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Parental Characteristics and Lead Knowledge in the Minimization of Environmental Lead Exposure

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Walden University
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Abstract

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by

Trina Yvette Redford

MS, St. Joseph's University, 2003

BS, Millersville University, 1990

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

A method for guiding lead intervention and minimizing lead exposures in Philadelphia, Pennsylvania (PA) is through understanding the relationship between lead knowledge and parental characteristics such as gender, age, income, marital status, and education attainment. Parental characteristic may play a significant role in the identification of population groups where knowledge pertaining to lead exposure is inadequate. Through awareness and intervention, preventive measures can be implemented to minimize and eliminate lead exposure. The theoretical concept used in this quantitative study was Krieger ecosocial theory. The ecosocial theory provides guidance and analyzes differences in existing health relationships, especially those with biological and psychosocial influences. An exploratory cross-section design was used to explore the association between parental characteristics of gender, age, income, marital status, and education attainment with lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia, PA. The Lead Knowledge Test questionnaire was completed by 124 participants. Descriptive statistics were used through calculation of central of tendency. Data analysis for inferential statistics was completed through multiple variable regressions. Results indicated parents gender, age, income, marital status, and education attainment were not predictors of lead knowledge. The results of this study have the potential to produce social change through identifying lead exposure in Philadelphia, PA, aiding in the minimization and prevention of lead exposures, in addition to reducing cognitive and neurological impacts for improved academic performance resulting in quality jobs and increased socioeconomic status.

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Dedication

This dissertation is dedicated to my parents and grandparent, in addition to low-income minority families who suffered from physiological, cognitive, and neurological damage due to lack of knowledge pertaining to lead exposures.

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2. Chapter 1: Introduction to the Study

Introduction

The ban of lead-based paint took place in the United States 40 years ago (Centers for Disease Control and Prevention, 2013). Despite this ban, lead poisoning in children in the United States continues to be problematic, as deteriorating lead-based paint in old, poorly maintained homes create lead exposures (Jones, 2012). Lead paint exposure continues to be a significant public health concern, as lead can adversely affect many physiological systems, including neurological, renal, hematological, endocrinology, gastrointestinal, cardiovascular, reproductive, and developmental (Agency for Toxic Substances and Disease Registry, 2016; CDC,2013). In children, lead exposures can affect academic performance, especially those of lower socioeconomic status living in ethnic communities (CDC,2014). Reuben (2017) followed 565 New Zealanders for four decades and found lower cognitive and socioeconomic status associated with high lead exposure in adults.

Parents play a key role in controlling the environmental activities of their children (Dziubanek, et al., 2013). On a nationwide basis, however, little is known about parental knowledge of environmental lead exposure. Few studies have specifically looked at lead knowledge with regard to the relationship between parental characteristics such as gender, age, income, marital, and educational attainment. Blando, Antoine and Lefkowitz (2013) conducted research to understand lead awareness. Their findings revealed that the general public adult perceptions regarding lead in the environment are not accurate. There is confusion and uncertainty pertaining to lead exposures emanating from pipes,

paints, and gasoline throughout the United States (Rosner, 2016). The state of Arkansas has conducted programs regarding public lead knowledge outreach and training. These workshops have produced valuable knowledge and also contributed to the public health efforts in reducing lead exposures emanating from Arkansas communities to make intervention effective (Ferguson, Gilkey, Kern, & Jasmine, 2012). These workshops also suggested that more research about parental characteristics may produce valuable insights to guide future public health interventions. On a nationwide basis, very little is known about parental knowledge of environmental research needs to be done to understand how to build community knowledge particularly among individuals responsible for childcare (Ferguson et al., 2012).

In Philadelphia, Pennsylvania child lead exposures, and lead poisonings remain particularly problematic (Philadelphia Department of Public Health, 2015). See Figures 1 and 2. The is a result of deteriorated paint and lead dust in homes, with rental units contributing to more than half of lead exposures (PDPH,2015). A method for guiding lead intervention and minimizing lead exposures in Philadelphia is through understanding the relationship between parental characteristics such as gender, age, income, marital status, and education attainment and lead knowledge.

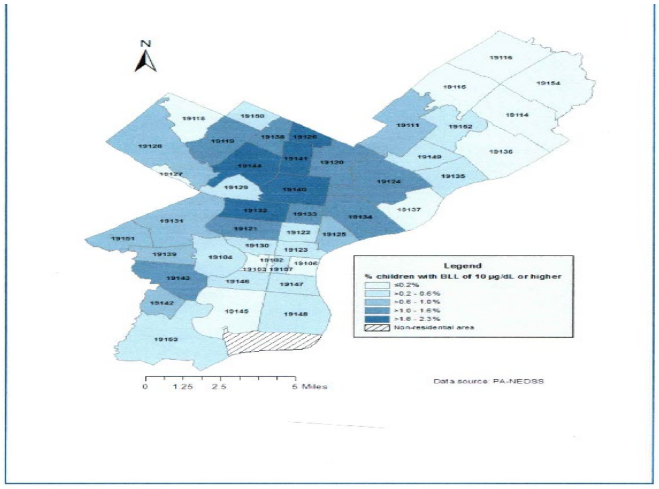

Figure 1. Incidences of Philadelphia children with venous BLLs of ≥10 ug/dL by zip code, 2015. Adapted from" Childhood Lead Poisoning Surveillance Report" by Philadelphia Department of Public Health, p.16.

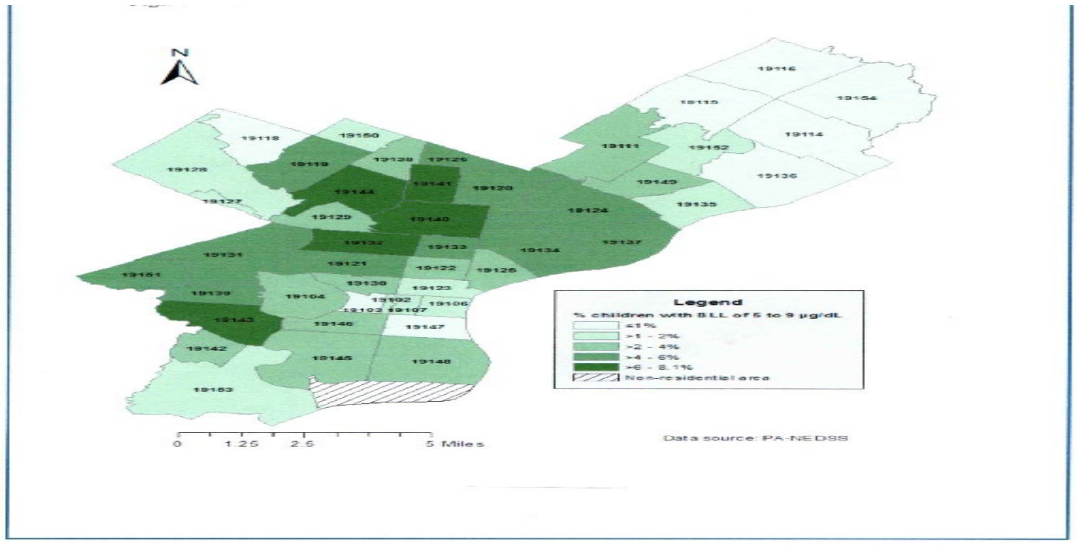

Figure 2. Incidences of Philadelphia children with venous BLLs of 5-9 ug/dL by zip code, 2015. Adapted from" Childhood Lead Poisoning Surveillance Report" by Philadelphia Department of Public Health, p.15.

Background

An estimated 24 million homes in the United States include deteriorated lead paint and elevated lead levels (CDC, 2013). The populations of highest risk are children under age six, those in poverty and of ethnicity. Economic status impacts access to adequate housing and intervention (PDPH, 2015). One challenge faced with lead intervention is the implementation of effective awareness (Ciochetto & Haley, 2017). Philadelphia, Pennsylvania is particularly noteworthy. Philadelphia has 26.5% of its population living in poverty (PDPH, 2015). This population is vulnerable to environmental lead exposures resulting from lead paint and other sources (Hore, Ahmed, Nagin, & Clark, 2014). Philadelphia ranks second compared to the other main cities with lead-based paint exposures (PDPH, 2015). Blood lead levels reveal 6.9%-11.37% of children in Philadelphia with lead levels exceeding five ugs/dL (Pennsylvania Department of Health, 2014). Levels greater than five ug/dL associates with diminished academic skills, and further contribute to low socioeconomic status in inner city populations (Dziubanek, et al., 2013).

Lead awareness for the parents of these children presents challenges for two reasons. The first problem pertains to what information people know and do not know about lead exposures and hazards (Ciochetto & Haley, 2017). The second concerns are with enhancing respondents to make the "don't know" choice when unfamiliar with information about lead-based paint exposure (Ciochetto & Haley, 2017). The exploration of marital status, gender, age, and educational attainment level of parents will help to fill a significant gap in research and could potentially provide information for reducing the

challenges associated with public health lead intervention and awareness efforts in Philadelphia. Exploring parental characteristic also allows the identification of differences that may provide insights into how to improve lead paint intervention by specified targeted information.

Pennsylvania ranks fifth in the nation with housing stock built before 1950 (Pennsylvania Department of Health, 2018). The older housing stock places population groups, particularly children at risk for lead exposure (Pennsylvania Department of Health, 2018). Of counties in Pennsylvania, Philadelphia has the highest blood lead levels in the state with maximum blood levels between 5-9.99 ug/dL (Pennsylvania Department of Health, 2018). Based on an analysis of Philadelphia communities there is a continuing need for meaningful public health interventions including increased awareness of lead hazards as well as the elimination of lead-based paint and lead threats in Philadelphia communities. The exploration of parental characteristics including gender, age, income, marital status, and educational attainment provides a mechanism to identify population groups where information about lead exposure is inadequate. It is the exploration of gender, age, income, marital status, and education attainment that serves as a potential mechanism for the education of communities about an old problem that continues to plague communities without continued awareness and prevention, resulting in elevated blood lead levels (EBBL).

Problem Statement

According to the EPA (2018), “elevated blood levels pose a significant health and safety threat to children, preventing them from reaching the fullest potential of their

health, intellect, and their future" (para. 15). Although the ban of lead transpired over 40 years in the United States, it continues to be problematic (Center for Disease Control and Prevention, 2013). This is a result of deteriorated lead-based paint in old, poorly maintained homes create lead exposures (Jones, 2012). There is no safe level of exposure to lead (U.S. Environmental Protection Agency, 2018). Parents play a key role in controlling the environmental activities of their children (Dziubanek, et al., 2013). (Blando et al., 2013) conducted research to understand lead awareness; however, the general public perceptions are not accurate. Few studies have specifically looked at lead knowledge with regard to the relationship between parental characteristics such as gender, age, income, marital status, and educational attainment. The state of Arkansas demonstrated the efficacy of lead outreach and training through workshops which contributed to the public health efforts in reducing lead exposures emanating in Arkansas communities to make intervention effective (Ferguson.et al., 2012). To assist communities in making lead intervention efforts effective, more needs to be done to build community knowledge particularly among individuals responsible for childcare (Ferguson et al., 2012). Philadelphia, Pennsylvania, child lead exposures and lead poisonings remain particularly problematic (PDPH, 2015). This is a result of deteriorated paint and lead dust in homes, with rental units contributing to more than half of lead exposures (PDPH, 2015).

Purpose of the Study

This study was an exploratory cross-sectional quantitative study. The purpose of this study was to deepen the understanding of how parental characteristics, including

gender, age, income, marital status, and educational attainment (independent variable) relate to the knowledge of environmental lead exposures (dependent variable) in Philadelphia, Pennsylvania. Significant research documenting the prevalence of socioeconomic status, adverse health outcomes, and intervention exist; however, the literature does not reflect on the relationship between parental characteristics (i.e., gender, age, income, marital status, and education attainment) as independent or co-independent variables and lead knowledge as the dependent variable.

Research Questions and Hypotheses

The following research questions were explored:

Question 1: Is there an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 1: There is no association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 1: There is an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Question 2: Is there an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia?

Ho 2: There is no association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

H1 2: There is an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

Question 3: Is there an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 3: There is no association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 3: There is an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Question 4: Is there an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 4: There is no association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 4: There is an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Question 5: Is there an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 5: There is no association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 5: There is an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Theoretical Framework

The theoretical framework for this study was ecosocial theory. The theory was first developed in 1994 by Nancy Krieger to address how discrimination harms health (Krieger, 2012). This theory draws on who and what drives social inequalities in health and offers a broad assessment of human disease in the context of political economy and human-environment interaction (Krieger, 2014). Trickett & Beehler (2013) explored the ecosocial theory to address multilevel intervention associated with the maintenance and creation of health disparities among various groups. Bisung & Elliot (2014), on the other hand, looked at the use of ecosocial framework in the role of social capital in improving water-related knowledge, attitude and practice, in addition to enabling collective action to improve water and sanitation. The intent of this research was to examine the relationship between parental characteristic and the minimization of environmental lead exposure in

Philadelphia. A more detailed explanation of this theory and its application in this study is provided in Chapter 2.

The goal of this cross-sectional quantitative study was to determine the relationship between parental characteristics including gender, age of parents, income, marital status, and educational attainment (independent variable) and lead knowledge (dependent variable). To facilitate the research, the modified Lead Knowledge Test, which receives scores ranging from 0-38, was used. A multiple variable regression provided the statistical analysis of the data. The Philadelphia Department of Health geographic information system (GIS) data provided data relevant to areas with elevated blood lead levels. The sample size of the study was 90. More details on methodology are provided in Chapter 3.

Definition of Terms

Age of parent: The length of time in completed years that a person has lived. (United States Bureau of Census, 2018).

Education attainment: How many years of schooling (Keager, et al., 2016).

Exposure: Contact between an agent and a target (U.S. Environmental Protection Agency, 2018).

Gender: Referred to as being psychosocial of being woman or male (Pellietier, 2015).

Hazard: Inherent property of an agent or situation having the potential to cause adverse effects when an organism, system, or population is exposed to the agent (U.S. Environmental Protection Agency, 2018).

Knowledge: Knowledge is a highly valued state in which a person is in cognitive contact with reality. It is, therefore, a relation. On one side of the relation is a conscious subject, and on the other side is a portion of reality to which the knower is directly or indirectly related (Zagzebski, 2017).

Lead: Lead is ubiquitous and one of the earliest metals discovered by the human race. Unique properties of lead like softness, high malleability, ductility, low melting point and resistance to corrosion, haves lead resulted in its widespread usage in different industries like automobiles, paint, ceramics, and plastics (Flora, Gupta, & Tiwari, 2012).

Lead-based paint hazard: The term lead-based paint hazard means any condition that causes exposure to lead from lead contaminated dust, lead-contaminated oil, lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects as established by the appropriated federal agency (U.S. Department of Housing and Urban Development, 2005).

Income: An amount derived (during a 12-month period) from assets to which any member of the family has access (U.S. Department of Housing and Urban Development, 2000).

Lead knowledge: Correctly answering a question about lead (Huang, Ning, Baum, Chen, & Hsiao, 2017).

Lead prevention: The goal is to prevent lead exposure to children before they are harmed. There are many ways parents can reduce a child's exposure to lead. The most important is stopping children from coming into coming into contact with lead. Lead

hazard in a child's environment must be identified and controlled or removed safely (Center for Disease Control and Prevention, 2014).

Lead reduction: The term lead reduction means measures designed to reduce or eliminate human exposure to lead-based paint hazards through methods including interim controls and abatement (U.S. Department of Housing and Urban Development, 2005).

Marital status: The marital status classification identifies four major categories: never married. married, widowed, and divorced (United States Bureau of Census, 2018).

Assumptions

Due to the use of GIS data, assumptions must be made in relation to the quality and representativeness of the data. The first assumption was associated with data collection from personnel who reside in areas where lead exposures are problematic. The second assumption pertained to all population groups having had basic knowledge of the hazards associated with lead exposure in homes. It was assumed questionnaire dissemination was to parents 18 years and older. It was also assumed the language of the modified Lead Knowledge questionnaire is in English. There was also an assumption that all parents participating were 18 years or older at the time of participation. Finally, an assumption was made that the quantitative research design and statistical analysis performed in this study were the best tools for addressing the research question and hypotheses.

Scope and Delimitations

In this study, I analyzed data for the modified Lead Knowledge to determine the relationship between parental characteristics such as gender, age, income, marital status,

and education attainment and lead. The study fills a gap in identifying the association between parental characteristics and lead knowledge in Philadelphia communities. The exploration of parental characteristics including gender, age, income, marital status, and educational attainment provide a mechanism to identify population groups where information about lead exposure is inadequate. Lead exposure is an old problem that continues to plague lower socioeconomic communities that lack continued awareness and prevention. The exploration of parental characteristics including gender, age, income, marital status, and education attainment may serve as a mechanism for the education of communities to aid in minimize and elimination of lead exposure.

Limitations

This research has several limitations. First, the research did not consider population group who do not use the transit system. Secondly, it did not address parents under the age of 18 years of age. Lastly, it did not address population group which English is not their primary language.

Significance

For more than 40 years, lead produced hazardous exposures in communities. The presence of lead is ubiquitous in the environment, lead can be found in lead-based paint, in water pipes, toys, cosmetics and food products. As an evidence-based practice, it is through research awareness and knowledge of hazards that, we are able to implement preventive measures to reduce and eliminate the hazards in communities. A more complete characterization of the factors that may help inform lead exposure prevention will fill a void in our knowledgebase.

Potential for Positive Social Impact

Social change associates with the ability to observe difference in population groups and implementation of positive change to create a difference. Rosenburg (2008) indicates social change has a positive impact on society (Rosenburg, 2008). It is beneficial to people who have been deprived (Rosenburg, 2008). Exploration of the topic "Parental Characteristic and the Minimization of Environmental Lead Exposure " explored how evidence based public health may lead to new knowledge which may lead to better interventions and social change.

The research topic explored social change in several ways. First, it identified the lead hazards emanating in Philadelphia. Secondly, it explored the lead knowledge of parental characteristics such as gender, age, income, marital status and education attainment to aid in the minimization and prevention of lead exposures in Philadelphia communities. Lastly, through prevention and minimization of lead in communities, people are able to increase their cognitive and neurological impacts associated with lead exposures. Increased cognitive and neurological function correlates with improved academic performance. Higher academic performance and education provides an opportunity for quality job employment resulting in increased socioeconomic status.

Summary

The study fills a gap in identifying the association between parental characteristics and lead knowledge in Philadelphia communities. The exploration of parental characteristics including gender, age, income, marital status, and educational attainment provide a mechanism to identify population groups where information about

lead exposure is inadequate. Lead exposure is an old problem that continues to plague lower socioeconomics communities that lack continued awareness and prevention; the exploration of parental characteristics including gender, age , income, marital status and education attainment that serves as a mechanism for the education of communities to aid in minimization and elimination of lead exposure.

Chapter 2: Literature Review

Introduction

The purpose of this study was to deepen the understanding of how parental characteristics, including gender, age, income, marital status, and educational attainment relate to the knowledge of environmental lead exposures in Philadelphia, Pennsylvania. Significant research documenting the prevalence of socioeconomic status, adverse health outcomes, and intervention exist; however, the literature does not reflect on the relationship between parental characteristics (i.e., gender, age, income, marital status, and education attainment) as independent or co-independent variables and lead knowledge as the dependent variable.

Literature Search Strategy

The literature review strategy supporting this study consisted of searching keywords within peer-reviewed literature and governmental reports from the past five years using the following terms: lead, lead health effects, lead exposures and crimes lead-based paint, lead awareness and lead intervention. The following websites facilitated the search of government reports: The Center for Disease Control (CDC), World Health Organization (WHO) and the National Institute of Environmental Health Science (NIEHS) websites.

The following databases contributed to the search: CINL Plus with full text, MEDLINE with full text, PUBMED, and Thoreau Multiplus database. These databases were searched were searched for peer-reviewed research published between January 2012 and January 2019. The literature review produced 43 articles on lead paint exposure and no articles about parental characteristics and lead paint exposure.

Theoretical Foundation

The theoretical concept for this study was Krieger's ecosocial theory. The ecosocial theory introduction transpired in 1994 (Krieger, 2014). The goal of the theory is the generation of the fundamental principles that guide causal relationship in disease distribution, specifically those with biological and psychosocial influences (Krieger, 2014). It concerns with who and what drives social inequalities in health (Krieger, 2012). The ecosocial guides and analyzes changes in current patterns of health, disease, and well-being about the comparison to each biological, ecological and social organization (Krieger, 2014). The major focus is the racial and ethnic disparities emanating in societies resulting in socially patterned exposures generating physiology, behavior and gene expressions, impacting the development, growth, regulation and death of the body's biological system, organs, and cells, culminating in disease, disability, and death (Krieger,2012). The prefix "eco" affiliates with interactions between living organism and inanimate matter and energy of time and space (Krieger, 2014). Based upon this framework, the exploration of parental characteristics and lead knowledge enables the understanding of multiple levels of influence and/or parental populations groups that may lack essential lead information resulting in increased lead level in Philadelphia.

Literature Review Related to Key Variables

The literature review produced 22 peer-reviewed publications, including six special studies and governmental reports. An analysis of the results provided 10 studies selected for further review and inclusion as the foundation for this research. Relative to this study, these articles were classified into the following categories: (a) lead exposures in the United

States, (b) risk factors associated with lead exposure, (c) social influences, and (d) lead prevention and intervention.

Previous studies reflect sufficient information about socioeconomics and intervention; however, there is no clear understanding in the literature about the relationship of parental characteristics such as gender, age, income, marital status, and educational attainment with lead knowledge.

During the literature review, a second series of publications emerged regarding the CDC methodological use of standardized questionnaires for community engagement. Accordingly, this literature is also discussed.

Lead Exposure in the United States

In the United States, lead is one of the most pervasive environmental health threats (Triantafyllidou & Edwards, 2012). Naturally occurring, lead is a toxic metal found in the earth's crust. (World Health Organization, 2016). In the United States, sources of exposure emanates from gasoline and air, lead-based paint, toys and other consumer products, food and diet, drinking water, workplace and "take-home" lead exposure, and mining and smelting (Dignam, Kaufman, LeStourgeion, & Brown, 2019). The most highly concentrated and significant source among children is deteriorating lead-based paint found in older homes and buildings (Dignam et al., 2019).

According to David Trilling (2016), Americans lost billions of dollars attributed to lost wages from lead pollution generated from airplanes in the United States (Trilling, 2016). Schnur et al. (2014) indicated more than half of the homes built in the United States before 1950 contain lead-based paint. Blando et al. (2013) showed the degradation and

disturbance of lead-based paint produce lead dust with residential remodeling being a significant source of exposure for homeowners and workers. Schirmer et al. (2012) says an overlooked source of lead hazard maybe found in paint varnish. In the Richmond area, a large number of children's toys and toy jewelry obtained from bargain and retail vendor contained lead (Hillyer, Finch, Cerel, Dattelbaum, & Leopold, 2014). The US Food and Drug Administration (FDA) found lead associated with lead-glazed ceramic pottery, leaded crystal glassware, and lead foil wraps for wine, in addition to illegally distilled alcoholic beverages, folk medicines, cosmetics, herbal and Ayurvedic remedies, ethnic foods, imported candy wrappers, and certain spices (Dignam et al., 2019). In Flint, Michigan, lead found in water distribution systems provided another route for lead poisoning (Bellinger, 2016). Take-home lead exposure transpires from lead exposed workers in manufacturing, construction, and mining (Dignam et al., 2019). Although lead smelting and mining operations ceased in the United States, lead is still prevalent in 1,076 of 1,346 U.S. hazardous wastes sites (Dignam et al., 2019). The Center for Disease Control and Prevention notes low family income, living in old houses, passive smoking, maternal country of origin or exposure to lead during pregnancy as risk factors associated with lead exposure. Other risk factors include parental education, vitamin D, and iron.

Risk Factors Associated with Lead Exposures

Lead and socioeconomics. According to the Centers for Disease Control and Prevention (CDC, 2014), children under age six, those in poverty, and racial and ethnic groups (non-Hispanic African Americans) are at greatest risk. In the United States, children of lower socioeconomics and receiving Medicaid are more likely to have elevated blood

lead levels (BLLs). Lead exposure can result in diminished cognitive skills from increase BBLs (Zhang, et al., 2013). According to Wolfe et al. (2016), impaired cognitive skills lead to reduce income earnings.

Low economic status impacts access to adequate housing and intervention (PDPH, 2015). According to Hawthorne (2015), lead poisoning in Chicago neighborhoods, such as Austin, Englewood, and Lawndale links with poor school performance and crimes (Hawthorne, 2015). Some of these neighborhoods face multiple assaults, job losses, desegregation, and housing discrimination (Hawthorne, 2015). Poorer nations were health care diminished encounter higher levels of lead exposures in comparison to wealthier countries (Attina & Trasande, 2013). A second risk factor for lead exposure is ethnicity.

Lead and ethnicity. The CDC indicated people are at risk for lead exposure if they are a member of a racial-ethnic minority group; in addition to being a recent immigrant (CDC,2015). The city of New York City found 14% of children with elevated lead exposures were foreign borne from Bangladesh or Pakistan. Aoki and Brady (2018) found elevate BBL's in non-Hispanic black children participating in a woman infant and children (WIC) study among children ages one-five between 2007-2014. A third risk factor for lead exposure is age of housing.

Lead and age of home. The age of a home is paramount in the identification of lead hazard exposures. Numerous investigators have identified a relationship between age of home and lead exposure (Whitehead, et al., 2014). The most common source of lead exposure in children emanates from lead paint in pre-1979 homes (Cluett, 2019). Cluett et al. (2019) indicated children residing in homes built before 1950 are six times susceptible

to lead exposure in comparison to those homes of children living in lower risk housing. Not to mention being more vulnerable due to their crawling behavior and typical hand to mouth activity (Cluett, 2019). Caron et al. (2012) indicated vulnerability in children under age of six due to their high absorption rate and hand -to- mouth behaviors. A fourth risk factor associates lead exposure with Vitamin D and iron deficits, in addition to health effects.

Lead and vitamin D and iron deficits/health effects. Nutritional deficient such as iron and vitamin D place children at an increased risk for lead via absorption (Schnur,2014). Reddy et. al. (2018) revealed an additive effect between dietary iron deficiency and oral lead exposure resulting in reduced lactobacilli population in an experimental rat study. Lactobacilli is a large gram positive asporogenous rod-shaped organism with anaerobic characteristics widely found in the month, vagina and intestinal tract (Dorland's illustrated medical dictionary, 2012). There are 400-500 aerobic and anaerobic microbes found in the gastrointestinal tract which includes lactobacillus (Reddy et. al.,2018). Others include Escherichia, Bacteroides, Bifidobacterium, and E. coli which are responsible for synthesizing the vitamins that are essential for human nutrition (Reddy et al.,2018). The presence of lead in the gastrointestinal tract suppresses the effect of normal intestinal microorganisms (Reddy et al.,2018). Subsequently, iron deficits may increase the mediating effects of lead on the intestinal microbes (Reddy et al.,2018). Jeong et.al. (2015) indicated iron deficiency impact the lead absorption process in the gastrointestinal tract., in addition to impairment of cognitive function resulting from

elevated concentrations of lead. Iron deficiency also effects verbal intelligence quotient (IQ) (Choi, et al., 2017).

In children, elevated levels associate with delayed growth, decreased intelligence, short-term memory and hearing loss (Flora et al., 2012). Low levels associated with IQ, behavior, concentration ability (Flora et al., 2012). Betts (2012) indicated cognitive deficits in children occur at levels as low as two ug/dL (Betts, 2012). There is "no minimum safe level" of exposures in children (Betts, 2012).

Repeated exposures in children enabled accumulation of lead in the blood, bones, and other tissues (Howarth, 2012). According to Howarth, lead has a profound impact on all organs with major emphasis on the central nervous system (Howarth, 2012). According to Flora et al. (2012), lead exposure affects both the central and peripheral nervous system, however central nervous system damage is more common in children.

Hawthorne (2015) indicated early exposures of lead are not prevalent until years later. Faramawi et al. (2015) argued the past, and present lead exposure increases an individual's risk for unhealthy effects. Faramawi et al. (2015) described a linear relationship between environmental lead exposure and variability in systolic blood pressure. According to Hu (2014), lead exposures contributed to substance use, sexual risk-taking, and sexually transmitted infections. A fifth risk factor associates lead with take-home exposure.

Lead and take-home exposure. Take home exposure occurs when lead dust from the workplace of an employee is transported via an employee's skin, clothing, shoes and other personnel items to the car and home (Newman, Jones, Page, Ceballos, & Oza, 2015). In North Carolina, employees of a lead oxide manufacturing facility identified elevated

blood lead level in three children resulting from take-home lead. (Rinsky, et al., 2016). The National Institute for Occupational Safety and Health (NIOSH) discovered lead poisoning among two children of a father employed at and e-scrap facility (Newman et al., 2015). In Puerto Rico, 11 children revealed BLL's ≥ 10 ug/dL from parents employed at a battery recycling facility (Garcia, et al., 2012). A sixth risk factor impacting lead exposure is lead knowledge.

Lead knowledge. Although lead is a threat to our youth, children ages 10-18 lack the appropriate knowledge of preventive strategies and are misinformed pertaining to lead sources (Bogar, Szabo, Woodruff, & Johnson, 2017). Akcay & Ozcebe et al. (2018) indicated more education for parents, caregiver and children will raise awareness about lead exposures (Akcay & Ozcebe, 2018). White et. al. indicated there are racial/ethnic disparities existing in parental knowledge of the harm associated with lead exposures. They also indicated preventive measure for reducing lead exposure was providing parents with lead safety information (White et al., 2016). Zhang et. al. (2013) indicated the control of lead poisoning should transpire through the development of special education programs. It is suggested the preventive controls to include education of caregivers (Zhang, et al., 2013). In occupational settings, training programs centered around worker beliefs, knowledge resulted in an effective educational intervention (Blando et al.,2013). Educational intervention received by painters was effective a year after follow-up (Blando et al.,2013). Educating the public is paramount in the reduction of childhood lead. According to Haman et al. (2015), it is imperative that caregivers have knowledge of the lead sources, pathways of exposure and measures to reduce potential exposures. In New York, a media campaign

to increases parent awareness of childhood lead poisoning revealed increased knowledge of preventive behaviors in one year (Greene, Tehranifar, DeMartini, Faciano & Nagin, 2015). There are other preventions and interventions necessary to control exposures of the lead-based paint.

Lead Prevention and Intervention

These preventions consist of implementing and evaluation housing policy (Caron & Ulrich, 2012). Reduction of lead exposures in children is a public health priority given that blood lead levels previously considered safe associates with neuro-developmental deficits (U.S. Department of Health and Human Services, 2012). One policy directive for lead control is Title X.

A family planning program giving a broad range of family planning and preventive health services is Title X (U.S. Department of Health and Human Services, 2016). Title X is the first policy directive associated with lead-based paint hazards (Caron & Ulrich, 2012). According to Carson et al. (2012) policy goals include in the disclosure of lead information for housing units and proper certification for the people with occupational exposures. Although outdated, in the United Kingdom, the Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) guideline exists for the redevelopment of land contaminated with the lead but not land in current use (Modis & Vatalis, 2014). It is the national and local policies that aid in reducing the prevalence of lead poisoning (Keller, Faciano, Tsega, & Ehrlich, 2017). According to Keller, the implementations of local and national policies are also effective in reduction of lead

exposures (Keller et al., 2017). Other interventions included household intervention and the collection of blood lead levels.

The household intervention consists of removal of lead-contaminated dust by eliminating the environmental source at the community level and individual level. Nussbaumer-Streit, et al. (2016) include paint stabilization as a method for minimization of lead in porches. The collection of blood lead levels in the United States is through the CDC Childhood Blood Lead Surveillance (CBLS) and the Adult Blood Lead Epidemiology and Surveillance (ABLES) program (Egan, Tsai, & Chuke, 2019). These programs monitor the blood lead levels (BLLs) of children and adults to identify and remediate lead exposure (Egan et al.,2019). The purpose of the CDC's surveillance is to improved public health data for action at the local, state, and federal levels (Egan et al.,2019).

Use of Standard Questionnaire

In 1975, the CDC developed a personal-risk questionnaire that becomes the basis for collecting information about lead-based paint. Today, through refinement the test serves as the standard for community-based data collection for addressing lead-based paint-exposure in children. Developed in 1998, the Chicago Lead Test is now widely accepted as the best data collection tool to assess lead knowledge (Campbell et al.,2011).

The primary purpose of the questionnaires was for use during the Chicago Neighborhood-Based Childhood Based Lead Primary Prevention Project. The project was a jointly funded lead education and prevention developed by the CDC and the U.S.

Department of Housing and Urban Development. The instrument for data collection of this research was the modified Chicago Lead Knowledge Test.

The questionnaire was modified to address, age, income, gender, and education attainment. The questionnaire modification review consisted of lead experts at the state and local levels, in addition to a pediatrician from Advocate Society Hill Pediatrics in Philadelphia, and three Certified Industrial Hygienist (CIH) from the American Board of Industrial Hygiene.

Summary

The 43 peer-reviewed articles were analyzed and classified into the following categories: a) lead exposure in the United States; b) risk factors associated with lead exposure; c) social influences; 4) lead prevention and intervention. To date, there is an absence of information pertaining to parental characteristics such as gender, age, income, marital status and educational attainment**.**

Although, the CDC developed the personal risk questionnaire for the collection of information pertaining to lead-based paint in communities; it has not been used to systematically study the relationship between parental characteristics and lead exposures. The CDC questionnaire became the foundation for the modified Chicago Lead Knowledge Test developed by Dr. Helen Binns. This proven questionnaire contains questions to collect information on parental characteristics such as age, income, gender, and education attainment and was appropriate for use in this study**.**

Chapter 3: Research Method

Introduction

The purpose of this study was to deepen the understanding of how parental characteristics, including gender, age, income, marital status, and educational attainment relate to the knowledge of environmental lead exposures in Philadelphia, Pennsylvania. Significant research documenting the prevalence of socioeconomic status, adverse health outcomes and intervention exist; however, the literature does not reflect on the relationship between parental characteristics (i.e., gender, age, income, marital status, and education attainment) as independent or co-independent variables, and lead knowledge as the dependent.

In this chapter, there is a discussion of the process for carrying out the research procedures, including the (a) methodology, (b) survey instrument, and (c) ethical principles to address the details of collection of parental characteristics through a self-administered questionnaire. The methodology section included detailed information on the population, sampling procedures, variables, and data analysis plan. The second section about the survey instrument included background information on the origin of the instrument, in addition to validation of the modified questionnaire. The final section included a description of the permissions for instrument use, the sample location, and the purpose of the Walden University Institutional Review Board (IRB).

Research Design

To date, there is little or no research about how parental characteristics may relate to lead knowledge. In the absence of relevant data, the research for this study was

exploratory. Specifically, the plan was to determine the relationship of parental characteristics in minimizing lead exposure in Philadelphia. First, a standard questionnaire captures parental characteristics. Then, the coded data from the standard questionnaire was put into a database for quantitative analysis.

One aspect of the research enabling the investigator to provide a solution to the problem was the research design, also known as the "blue print" (Frankfort-Nachmias & Nachmias, 2008). Its purpose is to aid with the structure collection, analysis and interpretation of data (Frankfort-Nachmias & Nachmias, 2008). The sample design for this research was an exploratory cross-sectional design.

The cross-sectional design allowed the study to be carried out in natural, real-life settings through probability sampling (Frankfort-Nachmias & Nachmias, 2008). Researchers tend to ask a random set of individuals to provide response to a set of questions (Frankfort-Nachmia & Nachmias, 2008). An exploratory design, on the other hand, aims to define information-seeking problems which is open-ended, in addition to being tenaciously, multifaceted, and involving information seeking problem context (White, 2013). The design solves problems and assists with mental capacities (White, 2013). Ideally, its use stimulates symbiotic relationships through exploration of unfamiliar information (White, 2013).

Mactavish et al. (2018) identified the use of an exploratory cross-sectional approach in the relationship of the human health impact of lead in mining in Myanmar. According to Rapisarda et al. (2016), a cross-sectional research was the most definitive design in addressing the possible relationship between blood pressure and occupational

exposure to noise and lead. In addressing the sources of potential lead exposure among pregnant women in New Mexico, Bakhireva used a cross-sectional research to measure BLLs and to determine risk factors associated with exposures. The use for this research served as an approach for exploring many dependent variables related to lead knowledge in Philadelphia communities.

Population

To address the research questions for this study, the defined population was prescreened parents with children residing in their homes riding the Market-Frankfort (Blue Line) and Broad Street (Orange Line) part of Southeastern Transit Authority (SEPTA) located in Philadelphia, PA (see Figure 3 and 4). Prescreening of participants ensured that only parents with children residing in the zip code of concern completed the questionnaire. After prescreening, using a standard in-person self-administered interview, I collected responses from 90 residents situated along the Market-Frankfort (Blue Line) and Broad Street (Orange Line) part of Philadelphia, Pennsylvania transpire.

The SEPTA is a regional public transportation system, providing bus, subway/elevated rail line, commuter, and light rail line and electric services to Bucks, Chester, Delaware, Montgomery and Philadelphia communities. SEPTA's annual mass transit system, which includes both the blue and orange lines, its annual ridership was approximately four million. SEPTA provided access to participants with children living in areas where lead exposures were problematic.

Recruitment

Participant recruitment was from eight transit stops throughout Philadelphia: Snyder, Ellsworth-Federal, Erie, Olney, 60th Market, 52nd Market, Tioga, and Frankford. Eligible participants included adults 18 years of age and older. A total of 90 participants were expected to complete the questionnaire with a minimum of 10 at each transit stop. Only if time permitted would additional questionnaires be collected. Questionnaire distribution was for any passengers entering the transit stop who were both available to complete the questionnaire and met prequalification criteria. Time estimation at each transit stop is roughly two hours. Participants had an unlimited time frame for questionnaire completion; however, I kept a record of how long it took participants to complete the questionnaire. Upon completion, participants returned the questionnaire to me for time recording and storage.

On Saturdays and Sundays, the modified Chicago Lead Knowledge Test was disseminated to participants at eight SEPTA locations. Based on passenger availability on these days, 90 SEPTA passengers were expected to serve as interviewees. Any person residing in Philadelphia and riding trains between the hours of 8:00 a.m. and 6:00 p.m. were asked to participate in the study. The questionnaire distribution was planned to be to 10 passengers at each specified transit location. The survey collected background, general, exposure, and prevention information. A projection screen provides privacy for personnel completing the questionnaire. The collection of personal information was not essential to the research and did not occur. Interviewer spent two hours at each transit stop.

Once available and passengers had passed prescreening, a standard questionnaire was disseminated for independent completion. To receive the full complement of questions, participants had to be over the age of 18 and be the parent(s) of at least one child living within the defined geographic area. The focus of prequalification procedures ensured that participants would provide information on all independent study variables. Following prescreening, participants independently provided responses on their personal knowledge, perceptions, and behaviors concerning child environmental lead hazards. A projector screen assembled in a moderately quiet area gave privacy to participants completing the questionnaire. A line formation aided with added privacy for those awaiting questionnaire completion. The data collection tool was exploratory and descriptive. The standard questionnaire consisted of open-ended and closed-ended questions divided into the following sections: (a) background information, (b) general information, (c) exposure, and (d) prevention.

The background information was gathered using a combination of open-ended and close-ended questions. An open-ended question is one that is not followed by a response choice, while a close-ended question allows respondents to choose an answer suitable to their own view (Frankfort-Nachmias and Nachmias, 2008). The questionnaire consisted of two open-end questions regarding the participant's zip code and the age(s) of children in the household. Close-ended questions address the following parental markers (i.e., gender, age, children in the household, education, income, marital status, previous lead tests, and parental perceptions regarding their children's lead exposure). The Lead Knowledge Questionnaire contains 23 close-end questions segregated into three sections:

general information (15), exposures (4), and prevention (4). The collection of personal information was not essential to the research and did not occur. Upon completion, participants gave the completed questionnaire to me for time recording and storage.

The questionnaire distribution was to passengers using SEPTA in various areas of the city on a Saturday and Sunday. Interviews occurred at Snyder, Ellsworth-Federal, Erie, Onley, 60th Market, 52nd Market, Tioga, and Frankford transit stops. Time at each transit stop is two hours, starting at 8:00 a.m. and ending at 6:00 p.m., staying at each transit stop until completion of enough questionnaires. The times selected represented peak times where the selection of candidate to answer the questionnaire is abundant. These locations have known association with elevated blood lead levels in Philadelphia, Pennsylvania. GIS pairs with participants' responses from questionnaire.

Figure 3. SEPTA Broad Street line map. Adapted from www.septa.org

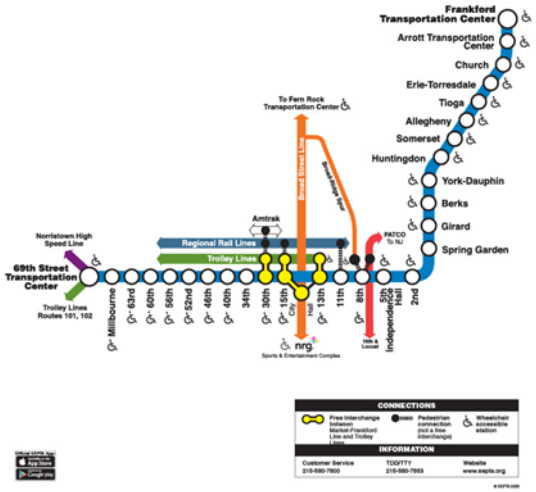

Figure 4. SEPTA Market-Frankford line map. Adapted from www.septa.org

Sampling and Sampling Procedures

The sampling achieved through the research was nonprobability sampling. Nonprobability sampling does not provide an opportunity for every individual to participate in the research (Daniel, 2012). The type of nonprobability sampling selected for the research was availability sampling (Daniel, 2012). Availability (convenient) sampling consisted of the selection of a target population through their availability convenience of the researcher and or their selection (Daniel, 2012).

Kadir et. al. (2016) used convenient sampling in determining the health effects of lead among children in Pakistan. Palad et.al. (2016) demonstrated the effective use of convenience sampling in determining the use of Play-Dough as a vector in accumulation of lead in day care centers. Additional uses of convenience sampling proved beneficial in Khosravi et al. (2014) research in determining blood lead concentrations and its

association with convulsions in a group of febrile children admitted to pediatric wards of hospitals in Tehran.

The G-Power determined an a priori sample size of 89 for statistical significance. G-Power was a statistical tool used in the computation of the essential statistical power for an array of test. Statistical power proves the likelihood of validity and quality of your hypothesis based on an effective population size.

Research Questions, Hypotheses and Summary of Findings

Question 1: Is there an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 1: There is no association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

.H1 1: There is an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental gender and lead knowledge.

Question 2: Is there an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia?

Ho 2: There is no association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

H1 2: There is an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental age of parents and lead knowledge.

Question 3: Is there an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 3: There is no association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 3: There is an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental income and lead knowledge.

Question 4: Is there an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 4: There is no association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 4: There is an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental marital status and lead knowledge.

Question 5: Is there an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 5: There is no association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 5: There is an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Data analysis: Multivariate regression explores the association between parental education attainment and lead knowledge.

Variables

Using responses from the modified Lead Knowledge Test questionnaires, the following variables were included in the study: age, gender, income, marital status, and education attainment (independent variable) and lead knowledge (dependent variable). A review of literature and relevant studies provided the basic information for the selection of the dependent and independent variables.

Independent variables. The independent variables were age, gender, income, marital status and educational attainment.

Dependent variables. The dependent variable was environmental lead knowledge.

Covariates: Race/ethnicity, age of housing.

Data Analysis Plan

The quantitative data derives from interviews of passengers at eight transit stops in Philadelphia. Selection of passengers was to be random, collecting information from any passenger approaching the kiosk. Participant completing the questionnaire receive incentives such as lead awareness pens and button. The in-person interviews include 32 questions (31 closed-end questionnaires and one open-end) from a modified Chicago Lead Knowledge Test (see Appendix).

The quantitative data enabled a better understanding of the relationships associated with parental characteristics and lead knowledge through a quantitative analysis. The quantitative analysis contained descriptive and inferential statistics.

Descriptive Statistics

The dependent variable received the calculation of the central of tendency. Measures of central of tendency provided the frequency distribution of the data; it includes the mean, mode and median (Frankfort-Nachmias and Nachmias, 2008). For categorical variables, the mode was most appropriate measure of central tendency. The mean is appropriate in determination of ages of parents and income.

Inferential Statistics

The inferential statistics was through multiple variable regression of responses from the questionnaire. To better understand these larger relationships, the multivariable regression design explored the relationship between gender, age, income, marital status, and education attainment (independent variables) and lead knowledge (dependent variables in the reduction of lead exposure in Philadelphia communities. The multivariable regression method captures multi-level data (parental characteristics) relative to lead awareness and intervention in the city of Philadelphia.

Multiple variable regressions was used to explore any potential relationships between environmental lead knowledge (dependent variable) and age of parents, gender, income and educational attainment (independent variable) in the reduction of lead in Philadelphia communities.

Instrumentation and Operationalization of Constructs

The definitions for the parental characteristics (age of the parents, gender, income, marital status, and educational attainment) are defined in this section. These constructs were identified in Chapter 2 but are presented again for review. Moody et al. (2016) indicated class differentials provide an ideal testing ground for exploring socioeconomic disparities in health particularly those associated with lead poisoning. The Krieger ecosocial theory explores parental characteristics and lead knowledge in minimization lead exposures. Age was operationally defined to determine the applicability of other questions for a particular individual and to classify other characteristics in tabulations (United States Bureau of Census, 2018). Education attainment was operationally defined

as how many years of schooling (Keager, et al., 2016). Gender was operationally defined as psychosocial of being a woman or male (Pellietier, 2015). Income was operationally defined as an amount derived (during a 12-month period) from assets to which any member of the family has access (U.S. Department of Housing and Urban Development, 2000). Marital status was operationally identified by four major categories: never married, married, widowed, and divorced (United States Bureau of Census, 2018).

In 2012, the CDC developed a standard questionnaire that has become the basis for collecting information about lead-based paints (Raymond, Wheeler, & Brown, 2014). In 1998, Dr. Helen Binns developed the Chicago Lead Knowledge Test. Today, its use serves as a primary instrument for the collection of data on lead knowledge (Campbell et al., 2011). A modified Chicago Lead Knowledge Test served as an instrument for data collection. See Appendix A. The modified Chicago Lead Knowledge Test validation was by three American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist (CIH); one pediatrician from AdvoCare Society Hill Pediatrics; one Ph.D. from Philadelphia Lead and Healthy Homes Programs; and the Director of Pennsylvania's Department of Health's Lead Surveillance Program.

Frey (2018) defined scales as a group of items, which are intended to measure the same constructs. Scales are essential in the processing of assessment and evaluation of constructs in research (Frey, 2018). The scale of measurement for the lead knowledge questions was the modified Chicago Lead Knowledge Test. It provides possible test scores ranging from0-38; with 38 being the highest possible score. A test score was generated for each respondent; correct responses were scored as 2, and incorrect

responses were scored as 1, and “I don’t know” were scored as 0. The frequency of correct, incorrect, and “I don’t know” responses’ were tabulated for each question and sorted in the “General knowledge,”,” Exposures,” and “Prevention” categories.

Threats to Validity

In a quantitative research, threats to validity were factors leading us to questions whether the research and assessments were valid (Taylor, 2013). There are several types of threats which may impact a research and its assessment. They were internal, external, statistical conclusion and construct validity (Taylor, 2013). Internal validity evaluated the ability of the research to specify evidence associated with a cause -and – effect relationship between the independent and dependent variable’s (Daily, 2018). Statistical conclusions determined if the statistical conclusions are reliable (Taylor, 2013). Construct validity was three-fold: a) connection of assessment results and the intended measurements, b) the effectiveness of the results relative to its purpose, and c) the social concerns related to conclusion and action resulting from test scores (Taylor, 2013). The threats to validity associated with the research are discussed in the following paragraphs.

Two types of threat associated with this research are internal, external and statistical validity. One type of internal validity identified to be a threat for the research was selection. Selection can pose a dilemma if participants are not randomly selected (Taylor, 2013). Randomization occurred at each transit stop by asking all prescreened rider to whom enter the kiosk to participate. External validity associated with determining if the participants in the research represent the general population under study (Mitchell, 2018). Subsequently, external validity was prevalent whenever one extends results drawn

for one population to a new population (Frey, 2018). Since participants derived from eight transit stops, the question of external validity arises. Random selection was also a mechanism used to ensure generalization in the participants of the research and minimize external validity (Wonderly, 2018).

Ethical Procedures

The required approval to start the research included sample location, instrument and IRB. The Walden IRB approval number was 07-18-19-0053957. The sample location permission consisted of submission of a letter to the Southeastern Transit Authority (SEPTA) Director of Security requesting to collect data at eight transit stops through the city. The instrument permission involved emailing Dr. Helen Binns administrative assistant at the Lurie Children Hospital requesting permission to utilize the questionnaire from the Chicago Lead Knowledge Test in the research. IRB ensured human subject in the research receive ethical treatment (Dziak, 2017). Two common practices aiding in a successful research are data integrity and recordkeeping.

Data integrity procedures consisted of reviewing each respondent's answers to ensure the respondent answers the question correctly. Recording keeping procedures included scanning of completed questionnaires. A computer stores the uploaded and scanned questionnaires. The transportation of hard copies from each transit stop was a locked backpack. The permanents storage of completed surveys was in a locked file cabinet until data coding occurs.

Summary

The study was a cross-sectional research to determine the relationship between environmental lead knowledge and parental characteristics in Philadelphia communities. Responses from the modified Lead Knowledge Test address the research question. It collected background, general information, exposure, and prevention information. G-Power determines a sample size of 89 for the data collection over a 30-day period. Participants derived from SEPTA rideshare from numerous locations throughout the city where lead exposure is problematic. The quantitative analysis used both descriptive and inferential statistics. Descriptive statistic was through the calculation of the central of tendency, whereas inferential statistics use multiple variable regression to draw conclusions. In addition to descriptive and inferential statistics, a researcher must safeguard it from threat. Internal and external validity were threats associated with the research. Similarly, both threats can be minimized through randomization of the population. Permissions to conduct research included authorization from SEPTA and IRB. A review of respondent's answers ensures data integrity. Scanning of questionnaires upon completion serves as a mechanism for recordkeeping. Although the literature provided sufficient evidence to validate cognitive and socioeconomic deficits; it is through GIS data and responses from participants that the exploration of the relationship between parental characteristics and lead knowledge's in minimizing environmental lead exposures in Philadelphia, PA is better understood.

Chapter 4: Results

The purpose of this study was to deepen the understanding of how parental characteristics, including gender, age, income, marital status, and educational attainment relate to the knowledge of environmental lead exposures in Philadelphia, PA. Significant research documenting the prevalence of socioeconomic status, adverse health outcomes and intervention exist; however, the literature does not reflect on the relationship between parental characteristics (i.e., gender, age, income, marital status, and education attainment) as independent or co-independent variables, and lead knowledge as the dependent.

This quantitative study assessed predictive relationship between parental characteristics and lead knowledge. In Chapter 4, the research question, a description of the data collection, an evaluation of the statistical assumptions, and the results from the multiple regression analysis are presented. The following research questions guided the study.

Research Questions and Hypotheses

Question 1: Is there an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 1: There is no association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 1: There is an association between parental gender and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental gender and lead knowledge.

Summary findings: Gender is a not significant predictor of lead knowledge. The value of .969 is greater than the *p*-value of 0.05

Question 2: Is there an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia?

Ho 2: There is no association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

H1 2: There is an association between parental age of parents and lead knowledge in the elimination of lead-based paint and high-risk exposure in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental age and lead knowledge.

Summary findings: Age is a not a significant predictor of lead knowledge. The value of .642 is greater than the *p*-value of 0.05.

Question 3: Is there an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 3: There is no association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 3: There is an association between parental income and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental income and lead knowledge.

Summary findings: Parental income is not a significant predictor of lead knowledge. The value of .190 is greater than the *p*-value of .0.05.

Question 4: Is there an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 4: There is no association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 4: There is an association between parental marital status and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

Data analysis: Multivariate regression explores the association between parental marital status and lead knowledge.

Summary findings: Parental marital status is not a significant predictor of lead knowledge. The value of .680 is greater than the *p*-value of .0.05

Question 5: Is there an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Ho 5: There is no association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia.

H1 5: There is an association between parental education attainment and lead knowledge in the elimination of lead-based paint and high-risk exposures in communities of Philadelphia?

Data analysis: Multivariate regression explores the association between parental education attainment and lead knowledge.

Summary findings: Parental education attainment is not a significant predictor of lead knowledge. The value of .063 is greater than the *p*-value of 0.05.

Data Collection and Results

A total of 124 participants completed the questionnaire. Participants responded to screening questions prior to completion of the questionnaire, the Lead Knowledge Test. All parents reported they were parents 18 years older with children residing in the home in the ascertain zip codes. This indicated that all participants met the inclusion criteria for study participation. Parents were asked demographic questions regarding age, gender, marital status, income, education attainment, and ethnicity (see Table 1). The transit stops were associated with zip codes where lead exposures were problematic in Philadelphia. Table 2 reflects the zip codes where participants completing the Lead Knowledge questionnaire resided.

Table 1

Frequency table for parental demographics characteristics

Variable	***n***	**%**
Sex		
Male	66	53.2
Female	58	46.8
Age		
18-30	50	40.3
31-40	47	37.9
41-50	17	13.7
51-60	7	5.6
60^{+}	3	2.4
Race		
White	14	11.3
Black	91	73.4
Hispanic	8	6.5
Asian	3	2.4
American Indian	0	0
Other	8	6.5
Income		
<$25,000	70	56.5
$25,000-$35,000	30	24.2

$35,000-$45,000	12	9.7
$45,000^{+}	12	9.7
Marital Status		
Married	20	16.1
Never Married	92	74.2
Widow	3	2.4
Divorced	9	7.3

Table 2

Zip Codes

	n	**%**
19111	3	2.4
19119	2	1.6
19120	1	8
19121	4	3.2
19124	15	12.1
19126	1	0.8
19132	4	3.2
19134	14	11.3
19135	6	2.4
19141	14	11.3
19144	6	4.8

19146	8	6.5
19147	2	1.6
19148	2	1.6
19149	3	2.4
19152	1	0.8
19153	2	1.6
Other	39	32.5
Total	124	100

Most participants reported they had children in their homes (see Table 3). The number of children in the households ranged from one to six. Most participants did not know the age of their home (see Table 4). Majority of participants were black males with high school/GED education with salaries ranging from $25,000-35,000. Most participants revealed they had never been married. A significant number of participants were from other zip codes throughout the city; however, zip code 19124 had the highest number of participants within the ascertain zip codes. Based on the aggregate data, this zip codes has >4-6% of the population with lead exposures greater than 5 to 9 ug/dL; in addition to 1-1.6 % of the population with blood lead levels greater than 10 ug/dL (Philadelphia Department of Public Health, 2015). From a public health perspective, there was significant number of participants residing in the zip code (19124) where lead exposure was problematic. Participants residing in this zip code would benefit from lead

knowledge as a mechanism to assist with the minimization of elevated BBLs in the community.

Table 3

Children in the household

Children in the household		
Response	***n***	**%**
Yes	106	85.5
No	18	14.5
Total	124	100

Table 4

Age of home

Age of home		
Response	***n***	**%**
Before 1970	27	21.8
After 1970	16	12.9
Don't know	81	65.3
Total	124	100

Many participants indicated their child(ren) were not tested for lead but revealed they did not believe their child(ren) were exposed to lead (see Tables 5 and 6). The time interval for completion of the Lead Knowledge Test ranged from 1:10-8:29 minutes.

Table 5

Child tested for lead

Child tested for lead		
Response	*n*	%
Yes	52	41.9
No	57	46
Don't know	15	12.1
Total	124	100

Table 6

Do you believe your child has been exposed to lead?

Do you believe your child has been exposed to lead?		
Response	***n***	**%**
Yes	24	19.4
No	76	61.3
Don't know	24	19.4
Total	124	100

The mean score on the Lead Knowledge Test was 20.6 (SD,5.47) of the possible 34 points. Participants scores ranged from 4-30. None of the participants received a

perfect score. Participants were very knowledge about general, exposure and prevention of lead. See Table 7. Participants lacked knowledge about the onset of symptoms, occurrence age of highest exposure, exposure routes (inhalation/ingestion), lead in herbal remedies, and the prevalence of lead in warm or cold water.

Table 7 : Lead Knowledge Test : Questions and Response

Questions	Correct Answer	Correct	Incorrect	Don't Know
General Information				
1. Lead paint chips can be poisonous when eaten.	T	114	7	3
2. High lead in the body can affect a child's ability to learn.	T	108	3	13
3. Most children have symptoms right away if they have an elevated blood lead level.	F	41	40	43
4. A child's highest blood lead level occurs around 5 years of age.	F	31	28	65
Exposure				
5. Lead paint is more likely to be found in newer homes than in older homes.	F	81	27	16
6. Living in a building during renovation/remodeling can increase a child's exposure to lead	T	108	6	10
7. A child can become lead poisoned during exposure to lead-containing dust.	T	108	7	9
8. Some pottery imported from Mexico or other countries is not safe to use in cooking or for eating because it contains lead.	T	60	15	49
9. Parents who work with lead at their jobs can bring lead home on their clothes.	T	83	11	30
10. The lead a pregnant woman takes into her body can be transferred to the unborn baby.	T	97	8	19
11. Lead in soil cannot harm children.	F	63	29	32
12. Most cases of childhood lead poisoning are caused by drinking water that contains lead.	F	22	75	27
13. Most children get lead poisoning by breathing in the lead, rather than by eating or swallowing lead.	F	40	48	36
14. Some herbal or traditional home remedies contain lead.	T	39	21	64
Prevention				
15. Washing a child's hand often helps prevent lead poisoning.	T	89	16	19
16. Warm tap water usually contains less lead than cold tap water.	F	27	41	56
17. Cleaning a home with soap and water decreases the lead in the home more than dusting or sweeping.	T	65	22	37

Evaluation of Statistical Assumptions

An assessment of the assumption of normality, homoscedasticity and multicollinearity transpired prior to the multiple linear regression analysis. The assessment ensured residuals in the linear regression did not produce erroneous outcomes and followed a normal distribution (Schmidt & Finan, 2018). A method to assess the assumption of normality and homoscedasticity was the application to residual in a linear model fit (Schutzenmeister et al., 2012). The model allowed simultaneous checks for outliers, non-normality, and heteroscedasticity (Schutzenmeister, et al., 2012).

The Shapiro-Wilk and Kolmogorov-Smirnov test was conducted to test for normality. The results (-.847) of the Shapiro-Wilks test indicated that the data distribution differed from a normal data distribution; indicating the assumption of normality was not met. The Kolmogorov- Smirnov revealed a value of .034 (see Table 9). Linear regression deviating from a normal distribution may produce valid results (Schmidt & Finan, 2018).

Multicollinearity occurs when two or more variables are closely related linearly (Field, 2014). Data clustered around 0 is symmetrical, however data, with positive scores with higher scores are positively skewed. The data are symmetrical (Field, 2014). Consequently, data scores at the more negative end are negatively skewed (Field, 2014). A kurtosis occurs when the values is greater than or equal to 3; subsequently enabling the variable's distribution to be marked differently than a normal distribution, resulting in outliers (Westfall & Henning, 2013).

The scores for the lead knowledge test does not exceed the guideline of kurtosis with values of -.047. The Shapiro-Wilk test was conducted to test for normality. The

Shapiro-Wilk test is commonly used parametric test used to validate a normal distribution (Noughabi, A comprehensive study on power of test for normality, 2018). A nonsignificant test indicated the sample is not different from the normal distribution (p >0.05), whereas a significant test indicated a difference from the normal distribution ($p < 0.05$) (Field, 2014). See Table 8. Shapiro-Wilks revealed a $p < 0.05$ indicating a significant test differing from the normal distribution.

Table 8

Results of the Normality Testing for Lead Knowledge Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Points LKT		124	.034	.967	124	-.847

The assessment of homoscedasticity was through the examination of a residual scatterplot for the expected normal versus the observed value. The points appeared to be distributed between -3 and 2 and there was no curvature in the plot. Hence, the assumption of homoscedasticity was met. Figure 5 presented the residual scatterplot for homoscedasticity. Other scatterplots were provided to illustrate the relationship between the independent and dependent variables. None of the scatterplots indicated relationships between the independent and dependent variables. See Figures 6-11.

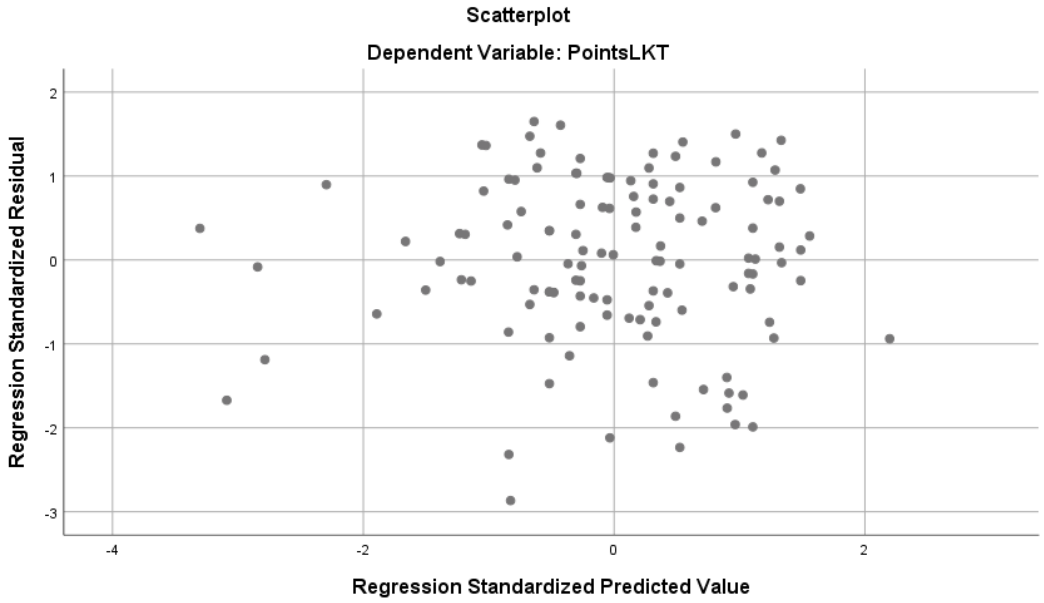

Figure 5. Residuals scatterplot for homoscedasticity of Lead Knowledge Test.

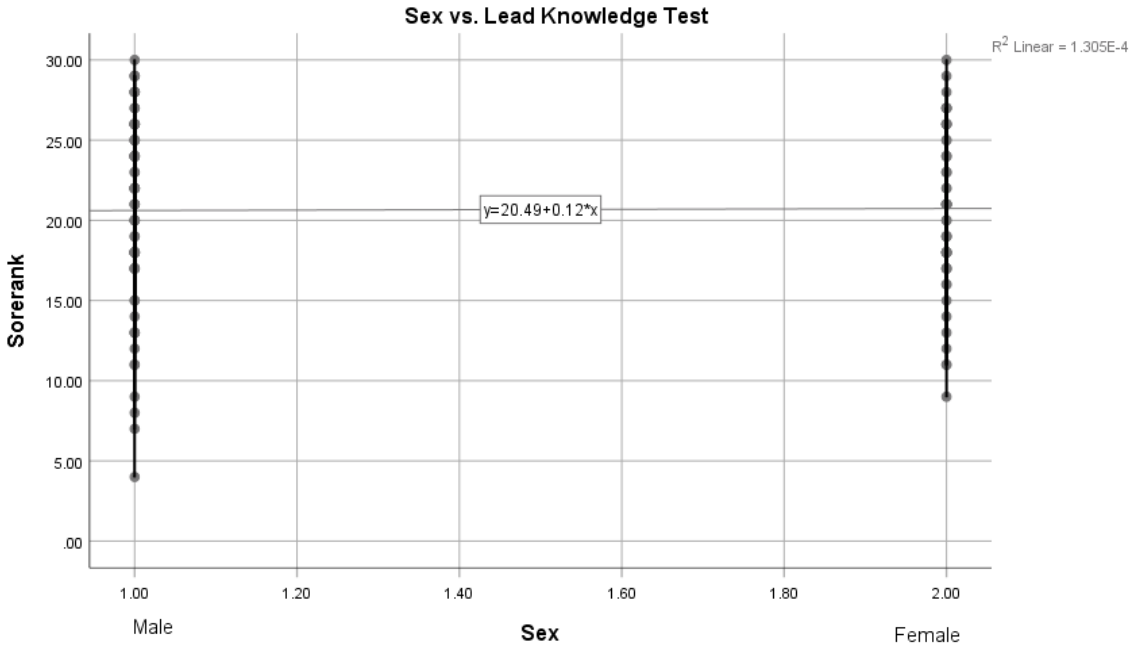

Figure 6. Scatterplot for Sex versus (vs.) Lead Knowledge Test

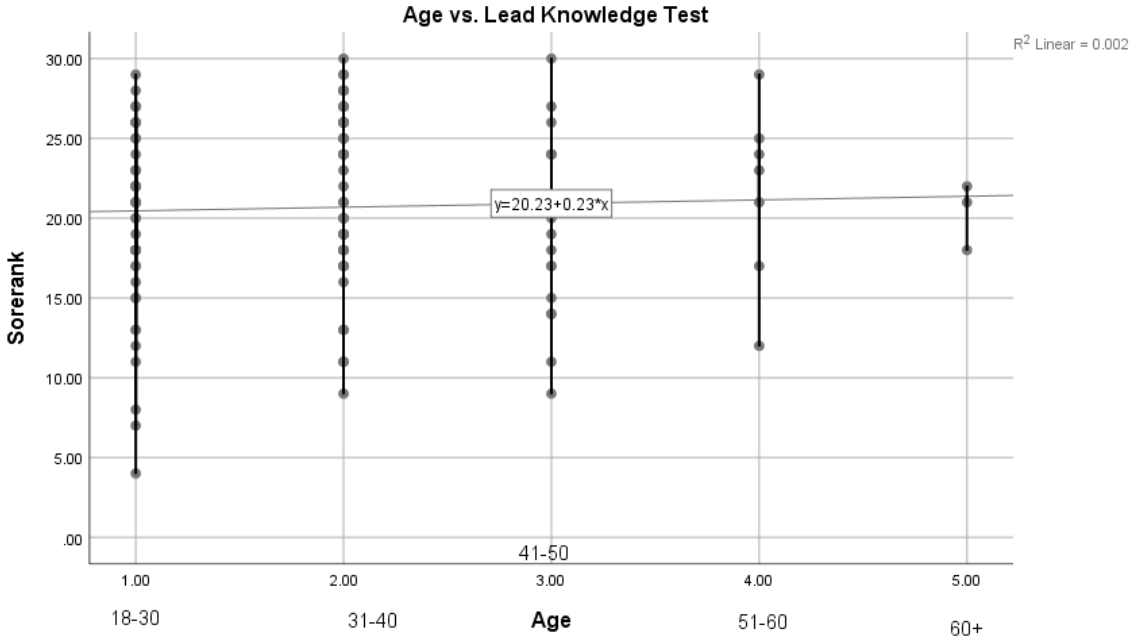

Figure 7. Scatterplot for Age versus (vs.) Lead Knowledge Test

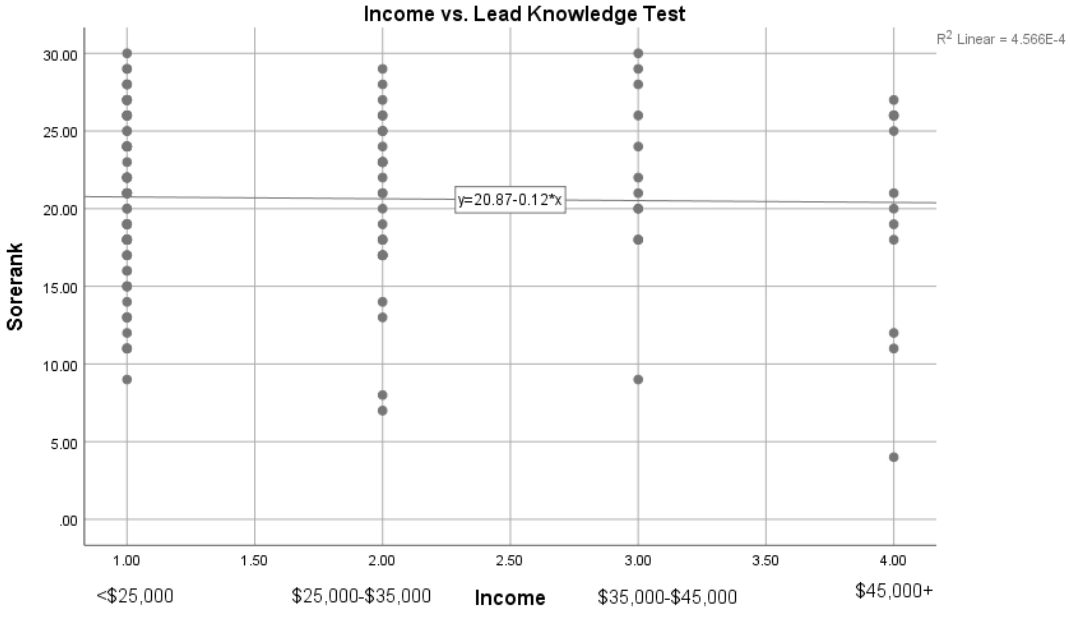

Figure 8. Scatterplot for Income versus (vs.) Lead Knowledge Test

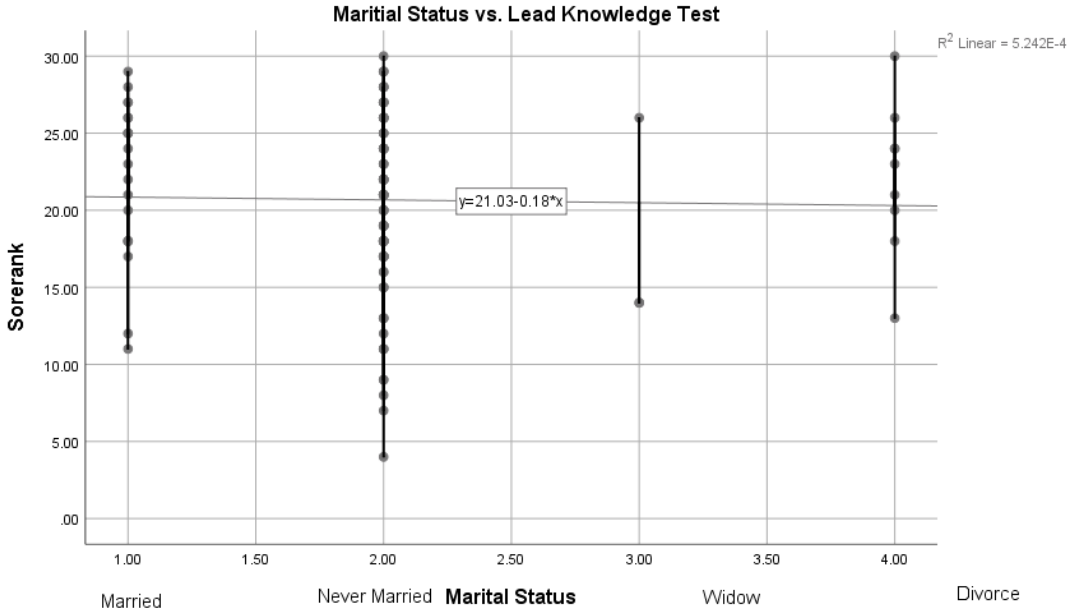

Figure 9. Scatterplot for Marital Status versus (vs.) Lead Knowledge Test

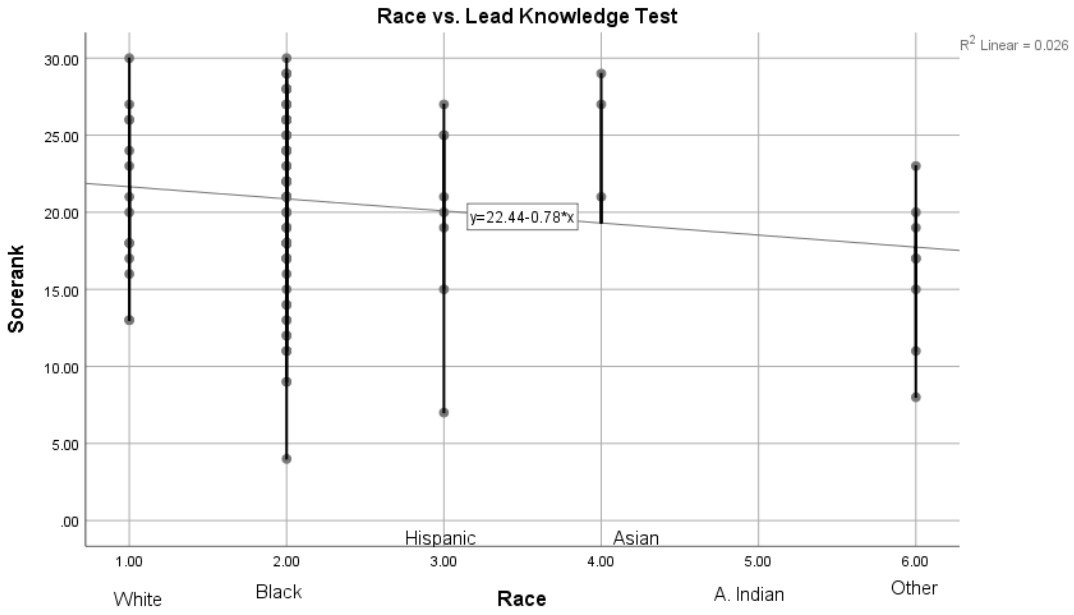

Figure 10. Scatterplot for Race versus (vs.) Lead Knowledge Test

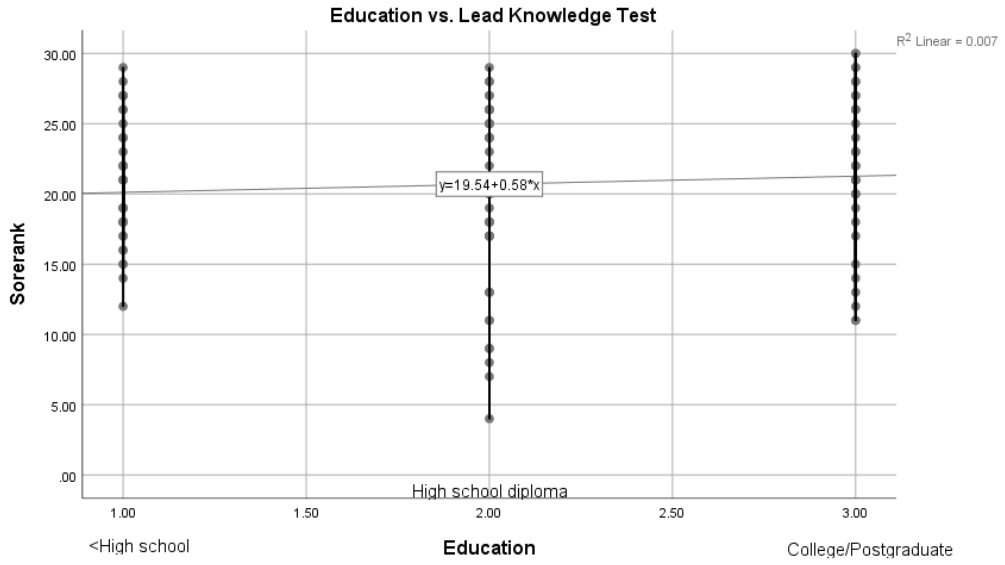

Figure 11. Scatterplot for Education versus (vs.) Lead Knowledge Test

Multicollinearity is used to determine the linear relationship between independent variables (see table 9). The calculation of the Variance Inflation Factor (VIF) determined the predictor variables and multicollinearity. In a regression, the VIF was significant in the estimation of the interrelationship of the independent variable and other explanatory variables (Marcoulide & Raykor, Evaluation of variance inflation factors in regression models using latent variable modeling methods, 2018). A VIF > 5 indicated near multicollinearity (Marcoulide & Raykor, Evaluation of variance inflation factors in regression models using latent variable modeling methods, 2018). None of the predicator variable VIFs were above 5, indicating no problem with (near) multicollinearity (see Table 10). Although the VIFs was not was problematic, all the independent variables were not statistically significant. The Person correlation was performed to address the correlation between the independent and dependent variables.

It is the most common measurement use to determine which two variable may coincide with each other and its linear dependency (Chao, 2017). Pearson correlation was often utilized in cross-sectional studies (Shan, Zhang, & Jiang, 2020). Subsequently, its use may be inappropriate for calculations involving multiple visits within the same subject (Shan et al., 2020). The correlation value for sex was .011 with a significance of .450. The correlation value for age was .041 with a significance of .324. The correlation value for race was -.160 with a significance of .038. The correlation value for education was .083 with a significance of .181. The correlation value for income was - .021 with a significance of .407. The correlation value for marital status was - .023 with a significance of .400. The variable were significant at the $p =< 0.05$. All the variables were statistically significant and with $p = <.0.05$; with the exception of education. See Table 11

Table 9

Collinearity statistics

Variable	**Significances**	**Statistics**
Sex	*.969*	.974
Age	.642	.941
Race	.063	.965
Education	.190	.857
Income	.443	.854
Marital status	.680	.988

p value =.05

Table 10

VIF Values for the Predictor Variables

Variable	**VIF**
Sex	1.027
Age	1.063
Race	1.037
Education	1.166
Income	1.170
Marital status	1.013

Table 11

Pearson Correlation

Variable	**Significances**	**Statistics**
Sex	*.450*	.011
Age	.325	.041
Race	.038	-.160
Education	.181	.083
Income	.407	-.021

Marital status	.400	-.023
p value =.05		

Multiple Linear Regression

Multiple linear regression using the standard method addressed the research question for this study. Through the standard method, all independent variables are entered at the same time. The predictor variable from the research question was lead knowledge. The demographic variables were sex, age, race, education, income and marital status. A total of six standard multiple linear regression analyses the relationship between the independent variable and the dependent variables.

Predicting relationship between lead knowledge and sex, education, income, and marital status. Multiple linear regression assessed the relationship between predictor variables and demographic variables. The predictor variable (independent) was lead knowledge. The demographic variables (dependent) were sex, education, income and marital status.

The results for the multiple linear regression was not significantly significant F (26,30) =.869, p = .520, R^2 = .043 (see Table 12). This finding indicated the model was not significant in addressing the relationship between lead knowledge and parental characteristics in the minimization of lead in Philadelphia. Particularly, the model contributes to 43% of variation of parental characteristics (sex, age, race, education, income, marital status) association with lead knowledge scores.

Sex was not a significant predicator influencing lead knowledge, B =.039, *p* = .969. Males achieved .039 points higher than their female counterparts. Age was not a significant factor influencing lead knowledge B =.240, *p* =.642. The results indicated participants aged 18-30 scored .240 points higher on the lead knowledge test. Race was not a significant predicator of lead knowledge B =-.847, *p*. =.063. The results indicated Blacks scored -.847 points lower on the lead knowledge than their counterparts. Education was not a significant factor B =.898, *p* =.190. The results indicated those with High School/GED scored .898 points higher on the Lead Knowledge Test. Income was a significant factor B = -.416, *p* = .443. The results indicated those earning < $25,000 has a - .416 decrease score on the Lead Knowledge Test. Lastly, marital status was a significant factor B =. -298, *p* =.969. The result indicated those never married had a decrease score of -.298 on the Lead Knowledge Test.

Table 12

Results for Linear Regression Predicting Lead Knowledge

Variable	**B**	**SE**	**β**	**t**	***p***
Sex	.039	1.002	.004	.038	.969
Age	.240	.514	.043	.466	.642
Race	-.847	.451	-.173	-1.880	.063
Education	.898	.680	.129	1.319	.190
Income	-.416	.540	-.075	-.769	.443
Marital Status	-.298	.719	-.038	-.414	.680

Summary

Multiple linear regression analyzed the relationship between lead knowledge and parental characteristics (sex, age, race, education, income and marital status) to determine statistical significance between the predictor variable (lead knowledge) and demographic variables (parental characteristics). All demographic variables were not statistically significant. The results indicated the demographic variables did not contribute to the variation in lead knowledge scores. The VIF of the demographic variables (parental characteristic) and predicator variable (lead knowledge) was not problematic. Chapter includes the interpretation of the findings, the limitations of the study, and recommendations for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to deepen the understanding of how parental characteristics, including gender, age, income, marital status, and educational attainment relate to the knowledge of environmental lead exposures in Philadelphia, Pennsylvania. Significant research documenting the prevalence of socioeconomic status, adverse health outcomes and intervention exist; however, the literature does not reflect on the relationship between parental characteristics (i.e., gender, age, income, marital status, and education attainment) as independent or co-independent variables, and lead knowledge as the dependent.

This research found parental characteristics (i.e., age, income, marital status, and education attainment) not to be predictors of lead knowledge. The results indicated that parental characteristics does not influence lead knowledge in minimizing lead exposure in the Philadelphia. In addition, ethnicity was not related to lead knowledge, p African Americans. The research provided new data to identifying the relationship between parental characteristics and lead knowledge in the minimization of lead exposures in Philadelphia.

Theoretical Framework and Research Findings

The theoretical framework for this study was Krieger's ecosocial theory. The framework addressed how discrimination is a form of societal injustice, in addition to the manifestation of health inequalities. Krieger argues to validate the existence of the health impact of structural determinations or racial inequality impact, we must also understand (a) laws, institutional policies and practices; (b) national, regional, state, and local

economic and political infrastructure; and (c) neighborhoods and workplace conditions (Krieger,2012). Although parental characteristics (i.e., gender, age, income, marital status, and education attainment) results were obtained, their findings were not statistically significant to support the relationship with lead knowledge and align with Krieger's theory.

Limitation to the Study

There were several limitations to the study. First was the generalizability of the results. Participants were selected via convenience sampling. This method incurred challenges due to the multitude of personnel at entrances, egresses, and kiosks. Secondly, randomization was difficult due to personnel wearing earphones. Personnel wearing earphones were unapproachable and inattentive to the interviewers request to participate in the research. Third, each transit location lacked variability in ethnicity; most participants were African American. A fourth challenge was that the transit stops did not provide demographic information relative to personnel living in high risk lead areas who did not rely on the transit system. Lastly, the collection of the minimum questionnaire presented challenges at some of the transit stops.

Although the minimum number of questionnaires were obtained at each location, it took eight hours to collect information. Subsequently, the questionnaire lacked variability in other languages. A significant number of participants lacked knowledge on the age of their home, in addition to knowledge of their child being tested for lead. Lastly, more research is essential through different methods. To facilitate future research, there are several recommendations.

Recommendations

First, with regard to similar future research efforts, the questionnaires should be presented in locations where there is an abundance of children and parents residing in zip codes with elevated lead levels, in addition to ethnicities, incomes, and languages. One feasible location is area schools (public and private). Area schools present an array of demographics for the exploration of parental characteristics. Secondly, public health centers should partner with school district to provide mechanisms to ensure children are lead tested and parents have cognizant knowledge pertaining to the age of their homes and associated risk. In Philadelphia, there needs to be a policy directive for children entering school to be lead tested, in addition to homes undergoing renovation where children reside. Workplaces with lead exposures should implement policy directives for employees working with lead in addition to children under the age of 6 in homes. Employers should partner with public health agencies to minimizing take home lead exposures. Building material suppliers should provide literature pertaining to the hazards associated with home renovations and lead exposure, in addition to development of a registry. A national policy needs to be implemented on the ban of imported lead goods into the country. The minimization of lead hazards in communities are effortless without knowledge of the risks and mechanisms to remediate them.

Implications

The finding from this research provided several implications for social change in minimization of lead in Philadelphia, Pennsylvania. This research provided additional information to increase lead knowledge through the exploration of parental characteristics

(gender, the age of parent, income, marital status and education attainment). Although, Taggert et al. (2019) explored the association of community-level housing characteristics and socioeconomic as risk factors for lead exposure in Philadelphia. To date, there was limited data reflecting parental characteristics and lead knowledge in the minimizing of lead exposure in Philadelphia. Secondly, results from this research have helped identify parental characteristics relative to lead knowledge. For example, in minimization efforts of lead in Philadelphia, lead knowledge may be provided to females who have never married, earned < $25,000, and have earned high school diploma/GED or less. Lastly, to further facilitate social change, policy directive should be implemented prior to children entering schools to address children at risk, in addition to homes undergoing renovations, building suppliers shall provide information pertaining to lead exposures during renovations.

Conclusions

This study was conducted to fill the gaps in knowledge and literature pertaining to the relationship between lead knowledge and parental characteristics (gender, age, income, marital status and education attainment) in minimizing environmental lead in the city of Philadelphia. Although, lead levels have declined in the city, lead exposures continue to be a challenge in the city (Taggert, et al., 2019). Previous research fails to address the relationship between lead knowledge and parental characteristics (gender, age, income, marital status and education attainment).

Although this research did not provide statistically significant data to explore a relationship between parental characteristics (gender, age, income, marital status and

education attainment) and lead knowledge; it provided essential demographic information for the exploration of future research. The research promoted social change by promoting the examination of stringent policy directives for children entering school, home renovations, and take-home exposures from work-related exposures.

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Appendix: Lead Knowledge Test

Lead Knowledge Test

Questions and Response

Background Information			
Sex: ◯ Male ◯ Female			
Age: ◯ 18-30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ 60+			
Race: ◯ White ◯ Black ◯ Hispanic ◯ Asian ◯ American Indian ◯ Other			
Zip Code:			
Children in Household: ◯ Yes ◯ No	Age of children in the household:		
Age of Home:			
	Yes	No	Don't know
Have you or your child ever been tested for lead?			
Do you believe that your child has been or is being exposed to lead?			

Education:	**Income:**	**Marital Status:**
◯ < High School	◯ <25,000	◯ Married
◯ H.S Diploma/GED	◯ 25,000-35,000	◯ Never Married
◯ College/ Post Graduate	◯ 35,000-45,000	◯ Widow
	◯ 45,000+	◯ Divorced

Lead Knowledge Questions			
General Information			
	True	False	Don't know
1. Lead paint chips can be poisonous when eaten.			
2. High lead in the body can affect a child's ability to learn.			
3. Most children have symptoms right away if they have an elevated blood lead level.			
4. A child's highest blood lead level occurs around 5 years of age.			
Exposure			
	True	False	Don't know
5. Lead paint is more likely to be found in newer homes than in older homes.			
6. Living in a building during renovation/remodeling can increase a child's exposure to lead.			
7. A child can become lead poisoned during exposure to lead-containing dust.			
8. Some pottery imported from Mexico or other countries is not safe to use in cooking or for eating because it contains lead.			
9. Parents who work with lead at their jobs can bring lead home on their clothes.			
10. The lead a pregnant woman takes into her body can be transferred to the unborn baby.			

11. Lead in soil cannot harm children.			
12. Most cases of childhood lead poisoning are caused by drinking water that contains lead.			
13. Most children get lead poisoning by breathing in the lead, rather than by eating or swallowing lead.			
14. Some herbal or traditional home remedies contain lead.			
Prevention			
15. Washing a child's hand often helps prevent lead poisoning.			
16. Warm tap water usually contains less lead than cold tap water.			
17. Cleaning a home with soap and water decreases the lead in the home more than dusting or sweeping.			