Comfort With aggression consist of six items, and Power/Safety consists of four items. So, the highest score that a participant can receive on: Aggressive Response to Shame subscale is 16, Excitement subscale is 10, Comfort With Aggression subscale is 12 and Power/Safety subscale is 8. Additionally, three items were not included in any of the subscales where two of them were duplicates of the corresponding items in the subscales to evaluate the consistency of responses and were used to derive the inconsistency score, and the third item was only used to calculate the total score.

All the information was kept confidential and only de-identified summary data were published. The data were analyzed using SPSS v.25. Although random sampling and random assignment allow for the randomization of the potential effect of the confounding variables across groups, since this will be a correlation study, random assignment was not possible and convenience sampling was used. However, the potential effect of confounding variables was acknowledged along with the potential effects of the independent variables.

This research analyses investigated the following research questions, including the null and alternative hypotheses listed below.

RQ1: Is there a significant association between self-reported ADHD diagnosis and the attitudes toward gun violence among young African American men living in New Orleans?

Null Hypo 1: There is no significant association between self-reported ADHD diagnosis and the attitudes toward gun violence among young African American men living in New Orleans.

Alt Hypo 1: There is a significant association between self-reported ADHD diagnosis and the attitudes toward gun violence among young African American men living in New Orleans.

DV: Attitudes toward gun violence (scale)

Groups: Self-reported ADHD diagnosis (dichotomous)

Test statistic: Independent samples t-Test

Statistical test: Means: Difference between 2 independent means (between/independent samples t-test)

Tails: Two

Alpha: 0.05

Power: 0.80

Effect Size d: 0.5 (medium)

Allocation ratio (N2/N1): 1

Calculated Minimum Sample Size: 128

Software: G*Power 3.1.9.7

RQ2: Is there a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans?

$H_0$2: There is no significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

H_a2: There is a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

DV: Self-reported ADHD diagnosis (dichotomous)

IVs: SLLs (scale)

Test statistic: Binary logistic regression

Statistical test: Logistic Regression (binary logistic regression with a continuous predictor)

Tails: Two

Alpha: 0.05

Power: 0.80

Pr(Y = 1|χ = 1) H1: .22 (What is the probability of Self-reported ADHD diagnosis (Y=1) when the main predictor (SLLs) is one standard deviation (SD) unit (i.e., one z-score) above its mean, and all other covariates, if applicable, are set to their mean values?)

Pr(Y = 1|χ = 1) H0: .12 (What is the probability of Self-reported ADHD diagnosis (Y=1) when the main predictor (SLLs) is at the mean, and all other covariates, if applicable, are set to their mean values)]

R2 other χ: 0

χ distribution: Normal

χ parm μ: 0

χ parm σ: 1

Calculated Minimum Sample Size: 142

Software: G*Power 3.1.9.7

RQ3: Is there a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$3: There is no significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

H_a3: There is a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

DV: Attitudes toward gun violence (scale)

IVs: SLLs (scale)

Test statistic: Simple linear regression

Statistical test: Linear Multiple Regression: Fixed Model, R2 deviation from zero

Tails: Two

Alpha: 0.05

Power: 0.80

Effect Size f2: 0.15 (medium)

Number of predictors: 1

Calculated Minimum Sample Size: 55

Software: G*Power 3.1.9.7

RQ4: Is there an effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$4: There is no effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

H_a4: The is an effect of SLL on the association between self-reported ADHD diagnoses and attitudes towards gun violence in young African American men living in New Orleans.

DV: Attitudes toward gun violence (scale)

IVs: Self-reported ADHD diagnosis (dichotomous)

Potential moderator: SLLs (scale)

Test statistic: Multiple linear regression with moderation analysis

Statistical test: Linear Multiple Regression: Fixed Model, R2 deviation from zero

Tails: Two

Alpha: 0.05

Power: 0.80

Effect Size f2: 0.15 (medium)

Number of predictors: 2

Calculated Minimum Sample Size: 68

Software: G*Power 3.1.9.7

For the simple and multiple linear regressions, if the normality and the homoscedasticity of the residual assumptions were not met, due to the robustness of the linear regression model given that there is a sufficiently large sample size for each corresponding hypothesis, the violation of these assumptions can be ignored (Ernst &

Albers, 2017). If the linearity assumption was violated, different transformations of the dependent variable on trial-and-error basics can be conducted until there is an approximate linear relationship (Ernst & Albers, 2017). For multiple linear regression (RQ4) if the multicollinearity assumption was violated, the potential independent variable causing the issue will be removed from the model, and it will be tested again for multicollinearity (Ernst & Albers, 2017). Additionally, for simple and multiple linear and binary logistic regressions, if the independence of residuals assumption was violated, since this depends on the sampling design and only a truly random sample can assure independence of residuals, the violation will be noted as a limitation (Ernst & Albers, 2017). Also, since the proposed design showed that the outcome variable for RQ2, the self-reported diagnosis of ADHD, is a binary variable, it was not possible for this assumption of binary logistic regression to be violated. According to Ernst and Albers (2017), normality assumption will be tested using histogram of the distribution of residuals and p-p plot where an approximately bell-shaped distribution indicates the satisfaction of normality of residuals assumption; homoscedasticity assumption will be tested with a plot of regression standardized predicted values versus regression standardized residuals where randomly scattered residuals on the plot from left to right without forming a specific pattern indicates satisfaction homoscedasticity of residual assumption; multicollinearity assumption will be tested using the Variance Inflation Factor (VIF) and Tolerance where a VIF value of 5 or greater and/or Tolerance value of less than .5 will indicate a violation of the multicollinearity assumption.

Threats to Validity

Since this study was not an experimental design and random assignments was not used, the internal validity can be a challenge (Wang & Ji, 2020). So, the change in the dependent variable, attitudes toward guns and violence cannot be attributed with certitude to a change in the independent variables, self-reported ADHD diagnosis and soil lead (Wang & Ji, 2020). However, since this was an association study and the purpose was not to demonstrate causality there could be associations between the dependent variable and other variables that are not controlled (Wang & Ji, 2020). Also, with the use of the appropriate multivariable analysis, internal validity can be confirmed as much as possible. In addition, although the findings of the study can be applicable to populations with similar characteristics with the sample of the study, the generalization of the results to other populations should be done with caution, thus there is a threat for external validity.

Ethical Procedures

The Belmont report came into existence to regulate clinical research in the USA (Barrow et al., 2020). Researchers are responsible for protecting participants' autonomy and fully disclosing factors concerning the study, including potential benefits or harm (Barrow et al., 2020). Researchers' responsibility also includes informing the potential participants about their right to autonomy regarding whether to participate in the research study and about their right to not participate or rescind their consent at any time during the course of the study without penalty (Barrow et al., 2020). Finally, researchers must not coerce participants to participate in the study (Barrow et al., 2020). For this study, the

Walden University research ethics approval checklist was reviewed. The data for this research will be stored safely on a computer only used for this study for years, with password protection to ensure confidentiality. The consent process and data collection steps were explained in detail in this study, and the Institutional Review Board (IRB) of Walden University approved the data collection procedures prior to their implementation. Walden University's approval number for this study is 05-25-21-0448759. Every participant gave their consent to participate in this study by completing the survey. The completed survey was tracked using the online survey platform SurveyMonkey using the IP address associated with the device to ensure anonymity. Throughout the recruitment and the data collection process, there were no contact between the participant and the researcher, and no identifying information was collected.

Summary

Chapter 3 presented the study design as an observational cross-sectional study, which involved the collection and analysis of primary data. The target population consisted of African American men between the ages of 18 and 29 years who lived in New Orleans between birth and 11 years of age for at least a year. Potential participants were excluded if they were women or did not know the area in which they resided. The potential participant fell in one or two categories regarding self-reported ADHD diagnosis: Never diagnosed with ADHD or diagnosed with ADHD by a licensed mental health or medical provider. The data were analyzed, and the results is reported in Chapter 4.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to investigate whether there was an association between lead, ADHD, and attitudes toward gun violence. The following research questions and hypotheses guided this study:

RQ1: Is there a significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$1: There is no significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

H_a1: There is a significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

RQ2: Is there a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans?

$H_0$2: There is no significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

H_a2: There is a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

RQ3: Is there a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$3: There is no significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

H_a3: There is a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

RQ4: Is there an effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$4: There is no effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

H_a4: The is an effect of SLL on the association between self-reported ADHD diagnoses and attitudes towards gun violence in young African American men living in New Orleans.

Data Collection

The informed consent and the questionnaire for the primary data collection were placed on the web-based survey platform Survey Monkey. A page was created on Facebook using the information from the flyer with a link to the survey. Participants were recruited between June 13, 2021, and August 1, 2021; to meet the a priori power analysis, the final sample size was 142. After reaching that number, the page on Facebook containing the link to the survey was closed. After data collection was completed, data were exported to and analyzed on SPSS.

Descriptive Statistics

As Table 1 shows, most of the respondents self-reported as diagnosed with ADHD (70.4%, *n* =100). Also, on an average, the AGVQ total score was closer to the maximum possible score than to the minimum possible score (*M* = 37.06, *SD* 10.23, min. = 6.00, max. = 48.00) as Table 2 shows. In addition, as Table 3 indicates, more participants lived in areas in New Orleans that had SLLs between 100 and 199 mg/kg (21.1%, *n* = 30), followed by those who lived in areas in the city with SLLs between 300 and 399 (16.2%, *n* =23).

Table 1

Frequency Distribution of Self-Reported ADHD Diagnoses

	N	%
No	42	29.6%
Yes	100	70.4%

Table 2

Descriptive Statistics

	N	Min.	Max.	Mean	*SD*
AGVQ total score	142	6.00	48.00	37.0563	10.22913
Valid N (listwise)	142				

Table 3

Soil Lead Level Ranges (mg/kg)

	N	%
9–49 mg/kg	2	1.4%
50–99 mg/kg	8	5.6%
100–199 mg/kg	30	21.1%
200–299 mg/kg	16	11.3%
300–399 mg/kg	23	16.2%
400–499 mg/kg	12	8.5%
500–599 mg/kg	10	7.0%
600–699 mg/kg	18	12.7%
700–799 mg/kg	2	1.4%
800–899 mg/kg	5	3.5%
900–999 mg/kg	7	4.9%
≥1000 mg/kg	9	6.3%

Results

As seen in Table 4, on average, the AGVQ total score for those who self-reported as diagnosed with ADHD (M = 38.96, SD = 8.48) was higher than for those who self-reported as not being diagnosed with ADHD (M = 32.52 SD = 12.50). Additionally, as seen in Table 5, even though in nine of the 12 SLL ranges there is a greater percentage of participants who self-reported as being diagnosed with ADHD than those who did not, there was no clear consistent pattern in the self-reported ADHD diagnoses when moving from lower to higher SLL ranges. For example, from 100–199 mg/kg to 200–299 mg/kg, the percentage breakdown of those who self-reported as diagnosed with ADHD increased

from 73.3% for *Yes* and 26.7% for *No* to 87.5% for *Yes* and 12.5% for *No*. However, from 200–299 mg/kg to 300–399 mg/kg, the percentage breakdown of those who self-reported as diagnosed with ADHD decreased from 87.5% for *Yes* and 12.5% for *No* to 73.9 for *Yes* and 26.1% for *No*. As Table 6 indicates, there were no clear consistent patterns in the AGVQ total score when moving from lower to higher SLL ranges. For example, from 9–49 mg/kg to 100–199 mg/kg, there is a consistent pattern of increase in the mean AGVQ total score from 36 to 36.60. However, from 100–199 mg/kg to 200–299 mg/kg, the mean AGVQ total score decreases to 36.50. Based on the descriptive analyses for RQ1, RQ2 and RQ3, on average, there was a difference in the AGVQ total score between those who self-reported as diagnosed with ADHD and those who did not. However, there were no clear and consistent patterns of change either in self-reported ADHD diagnoses or in AGVQ total score with change in SLL ranges.

Table 4

Distribution of the AGVQ Total Score Among the Self-Reported ADHD Diagnoses Groups

ADHD			Value	SE
No	Mean		32.5238	1.92943
	95% C.I. for mean	Lower bound	28.6273	
		Upper bound	36.4204	
	5% Trimmed mean		33.0661	
	Median		32	
	Variance		156.353	
	SD		12.5041	
	Minimum		6	
	Maximum		48	
	Range		42	
	Interquartile range		22.25	
	Skewness		-0.304	0.365
	Kurtosis		-1.2	0.717
Yes	Mean		38.96	0.84792
	95% C.I. for mean	Lower bound	37.2775	
		Upper bound	40.6425	
	5% Trimmed mean		39.7333	
	Median		42	
	Variance		71.897	
	SD		8.47923	
	Minimum		10	
	Maximum		48	
	Range		38	
	Interquartile range		10	
	Skewness		-1.402	0.241
	Kurtosis		1.547	0.478

Table 5

ADHD Numeric Soil Lead Level Ranges (mg/kg), Crosstabulation

ADHD Numeric		Soil lead level ranges												Total
		9-49 mg/kg	50-99 mg/kg	100-199 mg/kg	200-299 mg/kg	300-399 mg/kg	400-499 mg/kg	500-599 mg/kg	600-699 mg/kg	700-799 mg/kg	800-899 mg/kg	900-999 mg/kg	≥1,000 mg/kg	
No	Count	2	4	8	2	6	1	6	4	0	1	5	3	42
	% within SLL ranges mg/kg	100.0%	50.0%	26.7%	12.5%	26.1%	8.3%	60.0%	22.2%	0.0%	20.0%	71.4%	33.3%	29.6%
	% of Total	1.4%	2.8%	5.6%	1.4%	4.2%	0.7%	4.2%	2.8%	0.0%	0.7%	3.5%	2.1%	29.6%
Yes	Count	0	4	22	14	17	11	4	14	2	4	2	6	100
	% within SLL ranges mg/kg	0.0%	50.0%	73.3%	87.5%	73.9%	91.7%	40.0%	77.8%	100.0%	80.0%	28.6%	66.7%	70.4%
	% of total	0.0%	2.8%	15.5%	9.9%	12.0%	7.7%	2.8%	9.9%	1.4%	2.8%	1.4%	4.2%	70.4%
Total	Count	2	8	30	16	23	12	10	18	2	5	7	9	142
	% within SLL ranges mg/kg	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of total	1.4%	5.6%	21.1%	11.3%	16.2%	8.5%	7.0%	12.7%	1.4%	3.5%	4.9%	6.3%	100.0%

Table 6

Distribution of the AGVQ Total Score Among the SLL Ranges

Soil lead level ranges (mg/kg)				Statistic	SE
AGVQ total score	9-49 mg/kg	Mean		36.0000	10.00000
		95% C.I. for mean	Lower bound	-91.0620	
			Upper bound	163.0620	
		5% Trimmed mean			
		Median		36.0000	
		Variance		200.000	
		SD		14.14214	
		Minimum		26.00	
		Maximum		46.00	
		Range		20.00	
		Interquartile range			
		Skewness			
		Kurtosis			
	50-99 mg/kg	Mean		36.3750	3.33240
		95% C.I. for mean	Lower bound	28.4951	
			Upper bound	44.2549	
		5% Trimmed mean		36.5278	
		Median		38.5000	
		Variance		88.839	
		SD		9.42546	
		Minimum		24.00	
		Maximum		46.00	
		Range		22.00	
		Interquartile range		19.50	
		Skewness		-0.310	0.752
		Kurtosis		-2.049	1.481
	100-199 mg/kg	Mean		36.6000	2.33593
		95% C.I. for mean	Lower bound	31.8225	
			Upper bound	41.3775	
		5% Trimmed mean		37.5926	
		Median		44.0000	
		Variance		163.697	
		SD		12.79440	
		Minimum		6.00	
		Maximum		48.00	
		Range		42.00	
		Interquartile range		20.25	
		Skewness		-1.112	0.427
		Kurtosis		0.074	0.833
	200-299 mg/kg	Mean		36.5000	1.54919
		95% C.I. for mean	Lower bound	33.1980	
			Upper bound	39.8020	
		5% Trimmed mean		36.5556	
		Median		36.5000	
		Variance		38.400	
		SD		6.19677	
		Minimum		26.00	
		Maximum		46.00	
		Range		20.00	
		Interquartile range		9.50	
		Skewness		-0.209	0.564
		Kurtosis		-0.692	1.091
	300-399 mg/kg	Mean		39.0435	1.87081
		95% C.I. for mean	Lower bound	35.1637	
			Upper bound	42.9233	

Soil lead level ranges (mg/kg)			Statistic	SE
	5% Trimmed mean		39.8792	
	Median		44.0000	
	Variance		80.498	
	SD		8.97207	
	Minimum		15.00	
	Maximum		47.00	
	Range		32.00	
	Interquartile range		11.00	
	Skewness		-1.264	0.481
	Kurtosis		0.793	0.935
400-499 mg/kg	Mean		34.9167	3.47820
	95% C.I. for mean	Lower bound	27.2612	
		Upper bound	42.5721	
	5% Trimmed mean		35.3519	
	Median		38.5000	
	Variance		145.174	
	SD		12.04883	
	Minimum		14.00	
	Maximum		48.00	
	Range		34.00	
	Interquartile range		20.25	
	Skewness		-0.639	0.637
	Kurtosis		-0.958	1.232
500-599 mg/kg	Mean		43.2000	2.39351
	95% C.I. for mean	Lower bound	37.7855	
		Upper bound	48.6145	
	5% Trimmed mean		44.1111	
	Median		46.0000	
	Variance		57.289	
	SD		7.56894	
	Minimum		22.00	
	Maximum		48.00	
	Range		26.00	
	Interquartile range		2.25	
	Skewness		-2.979	0.687
	Kurtosis		9.150	1.334
600-699 mg/kg	Mean		34.6667	2.43611
	95% C.I. for mean	Lower bound	29.5269	
		Upper bound	39.8064	
	5% Trimmed mean		35.2963	
	Median		39.5000	
	Variance		106.824	
	SD		10.33555	
	Minimum		12.00	
	Maximum		46.00	
	Range		34.00	
	Interquartile range		16.50	
	Skewness		-1.028	0.536
	Kurtosis		-0.190	1.038
700-799 mg/kg	Mean		45.0000	1.00000
	95% C.I. for mean	Lower bound	32.2938	
		Upper bound	57.7062	
	5% Trimmed mean			
	Median		45.0000	
	Variance		2.000	
	SD		1.41421	
	Minimum		44.00	
	Maximum		46.00	
	Range		2.00	
	Interquartile range			

Soil lead level ranges (mg/kg)			Statistic	SE
	Skewness			
	Kurtosis			
800-899 mg/kg	Mean		37.2000	5.63383
	95% C.I. for mean	Lower bound	21.5580	
		Upper bound	52.8420	
	5% Trimmed mean		37.9444	
	Median		42.0000	
	Variance		158.700	
	SD		12.59762	
	Minimum		15.00	
	Maximum		46.00	
	Range		31.00	
	Interquartile range		17.00	
	Skewness		-2.070	0.913
	Kurtosis		4.438	2.000
900-999 mg/kg	Mean		33.4286	4.89829
	95% C.I. for mean	Lower bound	21.4429	
		Upper bound	45.4142	
	5% Trimmed mean		33.7540	
	Median		40.0000	
	Variance		167.952	
	SD		12.95964	
	Minimum		15.00	
	Maximum		46.00	
	Range		31.00	
	Interquartile range		23.00	
	Skewness		-0.470	0.794
	Kurtosis		-2.109	1.587
≥1000 mg/kg	Mean		37.1111	2.36552
	95% C.I. for mean	Lower bound	31.6562	
		Upper bound	42.5660	
	5% Trimmed mean		37.2346	
	Median		37.0000	
	Variance		50.361	
	SD		7.09656	
	Minimum		26.00	
	Maximum		46.00	
	Range		20.00	
	Interquartile range		12.50	
	Skewness		-0.473	0.717
	Kurtosis		-0.722	1.400

Assumptions

Because both Shapiro-Wilk ($p < .001$) and Kolmogorov-Smirmov ($p < .001$) tests of normality revealed a significant difference between the distribution of the dependent variable (AGVQ total score) and a normal distribution (see Table 7), the normality assumption for the independent samples t-test was not met. Therefore, a nonparametric analogue to the independent sample t-test, Mann-Whitney U test, was conducted to

evaluate the difference in the AGVQ total score between those who self-reported as being diagnosed with ADHD and those who did not. Because the dependent variable of self-reported ADHD diagnosis is a binary variable, binary logistic regression was used to evaluate the association between the self-reported diagnosis of ADHD and SLL. Based on the histogram and the P-P Plot, the residuals were not normally distributed (Figure 1 and Figure 2). However, because residuals tended to be normally distributed in the population, the results of the linear regression analysis to test the association between SLL and AGVQ total score can still be considered valid. Also as seen in the homoscedasticity plot (Figure 3), the plot does not seem to be forming an overall pattern and the residuals appear to be randomly distributed. Therefore, overall, the homoscedasticity assumption seems to have been met.

Table 7

Tests of Normality

ADHD numeric		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		value	*df*	*p*	value	*df*	*p*
AGVQ total score	No	0.180	42	0.002	0.887	42	0.001
	Yes	0.189	100	0.000	0.833	100	0.000

a. Lilliefors significance correction.

Figure 1

Distribution of the Standardized Residuals to Test for AGVQ Total Score and SLL

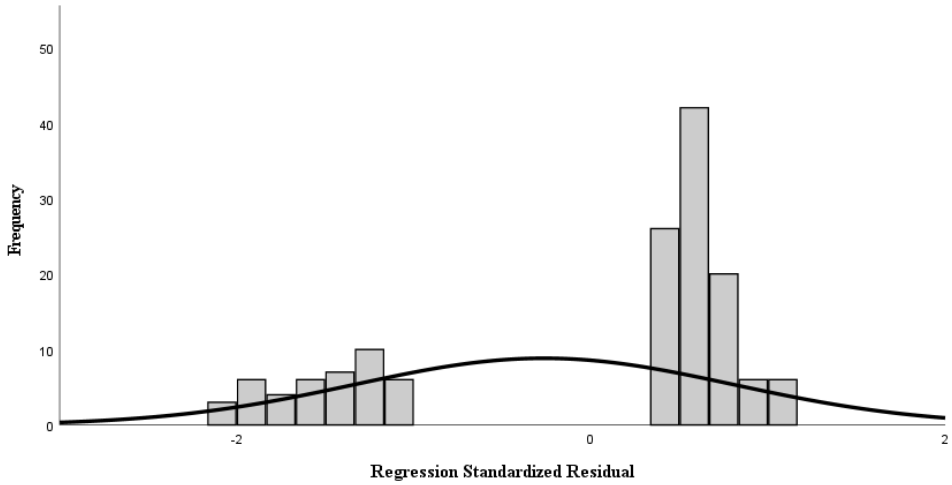


Figure 2

Percentile-Percentile (P-P) Plot for AGVQ Total Score and SLL

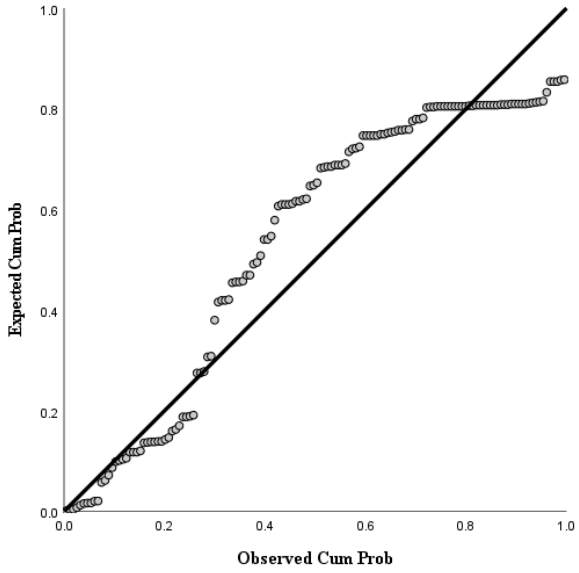
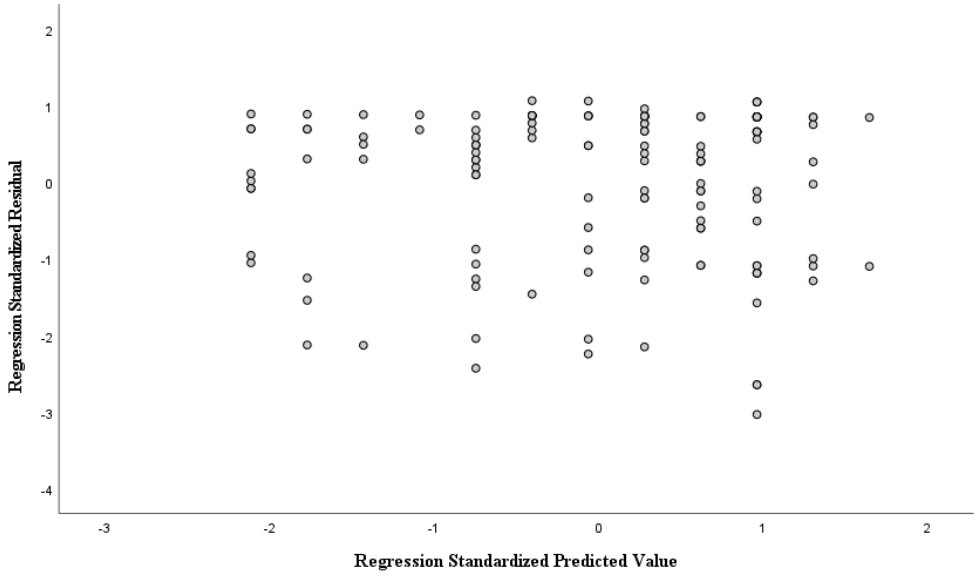


Figure 3

Standardized Predicted Values Against Residuals for the AGVQ Total Score and SLL



Findings of the Statistical Analyses

RQ1: Is there a significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$1: There is no significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

H_a1: There is a significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

As seen in Table 8, because the p-value associated with the Mann-Whitney U (U = 1602, p = .025) was less than the significance level, α = .05, I reject the null hypothesis. Based on the result, there was a significant association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

Table 8

Mann-Whitney U Test in Terms of the AGVQ Total Score Grouped by ADHD

	AGVQ total score
Mann-Whitney U	1602.000
Wilcoxon W	2505.000
Z	-2.244
p	.025

a. Grouping variable: ADHD numeric.

RQ2: Is there a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans?

$H_0$2: There is no significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans.

H_a2: There is a significant association between SLLs and self-reported ADHD diagnoses among young African American men living in New Orleans based on the result of binary logistic regression to test for the association between SLL (ordinal level) and self-reported diagnosis of ADHD (see Table 9), the overall model was not significant ($\chi^2(1) = .297$, $p = .585$). Also, the overall percentage correct did not change (see Table 10

and Table 11). After introducing the predictor variable SLL range (ordinal level) in the model (block 1). Based on the value of the Nagelkerke R^2 as seen in Table 12 ($R^2_{Nagelkerke}$=.003), 0.3 % of the variability in the ADHD status can be explained by the model. The association between SLL and ADHD was further investigated using the odds ratio and its associated significance. Based on Table 13, the SLL range did not have a significant odds ratio (p>.05) for the odds of self-reported diagnoses of ADHD. Therefore, I failed to reject the null hypothesis

Table 9

Omnibus Tests of Model Coefficients for SLL and ADHD

		χ2	df	p
Step 1	Step	.297	1	.585
	Block	.297	1	.585
	Model	.297	1	.585

Table 10

Classification Table [a, b]

	Observed		Predicted		
			ADHD numeric		Percentage correct
			No	Yes	
Step 0	ADHD numeric	No	0	42	.0
		Yes	0	100	100.0
	Overall percentage				70.4

a. Constant is included in the model. b. The cut value is .500.

Table 11

Classification Table [a]

	Observed		Predicted		
			ADHD numeric		Percentage correct
			No	Yes	
Step 1	ADHD numeric	No	0	42	.0
		Yes	0	100	100.0
	Overall percentage				70.4

a. The cut value is .500

Table 12

Model Summary

Step	-2 Log likelihood	Cox & Snell R square	Nagelkerke R square
1	172.159[a]	.002	.003

a. Estimation terminated at iteration Number 4 because parameter estimates changed by less than .001.

Table 13

Odds Ratio (OR) between SLL and ADHD

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1a	Soil lead level ranges (mg/kg)	-.034	.062	.299	1	.584	.966	.855	1.092
	Constant	1.068	.413	6.677	1	.010	2.909		

a. Variable(s) entered on step 1: Soil lead level ranges (mg/kg).

RQ3: Is there a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$3: There is no significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

H_a3: There is a significant association between SLLs and attitudes toward gun violence among young African American men living in New Orleans.

Based on Table 14, a simple linear regression analysis did not reveal a significant association between SLL range and AGVQ total score, ($F(1,140) = .02$, $p = .883$). Based on the value of the R^2 as seen in Table 15 ($R^2 = .000$) the model has a very poor to no fit to the data. Therefore, fail to reject the null hypothesis.

Table 14

Overall Univariate Linear Regression Model for the Association Between SLL and AGVQ Total Score

Model		Sum of squares	df	Mean square	F	p.
1	Regression	2.282	1	2.282	.022	.883b
	Residual	14751.267	140	105.366		
	Total	14753.549	141			

a. Dependent variable: AGVQ total score. b. Predictors: (Constant), Soil lead level ranges (mg/kg).

Table 15

Model Summary[b]

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.012[a]	.000	-.007	10.26480

a. Predictors: (Constant), Soil lead level ranges (mg/kg). b. Dependent variable: AGVQ total score.

RQ4: Is there an effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans?

$H_0$4: There is no effect of SLL on the association between self-reported ADHD diagnoses and attitudes toward gun violence among young African American men living in New Orleans.

H_a4: The is an effect of SLL on the association between self-reported ADHD diagnoses and attitudes towards gun violence in young African American men living in New Orleans.

For a variable to be considered a moderator, it must be significantly associated with the dependent variable as well as with the independent variable in a univariate analysis. As seen in Table 15, there was a significant association between independent or predictor variable (self-reported ADHD diagnosis) and the dependent variable (AGVQ total score). However, based on the results of the analysis for Null Hypo 3, there was no significant association between SLL range, and AGVQ total score (see Table 16). Therefore, the assumption for SLL to be considered a moderator were not met, and we failed to reject the null hypothesis (see Tables 16 and 17).

Table 16

Overall Multivariate Linear Regression Model for the Association Between SLL, ADHD and AGVQ Total Score

Model		Sum of squares	df	Mean square	F	p
1	Regression	1225.233	1	1225.233	12.680	.001b
	Residual	13528.316	140	96.631		
	Total	14753.549	141			
2	Regression	1225.243	2	612.621	6.295	.002c
	Residual	13528.307	139	97.326		
	Total	14753.549	141			
3	Regression	1283.960	3	427.987	4.385	.006d
	Residual	13469.589	138	97.606		
	Total	14753.549	141			

a. Dependent variable: AGVQ total score. b. Predictors: (Constant), ADHD numeric.

c. Predictors: (Constant), ADHD numeric, soil lead level ranges (mg/kg). d. Predictors:

(Constant), ADHD numeric, Soil lead level ranges (mg/kg), ADHDXSLL

Table 17

Detailed Multivariate Linear Regression Model of the Association Between SLL, ADHD and AGVQ Total Score

Model		Unstandardized coefficients		Standardized coefficients	t	p	95.0% CI for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	(Constant)	32.524	1.517		21.442	.000	29.525	35.523		
	ADHD numeric	6.436	1.807	.288	3.561	.001	2.863	10.010	1.000	1.000
2	(Constant)	32.507	2.290		14.195	.000	27.979	37.035		
	ADHD numeric	6.437	1.816	.288	3.545	.001	2.847	10.027	.998	1.002
	Soil lead level ranges (mg/kg)	.003	.284	.001	.010	.992	-.559	.564	.998	1.002
3	(Constant)	34.168	3.138		10.890	.000	27.964	40.371		
	ADHD numeric	3.765	3.896	.169	.966	.336	-3.938	11.468	.217	4.599
	Soil lead level ranges (mg/kg)	-.273	.455	-.078	-.599	.550	-1.173	.627	.389	2.568
	ADHDXSLL	.452	.583	.154	.776	.439	-.701	1.605	.168	5.944

a. Dependent variable: AGVQ total score

Summary

The four research questions presented in the study were investigated. According to the study results, there was a significant difference in the attitudes toward gun violence between those who self-reported as being diagnosed with ADHD and those who did not among young African American men in New Orleans. No significant association was found either between SLL, and the independent variable, self-reported ADHD diagnosis, or between SLL and the dependent variable, AGVQ total score. Therefore, based on the results, SLL does not seem to be moderating the associations between self-reported ADHD diagnosis and the attitudes toward gun violence. The association between ADHD and gun violence among young African American young men in New Orleans will be further explained in Chapter 5 along with the study limitations. These were related to the methodological choices, and to the Covid-19 pandemic during which the data were collected.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to investigate whether there is an association between lead toxicity, ADHD, and attitudes toward gun violence among young African American men in New Orleans. The dependent variable was the total score on the AGVQ. The independent variable was self-reported diagnoses of ADHD, and the potential moderator was the SLL range. There was a statistically significant difference in the total AGVQ score between those who self-reported as being diagnosed with ADHD and those who did not. However, there was no statistically significant association between SLL and self-reported diagnoses of ADHD or between SLL and AGVQ total score. Because there was no statistically significant association between the potential moderator SLL and either the independent variable self-reported diagnosis of ADHD or dependent variable AGVQ total score, there was insufficient evidence to support the moderation of the association between the self-reported diagnosis of ADHD and the AGVQ total score by SLL. Findings support an association between ADHD and attitudes toward gun violence among young African American men in New Orleans. In this chapter, study results are interpreted in the historical, social, and environmental context of New Orleans, study limitations are presented, and recommendations are made for future studies.

Interpretation of Findings

ADHD and Gun Violence

In RQ1, the study findings supported an association between self-reported diagnosis of ADHD and AGVQ total score, $U = 1602$, $p = .025$. Specifically, the participants who self-reported as being diagnosed with ADHD had a higher mean AGVQ total score ($M = 38.96$, $SD = 8.48$) than those who self-reported as not being diagnosed with ADHD ($M = 32.52$, $SD = 12.50$). As discussed in Chapters 1 and 2, this result is consistent with previous findings (Boutwell et al., 2017; Daneshparvar et al., 2016). This finding becomes especially salient for New Orleans. When compared with other U.S. cities of similar population size, racial composition, and poverty level, New Orleans stands out due to the high rate and persistence of homicides in the city over the last two decades.

The prevalence of violent behavior that characterizes these homicides among young adults across the United States is a major public health concern, but it is particularly severe among African Americans, as they represent a disproportionally large portion of both perpetrators and victims (Masho et al., 2016). Specifically, young African American men are at 60% greater risk of being involved in fatal or nonfatal incidences involving gun violence as either the victim or perpetrator compared to Caucasian young men (Noonan et al., 2016). This becomes especially relevant in New Orleans where African Americans make up 59% of the population (Fagan & Richman, 2017; Data Center Research, 2019a; Data Center Research, 2019b). These data clearly show that the criminal justice system has failed to stem the prevalence of gun violence among young

African American men in New Orleans, requiring a deeper look at the aggression and violent behavior that underpin these crimes.

Interestingly, researchers have previously found a significant association between the hyperactivity component of ADHD and criminally violent behavior (González et al., 2013). Specifically, the pathology in PFC underlies both aggression that characterizes violent behavior and hyperactivity that characterizes ADHD (Pirau & Lui, 2018; Prehn-Kristensen et al., 2018; Seiden, 2004). Given this common neuropathology between ADHD symptomatology and criminally violent behavior, the prevalence of ADHD becomes an important consideration when investigating factors associated with gun violence. In this context, the finding becomes especially relevant because Baton Rouge, Louisiana, and New Orleans reported the highest rate of ADHD diagnoses in children ages 2 to 18 from 2011 to 2017, compared nationally among households with private insurance (Haefner, 2019). This finding provides a preliminary basis for the development of awareness and prevention programs geared toward reducing the prevalence of gun violence.

HBM can provide a theoretical basis for what a person believes about their health, which plays a determining role in changing their behavior (Glanz et al., 2015). HBM has been demonstrated to be an effective model for addressing an individual's defensiveness against a specific health risk and toward helping them devise ways to reduce it (Lynch & Logan, 2017). Based on the study findings, interventions informed by HBM can be designed to raise awareness among parents about addressing their children's ADHD symptoms early in their childhood. Specifically, by emphasizing the intensity and

prevalence of gun violence among young African American men in New Orleans, parents' awareness about the gravity of this public health problem can be increased. This can be followed by a clear explanation of the positive association between ADHD and gun violence and how the risk of a child's involvement with gun violence can be reduced by addressing and managing ADHD symptoms starting early in childhood.

Soil Lead Level and ADHD

For RQ2, there was no significant association between ADHD and SLL ranges. Specifically, the odds ratio for the odds of self-reported ADHD diagnosis for the SLL range was not significant ($p > .05$). This result was not expected because lead is a known neurotoxin that has been associated with symptoms of ADHD in children (Singh et al., 2015). Especially concerning is the finding that even a low level of lead in the blood (<5.0 mcg/dL) is a risk factor for ADHD (Park et al., 2016). Specifically, once lead is in children's blood stream, it can disrupt brain development, putting a child at risk for ADHD (Wani et al., 2015). Children can become exposed to lead from two primary sources, lead in paint chips and lead fallout in the atmosphere. The lead can enter the body either by inhalation of lead dust particles or by ingestion of lead in the soil deposited from flaking lead paint (ATSDR, 2019). Specifically, children of age 6 and younger usually contract lead from the soil via hand to mouth soil ingestion because lead particles in paint chips are too large to be inhaled (Clay et al., 2019; Mielke et al., 2017; Sripada, 2017). Additionally, environmental calamities such as hurricanes and floods can have a significant impact on the soil composition over a large area by displacing lead and

other toxic chemicals from the water body where they had been dumped over decades into residential areas (Bullard et al., 2007).

This finding can be explained at several levels. The predictor variable, SLL range, was derived from Mielke et al.'s (2017) study on SLLs in New Orleans before (1998–2001) and after (2013–2016) HKR. The extent to which these SLL ranges correspond to the actual SLL in the areas where participants lived during their childhood (between birth and 11 years of age) depends on the accuracy of their recollection of the ward they lived in and the nearest street or intersection. Also, how well the census tracts used by Mielke et al. (2017) fit to the ward map used to assign a SLL range to each participant, and the accuracy of the SLL ranges over the time periods covered in the study are likely to have an impact on the accuracy of the SLL estimate.

Soil Lead Level and AGVQ

In RQ3, no significant association was found between SLL and AGVQ total score, ($F(1,140) = .02$, $p = .883$). This is an unexpected result since previous studies have found an association between lead exposure and violent behavior at various stages in life such as socially undesirable behavior in children, frequent neglectful behavior in adolescence, and criminally deviant behavior in adults (Liu et al., 2014). Specifically, previous studies have found an association between exposure to lead in children and antisocial behavior including violent crimes as young adults (Radulescu & Lundgren, 2017; Sripada, 2017). Perhaps most relevant to this study is the finding that increased childhood lead exposure substantially contributed to the acts of gun violence during adulthood in Milwaukee, Wisconsin (Emer et al., 2020). The factors that may explain the

discrepancy between this finding and alternative hypothesis 3 are the same as the ones that may explain the discrepancy between the finding for RQ2 and alternative hypothesis 2.

SLL, ADHD, and AGVQ

In research question 4, since SLL was not found to be significantly associated with the independent variable self-reported diagnosis of ADHD and the dependent variable AGVQ total score, SLL does not seem to be moderating the relationship between self-reported diagnosis of ADHD and the AGVQ total score. This finding does not support alternative hypothesis 4 and is contrary to expectations since past studies have found significant association between lead exposure and ADHD symptoms and between lead exposure and gun violence (Boutwell et al., 2017; Daneshparvar et al., 2016). This discrepancy can be explained by the methodological factors associated with how the SLL ranges were determined in this study which are listed in the rationale for the discrepancy between RQ2 and alternative hypothesis 2.

Limitations of the Study

A general limitation of this study was the relatively constrained timeframe and resources. Convenience sampling landed itself better to a constrained timeframe and limited resources as it allowed for more efficient recruitment. The drawback of convenience sampling is that there is a risk of biased sample as it may result in over representation of certain groups and underrepresentation of other groups in the population. For example, since the level of gun violence in New Orleans is not equal across different wards, participants who live in wards that have witnessed

disproportionately greater level of gun violence would be more likely to be interested in participating in the study. However, this possibility of a biased sample is inherent to convenience sampling. An advantage of this study which was set in New Orleans and only included African American males who lived in the city as children or adolescents for a year or more is that there can be relatively greater confidence in the applicability of the results to the population of interest, male African American youths in the city of New Orleans.

In this study the lead exposure was quantified as the SLL range from multi-year studies conducted by Mielke et al. (2017) in New Orleans. Although BLL (BLL) is the most used measurement for lead exposure (ATSDR, 2019), past studies have found a positive association between BLL and SLL in New Orleans pre and post HKR (Zahran et al., 2010; Mielke et al., 2007). Therefore, the use of SLL ranges from Mielke et al. (2017) was supported to quantify lead exposure. However, since Mielke et al. (2017) determined SLL ranges based on the census tract, and the boundaries of this census tract are not widely known among the general population of New Orleans, the ward in which they lived, and the nearest streets and intersection were used to assign a SLL range to each participant. Since participants were not supervised while filling out the survey, the precision, and the accuracy of the locations they provided could not be confirmed which in turn could have resulted in inaccurate SLL range assignments. Another factor that could have affected the assignment of the SLL ranges is about the inference as to the time period covered in Mielke et al. (2017) within which they fell based on the longest period of time that the participant lived in New Orleans between birth and 11 years of age.

Mielke et al. (2017) classified pre-Katrina SLL ranges for the data collected between the years 1998 and 2001 and post-Katrina SLL ranges for the data collected between 2013 and 2016. This meant that if the time period during which the participants who lived the longest between birth and 11 years of age in New Orleans fell between 2002 and 2012 an inference had to be made regarding their SLL range based on how close the majority of this 11-year period was to the pre-Katrina and post-Katrina range as defined by Mielke et al. (2017). Additionally, in this survey based correlational study since all potential confounding variables were not controlled for, a claim of causality between the independent and the dependent variables cannot be made for any of the research questions.

Recommendations

It is recommended that the future studies include methods that more closely capture the ADHD symptoms, lead exposure, and gun violence. The severity of ADHD symptoms can vary across children and can be affected by a variety of factors including the level of adherence to the prescribed medications. In fact, in Louisiana more than half a million children with Medicaid were prescribed medication for ADHD but did not follow up with medical or behavioral health care treatment (Office of Inspector General, 2019). It is important to examine ADHD medication adherence for investigation of an association between ADHD and gun violence and lead because in ADHD, normal functioning depends on effective medication management and inconsistency can lead to worsening of symptoms which has been found to be associated with increasing level of criminality (Lichtenstein et al., 2013). So, a future study that uses a valid and reliable

instrument to measure ADHD medication adherence is likely to capture the variability more closely in the severity of ADHD symptoms across participants. Therefore, such a study will be better positioned to provide insights into the association between ADHD and gun violence.

Since BLL is the most used measure of lead exposure, future studies that use BLL are likely to capture lead exposure more precisely and more accurately (ATSDR, 2019; Ford et al., 2016). Alternatively, where obtaining participants' BLL is not possible due to logistical constraints, measures could be taken to determine their location more precisely during the given exposure period and more accurately assign them to the corresponding SLL range. For example, after initial information is obtained about the participant's ward and the street that was nearest to where they lived over the exposure period, street level maps of each ward can be included in the survey to help in determining their precise location. Also, to ensure that the time period during which the participant lived at the given location corresponds exactly to the time period for which the SLL range is known requires data that covers those years or excluding participants who fall within the years that were not included in the data.

In this study, since the goal was to investigate the association between ADHD diagnosis, lead toxicity, and attitudes toward gun violence, AGVQ was an appropriate instrument to capture the participant's attitudes toward gun violence. However, since attitudes do not always translate into action, for future studies, a more accurate measure of gun violence may be criminal records of the participants if they exist or records of the perpetrators of their visit to the emergency department trauma room.

Implication

Methodological Implication

In 2012, New Orleans had 53 murder victims per 100,000 population which were ten times the national average (U.S. Department of Justice, 2016; The New Orleans Advocate, 2013). In 2021, New Orleans remains amongst the cities with the highest number of homicides per capita (World Population Review, 2021). As a matter of fact, over the past 20 years, the criminal justice system in New Orleans has not been able to curb the fatal and non-fatal shootings that have been constant because of their frequent occurrence among African American men in the city (Fagan & Richman, 2017). The study finding of an association between ADHD and gun violence indicated that the problem requires a more comprehensive approach focusing on African American male children earlier in their childhood before they may become involved with guns. It would require policymakers to think beyond the sole deterrence objective of the criminal justice system and invest in programs that focus on the underlying issues such as ADHD.

Positive Social Change Implications

Since 2010, there has been a racial disparity in New Orleans where young African American men have been involved in fatal and non-fatal shootings in disproportionately greater numbers compared to young men of other races (Fagan & Richman, 2017). Additionally, African American men involved in gun violence are getting younger as evident by the recent report of a shooting involving a 14-year-old perpetrator (NOLA, 2021). Although imprisoning such perpetrators removes them from the society in the relatively short term, gun violence statistics in New Orleans have shown over the years

that it does not seem to lead to a meaningful reduction in gun violence due to recidivism and/or other young African American males taking their place (Fagan & Richman, 2017). Continuing only with this criminal justice approach to gun violence has far reaching and grave consequences for the society at large and for the destroyed futures of young African American males in New Orleans. Programs that focus on addressing ADHD symptoms early in childhood may prove more effective in preventing or reducing gun violence among African American males in New Orleans. New policies to make it less easy to obtain guns is an approach. Guns and homicides are confluence; if guns are more difficult to obtain, homicides and non-fatal shootings will decrease (American Psychological Association, 2013). In addition, according to Mao et al. (2020), when making policies for social change it should include and not be limited to government agencies, ministries, community members, researchers, and community businesses. Therefore, various stakeholders can join forces to create processes to better the communities in reducing the problem such as gun violence (Mao et al, 2020).

Although the findings in this study did not provide an association between lead toxicity, ADHD, and gun violence, based on the findings of high levels of lead in the soil in New Orleans (Mielke et al., 2017), further studies investigating the potential role of lead in the association between ADHD and gun violence in the city are warranted. The need for such studies become especially salient when considering effects of gentrification in New Orleans that was accelerated after Katrina where white residents started moving into neighborhoods previously occupied by African Americans (Holm & Wyczalkowski,

2018). Therefore, since all communities of New Orleans are at risk of potential exposure, lead toxicity must be considered a citywide issue.

Conclusion

This research aimed to measure the association between lead exposure, self-reported diagnosis of ADHD, and gun violence among African American men in New Orleans. This research provided data on the characteristics and pathogenesis of ADHD and shined a light on the gun violence occurring in New Orleans. The findings of this study showed a positive association between ADHD and attitudes toward gun violence. Consequently, ADHD could be a risk factor for gun violence. This finding is consistent with other studies from literature review that have found a positive association between ADHD and criminal violent behavior. This finding supports the need for intervention strategies that can promote programs that address ADHD early in childhood among African American communities in New Orleans that suffer from gun violence. Moreover, with improved data collection for lead exposure, the author of this study proposes as supported by the findings in the literature review that lead toxicity remains an issue of interest in New Orleans when considering the association between ADHD and gun violence.

References

Agency for Toxic Substances and Disease Registry. (2012). *Lead toxicity.* https://www.atsdr.cdc.gov/csem/lead/docs/lead.pdf

Agency for Toxic Substances and Disease Registry. (2017). *Environmental health and medicine education.* https://www.atsdr.cdc.gov/emes/index.html

Agency for Toxic Substances and Disease Registry. (2019). What is the biological fate of lead in the body? https://www.atsdr.cdc.gov/csem/csem.asp?csem=34&po=9

Al Osman, M., Yang, F., & Massey, I. (2019). Exposure routes and health effects of heavy metals on children. *Biometals, 32*(4), 563–573. https://doi.org/10.1007/s10534-019-00193-5

Alvarez, A., & Bachman, R. (2020). *Violence: The enduring problem*. SAGE.

American Statistical Association. (2020). *G * Power 3.1 manual.* https://www.psychologie.hhu.de/fileadmin/redaktion/Fakultaeten/Mathematisch-Naturwissenschaftliche_Fakultaet/Psychologie/AfricanAmericanP/gpower/GPowerManual.pdf

American Psychological Association, (2013). *Gun violence: Prediction, prevention, and policy.* https://www.apa.org/pubs/reports/gun-violence-prevention

Barrow, J., Brannan, G., & Khandhar, P. (2020). *Research ethics.* Stat Pearls Publishing https://www.ncbi.nlm.nih.gov/books/NBK459281/

Battelle Memorial Institute. (1998). Sources of lead in soil: A literature review. https://www.epa.gov/sites/production/files/documents/r98-001a.pdf

Bergal, J. (2007). *City adrift: New Orleans before and after Katrina*. Louisiana State

University Press.

Bullard, R., Mohai, P., Saha, R., & Wright, B. (2007). Toxic wastes and race at twenty. https://www.ucc.org/environmental-ministries_toxic-waste-20

Bush, G. (2010). Attention-deficit/hyperactivity disorder and attention networks. *Neuropsychopharmacology*, *35*(1), 278–300. https://doi.org/10.1038/npp.2009.120

Cecil, K. M., Brubaker, C. J., Adler, C. M., Dietrich, K. N., Altaye, M., Egelhoff, J. C., Wessel, S., Elangovan, I., Hornung, R., Jarvis, K., & Lanphear, B. P. (2008). Decreased brain volume in adults with childhood lead exposure. *PLoS Medicine*, *5*(5), e112. https://doi.org/10.1371/journal.pmed.0050112

Centers for Disease Control and Prevention. (2013). *National biomonitoring program.* https://www.cdc.gov/biomonitoring/Lead_factsheet.html

Centers for Disease Control and Prevention. (2019a). *Childhood lead poisoning prevention: At-risk populations.* https://www.cdc.gov/nceh/lead/prevention/populations.htm

Centers for Disease Control and Prevention. (2019b). *State-based prevalence of ADHD diagnosis and treatment.* https://www.cdc.gov/ncbddd/adhd/data/diagnosis-treatment-data.html

Centers for Disease Control and Prevention. (2019c). *Blood lead levels in children.* https://www.cdc.gov/nceh/lead/prevention/blood-lead-levels.htm

Centers for Disease Control and Prevention. (2020). *CDC blood lead reference value.* https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm

Champion, L., Economides, M., & Chandler, C. (2018). The efficacy of a brief app-based mindfulness intervention on psychosocial outcomes in healthy adults: A pilot randomized controlled trial. *PLoS 13*(12). https://doi.org/10.1371/journal.pone.0209482

Cheng, H. G., & Phillips, M. R. (2014). Secondary analysis of existing data: opportunities and implementation. *Shanghai Archives of Psychiatry*, *26*(6), 371–375. https://doi.org/10.11919/j.issn.1002-0829.214171

Clark, L. A., Cuthbert, B., Lewis-Fernández, R., Narrow, W. E., & Reed, G. M. (2017). Three approaches to understanding and classifying mental disorder: ICD-11, *Diagnostic and Statistical Manual of Mental Disorders-5*, and the national institute of mental health's research domain criteria (RDOC). *Psychological Science in the Public Interest, 18*(2), 72–145. https://doi.org/10.1177/1529100617727266

Clay, K., Portnykh, M., Severnini, E. (2019). The legacy lead deposition in soils and its impact on cognitive function in preschool-aged children in the United States. *Journal of Economics & Human Biology*, *33*, 181–192. https://doi.org/10.1016/j.ehb.2019.03.001

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative & mixed methods approaches*. Sage.

Cristofori, I., Zhong, W., Mandoske, V., Chau, A., Krueger, F., Strenziok, M., & Grafman, J. (2016). Brain regions influencing implicit violent attitudes: A lesion-mapping study. *Journal of Neuroscience, 36*(9), 2757–2768.

https://doi.org/10.1523/jneurosci.2975-15.2016

Curatolo, P., D'Agati, E., & Moavero, R. (2010). The neurobiological basis of ADHD. *Italian Journal of Pediatrics, 36*(1), 79. doi:10.1186/1824-7288-36-79

Daneshparvar, M. (2016). The role of lead exposure on Attention-Deficit/ Hyperactivity Disorder in children: A systematic review. *Iranian Journal of Psychiatry, 11*(1), 1-14. doi: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4888135/

Data Center Research (2019a). *Who lives in New Orleans and Metro Parish now?* Retrieved from https://www.datacenterresearch.org/data-resources/who-lives-in-new-orleans-now/

Data Center Research (2019b). *Total Population by Parish for the New Orleans Metro*. Retrieved from https://www.datacenterresearch.org/data-resources/population-by-parish/

Datko-Williams, L., Wilkie, A., & Richmond-Bryant, J. (2014). Analysis of U.S. soil lead (Pb) studies from 1970 to 2012. *Science of The Total Environment, 468-469*, 854-863. doi: 10.1016/j.scitotenv.2013.08.089

Desmurget, M., Richard, N., Harquel, S., Baraduc, P., Szathmari, A., Mottolese, C., & Sirigu, A. (2014). Neural representations of ethologically relevant hand/mouth synergies in the human precentral gyrus. *Proceedings of the National Academy of Sciences, 111*(15), 5718-5722. doi:10.1073/pnas.1321909111

Dovis, S., Maric, M., Prins, P. J., & Oord, S. V. (2019). Correction to: Does executive function capacity moderate the outcome of executive function training in children with ADHD? *ADHD Attention Deficit and Hyperactivity Disorders, 11*(4), 461-

462. doi:10.1007/s12402-019-00310-x

Emer, L. R., Kalkbrenner, A. E., O'brien, M., Yan, A., Cisler, R. A., & Weinhardt, L. (2020). Association of childhood blood lead levels with firearm violence perpetration and victimization in Milwaukee. *Environmental Research, 180,* 108822. doi:10.1016/j.envres.2019.108822

Environmental Protection Service (EPA). (2019a). *Hazard standards for lead in paint, dust, and soil (TSCA section 403).* Retrieved from https://www.epa.gov/lead/hazard-standards-lead-paint-dust-and-soil-tsca-section-403

Environmental Protection Service (EPA). (2019b). *Superfund Sites in Reuse in Louisiana.* Retrieved from https://19january2017snapshot.epa.gov/superfund-redevelopment-initiative/superfund-sites-reuse-louisiana_.html

Environmental Protection Agency (EPA, 2018a). *Federal action plan to reduce childhood lead exposure.* Retrieved from https://www.epa.gov/sites/production/files/2018 12/documents/fedactionplan_lead_final.pdf

Environmental Protection Service (EPA), (2018b). *What is Superfund?* Retrieved from https://www.epa.gov/superfund/what-superfund

Environmental Protection Service (EPA), (2017). *Protect your family from exposures to lead*. Retrieved from https://www.epa.gov/lead/protect-your-family-exposures-lead#soil

Environmental Protection Service (EPA), (2011). *Steps to lead safe renovation, repair,*

and painting. Retrieved from https://www.epa.gov/sites/production/files/documents/steps.pdf

Epstein, J. N., & Loren, R. E. (2013). Changes in the Definition of ADHD in Diagnostic and Statistical Manual of Mental Disorders-5: Subtle but Important. *Neuropsychiatry, 3*(5), 455–458. doi:10.2217/npy.13.59

Ettinger, A. S., Leonard, M. L., & Mason, J. (2019). CDC's Lead poisoning prevention program: A long-standing responsibility and commitment to protect children from lead exposure. *Journal of Public Health Management and Practice: JPHMP, 25(1),* 5–12. doi:10.1097/PHH.0000000000000868

Fagan, J., & Richman, D. (2017). Understanding recent spikes and longer trends in American murders. Columbia Law Review, 117(5), 1235-1236. Retrieved from https://scholarship.law.columbia.edu/faculty scholarship/100/

Ford, D. M., Margaritis, V., & Mendelsohn, A. B. (2016). Characteristics of childhood lead poisoning among Tennessee children ages one to five years, 2009–2013. *Public Health, 136,* 188–191. https://doi.org/10.1016/j.puhe.2016.02.027

Gharamaleki, N. S., Roshan, R., Pourabdol, S., Saravani, S., & Ghaedi, G. H. (2018). A Comparison of Frontal Lobe Function Between Students with Attention- Deficit Hyperactivity Disorder and Normal Students. *Zahedan Journal of Research in Medical Sciences, 20*(4). doi:10.5812/zjrms.64198

Glanz, Rimer, & Viswanath (Eds.). (2015). *Health Behavior: Theory, Research, and Practice*. San Francisco, CA: John Wiley & Sons.

González, R. A., Kallis, C., & Coid, J. W. (2013). Adult Attention Deficit Hyperactivity

Disorder and Violence in the Population of England: Does Comorbidity Matter? *PLoS ONE, 8*(9). doi: 10.1371/journal.pone.0075575

Government Accountability Office. (2008). *Hurricane Katrina: Continuing debris removal and disposal issues.* Retrieved from https://www.gao.gov/products/GAO-08-985R

Goodlad, J. K., Marcus, D. K., & Fulton, J. J. (2013). Lead and attention-deficit/hyperactivity disorder (ADHD) symptoms: A meta-analysis. *Clinical Psychology Review, 33*(3), 417-425. doi: 10.1016/j.cpr.2013.01.009

Haefner, M. (2019). Blue Cross and Blue Shield Association: Louisiana has nation's highest rate of ADHD diagnoses among children ages 2-18. Retrieved from https://news.bcbsla.com/press-releases/2019/louisiana-adhd

Holland, K. and Riley, E. (2018). ADHD by the Numbers: Facts, Statistics, and You. Retrieved from https://www.healthline.com/health/adhd/facts-statistics-infographic

Holm J., & Wyczalkowski, C. K. (2018). Gentrification in the wake of a Hurricane: New Orleans after Katrina. *Urban Studies, 56*(13), 2763-2778. doi:10.1177/0042098018800445

Hong, S., Im, M., Kim, J., Park, E., Shin, M., Kim, B., . . . Cho, S. (2015). Environmental Lead Exposure and Attention Deficit/Hyperactivity Disorder Symptom Domains in a Community Sample of South Korean School-Age Children. *Environmental Health Perspectives, 123*(3), 271-276. doi:10.1289/ehp.1307420

Jarvis, P., Quy, K., Macadam, J., Edwards, M., & Smith, M. (2018). Intake of lead (Pb)

from tap water of homes with leaded and low lead plumbing systems. *Science of The Total Environment, 644*, 1346-1356. doi: 10.1016/j.scitotenv.2018.07.064

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an explanatory framework in communication research: exploring parallel, serial, and moderated mediation. *Health communication*, *30*(6), 566–576. doi:10.1080/10410236.2013.873363

Kegler, M. C., & Malcoe, L. H. (2004). Results from a lay health advisor intervention to prevent lead poisoning among rural Native American children. *American Journal of Public Health*, *94*(10), 1730–1735. doi:10.2105/ajph.94.10.1730

Kordas, K. (2017). The "lead diet": Can dietary approaches prevent or treat lead exposure? *The Journal of Pediatrics, 185*. doi:10.1016/j.jpeds.2017.01.069

Kofler, M., Irwin, L., Soto, E., Groves, N., Harmon, S., & Sarver, D., (2018). Executive functioning heterogeneity in pediatric ADHD. *Journal of Abnormal Child Psychology*, *47*(2), 273-286. https://doi.org/10.1007/s10802-018-0438-2

Kumar, R. & Gleason, M. (2019). Pediatric Attention-Deficit/Hyperactivity Disorder in Louisiana: Trends, challenges, and opportunities for enhanced Quality of Care. *The Ochsner Journal*, *19*(4), 357–368. https://doi.org/10.31486/toj.18.0103

Lane, S. D., Kjome, K. L., & Moeller, F. G. (2011). Neuropsychiatry of aggression. *Neurologic Clinics, 29*(1), 49–vii. doi: 10.1016/j.ncl.2010.10.006

Langer, N., Benjamin, C., Becker, B. L., & Gaab, N. (2019). Comorbidity of reading disabilities and ADHD: Structural and functional brain characteristics. *Human Brain Mapping, 40*(9), 2677-2698. doi:10.1002/Health Belief Model.24552

Ledochowski, J., Andrade, B. F., & Toplak, M. E. (2019). A novel unstructured performance-based task of executive function in children with attention-deficit/hyperactivity disorder. *Journal of Clinical and Experimental Neuropsychology, 41*(5), 445-459. doi:10.1080/13803395.2019.1567694

Lee, M. J., Chou, M. C., Chou, W. J., Huang, C. W., Kuo, H. C., Lee, S. Y., & Wang, L. J. (2018). Heavy metals' effect on susceptibility to Attention-Deficit/Hyperactivity Disorder: Implication of lead, cadmium, and antimony. International Journal of Environmental Research and Public Health, 15(6), 1221. doi:10.3390/ijerph15061221

Linab, Y., Huang, L., Xu, J., Specht, A., Yana, C., Geng, H., …, Hu, H. (2019). Blood lead, bone lead, and child attention-deficit-hyperactivity-disorder-like behavior. *Science of The Total Environment*, *659*(1), 161-167. https://doi.org/10.1016/j.scitotenv.2018.12.219

Lichtenstein, P., Halldner, L., Zetterqvist, J., Sjölander, A., Serlachius, E., Fazel, S., & Larsson, H. (2013). Medication for attention deficit hyperactivity disorder and criminality. *New England Journal of Medicine, 368*(8), 775-776. doi:10.1056/nejmc1215531

Linab, Y., Huang, L., Xu, J., Specht, A., Yana, C., Geng, H., …, Hu, H. (2019). Blood lead, bone lead, and child attention-deficit-hyperactivity-disorder-like behavior. *Science of The Total Environment*, *659*(1), 161-167. https://doi.org/10.1016/j.scitotenv.2018.12.219

Liu, J., Liu, X., Wang, W., Mccauley, L., Pinto-Martin, J., Wang, Y., . . . Rogan, W. J.

(2014). Blood Lead Concentrations and Children's Behavioral and Emotional Problems. *JAMA Pediatrics, 168*(8), 737. doi:10.1001/jamapediatrics.2014.332

Loveland-Jones, C., Ferrer, L., Charles, S., Ramsey, F., Zandt, A. V., Volgraf, J., . . . Goldberg, A. (2016). A prospective randomized study of the efficacy of "Turning Point," an inpatient violence intervention program. *Journal of Trauma and Acute Care Surgery, 81*(5), 834-842. doi:10.1097/ta.0000000000001226

Mace, R. A., Waters, A. B., Sawyer, K. S., Turrisi, T., & Gansler, D. A. (2018). Components of executive function predict regional prefrontal volumes. doi:10.1101/374009. Retrieved from https://www.biorxiv.org/node/113315.abstract

Magnus, W., Nazir, S., Anilkumar, A., & Shaban, K. (2019). *Attention Deficit Hyperactivity Disorder (ADHD)*. Treasure Island, FL: Stat Pearls Publishing. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK441838/

Martel, M. M. (2013). Individual differences in Attention Deficit Hyperactivity Disorder symptoms and associated executive dysfunction and traits: Sex, ethnicity, and family income. *American Journal of Orthopsychiatry, 83*(2-3), 165-175. doi:10.1111/ajop.12034

Mao, C., Koide, R., Brem, A., & Akenji, L. (2020). Technology foresight for social good: Social implications of technological innovation by 2050 from a global expert survey. *Technological Forecasting and Social Change, 153*, 119914. https://doi.org/10.1016/j.techfore.2020.119914

Masho, S. W., Schoeny, M. E., Webster, D., & Sigel, E. (2016). Outcomes, data, and

indicators of violence at the community level. *The Journal of Primary Prevention, 37*, 121–139. http://doi.org/10.1007/s10935-016-0429-4

Mackinnon D. P. (2011). Integrating Mediators and Moderators in Research Design. *Research on social work practice, 21*(6), 675–681. doi:10.1177/1049731511414148

Mead, H. K., Beauchaine, T. P., & Shannon, K. E. (2010). Neurobiological adaptations to violence across development. *Development and Psychopathology, 22*(1), 1-22. doi:10.1017/s0954579409990228

Mielke, H. W., Gonzales, C. R., & Powell, E. T. (2019). Curtailing Lead Aerosols: Effects of Primary Prevention on Declining Soil Lead and Children's Blood Lead in Metropolitan New Orleans. *International Journal of Environmental Research and Public Health, 16*(12), 2068. doi:10.3390/ijerph16122068

Mielke, H. W., Gonzales, C. R., Powell, E. T., & Mielke, P. W. (2017). Spatiotemporal exposome dynamics of soil lead and children's blood lead pre- and ten years post-Hurricane Katrina: Lead and other metals on public and private properties in the city of

New Orleans, Louisiana, U.S.A. *Environmental Research, 155*, 208-218. doi: 10.1016/j.envres.2017.01.036

Mielke, H., Gonzales, C., & Powell, E. (2017). Soil lead and children's blood lead disparities in pre- and post-hurricane Katrina New Orleans (USA). *International Journal of Environmental Research and Public Health, 14*(4), 407. doi:10.3390/ijerph14040407

Mielke, H. W., Gonzales, C. R., Powell, E. T., & Mielke, P. W. (2013). Environmental and health disparities in residential communities of New ORLEANS: The need for SOIL LEAD intervention to advance primary prevention. *Environment International, 51*, 73-81. doi: 10.1016/j.envint.2012.10.013

Mielke, H. W., Gonzales, C. R., Powell, E., Jartun, M., & Mielke, P. W. (2007). Nonlinear association between soil lead and blood lead of children in metropolitan New Orleans, Louisiana: 2000–2005. *Science of The Total Environment, 388*(1-3), 43-53. doi: 10.1016/j.scitotenv.2007.08.012

Mielke, (1998). Agricultural street superfund site. Retrieved from http://www.toxicsites.us/stories/mielkememo.pdf

Milam, A. J., Buggs, S. A., Furr-Holden, C. D., Leaf, P. J., Bradshaw, C. P., & Webster, D. (2016). Changes in Attitudes toward Guns and Shootings following Implementation of the Baltimore Safe Streets Intervention. *Journal of Urban Health, 93*(4), 609-626. doi:10.1007/s11524-016-0060-y

Modesto-Lowe, V., Farahmand, P., Chaplin, M., & Sarro, L. (2015). Does mindfulness meditation improve attention in attention deficit hyperactivity disorder? *World Journal of Psychiatry*, *5*(4), 397–403. doi:10.5498/wjpv5.i4.397

Mokobane, M., Pillay, B. J., & Meyer, A. (2019). Behaviour planning and inhibitory control in Sepedi-speaking primary school children with Attention-Deficit/Hyperactivity Disorder. *South African Journal of Psychology,* 008124631983810. doi:10.1177/0081246319838104

Morris, L. S., Kundu, P., Dowell, N., Mechelmans, D. J., Favre, P., Irvine, M. A., . . .

Voon, V. (2016). Fronto-striatal organization: Defining functional and microstructural substrates of behavioral flexibility. *Cortex, 74*, 118-133. doi: 10.1016/j.cortex.2015.11.004

Murphy, S., Xu, J., Kochanek, K., Curtin, S., & Arias, E. (2018). Deaths: Final data for 2015. Retrieved from https://www.cdc.gov/nchs/nvss/deaths.htm

National Center for Health Statistics. (2017). Health, United States, 2016: With chartbook on long-term trends in health. Retrieved from https://www.cdc.gov/nchs/data/hus/hus16.pdf

National Institute of Mental Health. (2019). *Attention-deficit/hyperactivity disorder*. Retrieved January 08, 2020, from https://www.nimh.nih.gov/index.shtml

The New Orleans Advocate [NOLA]. (2021). *Teens who tried to carjack tesla in mid-city arrested; carjacking attempt caught on video*. Retrieved from https://www.nola.com/news/crime_police/article_0e272cc0-593c-11ec-8add-7b5d7860baf5.html.

The New Orleans Advocate [NOLA]. (2019). *Two teens and adult man ID'd as 3 victims shot dead in New Orleans over violent weekend*. Retrieved from https://www.nola.com/news/crime_police/article_15cc6aa4-de13-11e9-bf0a-778de8c9304b.html.

The New Orleans Advocate [NOLA]. (2016). *Why does New Orleans have more murders than similar cities? Experts search for answers*. Retrieved from https://www.nola.com/news/crime_police/article_c78b758a-7214-58d5-81cb-0218ff42f55b.html.

Nicolescu, R., Petcu, C., Cordeanu, A., Fabritius, K., Schlumpf, M., Krebs, R., . . . Winneke, G. (2010). Environmental exposure to lead, but not other neurotoxic metals, relates to core elements of ADHD in Romanian children: Performance and questionnaire data. *Environmental Research, 110*(5), 476-483. doi: 10.1016/j.envres.2010.04.002

Nigg, J., Knottnerus, G., Martel, M., Nikolas, M., Cavanagh, K., Karmaus, W., Rappley, M. (2008). Low blood lead levels associated with clinically diagnosed attention-deficit/hyperactivity disorder. In Rocha, A., & Trujillo, K. A. (2019). Neurotoxicity of low-level lead exposure: History, mechanisms of action, and behavioral effects in humans and preclinical models. *NeuroToxicology, 73*, 58-80. doi: 10.1016/j.neuro.2019.02.021

Noonan, A. S., Velasco-Mondragon, H. E., & Wagner, F. A. (2016). Improving the health of African Americans in the USA: an overdue opportunity for social justice. *Public health reviews*, *37*, 12. doi:10.1186/s40985-016-0025-4

Norgaard, M., Ehrenstein, V., & Vandenbroucke, J. P. (2017). Confounding in observational studies based on large health care databases: problems and potential solutions - a primer for the clinician. *Clinical epidemiology*, *9*, 185–193. doi:10.2147/CLEP.S129879

Office of Inspector General. (2019). *Many medicaid-enrolled children who were treated for ADHD did not receive recommended follow-up care*. Retrieved from https://oig.hhs.gov/oei/reports/oei-07-17-00170.asp

Ott, T., & Nieder, A. (2019). Dopamine and cognitive control in prefrontal cortex. *Trends*

in Cognitive Sciences, 23(3), 213-234. doi: 10.1016/j.tics.2018.12.006

Paliwal, A., Cabrera, N., Dougherty, J., & Klofas, J. (2016). Comparison of cities' homicide rates over time: 2015 Data. Retrieved from https://www.rit.edu/liberalarts/sites/rit.edu.liberalarts/files/documents/our-work/2016-07%20-%20ComparisonofCitiesHomicideRatesOverTime-2016_Final.pdf

Park, J. H., Seo, J., Hong, Y., Kim, Y., Kang, J., Yoo, J., . . . Choe, B. M. (2016). Blood lead concentrations and attention deficit hyperactivity disorder in Korean children: A hospital-based case control study. *BMC Pediatrics, 16*(1). doi:10.1186/s12887-016-0696-5

Peveto, K. (2014). Louisiana ADHD increase among highest in nation. Retrieved from http://www.theadvocate.com/baton _rouge/news/article_98f2a72a-fa72-54f4-9eee-9459cfcf9ba2.html

Pirau L & Lui F. (2018). *Frontal lobe syndrome*. Treasure Island, FL: StatPearls Publishing. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK532981

Prehn-Kristensen, A., Zimmermann, A., Tittmann, L., Lieb, W., Schreiber, S., Baving, L., & Fischer, A. (2018). Reduced microbiome alpha diversity in young patients with ADHD. *Plos One, 13*(7). doi: 10.1371/journal.pone.0200728

Qi, X., Xu, X., Zhong, C., Jiang, T., Wei, W., & Song, X. (2018). Removal of cadmium and lead from contaminated soils using sophorolipids from fermentation culture of *s*tarmerella bombicola CGMCC 1576 Fermentation. *International Journal of Environmental Research and Public Health*, *15*(11), 2334.

doi:10.3390/ijerph15112334

Rabin, R. (2008). The lead industry and lead water pipes, “a modest campaign.” *American Journal of Public Health*, *98*(9), 1584–159. doi:10.2105/AJPH.2007.113555

Rabito, F. A., Iqbal, S., Perry, S., Arroyave, W., & Rice, J. C. (2012). Environmental lead after Hurricane Katrina: Implications for future populations. *Environmental Health Perspectives, 120*(2), 180-184. doi:10.1289/ehp.1103774

Radulescu, A., & Lundgren, S. (2019). A pharmacokinetic model of lead absorption and calcium competitive dynamics. Retrieved from https://arxiv.org/abs/1902.06247

Rai, P., Lee, S., Zhang, M., Tsang, Y., Kim, K., (2019). Heavy metals in food crops: Health risks, fate, mechanisms, and management. *Environment International,125*, 365-385. https://doi.org/10.1016/j.en vint.2019.01.067

Raine, A. (2019). Antisocial Personality as a Neurodevelopmental Disorder. *Clinical Psychology, 14*, 259-289. doi:10.1146/annurev-clinpsy-050817-084819

Saloniki, E., Malley, J., Burge, P., Lu, H., Batchelder, L., Linnosmaa, I., . . . Forder, J. (2019). Comparing internet and face-to-face surveys as methods for eliciting preferences for social care-related quality of life: Evidence from England using the ASCOT service user measure. *Quality of Life Research, 28*(8), 2207-2220. doi:10.1007/s11136-019-02172-2

Saylor & Amann, (2016). Impulsive Aggression as a Comorbidity of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *Journal of child and adolescent psychopharmacology*, *26*(1), 19–25.

https://doi.org/10.1089/cap.2015.0126

Seiden, J. (2004). The criminal brain: Frontal lobe dysfunction evidence in capital proceedings. *Capital Defense Journal, 16*(2), 395-420.

Selya, A. S., Rose, J. S., Dierker, L. C., Hedeker, D., & Mermelstein, R. J. (2012). A practical guide to calculating Cohen's f(2), a measure of local effect size, from PROC mixed. Frontiers in Psychology, 3, 111. https://doi.org/10.3389/fpsyg.2012.00111

Shapiro, J. (2000). *Attitudes toward Guns and Violence Questionnaire*. Retrieved from https://www.wpspublish.com/agvq-attitudes-toward-guns-and-violence-questionnaire

Singh, A., Yeh, C. J., Verma, N., & Das, A. K. (2015). Overview of Attention Deficit Hyperactivity Disorder in Young Children. *Health psychology research, 3*(2), 2115. doi:10.4081/hpr.2015.2115

Sjowall, D., & Thorell, L. B. (2018). A critical appraisal of the role of neuropsychological deficits in preschool ADHD. *Child Neuropsychology, 25*(1), 60-80. doi:10.1080/09297049.2018.1447096

Sripada, K. (2017). "Beginning with the Smallest Intake": Children's Brain Development and the Role of Neuroscience in Global Environmental Health. *Neuron, 95*(6), 1242-1245. doi: 10.1016/j.neuron.2017.08.009

Sutton, J., & Austin, Z. (2015). Qualitative Research: Data Collection, Analysis, and Management. *The Canadian Journal of Hospital Pharmacy*, *68*(3), 226–231. doi:10.4212/cjhpv68i3.1456

The New Orleans Advocate [NOLA]. (2019). *Ten people shot on Canal Street in New Orleans, NOPD says: 2 in critical condition* Retrieved from https://www.nola.com/news/crime_police/article_883833a4-142b-11ea-b1d8-f731a9c223b0.html

The New Orleans Advocate [NOLA]. (2016). *Why does New Orleans have more murders than similar cities? Experts search for answers.* Retrieved from https://www.nola.com/news/crime_police/article_c78b758a-7214-58d5-81cb-0218ff42f55b.html

The New Orleans Advocate [NOLA]. (2013). Murders in New Orleans were slightly fewer in 2012 than in 2011. Retrieved from https://www.nola.com/news/crime_police/article_4dd8e4ae-6cb4-5e10-8683-e0e95e6bb7c5.html

U.S. Department of Justice, (2016). *Combatting youth violence in American cities*. Retrieved from https://rems.ed.gov/Docs/COPS_CombattingYouthViolence.pdf

Vaidya, C. J., & Stollstorff, M. (2008). Cognitive neuroscience of Attention Deficit Hyperactivity Disorder: Current status and working hypotheses. *Developmental Disabilities Research Reviews, 14*(4), 261-267. doi:10.1002/ddrr.40

Wani, A. L., Ara, A., & Usmani, J. A. (2015). Lead toxicity: a review. *Interdisciplinary Toxicology, 8*(2), 55–64. https://doi.org/10.1515/intox-2015-0009

Warner, R. M. (2013). *Applied statistics: from bivariate through multivariate techniques*. SAGE Publications.

Webster, D., & Bloomberg. (2019). A critical gap in gun violence data. Retrieved from

https://americanhealth.jhu.edu/article/critical-gap-gun-violence-data

Who Health Organization (WHO). *Lead poisoning and health.* Retrieved from https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health

World Population Review (2021). Cities With Most Murders 2021. Retrieved from https://worldpopulationreview.com/us-city-rankings/cities-with-most-murders

Wormith, J. S., Craig, L., & Hogue, T. E. (2020). *Handbook of what works in Violence risk management: Theory, research, and practice*. Hoboken, NJ: John Wiley & Sons.

Wustner, A., Otto, C., Schlack, R., Holling, H., Klasen, F., & Ravens-Sieberer, U. (2019). Risk and protective factors for the development o2f ADHD symptoms in children and adolescents: Results of the longitudinal BELLA study. *Plos One, 14*(3), 1-19. doi: 10.1371/journal.pone.0214412

Wang, X and Ji, X. (2020). Sample Size Estimation in Clinical Research: From Randomized Controlled Trials to Observational Studies. Retrieved from https://pubmed.ncbi.nlm.nih.gov/32658647/.

Zahran, S., Mielke, H. W., Mcelmurry, S. P., Filippelli, G. M., Laidlaw, M. A., & Taylor, M. P. (2013). Determining the relative importance of soil sample locations to predict risk of child lead exposure. *Environment International, 60*, 7-14. doi: 10.1016/j.envint.2013.07.004

Zahran, S., Mielke, H. W., Gonzales, C. R., Powell, E. T., & Weiler, S. (2010). New Orleans before and after hurricanes Katrina/Rita: A quasi-experiment of the association between soil lead and children’s blood lead. *Environmental Science &*

Technology, 44(12), 4433-4440. doi:10.1021/es100572s

Appendix A: Recruitment Flyer

Seeking Participants for an Online Survey Study on Gun violence

There is a new study called "An Association Between Lead Toxicity, Attention Deficit Hyperactive Disorder, and Attitudes toward Gun Violence Among Young African American Men in New Orleans" that could help public health professionals design more effective interventions toward reducing gun violence among young African American men in New Orleans. For this study you are asked to provide information about yourself including past addresses, behavioral history and your honest views on guns and violence.

This survey is part of the doctoral study for Gwen McIntosh, a Ph.D. student at Walden University.

About the study:

· The survey takes about 20 minutes

· You will NOT be asked for your name or any ID.

Volunteers must meet these requirements:

· African American Male

· 18 to 29 years old

· Lived in New Orleans for at least a year between birth and 11 years of age.

Thank you for taking the time for reading this flyer. As a token of appreciation for your time and effort you will receive a $10 Amazon gift card upon completion of this survey regardless of the response choices.

Please continue onto the survey by clicking here.

Appendix B: Informed Consent Form

You are invited to take part in a research study about the gun violence in New Orleans. The title of the study is "An Association Between Lead Toxicity, Attention Deficit Hyperactive Disorder, and Attitudes toward Gun Violence Among Young African American Men in New Orleans." The researcher is inviting African American males between the ages of 18 and 29 years who have lived in New Orleans for at least a year between birth and 11 years of age, and who know their ward in which they resided, and are able to point out the two nearest streets with the help of maps that will be provided as part of the survey.

This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by Gwen McIntosh RN, BSN, MS, who is a doctoral student in the Public Health Department at Walden University.

Background Information:
The purpose of this study in the short term is to add to what we currently know about factors that could affect gun violence in New Orleans. In the long term, the purpose of this study is to bring attention to people who are able to help in creating programs to reduce gun violence in the city of New Orleans.

Procedures:
This study involves the following steps:

- Complete the anonymous online survey (about 20 minutes) by following directions on each page.

Here are some sample items:

- I lived the longest between the time I was born and 11 years of age in ward_____ and the two nearest streets or intersection was/were_____
- I have been diagnosed with ADHD by a doctor
  Yes No

Voluntary Nature of the Study:
Research should only be done with those who freely volunteer. So, everyone involved will respect your decision to join or not. You will be treated the same at Walden University whether or not you join the study. If you decide to join the study now, you can still change your mind later. You may stop at any time. The researcher seeks 142 volunteers for this study.

Risks and Benefits of Being in the Study:
Being in this study could involve some risk of the minor discomforts that can be encountered in daily life, such as potential feelings of inadequacies or inferiority due to having to recall your ADHD diagnosis**.** With the protections in place, this study would pose minimal risk to your wellbeing. The information regarding your diagnosis will be kept anonymous which means you will NOT be asked for your name or any ID.
This study offers no direct benefits to individual volunteers. The aim of this study is to benefit society by suggesting more effective interventions toward reducing gun violence in the city of New Orleans.

Payment:
As a token of appreciation for your time and effort you will receive a $10 Amazon gift card upon completion of this survey regardless of the response choices.

Privacy:
The researcher is required to protect your privacy. Your identity will be kept anonymous which means you will NOT be asked for your name or any ID.

If this researcher were to share your responses with another researcher in the future, your name or personal ID cannot be shared because your name and personal ID are not collected. Your responses will be securely stored by the online platform SurveyMonkey and by this researcher on her password protected personal computer for a period of at least 5 years, as required by the university.

Contacts and Questions:
You can ask questions of the researcher by contacting her at her email address, xxxxxxxxxxxx. If you want to talk privately about your rights as a participant or any negative parts of the study, you can call Walden University's Research Participant Advocate at xxxxxxxx. Walden University's approval number for this study is **05-25-21-0448759** and it expires on **May 24, 2022.**

Obtaining Your Consent

If you feel you understand the study and wish to volunteer, please proceed to the next page to start the survey. Note that by completing the survey you are giving your consent to participate in this study.. Also, you can stop the survey at any time by closing the window.

Appendix C: Pre-Survey Questions

I am an African American man.

Yes No

I am between the ages of 18 and 29.

Yes No

Between the time I was born and 11 years of age, in New Orleans for at least one year.

Yes No

Section 1

For this section there are some questions that ask for your opinion about different things. Opinion means what you feel or think about something. This is not a test because these questions do not have right answers and wrong answers. Everybody has different opinions, and everybody has the right to have their own opinions. You will read an idea and then you'll decide whether you agree or disagree with the idea. Or whether you are not sure. Give your answer by circling the x that shows whether you agree, disagree or are not sure.

Now, here are the questions.

1. You have got to fight to show people you're not a wimp.
2. If someone disrespects me, I have to fight them to get my pride back.
3. Carrying a gun makes people feel safe.
4. Carrying a gun makes people feel powerful and strong.
5. If people are nice to me, I will be nice to them, but if someone stops me from getting what I want, they'll pay for it bad.
6. I'd like to have a gun so that people would look up to me.
7. It would be exciting to hold a loaded gun in my hand.
8. I wish there weren't any guns in my neighborhood.

9. I bet it would feel real cool to walk down the street with a gun in my pocket.

10. I'd feel awful inside if someone laughed at me and I didn't fight them.

11. It would make me feel really powerful to hold a loaded gun in my hand.

12. I'd like to have my own gun.

13. Most people feel nervous around someone with a gun and they want to get away from that person.

14. The people I respect would never go around with a gun because they're against hurting people.

15. I think it would be fun to play around with a real gun.

16. If someone insults me or my family, it really bothers me, but if I beat them up, that makes me feel better.

17. If somebody insults you, and you do not want to be a chump you have to fight.

18. I don't like people who have guns because they might kill someone.

19. Carrying a gun makes people feel powerful and strong.

20. A kid who doesn't get even with someone who makes fun of him or her is a sucker.

21. Belonging to a gang makes kids feel safe because they've got people to back them up.

22. If I acted the way teachers think I should out on the street, people would think I was weak and I'd get pushed around.

23. I wish everyone would get rid of all their guns.

24. I'd feel awful inside if someone laughed at me and I didn't fight them.

25. I don't like being around people with guns because someone could end up getting hurt.

26. Kids in gangs feel like they're part of something powerful.

Section 2

I lived the longest between the time I was born and 11 years of age in ward_____ and the two nearest streets or intersection was/were (please use the map below to help with your memory):_____

Please name any school if known that was closest to where you lived up to ages 11.

Elementary School_____

Middle School_____

Section 3

Please select the applicable option below-regarding ADHD diagnosis:

I have been diagnosed with ADHD by a doctor Yes No

To the best of my memory, I was diagnosed at _____years of age. (only input numbers)

Section 4

Demographic questions

What is your age? _____

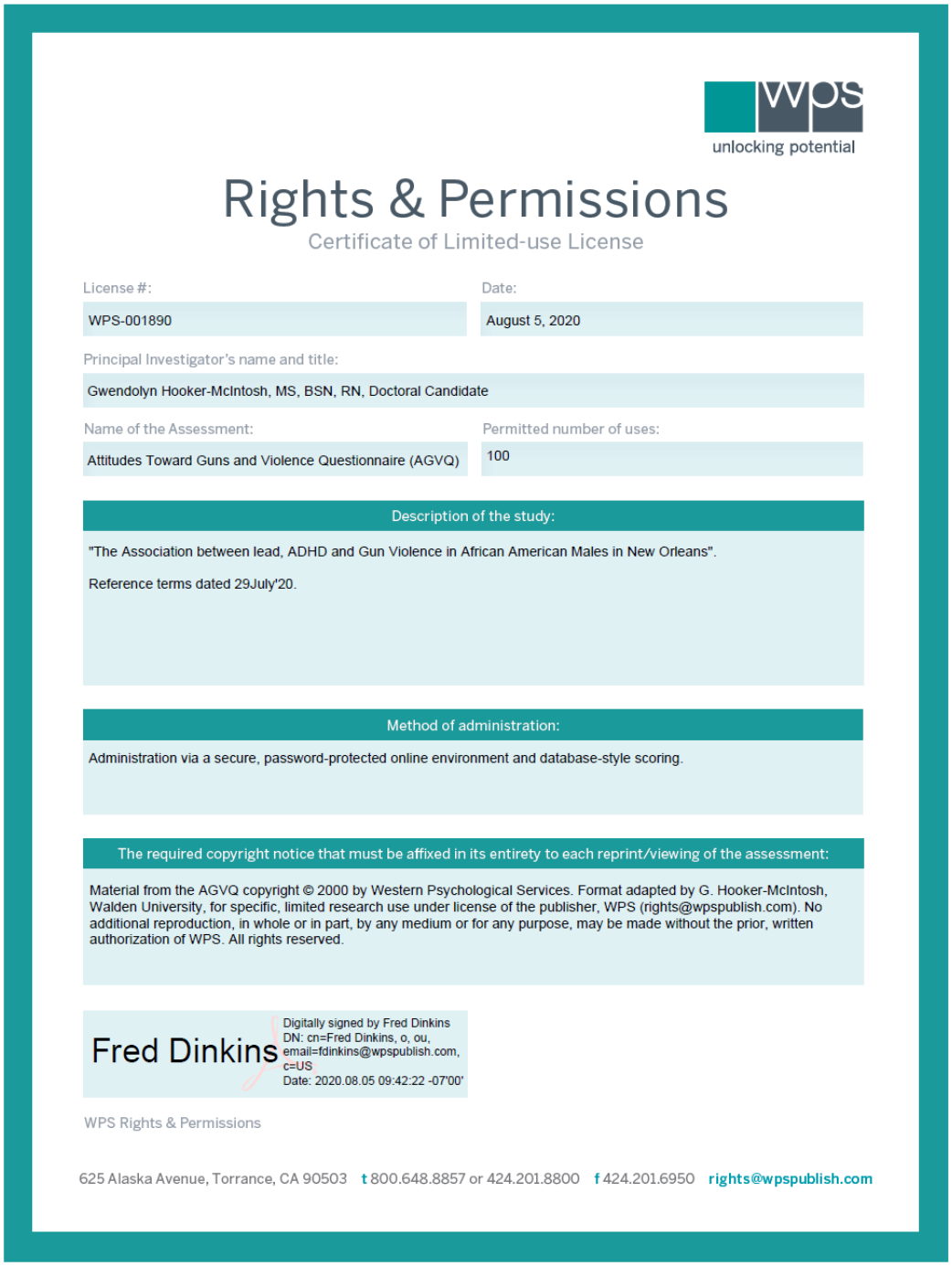
Please list the highest level of education you have completed

- Did not complete high school or do not have a GED
- I have a high school diploma or GED
- I attended college
- I have a college degree

My household used food stamps between 1990 and 2002. Yes No

Thank you for your time please proceed to the next page for claiming your $10.00 Amazon gift card.

Appendix D: Certificate for the Rights and Permissions to Use AGVQ



WPS
unlocking potential

Rights & Permissions

Certificate of Limited-use License

License #: WPS-001890

Date: August 5, 2020

Principal Investigator's name and title: Gwendolyn Hooker-McIntosh, MS, BSN, RN, Doctoral Candidate

Name of the Assessment: Attitudes Toward Guns and Violence Questionnaire (AGVQ)

Permitted number of uses: 100

Description of the study:

"The Association between lead, ADHD and Gun Violence in African American Males in New Orleans".

Reference terms dated 29July'20.

Method of administration:

Administration via a secure, password-protected online environment and database-style scoring.

The required copyright notice that must be affixed in its entirety to each reprint/viewing of the assessment:

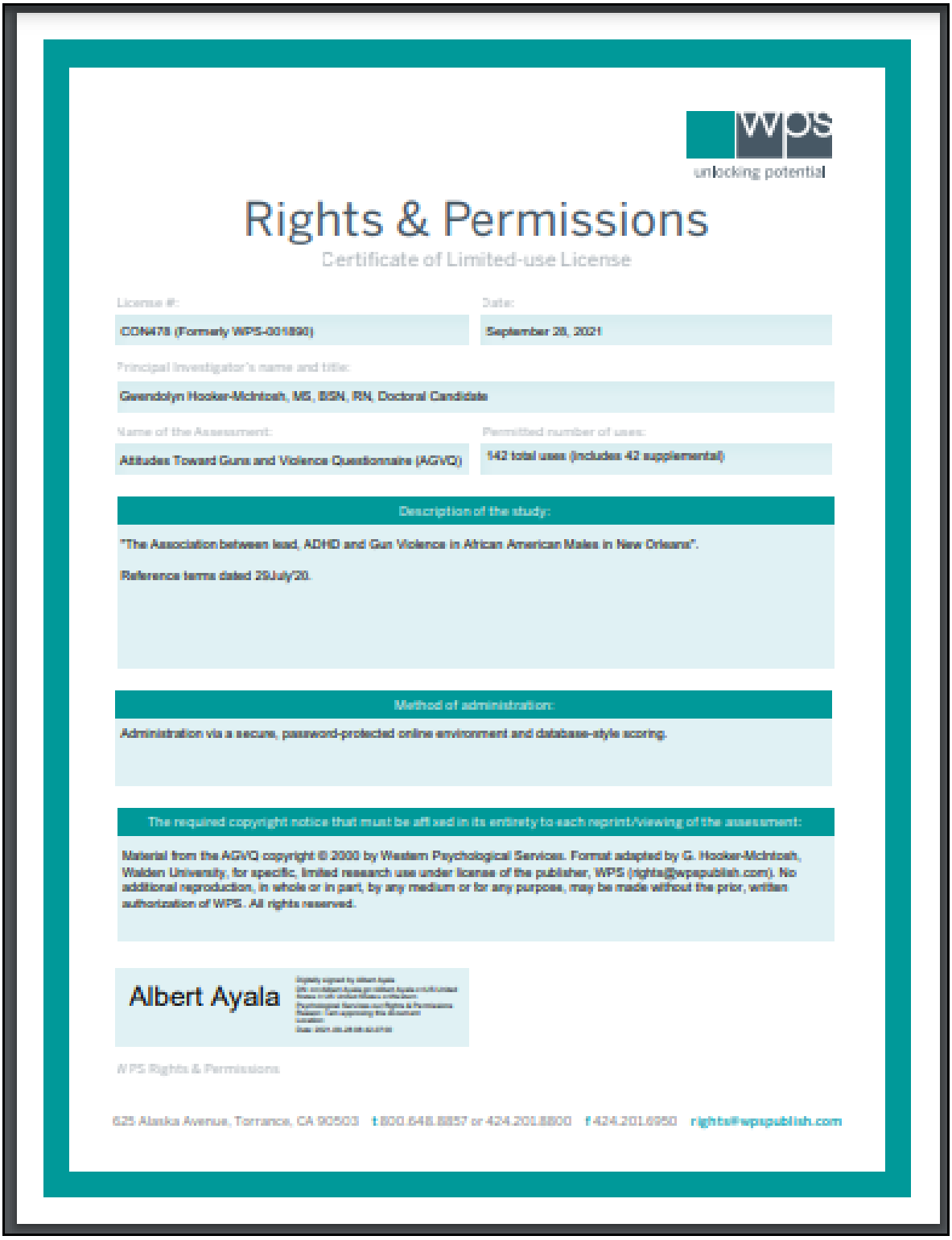
Material from the AGVQ copyright © 2000 by Western Psychological Services. Format adapted by G. Hooker-McIntosh, Walden University, for specific, limited research use under license of the publisher, WPS (rights@wpspublish.com). No additional reproduction, in whole or in part, by any medium or for any purpose, may be made without the prior, written authorization of WPS. All rights reserved.

Fred Dinkins

Digitally signed by Fred Dinkins
DN: cn=Fred Dinkins, o, ou, email=fdinkins@wpspublish.com, c=US
Date: 2020.08.05 09:42:22 -07'00'

WPS Rights & Permissions

625 Alaska Avenue, Torrance, CA 90503 t 800.648.8857 or 424.201.8800 f 424.201.6950 rights@wpspublish.com



unlocking potential

Rights & Permissions

Certificate of Limited-use License

License #:
CON478 (Formerly WPS-031890)

Date:
September 28, 2021

Principal Investigator's name and title:
Gwendolyn Hooker-McIntosh, MS, BSN, RN, Doctoral Candidate

Name of the Assessment:
Attitudes Toward Guns and Violence Questionnaire (AGVQ)

Permitted number of uses:
142 total uses (includes 42 supplemental)

Description of the study:

"The Association between lead, ADHD and Gun Violence in African American Males in New Orleans".

Reference terms dated 29July'20.

Method of administration:

Administration via a secure, password-protected online environment and database-style scoring.

The required copyright notice that must be affixed in its entirety to each reprint/viewing of the assessment:

Material from the AGVQ copyright © 2000 by Western Psychological Services. Format adapted by G. Hooker-McIntosh, Walden University, for specific, limited research use under license of the publisher, WPS (rights@wpspublish.com). No additional reproduction, in whole or in part, by any medium or for any purpose, may be made without the prior, written authorization of WPS. All rights reserved.

Albert Ayala

WPS Rights & Permissions

625 Alaska Avenue, Torrance, CA 90503 t 800.648.8857 or 424.201.8800 f 424.201.8950 rights@wpspublish.com

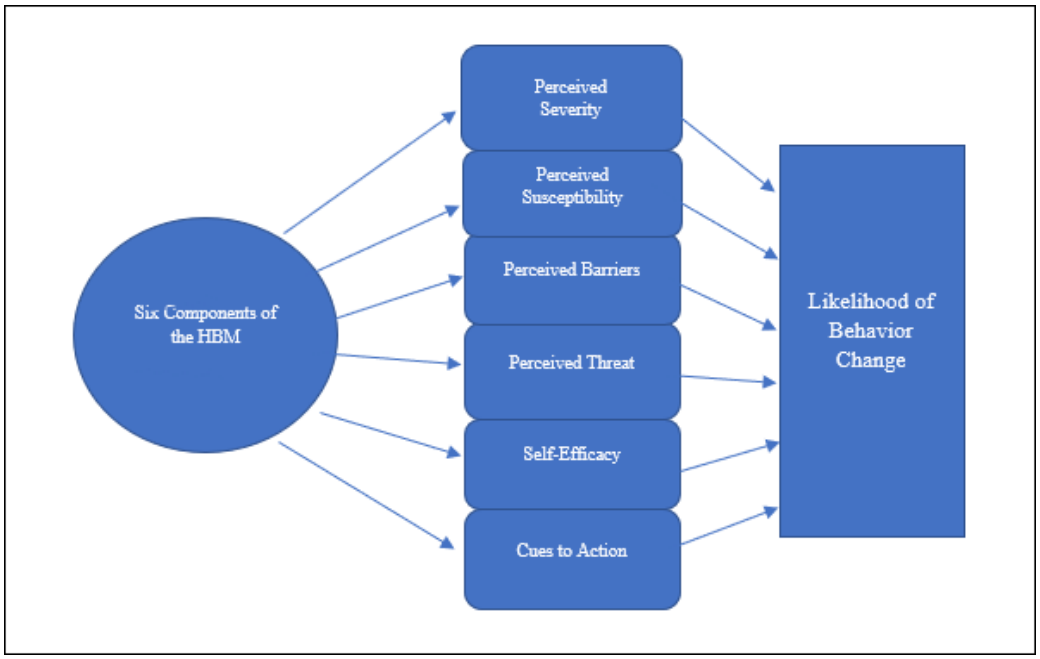
Appendix E: Prevalence Estimates for ADHD

Data Table

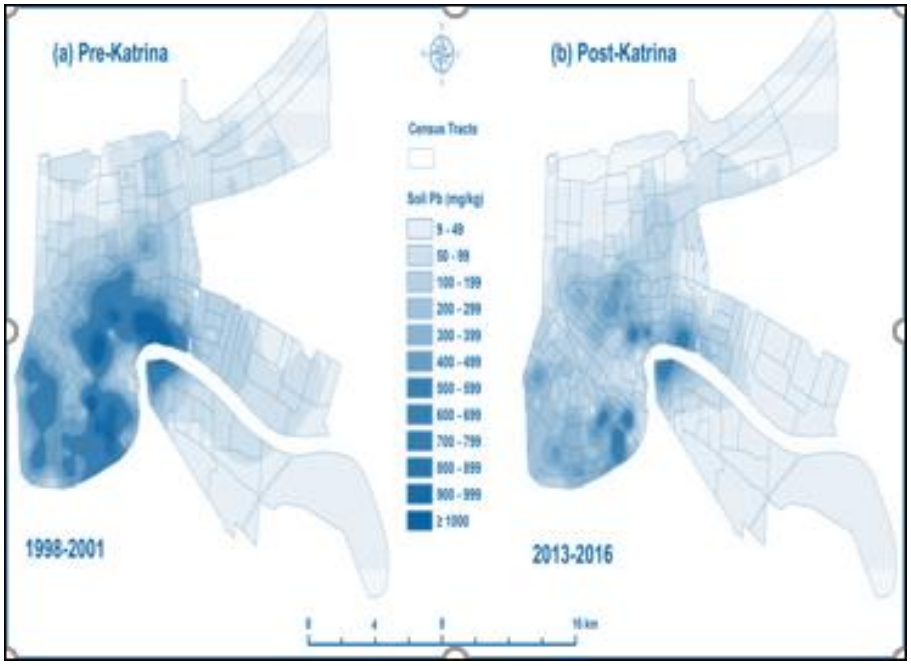
Location	Percentage
Alabama	12.50%
Alaska	7.60%
Arizona	8.90%
Arkansas	15.10%
California	6.70%
Colorado	6.30%
Connecticut	8.70%
Delaware	12.80%
Florida	10.20%
Georgia	10.80%
Hawaii	7.60%
Idaho	7.70%
Illinois	7.90%
Indiana	14.10%
Iowa	12.10%
Kansas	10.20%
Kentucky	15.60%
Louisiana	14.20%
Maine	11.60%
Maryland	10.50%
Massachusetts	10.00%
Michigan	11.30%
Minnesota	10.30%
Mississippi	12.90%
Missouri	8.60%
Montana	10.30%
Nebraska	10.20%
Nevada	5.10%
New Hampshire	10.90%
New jersey	6.90%
New Mexico	6.80%
New York	8.80%
North Carolina	12.80%
North Dakota	10.40%
Ohio	12.80%
Oklahoma	10.50%
Oregon	9.60%
Pennsylvania	10.70%
Rhode Island	12.20%
South Carolina	13.80%
South Dakota	8.00%
Tennessee	13.50%
Texas	9.40%
Utah	7.40%
Vermont	9.40%
Virginia	10.60%
Washington	8.60%
Washington D.C.	8.40%
West Virginia	10.60%
Wisconsin	11.20%
Wyoming	8.40%

Note. At 14.20%, Louisiana ranks third nationwide in the prevalence of ADHD amongst children.

Appendix F: Components of the Health Belief Model



Appendix G: Soil Lead Level Pre- and Post-Hurricane Katrina



Note. Data were collected from census tracts in New Orleans from 1998 to 2001 (pre-Katrina) and from 2013 to 2016 (post-Katrina) (Mielke et al., 2017).