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Model Provisions For Building a Successful Lead Poisoning Prevention Program: A Case Study for the Western United States

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MODEL PROVISIONS FOR BUILDING A SUCCESSFUL LEAD POISONING PREVENTION PROGRAM: A CASE STUDY FOR THE WESTERN UNITED STATES

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ABSTRACT

Model Provisions for Building a Successful Lead Poisoning Prevention Program: A Case Study for the Western United States

By

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It has been 236 years since Benjamin Franklin voiced his concerns about lead poisoning from the occupational exposures in his printing shop, yet, in 2012 childhood lead poisonings and adult occupational exposures are still serious public health issues in the United States. Lead poisoning is a 100% preventable affliction if the ingestion or inhalation of lead from environmental exposures can be avoided.

The quality of blood lead detection methods and brain function studies have improved dramatically over the last few decades and far more is now known about the adverse health effects from low level (microgram- µg) exposures to lead. National health professionals state that there is no safe threshold of lead exposures for children (CDC, 2011).

Although long standing federal laws addressing lead in consumer products and lead-safe abatement practices exist; and recently promulgated state laws are trying to enhance the federal mandates, one million children are still afflicted with lead poisoning in the United States (EPA, 2012).

The experts involved in the area of lead assessment or abatement, nation-wide, were surveyed to collect their opinions on what they would list as the *critical factors* that are necessary to produce a successful lead poisoning prevention program. The group's

opinion was unswerving and the most frequently given list was: enforcement, primary prevention, awareness, dedication, funding, blood testing and data sharing.

Qualitative research methods, based on the triangulation of historical data, survey and interviews, as well as personal interaction, were utilized to review the Philadelphia Lead Poisoning Prevention Program. The understanding of the phenomenon, which was the *success* of the Philadelphia program, was evaluated by considering all aspects of the program and exploring the complexity of the variables, which, in this case, were the *critical factors* unique to the Philadelphia experience.

The qualitative research, designed as an explanatory case study (Yin, 1994, 2003) was constructed to analyze the Philadelphia lead program. This analysis concentrated on one purposeful sampling, *the Philadelphia experience*, pulling it apart and putting it back together, "factor by factor," in order to make use of the evidence and explain the- "how" and "why"- of Philadelphia's success.

In their own words, the advocates of the Philadelphia Citizens for Children and Youth (PCCY) organization describe what it took to make the Philadelphia program work. ... "a phenomenal success, Philadelphia's lead program is a prime example of how a confluence of forces inside and outside government, along with commitment and collaboration can bring about powerful, effective system change to benefit the public good in big cities" (PCCY, 2009).

Yin (1994) says that theory can be used to guide the case study in an exploratory way. As John Kingdon suggests in his Garbage Can Theory (Kingdon, 2003), public policy can be explored metaphorically as three streams that cross in a manner where by "problems, solutions, and participants" come together to create a policy. "These three

elements can move from one choice opportunity to another in such a way that the nature of the choice, the time it takes, and the problem it solves all depend on a relatively complicated intermeshing of elements" (Cohen, et al., 1972, p.16). The intermeshing of the critical factors, powered by the dedication of the Philadelphia program advocates has built a lead poisoning prevention program that the western states can emulate.

ACKNOWLEDGEMENTS

I dedicate this dissertation to all the hard working lead professionals who I have had the privilege to meet and teach and who have become my colleagues in this fight against the most debilitating, yet 100% preventable, disease of modern time. It will take a continued grassroots effort within each American community to demand an environmental policy that will remove this toxin from our environment, homes and consumer products, thus protecting our citizens from any further accidental lead exposures.

My husband Paul's maternal grandfather died in 1950 from lead poisoning so his stake in this venture was somewhat personal. I must thank my family, especially my husband, Paul, for all of his support and time dedicated to our children, Kellilyn and Danny, while I spent countless hours on this project. I thank my parents Bert Lauckner and Mary Ellen Durkin-Lauckner who instilled in me the importance of education and perseverance. To my friends and work mates, thank you for lending your support and encouragement that I would finish, no matter how long it took. In all those years, the Professors of UNLV never discouraged me, and although my committee members changed throughout the years, each one offered their own knowledge and insights and truly did enhance my overall interest in Higher Education.

In a Jason Mraz song, he sings, "You are the best definition of a good intention." I define myself as a teacher and I intend to keep working so that no one else is poisoned by lead due to a lack of knowledge. Thank you to all who will join me.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

"This, my dear friend, is all I can at present recollect on the Subject. You will see by it, that the Opinion of this mischievous Effect from Lead, is at least above Sixty Years old; and you will observe with Concern how long a useful Truth may be known, and exist, before it is generally receive'd and practis'd on.
I am, ever,
Yours most affectionately
B. Franklin" (Franklin 1776/U.S. U.S.EPA, 1995)

History of Lead Use

It has been 236 years since Benjamin Franklin voiced his concerns about the effects of lead poisoning on his employees who worked with printer ingots made of lead. He could not have foreseen the new dangers within our consumer market that would continue to burden the human race with this poison. Despite the known environmental and health hazards associated with lead exposure, and the advances in screening for human blood lead levels, the estimations of how many U.S. citizens are lead poisoned is atrociously under-estimated. Although we have known of the dangers of lead exposure and the consequences to human health since the time of antiquity, humans still insist on placing toxic lead into consumer products, the atmosphere, land, and water supplies while perpetuating overwhelming exposures from senseless and antiquated mining and occupational practices.

Around the world, lead is a ubiquitous pollutant on the lands and in the waters due to its use as a gasoline additive and from lead smelting (EPA, 2000, December). Lead is a heavy metal that volatilizes in emissions but then cools and falls to earth—*what goes up, must come down*. Lead is a cheap metal to mine and to use and, as such, it became a very versatile commodity that is manufactured into so many products.

Some of the more whimsical but historically profound uses of lead were for renaissance pigments, as a spermicidal ingredient for birth control and the ideal metal of choice for chastity belts. This metal enhanced about one-fifth of the 450 cookbook recipes by Apicius, the first Roman gourmet chef. From the middle ages, people put lead acetate or "sugar of lead" in drinks and on food. It was used as a condiment and enhancer for not so sweet wines. Its malleability made it the perfect metal to be shaped into pewter cups, plates, pots and pans. It was minted into money for early European and Greek cultures.

The Romans failed to recognize the toxicity of lead and continued to add lead acetate to wine to enhance its taste. The lead concealed in the food and wine devoured within these aristocratic cultures had a great deal to do with the outbreak of gout and sterility among the men and infertility and stillbirths among their mates. Julius Caesar had only one offspring, his son, Caesar Augustus, had none. The symptoms of “plumbism” or lead poisoning were apparent as early as the first century B.C. Marcus Vitruvius, architect and engineer under the Emperor Augustus, was familiar with the toxicity of lead and observed the laborers in the smelter had pale complexions – “the pallor people” (Dartmouth, 2011). This ashen complexion was due to their lead-induced chronic anemia.

Lead is the most basic of elements, and its use can be traced through the centuries. It is used in so many applications because of its chemical construct. It is found in the earth's crust, mined from the earth’s aggregate of Galena (Oracle Think Quest, 2011). Lead mining and smelting was one of the first industrial occupations of the American colonist. In 1621, the metal was forged in Virginia as a staple building

material because of its low melting point, malleability, and resistance to corrosion. Lead is still mined for the manufacturing of batteries, ammunition, metal products, and devices to shield radiation (Lewis, 1985). More recent discoveries have revealed that lead is being put into other commercial products such as pesticides and vinyl components.

Leaded Gasoline

The most environmentally damaging use of lead was as tetraethyl lead. This chemical was manufactured in 1923 as an anti-knock, octane boosting gasoline additive. The use of tetraethyl lead increased exponentially with the World War II efforts and the need to produce larger engines for mass transportation.

The adaptation of the war-era technology and machinery into a civilian society initiated the worst environmental assault from leaded gasoline onto the earth.(Kovarik, 2005).The hazards of lead, which were well documented, were virtually ignored by the chemical and oil industries, much to our detriment. Journalist, John Pekkanen, writing for the *Washingtonian (2006, August 1)* told the story of the introduction of tetra-ethyl lead so well; to paraphrase:

> Tetra Ethyl Lead (TEL) is a volatile liquid easily absorbed by the human body. In October of 1924 some workers became seriously ill at the Standard Oil New Jersey refinery. Five workers died, and the plant was dubbed “the house of butterflies” because workers were breathing in and absorbing “looney gas.” After an estimated 300 workers were lead, poisoned, many suffering from hallucinations—such as imagining butterflies-- and showing signs of psychosis, to the level at which some were institutionalized, the public health officials began to investigate the leaded gasoline effects.
>
> Because of the health concerns, lead in high concentrations in gasoline, paints and ceramic products, caulking, and pipe solder have been dramatically reduced in recent years. But, but it took decades for the bans on the use of lead to materialize. More than a dozen men died from lead exposure in the DuPont

> and Standard Oil plants, as well as the GM research facility in Dayton, Ohio. In 1925, the production of leaded gasoline was halted pending further study, and sales of leaded gas were suspended.
>
> In 1925, with public health and government officials in attendance, representatives of automotive, lead, oil, and chemical companies dominated a conference held on leaded gasoline convened by the Surgeon General in the US Treasury Department auditorium. Dr. Alice Hamilton, of the Harvard School of Public Health, one of the country's leading authorities on lead toxicity, urged that something other than lead be used to improve gasoline performance. Hamilton and other scientists warned that leaded gas would poison the air of our nation's cities and pose a grave threat to public health. The Surgeon General ended the conference by announcing that he would appoint an expert committee to study the issue.
>
> After a brief investigation, although it was concluded by the experts that lead was a poison, there were "no good grounds" for banning leaded gasoline. In 1926, the production of leaded gasoline resumed and by 1930, ninety percent of the fuel produced in the United States contained lead.
>
> Over the next six decades, leaded gas exposed more than 60 million American children to toxic lead levels. For much of this time, the prevailing consensus held that lead in the atmosphere was harmless and that lead toxicity occurred only at very high exposures. Most data supporting this consensus came from a single source: the Kettering Laboratory of Applied Physiology at the University of Cincinnati established and funded by the Ethyl, DuPont, and Frigidaire corporations. (pp. 8-10)

In the 1970s, progress in engine technology was one reason the car industry switched to unleaded gas and made the newly discovered catalytic converters a marketable product. The converters made cars run cleaner but they would not work with leaded gasoline. The switch to the catalytic converter technology and the cleaner, unleaded gasoline was a multi- billion- dollar windfall for the oil and car industries but consequentially it saved millions from being lead poisoned (Annest, 1983; EPA, 1985; Rosner & Markowitz, 1985).

Lead-based Paint

The use of lead in gasoline was by far the most insidious human action taken against the environment and its entire population. Adding to the list of lead-laden products, and the apex of this study, is the man made product, lead-based paint.

The antique pigment of white lead is a chemical invention with a very interesting historical background, dating even further back than that of the industrial marvels of the Roman Empire. In the Bible, the Book of Job mentions lead as a writing material. In 70 A.D., a physician and the "Father of Pharmacy", Pedanius Dioscorides, described the use of white lead, distinguishing it from cinnabar, and mentioned its use for painting and decorating walls (Greek Medicine, n.d.). Theophrastus, a Greek philosopher and student of Aristotle, described the manufacture of "ceruse" – basic lead carbonate or white lead in the *History of Stones 327-287 B.C.* (Gooch, 1993, p.94).

In more recent times, white lead was manufactured in the United States at the beginning of the nineteenth century and its principal use was as a house paint pigment. By the beginning of the twentieth century, white lead was widely promoted for use in interior and exterior house paint.

From about 1870 to 1920, the production of white lead paint was at its peak. It steadily declined in the 1930's except for short marketing periods when certain paint companies such as Dutch Boy promoted its sale to increase profit for not only their paint product but for the National Lead Company which was a Dutch Boy subsidiary (Harvard Business School, 2011).

In 1929, the Minerals Yearbook reported that new non-toxic whiteners such as zinc oxide or titanium pigments could be used in place of lead for white paints.

European countries had already legislatively restricted the use of white lead in paints, yet, the United States would not change paint formulas to include the new paint additives (as cited in Gooch, 1993, p.97). According to the Chemical Weekly publication of 1954, the health effects associated with lead paint were becoming a worldwide politics vs. science issue, yet, the U.S. companies still sold high volumes of leaded house paint without proper labeling through glossy, colorful magazine advertisements the stated the paint did not just look good... “it tasted good too” (*Appendix H*) (as cited in Gooch, 1993, p.95).

The first U.S. white lead factory was established in 1804 in Philadelphia. In the early 1840’s, the Eagle White Lead Company joined in the production of the paint product. In 1891, the National Lead Company was formed, and then acquired by United Lead, which gave the National Lead Company approximately 85% of the U.S. white lead market (Ingalls, 1908).

Documented in the Engineering and Mining Journal (Volume 194) were reports of the Eagle White Lead Company merging with the Picher Lead Company to form Eagle-Picher Lead. These mergers took place before 1950 and Eagle-Picher and National Lead became the only white lead producers. The paint companies moved into white lead production so not to be solely dependent on these two mining companies for the white lead needed for their burgeoning paint production.

National Lead Company held the strongest hold in the market with multiple plants, and all of the others maintained at least one plant. National Lead Company, the parent subsidiary company of Dutch Boy Paints continued to produce white lead well

into the 1960s when other companies had stopped producing white lead in the early 1950's (as cited in Gooch, 1993, p.98-99).

Since 1910, an estimated 4 million tons of lead were used in the United State for white paint alone. Of that, about 3 million tons of lead still remains in the paint of our nations' housing. Of the 77 million privately owned and occupied homes built prior to 1980, 57 million, or 75%, contain lead-based paint. When this data was collected in the 1970s, of the 57 million units containing lead-based paint an estimated 9.9 million were occupied by families with children under the age of 7. It is this segment of the population who are most at risk of being lead poisoned. Of the units containing lead-based paint and occupied by young children, 3.8 million homes had either peeling paint or excessive amounts of dust containing lead, or both (University of Cincinnati, 2001). The EPA lead in the news information website states that 38 million homes are still of an environmental and health concern due to deteriorating lead paint (EPA, 2011).

Health Effects

Over one hundred years ago, modern medical studies being conducted in Australia determined that lead paint was most poisonous to children under the age of 6; causing brain damage and even death (Donovon, 1996). In the early 1900's Dr. Alice Hamilton, the first female Professor of Harvard, taught industrial medicine at the Medical School and, later, the School of Public Health. She conducted long-term field studies, learning about industrial hazards, including lead poisoning and other harmful substances. She wrote the first American textbook in the field, *Industrial Poisons in the United States* (1925); in 1934, she wrote another classic, *Industrial Toxicology*. By the

time she conducted her last study, in 1938, federal funding and oversight for occupational health had grown significantly (Shen, 1997)

By 1928, many countries had banned the production of lead paint. But in the United States, eight lead paint manufacturers formed an alliance that stopped all attempts to ban lead paint for another 50 years. Their efforts were rewarded to the tune of billions of dollars being earned by the paint companies as they marketed their toxic substance as being safe for household use. As knowledge of the hazards of lead became known to the public, the threat of limiting or regulating the use of the leaded paint products intensified.

Dr. Herbert Needleman (1984) conducted a study while at the Harvard Medical School that provided the first clear evidence that lead, even at very low levels, could affect a child's IQ. Also, in a series of follow-up studies, he determined that lead poisoning had long-term implications for a child's attentiveness, behavior, and school success. As a pediatrician and researcher, he played a key role in securing some of the most significant environmental health protections against lead exposure achieved during the 20th century.

Dr. Needleman's research and findings were pivotal in debating the lead paint industry's revelations about the dangers of lead. Needleman and his mentor, Dr. Alice Hamilton, were industry "outsiders" and their data could not be controlled or sequestered by the lead paint or oil industries as this information was in the 1930s (Warren, 2000; The Free Library, n.d.).

The public and health officials alike now knew lead's deleterious health effects. This knowledge and acceptance of lead as a national public health issue resulted in

greater government control to protect public health. After extensive scientific review, Needleman's findings were instrumental in convincing the Centers for Disease Control and Prevention (CDC) to issue guidelines for the diagnosis and management of lead poisoning in children.

Needleman was also instrumental in persuading the United States Environmental Protection Agency (U.S. EPA) to mandate the removal of lead from gasoline and strongly urged the Consumer Product Safety Commission (CPSC) to ban the use of lead in residential paint products. This support of private funded research served to continually alert the public and government to the dangers of lead. This in turn helped the Department of Housing and Urban Development (HUD) to fund and promulgate the removal of lead paint from pre 1978 housing and child occupied facilities (Warren, 2000; CDC, 1992; HUD 1995).

Dr. Herbert Needleman (1998) received the Heinz Award in the Environment for his extraordinary contributions to the understanding and prevention of childhood lead poisoning. Presently, a pediatrician and child psychiatrist at the University of Pittsburgh Medical Center, Dr. Needleman is distinguished as a researcher who, having determined the developmental implications of excessive exposure to lead (Needleman & Bellinger, 1984), has worked tirelessly and at great personal cost to force governments and industry to confront the results of his research. The removal of lead from gasoline and paint has resulted in a five-fold reduction in the prevalence of lead poisoning among children in the United States. Yet, studies need to continue to assess those who are still afflicted by this disease from historical housing and new consumer products (CDC, 2011, October 4).

Christian Warren (2000), historian for the New York Academy of Medicine and author of "*Brush with Death: A Social History of Lead Poisoning*," argued that, during the debates throughout the century, the definition of "acceptable risk" from lead contamination had to be negotiated. This negotiation was often controlled by the lead and paint industries. These industries also funded the scientific research on which acceptable blood lead levels were determined. For this reason, the problem of lead poisoning was sequestered from public view for many decades. Warren concludes by noting that cooperation with industry is imperative in order to achieve the desired result of protecting the public. Implicit in his study was the notion that there is clearly a balance to be struck between control and cooperation.

Warren gives kudos to researchers and advocates such as Dr. Needleman and Alice Hamilton for not being cooperative with industry, but very demonstrative about the environmental and health risks associated with lead. They convinced the government using hard scientific health data that children of all nationalities were being lead poisoned. Their research worked to break the control of the lead and paint industries and laid the ground work for national legislation designed to ban the use of lead paint in residential housing after 1978 and the phasing out of the use of leaded gasoline by 1992 (Warren, 2000).

As the concern over lead poisoning moved from the factory to the slums to the general environment, the science that heavily favored the leaded gas and lead paint manufacturing companies diminished and more attention was paid to the general population, who were all now at risk of lead exposure (Needleman, 1991).

Lead Poisoning Today

"Yet the ability of human institutions to learn is frail. We need prudence, inventiveness, and persistence" (Lee, 1993, p.17).

Kai Lee, in his book *Compass and Gyroscope* was referring to a movement toward "civic science." He defines it as "our capacity to move from where we are today toward a sustainable future." He was suggesting that we need to learn from our mistakes. (Lee, 1993, p. 161-162) With all of our information about lead in our communities we have no idea how many people, in the world, have lead poisoning. For that matter, with all of our resources, it is unknown how many lead poisoning cases there are in America. Due to poor reporting practices and the failure to test all children between one and five years of age, there may be as many as one million children with un-reported lead poisoning in the U.S. (Mohney, 2009, May 16; Jones, et.al, 2009).

Dean Lovvorn (2011, October 17), lead based paint consultant and member of the *Leadnet*; a Lead Professional online email blog site, suggested, "thinking out loud..."

> EPA says around 8% of kids under 6 have > 5 mcg/dL of lead in their blood. This equates to around 2,000,000 kids. Brain damage and loss of IQ can start around 5µg/dL. CDC says the vast majority of elevated blood lead levels come from lead-based paint. Roughly (Census) 8% of residences have a child under 6 living in them. The EPA says around 38 million homes have lead- based paint. Around 3,000,000 children under 6 are living in these residences. Doesn't this mean (in broad terms) that there is a 66% chance that a child living in a home with lead-based paint will have >5µg/dL?

Dean proceeded to ask the 957 *Leadnet* subscribers to correct him if he was wrong. No one replied with a contradiction to his calculations. Suffice to say that, despite improvements in public health policies and substantial reductions in blood lead levels (BLLS), lead exposure remains an important health problem.

The Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP, 2011) voted to recommend a significant change in how the CDC selects the number at which a child's blood lead level should be considered elevated, and to renew its call for primary prevention. In a unanimous vote, the ACCLPP members passed a new resolution that pushed the premise that low-level lead exposure harms children and a renewed call for primary prevention is crucial:

> Based on its conclusions that blood lead levels < 10 µg/dL harm children, the Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) recommends the elimination of the use of the term “blood lead level of concern.” It recommends the use of a reference value based on the 97.5th percentile of the National Health and Nutrition Examination Survey, NHANES-generated blood lead distribution in children age 1-5 years (proposed level 5µg/dL) to identify children with elevated blood lead levels. These lower levels currently impact approximately 450,000 U.S. children. The absence of identified blood lead levels, without deleterious effects, underscores the critical importance of primary prevention. The ACCLPP document summarizing these recommendations and will be finalized and voted upon in January 2012. (Morley, November 2011)

As an update to this proposal, on May 16, 2012, CDC’s “level of concern,” was changed from 10 micrograms per deciliter to the new reference value of 5 micrograms per deciliter. This new level will focus action on those children with the highest blood lead levels (i.e. those above the 97.5th percentile) and will increase the number of children requiring follow-up services from less than 100,000 to 450,000 (CBS News; CDC, 2012, May 16)

The evidence that intellectual deficits occur with blood lead levels less than 10µg/dL instigated the move to now set the target level at 5ug/dL or 5 millionths of a gram per one tenth a liter of blood. It is thought that even at this lower level more harm to a child’s brain occurs and this lower level can contribute to hyperactivity, learning disability, school failure, and violence (Buyer, 1943; Bornstein & Sigman, 1986;

Bellinger, et.al, 1987; Bellinger, et.al., 1992; Bellinger & Dietrich, 1994; Bellinger & Needleman, 2003; Canfield et.al., 2003; & Lanphear, 2005).

The previous standard for lead poisoning in children was a lead level of 10 micrograms or more per deciliter of blood (10µg/dL). At this microscopic level, lead damages a child's brain and the ability to learn. At higher levels, such as 40µg/dL, lead can damage the kidneys, blood, and nervous system and progress to coma, convulsions or death at a level 80µg/dL and higher (CDC, 2011).

Recent national data sets for lead levels in children came from the National Health and Nutrition Examination Survey II (NHANES-II). NHANES is an ongoing series of cross-sectional surveys on health and nutrition designed to be nationally representative of the non-institutionalized, U.S. civilian population by using a complex, multistage probability design. The May 27, 2005, CDC, *Morbidity and Mortality Weekly Report* (*MMWR*), published new national data on lead poisoning. This report listed various blood lead statistics for 1999 through 2002, the first significant update since the National Health and Nutrition Examination Surveys (NHANES) data report from 1991 through 1994. These new data documented that further gains had been achieved in protecting children from lead poisoning—but that disparities still exist in lead poisoning rates across races and income levels. (CDC, 2005a)

The first estimates stemmed from a 1984 report and were projected from data collected in 1976-1980 (the years of NHANES- II). The degree of error in these estimates was difficult to quantify since sources of both over-estimation and underestimation were present. In addition, Hispanic, Asian, and other subgroups were omitted because no data was collected from these groups. At that time, it was

estimated and reported in the Agency for Toxic Substances and Disease Registry, (ATSDR) that 2,380,600 children were exposed to dangerous levels of lead in their environments and could show lead levels in their blood above the CDC level of concern which was 10 micrograms per deciliter of blood (10µg/dL) (ATSDR, 2007).

A report published by the CDC in 2005, "Blood Lead Levels-- United States, 1999-2002, indicated that a steep decline in lead levels in children occurred from the timeframe of 1976-1980 and 1999-1994. The percentage of children with elevated blood lead levels dropped from 77.8% to 4.4% in children ages 1- 5 years with BLLs equal to or greater than 10µg/dL. However, certain populations, such as minorities of low income, living in older homes were at greater risk of exposure. (CDC, 2005a)

The last series of NHANES data collected during 1999-2002 shows a steeper decline of children with elevated blood lead levels (BLLs) down to .7%. Yet that still equates to 310,000 children aged 1-5 years remaining at risk for exposure to harmful levels of lead. Youths aged 6-19 years had the lowest prevalence of elevated BLLs (0.2%), although this estimate was not statistically reliable. Overall, by race/ethnicity, non-Hispanic blacks and Mexican -Americans had higher percentages of elevated BLLs (1.4% and 1.5%, respectively) than non-Hispanic whites (0.5%) (CDC, 2005b).

Presently, state Medicaid programs are required to report blood lead levels to the CDC. Seventeen states have more aggressive programs that require that all screenings be reported to the State's health program, not just children who are positive for lead. Officials involved in these programs reported to the *Leadnet* that these laws are not enforceable and many do not report as required. Other statements concur, "Louisiana has a law on the books requiring reporting all blood lead tests. It is not

enforceable but helps gather data."... "I know Massachusetts has a universal screening law even though the numbers don't reflect it" (*Leadnet*, 2011, December, 03).

Despite the abysmal reporting figures, the results from the U.S. studies are promising and do reveal the fact that lead poisonings have decreased dramatically since removing lead from gasoline and household paint products, but that is not the end of the story. These medical conclusions about the dangers of lead have existed for thousands of years, yet we are still plagued by severe illness and even death from this 100% preventable disease.

In the 21st century, one would think that it would be rare to see people, especially children, dying of acute lead poisoning, yet, worldwide, it is still happening. In 2010, more than 400 children in the northern, Nigerian state of Zamfara died of lead poisoning because they were either sent into the mines to extract gold aggregate, or they helped to grind the aggregate on the same mills they use to grind their grain. At the time this incident was reported, there remained 3,600 children in the surrounding villages that required immediate chelation (medical extraction of the lead from the body) to prevent further deaths (Mason, 2010).

Relating this tragedy to the United States, although nothing is as tragic as death, we, for example, have spotty blood lead level data on children in America living in towns polluted with the lead from decades of industrial smoke and waste. In states such as Idaho and Nevada, mining continues and so does the environmental or occupational exposures to the metal. USA TODAY (2012, April, 20) posted an investigatory expose′ about 200 buried or demolished lead smelters that have left legacy lead waste in our nations' neighborhood soils. The story acknowledges the fact that these industrial

hazards have been lost to time and now neighborhoods have grown up around or on top of these contaminated sites. The health risks from the old leaded soils are unknown to the new community occupants.

The decline in elevated blood lead levels in America has resulted from the efforts to remove lead from gasoline, food containers, cookware, and residential paint products. The latest threat from lead is new consumer products manufactured as cheap commodities. One American Minnesota boy died in the summer of 2006 from swallowing a heart shaped charm from a bracelet manufactured for Reebok. The charm was made of nearly 100% lead.

The charm lodged in the boy's stomach and dissolved over three days at which time he succumbed to lead poisoning with his blood lead level (BLL) measuring 139µg/dL. Astonishingly, not one medical professional ever recognized his encephalitic symptoms as a symptom of lead poisoning (CDC, 2006).

In 2012, it is ludicrous to still have to worry about any child dying from lead poisoning. This health issue was to be eradicated by steps detailed in a 2005 government publication called *Building Blocks for Primary Prevention*. With the passing of the Lead-Based Paint Hazard Reduction Act, in 1992, new research and cooperative extension education were promoted to train contractors to work lead safe in the abatement of housing or school paints and the EPA provided a variety of publications for the public to be better informed. The information was distributed to the public via community health fairs, pediatrician offices and the Internet in an attempt to greatly expand the understanding of the sources of lead exposure to the public and define the different strategies to make a home safe from lead hazards (CDC, 2005).

Despite the government's efforts and the industrial reductions in lead emissions, lead poisoning cases are still emerging. If lead in the atmosphere from gasoline and other industrial productions had been reduced by 95% and the housing stock, which is lead painted is decreasing daily, then why in cities, such as Las Vegas, do we have a rate of 17% to 25% of our blood tested child populations testing positive for lead?

In Nevada, the University of Nevada, Las Vegas, School of Community Health Sciences, Department of Environmental and Occupational Health, with a grant from the CDC, has been collaborating with the Southern Nevada Health District (SNHD), to assess the number of children in Las Vegas that are being exposed to lead (Gerstenberger, 2007). In the SNHD annual reports for 2009-2010, 10,595 children were tested for blood lead and approximately 21.8% had detectable levels of lead. In 2010, 11,041 children were screened for lead and 17% of them tested positive.

The original UNLV-SNHD study was initiated in 2006, and since that time approximately 50,000 children have been tested with the yearly positive percentage rates ranging from 17% to 25% (Gerstenberger, 2011). These percentages far exceed the national NHANES estimations of 1.4% for the general population to 5.2 % for the most at risk minority populations. The study continues, and the ongoing speculation is that the exposure to lead, which is causing the elevated blood lead levels, is both from consumer products containing lead and /or deteriorating lead painted housing.

Adult Exposures to Lead

Most lead studies are conducted with children in mind because children, especially those younger than 6 years of age, are more susceptible to the nerve damage and learning deficits caused by the lead toxicity in the body. That does not

mean that adult exposures and subsequent poisonings are not as important to study and prevent. Approximately 95% of all elevated blood lead levels (EBLLs) in adult tests in the United States are work related. The Adult Blood Lead Epidemiology and Surveillance (ABLES) program reported 9,325 and 7,674 state resident adults with elevated blood lead levels, for years 2008 and 2009, respectively (Medscape News, 2011).

Among the cases with known exposure type, occupational exposures accounted for 94.8% of the cases in 2008, and 93.8% in 2009. These ABLES calculations were based on per /100,000 adults and, as an example, data from Hawaii reported .5 per /100,000 employed adults while Pennsylvania reported 37.6 per/ 100,000 adults. The variation in the blood lead levels, between the states, stems from the proportion of workers in high-risk industries that expose the workers to lead. Exposures from three particular occupations were reported to have caused the most exposures, those being; manufacturing, construction, and mining (CDC, 2006).

Just as in the children studies, the data for the number of adults who are lead poisoned are also severely under reported (CDC, 2006; OSHA 2011, NIOSH 2007). In 2006, the state of Nevada's northern county health officials were asked by this researcher for any blood lead test data they may have on file. At the time there were only two child lead poisoning cases officially recorded with the state health department. No adult data for the state of Nevada was recorded with the ABLES program (CDC, NIOSH, 2011).

Since 1994, the state-based Adult Blood Lead Epidemiology and Surveillance (ABLES) program has tracked laboratory-reported BLLs in U.S. adults. An overall

decline in the national prevalence rates of BLLs ≥ 25 micrograms per deciliter (µg/dL) from 14.0 adults per 100,000 employed adults in 1994 to 7.4 in 2005 was observed. This represented a 47% decrease in the prevalence rates of elevated BLLs during this 17-year time period. (CDC, 2011)

These results underestimated the true magnitude of lead exposures in adults, because some employers did not provide BLL testing to all lead-exposed workers as required by Occupational Safety and Health Administration (OSHA) regulations and because some laboratories did not report all tests as required by state regulations. The percentage of unknown data will vary state to state, for example, Pennsylvania reported 11,103 cases of adult lead poisoning between 2003 and 2008 (PANEDSS, 2012). In Nevada's case, the number is zero, not because of the fact that there were no adults that are lead poisoned, but because Nevada does not even participate in the ABLES program (CDC, NIOSH, 2012).

In 2006, when Nevada received its first increment of research funding from the CDC, it was discovered that there was essentially no data available for blood lead levels in children or adults. Dr. James Craner, MD, MPH a board-certified occupational and environmental medicine (OEM) physician based in Reno, Nevada, stated: (Personal Communication, July 29, 2008)

> The extent and distribution of environmental lead contamination in Reno/Sparks is unknown, as it has not been systematically studied, either through environmental sampling or random or targeted population blood lead levels. Northern Nevada's older residential building stock is a likely source of environmental lead paint. Environmental exposures from industries that manufacture and use lead products are another potential source, representing several millions of pounds of lead. The Reno/Sparks area is home to the largest concentration of fire assay laboratories and litharge (lead oxide)-based assay flux manufacturers in the United States, while Lyon County is home to a major

producer of lead shot. Most of these companies have OSHA-compliant lead exposure controls and medical surveillance programs in place to address these issues. Smaller assay laboratory facilities also exist at many of the gold and silver mines in the rural areas.

OSHA has a mandate extended to all employers who may expose their workers to lead. They must protect the worker from any amount of lead dust, but particularly levels over 50µg/m^3 in any hour of a work day require the worker to wear personnel protective equipment (PPE). If that amount of lead will be exceeded within the workers breathing zone, then, that worker must be prepared to wear a ½ faced, High Efficiency Particulate Air (HEPA) filtered respirator to prevent inhalation of the lead dust. The supervisor of the worker must also provide the amenities necessary to wash ones face and hands to prevent lead ingestion. (OSHA, 29-CFR 1926-62, 2012)

These preventative measures have been written as rules to follow through OSHA mandates since 1971. HUD developed lead-safe work practices in the 1970's when that organization was tasked to remove lead paint from public housing. Again, it is not the laws that do not exist to protect the workers, and their children from their occupational lead dust. It is a lack of enforcement and manpower to audit the contractors who should be using lead-safe work practices.

A New Approach

The Centers for Disease Control and Prevention (CDC) has a longstanding program and commitment of protecting children from lead poisoning. Since the 1970's, CDC has helped states and local health districts and departments establish lead poisoning prevention programs that screen children for elevated blood lead levels and to perform an environmental assessment to determine the source of the children's exposures (CDC, 2000). Since 1996, the EPA and CDC have sponsored education and

training certification programs that promote primary prevention through education, inspection, rehabilitation and clearances of properties, declaring the property at least "lead-safe" (40-CFR 745-Title X, 1996).

Primary prevention is essential to reducing lead exposures. If homes or consumer goods could be inspected for lead hazards, before anyone is exposed to the toxin, this would be a new approach to the prevention of lead poisoning. It is only through recent inspection techniques and technological advances in *X-ray Fluorescence* that the discovery of lead in housing and consumer goods---before anyone is harmed--has gained momentum.

The use of x-ray fluorescence to inspect for lead is not a brand new technique. The science and technology has been in use for at least 25 years. It is the scaled-down size of the x-ray device, used for home inspections, that is indeed a new and phenomenal technology. An XRF analyzer, just a bit larger than a hair dryer, has enough power to x-ray through walls and detect lead within the structure at milligram (mg)/centimeter squared ($cm^{2)}$ measurements. In the "bulk mode," the XRF can detect lead in the part per million (ppm) ranges when testing home soils or consumer products, such as candy or vinyl toys. The design and definition of this x-ray technology is presented in (Appendix B).

Research studies conducted by the graduate students of the University of Nevada, Las Vegas, School of Community Health Sciences, Department of Environmental and Occupational Health, included home and consumer goods inspections using the Niton XRF analyzer. The XRF technology was essential in the preliminary study of the properties in Las Vegas, conducted by UNLV graduate

students, and it was concluded that, 74% of the homes tested had lead-based hazards from either paint, dust, soil or ceramic tile (Torres, 2003). Listed below are just a few examples of consumer products in the homes determined to be “positive” for lead using the XRF analyzer.

- Ceramics
- Mexican pottery
- Mexican candy
- Vending machine jewelry
- Vinyl lunch boxes
- Fast food kids meal toys
- Assorted other toys, such as model cars, vinyl balls, and building blocks (Torres, 2003).

The on-going studies of “atypical” sources of childhood lead poisoning by the UNLV graduate students are an extension of original studies done by researchers of the CDC, (2002); *Childhood lead poisoning associated with tamarind candy and folk remedies – California, 1999-2000* and UNLV’s researchers, Emmanuel Gorospe and Dr. Shawn Gerstenberger, (2008) *Atypical sources of childhood lead poisoning in the United States: a systematic review from 1966-2006.* Atypical consumer products such as candy, ceramic cups, jewelry, vinyl lunch boxes and toys were found in the homes that were being investigated for possible lead hazards, as well as day care centers and schools, where the children of these homes may visit during any week.

The current Consumer Product Safety Commission government standard for the allowable limit of lead in any consumer product is 100 microgram per gram (100 µg/g) or

100 parts per million (100 ppm) (CPSC, 2011). The products discovered in the Las Vegas homes and day cares, in most cases, had lead concentrations that were hundreds or thousands of times higher than the 100 ppm allowed by law (Gerstenberger, 2009; 2010).

Since 2006, the Southern Nevada Health District, in partnership with the University of Nevada, Las Vegas have inspected several hundred homes in Las Vegas for lead, and to this point, have found that the older homes are not as lead-laden as our east coast housing stock. Despite the housing stock having a low incidence of lead paint (about 10% of the homes inspected), the children in these homes are exhibiting elevated blood lead levels. Following a survey, an interview, and a risk assessment of the home and family, it has been discovered that in most cases, the family is exhibiting elevated blood lead levels from consuming imported foods and folk remedies that are tainted with lead (Torres, 2003).

The Southern Nevada Health District and its Community Lead Poison Prevention Program Partners (CLPPP) have formed a multi disciplinary team to assess properties where children with elevated blood lead levels (EBLLs) are known to live. In 2009, there were 2,700 children with known BLLs in the SNHD database.

Presently, the Health District is initiating a new program called Healthy Homes. This program is to be funded by HUD and will incorporate lead assessments as one of its tasks. The healthy homes approach represents a new direction for the national housing policy that will advance the program directive from only assessing a home for lead and instead widen the assessment to include, pesticide, carbon monoxide, mold, radon, pests, and potential injury causing defects (SNHD, 2010).

Governmental Policy

Even though the goals for 2010 called for every governmental agency, involved in the elimination of lead poisoning, support that goal; and, millions of dollars were allocated to the program, the task was not finished and now those programs are facing severe budget cuts. The support given to the established lead poisoning prevention programs did allow for great accomplishments in lowering the number of lead poisoned children; but the job is not complete. If budgets are cut now, the western states will not have the resources to develop a lead poisoning prevention program that would be on par with the east coast programs.

The Senate Appropriations Committee for the 2011-2012 legislation session passed a bill funding the Labor, Health and Human Services and Education Departments for Fiscal Year 2012 in the amount of only $158B (billion). This unfortunately is $308M (million) below the FY 2011 comparable funding level. It is this service department that funds the lead poisoning prevention programs and *Healthy Homes* initiatives across the nation (*Leadnet*, 2011, November 16).

Historically, HUD issued the regulations to control exposures from lead hazards in housing. As early as 1972, HUD began rehabilitation projects on federally- assisted or public housing. Analysis of cost and benefits of this HUD regulation implied that the cost of implementation of the rule was $253M but the benefits were a minimum of $1.1B (Nevin, Weitz, & Jacobs 1995).

The U.S. EPA estimated that their regulations mandated by *Title X of the 1992 Housing and Community Development Act* would use HUD guidelines (HUD, 1995) for lead abatement in housing and protect 1.1 million children each year. In 1992, the

EPA's regulated program covered more housing units and it was estimated that the net benefits would be between $2.6 and $7.5B annually (U.S. EPA, 2006, February).

New studies beginning on the western states housing stock reveal that approximately 102,133 or 20% of homes in Clark County, Nevada with known years of construction were built prior to 1978. These pre-1978 homes are the target housing for the EPA Lead Program. More than 40,000 Hispanics, African Americans, and lower socioeconomic status subgroups of Clark County live in homes built prior to 1978 and are at potential risk for lead hazards. There are approximately 150,000 more homes dating pre -1978 throughout the rural regions of Nevada that have not been assessed for lead hazards (Gerstenberger, 2011). Throughout the west, only a very small percentage of the homes and their occupants have been assessed for any potential lead hazards. The devastating budget cuts to the housing programs will certainly inhibit any advancement of the western lead poisoning prevention programs.

The CDC, in 2005, published the *Building Blocks for Primary Prevention: Protecting Children from Lead-Based Paint Hazards.* This publication offers a comprehensive collection of 70 "building blocks" which are primary prevention strategies that should be considered by state and local governments and others in a position to reduce exposure to hazards in housing. This strategy was presented to help meet the CDC Healthy People 2010 goal of eliminating childhood lead poisoning.

> Exemplary strategies span a broad spectrum which includes targeting high risk properties; widely instituting safe work practices; building community capacity to check for hazards and work safety; delivering hazard assessments; expand financial resources; strengthen enforcement; raise public awareness; and establishing valuable partnerships. The strategies considered had to be sensitive to the economics of affordable housing, consistent with the principles of public health, holds the potential for broad-scale impact, stands a reasonable

> possibility of implementation, and offers promise for reducing lead and other environmental health hazards in high-risk housing.
>
> The purpose of this document was to "offer programs and policymakers easy access to information about innovative and promising strategies that span the spectrum of primary prevention, from which they may select one or several to pursue based on their jurisdiction's needs and political and economic realities.(2005, p.i).

It is now 2012 and the goals to eliminate lead poisoning have still not been realized. A new set of goals has been established in the CDC publication / program, "Healthy People, 2020." This document contains about 1,200 objectives in 42 topic areas designed to serve as this decade's framework for improving the health of all people in the United States. Under the "L" index *Lead Poisoning* is no longer listed. One has to look under *Environmental Health*, and then search for *lead poisoning*. The reference to lead poisoning occurs twice, once under the *Environmental Health Goal # 22*, which states: "Increase the number of states, territories, tribes, and the District of Columbia that monitor diseases or conditions that can be caused by exposure to environmental hazards." (p.103)

The other under "Topic 12" which addresses *Blood Lead Levels:*

> The number of children with elevated blood lead levels in the U.S. is steadily decreasing. As a result, determining stable national prevalence estimates and changes in estimated prevalence over time using NHANES is increasingly difficult. Eliminating elevated blood lead levels in children remains a goal of utmost importance to public health. The sample sizes available with the currently structured NHANES are too small to produce statistically reliable estimates and preclude the ability to have a viable target for HP2020 (see Objective 8.1). Efforts must and will continue to reduce blood lead levels and to monitor the prevalence of children with elevated blood lead levels. (Healthy People 2020, web page)

If the statistical prevalence is too low for a national estimation of lead levels, is that due to poor reporting or good progress in the elimination of lead poisoning? Will it

be up to the states to address their own lead issues and report accordingly if Federal support diminishes?

Problem Statement

Lead poisoning is a condition caused by exposure to environmental sources of lead, deteriorated or renovated housing or consumer products. The quality of blood lead testing methods and brain function studies has improved so dramatically over the last 30 years that we now know far more detail about the adverse health effects from low level (microgram-µg) exposures.

Scientific evidence from the Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) announced on November 16, 2011, that effects from lead poisoning, such as deficit in IQ, occur below 5µg/dL of blood lead concentration, and possibly there is no safe threshold for children (*Leadnet*, November 16). Sadly, conversely to this finding, the present day budget for the CDC and HUD programs to eliminate lead poisoning has been targeted for annihilation from the federal budget for 2012-2013 fiscal years (National Safe and Healthy Housing Coalition, 2012).

Improvements in analytical techniques have also had an impact on measurement quality of this pervasive lead pollutant, yet many children are still at risk of lead poisoning from their communities. Case in point, Philadelphia, April 20, 2012, in the front page story of USA Today:

> In hundreds of neighborhoods across the United States, children are living and playing near sites where factories once spewed lead and other toxic metal particles into the air. The factories, which melted lead in a process called smelting, closed long ago but poisonous lead particles can still be found in the

> soil nearby. Families interviewed were unaware of the dangers posed by their yards – and the government has done little to warn them, a USA TODAY investigation has found. (p. 1A, 6A-7A)

Needless to say, the complexity of ridding these neighborhoods of this ubiquitous pollutant remains a critical environmental issue for the U.S. EPA.

The reduction of lead in the environment from the elimination of leaded gasoline was a crucial national policy change saving millions of children from the continued exposure to atmospheric lead. Yet, poisonings from lead paint still affects an estimated 1 million children today. The CDC estimates that nearly 250,000 children living in the United States have blood lead levels high enough to require public health intervention, based on data from the last national survey conducted in 2003-2004. The major sources of lead exposure among children are lead-based paint and lead-contaminated dust found in deteriorating buildings (U.S. EPA, 2011). Pre-1978 housing, and the ground they are built on, still poses a real threat to the citizens of the U.S; and now consumer products, tainted with lead, do as well.

The problem addressed in this research was how to build a sustainable lead poisoning prevention program in the western states where the program development is in the novice stages or still to be initiated. Faced with the catastrophic budget cuts and a lack of an enforceable Federal mandate, “how and “why” did Philadelphia succeed in significantly lowering their cases of lead poisoned children? Is it possible to model the Philadelphia experience within the western states?

Significance of the Study

Based on the recommendations of an EPA, HUD, and CDC interagency lead elimination guideline, the *Federal Strategy for Eliminating Childhood Lead Poisoning* (CDC, February 2000), the officials emphasized the essential need to be pro-active in the abatement of lead hazards before the children become poisoned. In 2005, CDC published the *Building Blocks for Primary Prevention: Protecting Children from Lead-Based Paint Hazards.* This publication offered a comprehensive collection of 70 "building blocks" which are primary prevention strategies that should be considered by state and local governments and others in position to reduce exposure to hazards in housing plus meet the Healthy People 2010 goals set to eliminate lead poisoning.

While many east coast lead programs have implemented these strategies to reduce lead hazards, many of the western region states, defined for this study as, Arizona, Idaho, Montana, Nevada, New Mexico, and Wyoming were not able to establish a program to meet the goals of the Healthy People 2010 plan. If any advances to the lead poisoning prevention programs are established, as results of the newly published 2020 plan, it s yet to be seen.

One of the nation's well-established lead programs is in the City of Philadelphia. According to a Harvard School of Public Health study, it was cited as having an exemplary program that is head and shoulders above all others and was poised to meet the 2010 goals (CDC, 2008). Being an exemplary example of a successful lead poisoning prevention program, this research study reviewed the Philadelphia case to elucidate, with sufficient clarity, those factors that Philadelphia used to develop their template for success. This "template" may help the program managers and participants

of the more novice western programs avoid obstacles and duplication of errors experienced by this more established program.

Purpose of the Study

The purpose of this case study was to identify and describe the *critical factors* associated with the success of the Philadelphia Lead Program and determine if those factors can be entrenched in the newer programs of the western regions to make them successful in the eradication of lead poisoning.

Research Question

The study focused on the Philadelphia lead poisoning prevention program, 2002 to present time and researched the reasons why this City program is deemed successful.

- How did the Philadelphia program establish itself in the framework of the c*ritical factors* presented to achieve success in the significant reduction of lead poisonings?
- Could this program be analyzed and the critical factors isolated for assimilation into the more novice lead poisoning prevention programs across the western United States?

Theoretical Perspectives

In 1972 Michael Cohen, James March, and Johan Olsen developed the *Garbage Can Theory*. This theory presumes that organizational decision-making resembles an organized anarchy characterized by problematic, unclear technology, and fluid participation.

The organized anarchy demonstrates characteristics including the following:

Problematic reference: – inconsistent and non-preferred decision making. Instead of following a pattern of defined goals, decisions, and outcomes, organizations act first, and then develop goals, decisions, and outcomes, based on their past actions.
Unclear technology:- applies to procedures that are not known to the members of the organization, rather than technology like computers or specific equipment.
Fluid participation: – refers to the dissimilarity of time and effort that members spent on the process of decision-making (Cohen, March & Olsen, 1972).

In the Garbage Can Model, the opportunity to make a decision is described as a garbage can into which broad selections of problems are generated and solutions are deposited (Cohen, et al., 1972, p.2). It is suggested that "problems, solutions, and participants move from one choice opportunity to another in such a way that the nature of the choice, the time it takes, and the problem it solves all depend on a relatively complicated inter-meshing of elements" (Cohen, et al., 1972, p.16).

These elements, which are labeled "streams," include the combination of choices that are available at any one time, the combination of problems, the combination of solutions that are in search of problems, and the external requirements laced on the decision makers. The key to the decision making process is based on inter-twining or "coupling" the various streams.

The original Cohen, March and Olsen model was formulated in the context of the operation of a university's many interdepartmental communications problems (Riley, 2007). The garbage can model of decision making theorized that those organizations that have loose alignments, such as EPA, HUD and CDC in this case; do not have orderly decision making processes (Cohen, March, & Olsen, 1972). One of the prime

stimulants for policy development is dissatisfaction with the organization. In the garbage can model process, there are exogenous, time-dependent arrivals of decision opportunities, problems, solutions, and decision makers. Problems and solutions are attached to choices, in large part because of simultaneity (Cyert & March, 1963).

John Kingdon, author of the landmark study, *Agenda, Alternatives, and Public Policies,* revised the Cohen, March and Olsen theory to argue that decision-making consists of the coordination of three relatively independent "streams" of decision elements. Those elements are: problems, politics, and policies.

The "problem" stream represents the series of conditions requiring public attention. The "policy" stream represents the policy proposals that may address actual or potential problems. Problems and policies are both identified and championed by the participants in the organization. The "political" stream then represents the general policy environment and choice opportunities. The political stream includes elections and policy "mood" (Kingdon, 2003, pp. 145-164).

Only when the problem can be linked to a policy and the mood of the policymakers and the time is favorable, will the three streams join coincidentally and a new policy emerges (Kingdon, 2003). The results of this study provided evidence that the "mood" of the Philadelphia program directors exuded determination and that the time had come to finally eradicate the lead toxin from their neighborhoods with a new policy of primary prevention and enforcement. The participants of the program certainly do champion the cause and do the best, with the available resources, to promote primary prevention to eliminate lead poisoning instead of using the kids as the "canary

in the coal mine" – or lead mine in this case—and instead work to clean up the child's environment before the lead exposure can occur.

An older study, conducted in 1959 by Charles Lindblom, while he was an Economics Professor at Yale, set the stage for the Cohen-March-Olsen organizational theory and it too can describe the Philadelphia story of the early 1990's. Philadelphia officials tried to meet the Federal program guidelines to eliminate lead hazards but found that 80% of the housing in Philadelphia was pre-1978 target housing and no budget amount that would be possible could abate the entire lead hazard awaiting the program administrators. Lindblom (1959) essentially said that a rational-technical approach is not possible when it comes to public policy and he offered an alternative—an oxymoron – "The Science of Muddling Through." In his scenario, government administrators need to consider making national policy by alternative methods. To summarize, Lindblom argued that people act in the absence of clearly defined goals; indeed, action is often facilitated by "fuzzing" over what one is trying to accomplish.

Researching the elements of the Philadelphia program, it was very clear that there was no "fuzzing" over the fact that they had thousands of children that were lead poisoned and they had to formulate a way to reduce these numbers and rehabilitate the neighborhoods of Philadelphia. The Federal government valued the fact that they had an enforceable program promulgated by 40 CFR 745 and Title X of the Lead Poisoning Reduction Act of 1992 but the value that was not shared was the monetary value it would take to abate the hundreds of thousands of homes in Philadelphia that had the potential to expose children to lead.

Kai Lee, author of *Compass and Gyroscope: Integrating Science and Politics for the Environment*-based his notions of how the government makes policy by taking Kingdon's Garbage Can Theory and emphasizing the idea that institutions have rhythmic affects that may shape a policy because timing is critical; participants must be ready before the battle starts; alternatives that could be plausible need to be analyzed; political factions need to be sounded out about their receptivity to a particular solution, and the window of opportunity to make policy, once open, must be entered quickly (Lee, 1993).

In 2001, Philadelphia's possibility of eliminating lead poisoning by the Federal goal of 2010 was looking bleak. In this aging city only 131 properties were made lead safe and 754 children were found to be lead poisoned. By 2002, the City had a list of 1400 homes that had lead poisoned children. The City had neither the authority to compel owners to fix up their properties, nor the resources to pay for the lead abatement.

As reported by the Philadelphia Citizens for Children and Youth, dramatic changes to the Philadelphia program occurred in 2002 and the programs leaders had to "enter quickly." As a result of increased public awareness, advocacy, political commitment, local and federal resources and collaboration among public agencies a more pro-active movement took shape and the lead hazards in children's homes were assessed and eliminated in a much more proficient manner . With $15.77M in accumulated funds, Philadelphia was able to move forward with a more proactive approach making 450 homes lead safe and listing 500 more for rehabilitation. (PCCY, 2007)

Connecting Theoretical Perspectives to the Case Study

Kingdon' s earlier editions of the book *Agendas, Alternatives, and Public Policies*, investigated the deep connections between conflict, social error correction and political agendas. He offered insight as to how society's issues end up on the government agenda as public policy issues. The issues are brought to the attention of legislators, potential solutions are developed, and the "how" and "why" individual issues are carried through the policy process and result in tangible policy measures are explained by Kingdon as the "Garbage Can or Multiple Streams Theory. This theory suggests that learning in public policy occurs but that it may be perverse or accidental rather than logical.

Although Kingdon describes the policy- making as seemingly ambiguous steps to designing a national policy, it was an appropriate concept for the analysis of the "how" and "why" of the Philadelphia lead program. While reviewing the Philadelphia program infrastructure it became obvious that the decision making process coalesced with Kingdon's three relatively independent "streams" of decision making which are "problems, politics, and policies." (Kingdon, 1984)

The examination of the Philadelphia program, within the theoretical framework of Kingdon's Garbage Can Theory was possible, using Robert Yin's (1994) case study design of an *explanatory case study*. This type of case study allows questions to be asked concerning operational links, traced over time that can reveal "why" an organization structure is successful and "how" it achieved that success (Yin, 1994, p.6). Yin also suggests the use of a singular case study can be appropriate when combining two sources of evidence: 1) direct observation of the events being studied, and 2)

interviews of the persons involved in the events. The case study's unique strength is its ability to offer a variety of evidence—documents, artifacts, interviews, and observations of the contemporary event (Yin, 1994, p. 8)

Designing this research as an explanatory case study was appropriate because there were abundant sources of evidence to support the narrative suppositions of the Garbage Can Theory as interpreted by Lindblom, Cohen, March, and Olsen, Kingdon and Lee that policy is designed not just by one organization that tackled a problem and designed a policy with political approval but a coalition of organizations who acted to prevent further lead poisoning, at first, unclear of the process or outcome and relying on whatever support could be gathered by local government, health agencies, local businesses and advocates, but agreeing, a policy was needed that emphasized primary prevention. The advocates were able to move quickly, once resources were acquired, towards a more successful lead poisoning prevention program.

It was also appropriate to use a "purposive sampling technique" which is defined as a method of "purposefully selecting participants or sites (or documents) that will best help the researcher understand the problem and the research question (Creswell, 2003, p. 185). The single case selected was the Philadelphia lead program, which is a unique case that allowed the researcher to focus on the depth of information and utilize expert judgment to answer the research question under investigation (Teddlie & Yu, 2007). A sampling frame is "a resource from which you can select your smaller sample" (Mason, 2002, p. 140) In this study the resource was the individual lead programs of each state. The lead poisoning prevention program situation in the City of Philadelphia illustrated

the best representative sample of a “successful” program and thus was selected as the sample to be examined (Teddlie & Yu, 2007).

In an explanatory case study, a pilot study or Delphi study may be conducted to systematically collect opinions from a panel of experts in the area under investigation. A consensus is developed typically through a series of questionnaires that are presented to the panel members. Their responses are analyzed for patterns and themes and the groups’ opinions, derived from the questionnaires, are provided as feedback in the study process.

The goal of the Delphi process is to systematically facilitate communication of information via several stages of the researcher asking questions, undertaking analysis, providing feedback, and asking further questions. Linstone and Turoff (1975) proposed a view of the Delphi method that summarized both the technique and its objective: "Delphi may be characterized as a method for structuring a group communication process, so that the process is effective in allowing a group of individuals, as a whole, to deal with complex problems". (p. 3)

The one initial problem in this case study was to decipher what were the *critical factors.* That is, the factors that could be used to frame the Philadelphia case study and result in a quantitative narrative that would describe the success of the Philadelphia lead poisoning prevention program. Was the success of the Philadelphia program related to the *critical factors* presented through the opinions of the lead experts who responded to the survey question: *What are the critical factors necessary to create and sustain a successful lead poisoning prevention program?*

Role of the Research

I must interject here that I experienced overwhelming déjà vu while reading Kingdon's theory and going back to Kai Lee's book. I presented a paper circa 1999, entitled, "*Enhancing the Role of the Public in Environmental Policy Making – Did it make a Difference?"* The premise then was that the EPA had pushed a big campaign in 1990 about involving the public in more of their decision-making. The argument was that although the "elitist" within the government invited the "public" to participate, the public view was not respected or accepted. It is apparent that the Federal policies for the National Lead Program are failing in much the same manner. The lead rule as written, and the programs that have been designed around the Federal rule, are not eliminating lead poisonings. Philadelphia's health and housing administrators seriously asked, "What else can we try?"

The role of the researcher is usually placed within the research document to explain any "bias" within the process. My objective in this case study was to be a participant in this qualitative research, and explore ways to improve my role in the lead poisoning prevention program of Nevada. I see my role not just as a teacher, but also as a teacher/researcher interested in learning through self-reflection of my years within the lead program and recording my experiences that may, or may not, have a bearing on the research question.

As the researcher, I bring to this study first-hand knowledge of the lead issues. There is evidence that I was a lead poisoned child, distinctly remembering the sleepless nights and debilitating leg pains that I experienced and suffered as a four and five year old while living in a very old tenement apartment, located on the car congested 1st

Avenue of New York City. A bone density test at age 50 revealed a “lead line” in my right femur. My brother can attest to my aggressive behavior and bears the scars of my ferocious biting attacks on him as sibling in that cramped New York apartment.

Sudden angry outbursts are common in a lead afflicted child, but misbehaving in school in those days was not an option. The attention deficit disorders and learning disabilities—tell tale signs of lead poisoning were not exhibited then. In third grade I did suffer the wrath of my math teacher, who at every chance told me how poor my math skills were compared to my brother. I thought I grew up *OK,* but as I age, I’m wondering if I really did. I now suffer from *Microcytic Hypochromic Anemia*. An iron absorption condition, with no medical remedy for me at least, except intravenous (IV) Iron infusion. Is this a residual effect of being lead poisoned? No one knows for sure at this point but my Hematologist, who is an MD and a Ph.D., finds the question intriguing enough to follow up with his own research.

I believe that I did not suffer the debilitating effects of lead because my mother, who worked in the New York City Osteopathic Hospital, was made aware of the dangers of lead and put me on a diet of frequent meals featuring whole milk, cheese, and liver! It is possible that the calcium in the milk and cheese and the iron in the liver helped me to absorb less lead into the blood stream. Also, I was poisoned at age 5, not at 1 or 2. According to pediatric studies (Lin-Fu, 1973; Needleman, Sewell, & Shaprio, 1979; Silbergeld, 1991; & Lanphear, 2005) this does make a difference because younger children, fetal stage to four years old absorb lead from the intestines to the bloodstream and about 40 percent of the lead ingested remains within the body. As you age, the body absorbs less lead. For example, adults only absorb about 10 percent of ingested

lead. This makes children the highest risk group for lead poisoning (Nadakavukaren, 2006).

I have also speculated that the effects of lead poisoning were lessened because of the repetitive nature of my education at that time. Reading, writing and those never ending multiplication tables actually served me well and allowed my brain to "reroute" and over-compensate for the toxic effects of lead on the brain (Schwartz, 1994 & Lanphear, et.al., 2000).

At age 7 my parents moved the family from the lead-filled atmosphere of New York to a 100-year-old house in Pennsylvania. --- There is something to say about never learning... luckily we lived there less than a year and moved into a row home in Philadelphia with aluminum storm windows, linoleum floors and paneling. I lived in two such houses until college. Safe at last...

Today, as a professional trainer for the U.S. EPA, I have traveled the nation to conduct classes for lead inspectors, risk assessors, lead abatement supervisors and workers, and most recently, home renovators. In this capacity, I have seen a broad spectrum of housing stock throughout of America and witnessed first-hand the failings of many contractors, who were hired to renovate an old house, and subsequently caused the lead hazard due to their lack of knowledge. Contractors are under the impression that lead somehow went away in the 70s and no longer exists in the housing market. Holding on to this notion creates a hazardous scenario for the workers and their clients.

When conducting the contractor training classes, the testimony of their health effects that may be attributed to lead exposure is overwhelming. Descriptions of

memory loss, twitching hands, numb feet, and the more frequent headaches, stomach and leg aches often caused by lead inhalation or ingested while working unprotected from the lead dust. In addition to this anecdotal data, reports on workers poisoned by careless work practices and “do-it-yourself projects are recorded by the EPA and other state health programs (McDonald, 1997)

Since my indoctrination into the “lead world,” I have had the opportunity to visit with many families who have lead poisoned children. I do my best to offer education and empathy and they in turn help me to pass along the information to their communities so that other families can avoid the same dangers. As a researcher with first-hand knowledge of the lead issues nation-wide, I am perplexed as to why lead is still an issue. I wanted to engage in this case study to observe how others have experienced their own lead issues and are working to resolve them. Researching this unique Philadelphia case study may give insight as to “how” and “why” they are succeeding in the reduction of lead poisoning. Is it by sheer circumstance or an established plan?

Definition of Terms

Words defined in this section are to describe terms that are technical and unique to this study. Most are adopted from the U.S. EPA training manuals.

Blood Lead Level: The concentration of lead in a sample of blood. It is measured in microgram per deciliter (µg/dL)

Childhood Lead Poisoning: A symptomatic condition of illness in children between the ages of 12 to 72 months that have a detectable blood lead level at 10 µg/dL or higher.

Chelation: A Food and Drug Administration approved treatment of intravenous chelation therapy, using ethylenediaminetetraacetic acid (or EDTA), for the treatment of lead poisoning.

Disclosure Policy: Section 1018 of Title X, directing home landlords or sellers to disclose the known information on lead-based paint and lead hazards before rental or sale of property units built prior to 1978.

Lead exposure risk: Presence of lead dust and lead chips in the environment with potential to cause lead poisoning through inhalation or ingestion.

Microgram per deciliter (µg/dL): Unit of measurement as applied to lead concentration in the blood. One microgram (µg) is one millionth of a gram. One deciliter (dL) is one-tenth of a liter.

Lead-based paint: A paint material that contains 5000ppm lead per analyzed paint chip sample or 1mg/cm^2 by X-ray fluorescence methodology.

Title X: Law that Congress passed specifically to protect families from exposure to lead-based paint in and around residential homes. It is also known as the Residential Lead-based Paint Hazard Reduction Act of 1992.

X-ray fluorescence - emission of X-rays from irradiated sample: the emission of characteristic X-rays from a sample that has been bombarded by high-energy X-rays or gamma rays (U.S EPA, 2011/lead).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Regulatory Review

S.1811: Lead Poisoning Reduction Act of 2007 was a bill introduced into the 110th Congress: 2007-2008 to amend the Toxic Substances Control Act to assess and reduce the levels of lead found in child occupied facilities in the United States, and for other purposes. This bill was introduced by then Senator Barack Obama (D-IL). This bill never became law, and although it focused only on child-occupied facilities, it did outline a comprehensive lead program designed through the good works occurring in Obama's state of Illinois, particularly in the inner city neighborhoods of Chicago and other cities with severe lead issues.

This program, like others across the eastern United States, were promulgated by Federal mandates and work force guidelines designed to control and eliminate any further poisoning of children from shoddy housing and bad work practices.

United States Environmental Protection Agency (U.S. EPA)

The purpose of the U.S. EPA Residential Lead-based Paint Hazard Reduction Act of 1992, (Title X) is:

(1) To develop a national strategy to build the infrastructure necessary to eliminate lead-based paint hazards in all housing as expeditiously as possible;

(2) to re-orient the national approach to the presence of lead- based paint in housing to implement, on a priority basis, a broad program to evaluate and reduce lead-based paint hazards in the Nation's housing stock;

(3) to encourage effective action to prevent childhood lead poisoning by establishing a workable framework for lead-based paint hazard evaluation and reduction and by ending the current confusion over reasonable standards of care;
(4) to ensure that the existence of lead-based paint hazards are taken into account in the development of Government housing policies and in the sale, rental, and renovation of homes and apartments;
(5) to mobilize national resources expeditiously, through a partnership among all levels of government and the private sector, to develop the most promising, cost-effective methods for evaluating and reducing lead-based paint hazards;
(6) to reduce the threat of childhood lead poisoning in housing owned, assisted, or transferred by the Federal Government; and
(7) to educate the public concerning the hazards and sources of lead-based paint poisoning and steps to reduce and eliminate such hazards" (Section 1003, p. 2)

The scope and applicability of this law is to accredit states to enforce their own lead laws; accredit training programs to educate a workforce on lead safe work practices; certified individuals to contract for lead inspection or abatement work; set fees for certification; and enforcement. The EPA works together with HUD and CDC to set standards for what are dangerous levels of lead in the environment, a house or school and the toxicity levels for the body (U.S. EPA Public Law 102-550, 1992).

Housing and Urban Development (HUD)

The U.S. Department of Housing and Urban Development (HUD) issued *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, June 1995*. These *Guidelines* were issued pursuant to Section 1017 of the Residential

Lead-Based Paint Hazard Reduction Act of 1992, which is referred to as Title X because it was enacted as Title X of the Housing and Community Development Act.1992 (HUD, 2011).

Section 1017 of the Act requires the Secretary of the U.S. Department of Housing and Urban Development to issue "guidelines for the conduct of federally supported work involving risk assessments, inspections, interim controls and abatement of lead-base paint hazards." Therefore, the primary purpose of this document is to provide guidance to people involved in identifying and controlling lead-based paint hazards in housing that is associated with the Federal Government. The guidelines could be useful to individuals in housing that have no connection with the Federal government, as well as day-care centers and public buildings that exhibit conditions similar to those in residential structures (HUD, Executive Summary, 1995).

The *Guidelines* complement regulations, other directives issued by HUD, the EPA, and OSHA. The *Guidelines* are based on the concepts, definitions, and requirement set forth by congress in Title X of the Housing and Community Development Act of 1992. HUD expected to issue revisions and updates that would incorporate advances in technology and more cost effective methods validated by research and experience. Since that time, the only update to the guidelines has been the lowering of the dangerous levels of lead for clearance purposes. As an example, the clearance level for dust on the floor was at 100μg/ft^2 and is now 40μg/ft^2 (U.S. EPA, 1995, September 11; U.S. EPA 2001, January 05).

Centers for Disease Control and Prevention

The *Building Blocks for Primary Prevention: Protecting Children from Lead Based Pain Hazards*, (CDC, 2005) is a comprehensive CDC publication that offers 70 "building blocks" which are primary prevention strategies that were considered by state and local governments and others in position to reduce exposure to hazards in housing and developed to help meet the healthy People 2010 goal of eliminating childhood lead poisoning.

The report underscored a broad spectrum of strategies categorized as:

- Building Awareness and Public Support
- Building Capacity for Lead Safety
- Collaborations, Partnerships, and Incentives
- Financing and Subsidies
- Lead Safety and Healthy Homes Standards
- Targeting High Risk Housing
- Using Code Enforcement and Other Systems

This strategic plan for elimination of lead poisoning included primary prevention, partnering and program evaluation. Through this *Building Blocks* publication, the CDC Lead Poisoning Prevention Branch offered "grantees and others access to a compendium of promising primary prevention approaches to reduce exposure to lead paint hazards" (CDC. 2005, p. ii).

The research for the *Building Blocks* was guided by the descriptions of primary prevention in CDC's 1997 screening guidelines and 2002 case management guidelines, which emphasized elimination and controlling toxic exposures at the source (CDC,

2005, p. iii). It is crucial to emphasize here that the "Primary Actors" that contributed to the building block suggestions did not come from any of the western regional states guided by Federal Law, namely Idaho, Wyoming, Montana, Nevada, Arizona, or New Mexico.

While no city or state with a significant stock of leaded housing has successfully assembled all of the elements needed to make primary prevention a reality across its jurisdiction, state and local lead poisoning prevention programs across the country and their partners in other agencies and the private sector have implemented a multitude of innovative and successful primary prevention strategies over past years. The prospect of replicating an entire program with multiple components and elements can be daunting to the evolving Community Lead Poisoning Prevention Programs. The multitude of innovative strategies to identify, control, and prevent lead hazards in housing before a child is poisoned, that are currently being implemented across the country, have never been systematically documented or described in a way that makes information about their design and implementation readily accessible. Programs and their jurisdictions need this information at the building blocks level in order to decide which strategies to pursue based on local needs and conditions. (CDC, 2005 p.iii)

The document acknowledges that primary prevention encompasses activities that address all sources of exposure to lead but that primary prevention, as guided by the *Building Blocks* document, would focus on strategies for preventing and controlling lead hazards only in housing.

Occupational Safety and Health Administration (OSHA)

The Occupational Safety and Health Administration's rules set in 29 CFR 1926.62 also plays an important role in the lead agenda by setting the safety guidelines for workers who perform lead renovation or abatement. The scope of the worker rule states,

This rule applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead by 29 CFR 1910.1025(a)(2) is covered by this standard. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating (OSHA, 2011).

The OSHA standard for lead in construction relates to the primary prevention of lead poisoning by setting the threshold at which workers can be exposed to lead dust. Dust exposure above this limit requires the use of personal protective equipment (PPE). The threshold limit is ($50\mu g/m^3$ of lead dust exposure over a time-weighted average (TWA) of 8 hours (OSHA, 2011). The workers are trained to allow no dust to remain on the floor after renovation in amounts greater than 40 millionths of a gram ($40ug/ft^2$) on any square foot of the floor (U.S. EPA, 2001, January 2005).

To achieve this ultra clean level (clearance), the workers, at the completion of the renovation or abatement, must vacuum with a High Efficiency Particulate Air (HEPA) vacuum and wet- wash the entire area that was disturbed by the construction work. The work area must be wipe-sampled by a certified lead inspector. The dust wipe sample is mailed to an EPA approved laboratory – a National Lead Laboratory Accreditation Program (NLLAP) Laboratory—to be examined for any residual dust. The contractor is

"cleared" if the wipe does not present anything greater than 40μg/ft^2 of dust. If achieved, the home or apartment is "lead hazard free" and the occupants can assume they are moving into a lead safe property. According to EPA regulations (U.S. EPA, 40 CRF, 745.80, 2011), the contractor is then cleared from the project but must keep all records pertaining to the project for at least three years.

Title X: Contradiction

Unfortunately Title X is inherently flawed as it pertains to the primary prevention of lead poisoning because as the law states, "... nothing in this subpart requires the owner of property(ies) subject to these standards to evaluate the property(ies) for the presence of lead-based paint hazards or take any action to control these conditions if one or more of them is identified" (U.S. EPA, 1996).

The latest revision to Title X is (745.80, Subpart E) and this new rule for Renovation, Repair and Painting (RRP), was promulgated in 2008 and revised on October 5, 2011. The rule was written to protect workers during common renovation activities in pre -1978 homes or schools. Common renovation activities like sanding, cutting and the demolition of components containing lead paint can create hazardous lead dust, which can be harmful to adults and children (U.S.EPA, 2011).

To protect against this risk, EPA issued the RRP rule and required all contracted firms to be registered with the EPA and to be trained and certified in lead-safe work practices, which include:

- Containment of the work area
- Minimize the proliferation of dust.
- *Clean up thoroughly* (emphasis added).

Another inherent flaw in the rule, as it pertains to primary prevention, is the contractors' new given directive to "clean" instead of "clear." There is no way to assure the property is "lead hazard free" without dust-wipe testing. Cleaning with a rag as opposed to cleaning and clearing by laboratory analysis will not help eliminate lead poisonings if there is no assurance that the rehabilitated properties are not free of lead dust.

David Jacobs, Ph.D., CIH and Research Director of the National Center for Healthy Housing presented a written statement to the United State Senate Environment and Public Works Committee to present evidence that the prevalence of lead-based paint hazards in U.S. housing, uncontrolled housing renovation, repair and painting activities will cause lead poisoning; and the evidence was overwhelming (Jacobs, et.al., 2007). The National Center for Healthy Housing and others reviewed the new EPA rule that was proposed and found the regulation to be "badly flawed." The rule, as written, would allow methods such as power sanding and abrasive blasting and burning of lead paint. These methods were prohibited in federally-assisted housing and in local jurisdictions. This new EPA rule is for contractors such as kitchen remodelers or small business contractors not working on HUD housing posed the question: "Why should children living in unassisted housing receive no protection, while those living in federally- assisted housing are protected?" (Jacobs, 2002, p. 7)

As the researcher and trainer of this "Remodeler" course, I have first-hand knowledge that the rule was open for review by the public and the EPA welcomed any comments. Although the lead professionals and other stakeholders emphatically

contested the rule's shortcomings, the October 5, 2011 version of the RRP rule did not improve over the interim rule published in 2008.

Too much ambiguity was left in the rule regarding renovation versus abatement practices, and the contractors can still "clean" instead of "clear" their projects. It also did not address lead exposures from "do-it-yourself" projects other than to declare that homeowners could do their own repairs, provided they were not receiving any monetary compensation. The only time it is recommended that the homeowner does not engage in their own lead abatement is if they intend to rent the property, or if they already have a child with an elevated blood level (EBLL) living on the property. In those cases, a certified professional should be hired to perform the abatement of the lead hazard (U.S. EPA, 747-K-00-001, July, 2000, p. 6).

The EPA laws, as they pertain to the elimination of lead poisoning, have deteriorated since the original ruling was promulgated in 1992 (Needleman, 1998; Jacobs 2007). Author, John Kingdon, as part of his Garbage Can Theory claimed that problems may rise on governmental agendas, but they also fade from view (Kingdon, 2003, p.198). Has the EPA lost sight of the lead poisoning problem?

In 1987, Congress concluded that responding to lead-based paint hazards on an individual basis, only after a poisoning, was *inappropriate.* The Housing Act of 1987 (P.L.100-242) directed attention to finding and abating lead-based paint in housing to prevent lead poisoning and promoted *primary prevention*. At the time the presence of lead-based paint on any and all surfaces was considered to be a hazard, and permanent abatement of all lead-based paint was deemed the only appropriate response.

Although 64 million homes were estimated to contain lead paint hazards, the requirements for action were limited to conventional public and Indian housing. HUD's 1990 *Interim Guidelines*, and subsequent 1995 *Guidelines*, which evolved from this statute, properly emphasized the danger of lead-contaminated dust in all pre-1978 housing and the need for worker protection and proper protocols to thoroughly clean up and clear all pre-1978 properties to support the new directive for primary prevention.

Title X states that a "lead-based paint hazard is any condition that causes exposure to lead from lead-contaminated dust; bare, lead-contaminated soil; or lead-based paint that is deteriorated or intact lead-based paint present on accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects" (HUD-Executive Summary, 1995, p.1-8). These hazards, if renovated as the RRP rule suggests, will continue to cause lead exposure and lead poisonings which is contradictory to the EPA, HUD and CDC's commitment to promoting the elimination of lead poisoning, as written for the 2010 goals (Jacobs, 2007). If no serious actions are taken by the EPA to assure properties are cleared of their lead hazards and no drastic measures are taken to abate a child's environment of the ubiquitous lead toxins, then what will change by 2020?

Framing the Case Study within the Garbage Can Theory

Developed by Cohen, March and Olsen (1972), the Garbage Can theory presumes that "organizational decision making resembles an organized anarchy characterized by problematic, unclear technology, and fluid participation." The RRP rule is an excellent example of a policy that is problematic and certainly unclear... simply stated, "what was the EPA thinking!"

The opportunity to make a better decision is described as a garbage can into which broad selections of problems are generated and solutions are deposited (Cohen, et al., 1972, p. 2). As stated previously, Kingdon's theory, adapted from Cohen, has problems, solutions, and participants moving from one choice to another, in a set amount of time, and the problem solved depends on a relatively complicated inter-meshing of elements. These elements, which are labeled "streams," include the combination of choices that are available at any one time, the combination of problems, the combination of solutions that are in search of problems, and the external requirements placed on the decision makers (Kingdon, 2003).

The key to understanding the decision making process is the intertwining or "coupling" of the various streams, which is determined by temporal sorting. Temporal sorting is the process in which problems and solutions that arise at the same time become linked in choice opportunities, rather than by a rational fitting of solutions to problems (Lipson, 2007).

Kingdon also suggests that sometimes the solution to an environmental problem is found at a time when the national "mood" is right for the solution to be found. Economist, Robert Heilbroner, is known for looking at the big picture and warned in 1974 that environmentally what lies ahead is "change forced upon us by external events rather than by conscious choice, by catastrophe rather than by calculation" (Lee, 1993, p. xi). This could describe the reaction to the lead poisoning catastrophe when it was linked to leaded gasoline emissions. Change was forced upon the automobile industry to stop using leaded gasoline. Similarly, paint companies were forced to stop putting lead in paint in 1978 when contaminated housing became an environmental injustice

issue (CDC, 2002). The latest catastrophe is lead in food items, most notably lead-contaminated candies from Latin America which have gained attention in the public media and medical literature (Public Health Trust, 2008)

The premise of Kai Lee's acclaimed book, *Compass and Gyroscope: Integrating Science and Politics for the Environment* is to consider "adaptive management" as a tool to draw concepts from a variety of disciplines such as political pragmatics and interest group bargaining to look at what he calls civic science to resolve environmental issues concerning resource use (Lee, 1993). Lee's work is based on Kingdon's theory that governmental policy "is forged with organized anarchy and happens with a crisis, opportunity, and a receptive administration" (Lee, 1993, p.158).

There has been surprisingly little discussion about how we can or should undertake institutional and political changes of unprecedented scale and durability to actually eliminate lead poisoning. Changes are argued to be a necessity, and left at that, or proclaimed as a moral imperative, and left at that. It may be possible to demonstrate how science and politics, can in the appropriate combination, build a culture within the national program to finally eliminate lead poisoning. Lee, like Kingdon, could not "sell the solution," but instead presented a promising approach to a sustainable policy (Lee, 1993,p. xi).

Lee's approach is to describe the social learning needed to search for sustainability. *Adaptive Management* is the synthesis of science and policy that treats policies as large-scale experiments. *Bounded conflict* is a combination of politics, negotiation, and other means of promoting uncomfortable change, which provides tools

for establishing shared goals and probing the bounds of cooperative effort (Lee, 1993, p.16).

Large programs, such as the national lead poisoning prevention program may offer the possibility of observing cumulative and large-scale effects but the problems of the inner city may be different than those of rural districts. Lee states that researchers should not disparage if the knowledge is incomplete, but rather understand the differences and glean from the situation (Lee, 1993, p. 12).

Cohen, March and Olsen (1972) developed the concept of the garbage can model and Kingdon revised it to explain the construction of a national policy. Lindblom set the stage to think outside the box of rationalism, and Lee called it "adaptive management" and came to think of science and democracy as the compass and gyroscope. This statement made by Kai Lee is very apropos for this study: (Lee, 1993)

> I came to think of science and democracy as the compass and gyroscope – navigational aids in the quest for sustainability. Science linked to human purpose is a compass: a way to gauge directions when sailing beyond the maps. Democracy, with its contentious stability, is a gyroscope, a way to maintain our bearing through turbulent seas. Compass and gyroscope do not assure safe passage through rough, uncharted waters, but the prudent voyager uses all instruments available, profiting from their individual virtues. (p.6)

Overview of the Use of Case Study and the Garbage Can Theory

There were no studies in the literature that detailed any case study involving the analysis of a lead program(s) by means of using the Garbage Can Theory, but there are studies that do research the complexity of environmental policymaking using Kingdon's

Agendas work. His research describes the "how" and "why" policy issues rise and fall from the U.S. government agenda.

Kingdon argues that the lower the visibility of an issue, and the less ideological and partisan the debate about it, the greater the influence of interest groups. He identifies the major actors and their influences in the agenda-setting process, revealing that different policies drive different politics and decision-making patterns. The "policy entrepreneurs" look for connections between the politics and policymaking. These entrepreneurs are persistent and look for "windows of opportunity" for action (Kingdon, 2003, p. ix). It is possible to use this concept to examine the lead poisoning prevention program of Philadelphia, Pennsylvania and determine if the Kingdon theory influenced their organizational design.

Although Philadelphia's lead poisoning prevention program was the only event studied it is possible to validate this study using defined parameters and established objectives (Hamel, 1993; Yin, 2003). This qualitative case study did satisfy three tenets in its methodology: *describing* the Philadelphia program, *understanding* it purpose and mission, and explaining "how" and "why" the program is a success (Yin, 2003, p. 119).

The examination of the Philadelphia program constituted a unique study that defined an "explanatory" case, suitable for finding the causality (critical) factors for the program (Yin, 2003). Case studies make up a large body of work in the area of law and medicine. Juxtapose this research, involved federal law and lead poisoning, the evaluative application of the case study can be used to determine the critical factors – the *unit of analysis* in this case study—to maximize what can be learned by the *system of action* (the Philadelphia program) in the case (Tellis, 1997).

According to Feagin, Orum, and Sjoberg (1991), the quintessential characteristic of a case study is a *holistic* approach to analyzing a *cultural system of action*. In this case study, the Philadelphia lead program is the cultural system of action and the interrelated *critical factors* are the bounded system of interest (Stake, 1995). An explanatory case study is suitable for doing causal studies in a very complex and multivariate case. The Philadelphia case fits this description well enough to be certain that the explanatory case study is the best method of research for this event.

Yin (1994) states that internal validity using the single-case explanatory design can be achieved by using multiple sources of evidence as the way to ensure construct validity. The current study used multiple sources of evidence, specifically a survey instrument, interviews and documents to triangulate the evidence and evaluate the Philadelphia experience. The unit(s) of analysis providing the internal validity, as the Garbage Can Theory was explored, were the *critical factors* as presented by the experts. The theoretical relationship lies in the concept that the success of the Philadelphia program was achieved through the utilization of the critical factors, but as Kingdon suggest, the pathway to that success may be more complex.

Theories are developed and data collection and analysis test those theories. According to Yin (1994), external validity is more difficult to attain in a single-case study, but he ascertains that the external validity could be achieved from theoretical relationships, and generalizations could be made by pattern matching techniques.

Taking a little literary freedom with this concept, a simple survey of the lead program experts was conducted to ask their opinion for “What are the "critical factors" necessary to create and sustain a successful lead poisoning prevention program?” The

answers were analyzed for the patterns in their written opinions and the frequency with which the same critical factors were given. The factors that emerged presented a very clear list of critical factors with which to frame the research and study the Philadelphia program.

This research used the explanatory case study method within the theoretical framework of the Garbage Can Theory to describe, understand, and explain the learning processes within a policy network of organizations and individuals that influenced the management of a system governed by a Federal law structure (Kingdon, 1995). This same method has been used in conjunction with hazardous system research, although different from urban lead poisoning, the case structure is similar and the researcher learned from focused events and sudden, unusual, and widely know events that focused public and political attention on a policy issue (Birkland, 1997).

Case One:

George Busenberg, a former professor of this researcher, who wrote specifically about *hazardous systems,* namely oil and radioactive waste (Busenberg, 2000, 2001), used Kingdon's theory, among others, to propose the idea that a network (organization) could use learning arrangements in the pursuit of safety. As suggested by Birkland (1997), the ability to learn from focused events or sudden, unusual, and widely known events can focus public and political attention on a policy issue. A focusing event can elevate the prominence of that issue on a governmental agenda (Kingdon, 1995). Dr. Busenberg used the case study of the marine oil trade in the Prince William Sound as his environmentally hazardous system. His impetus to study this trade system was the Exxon Valdez oil tanker spill of 1989.

His approach was to research: 1) the evolution of policy over time (Baumgartner & Jones, 1993; Sabatier, & Jenkins-Smith, 1993), 2) the process of learning in organizations (Lipshitz, Popper, & Oz, 1996; Edmondson, A., & Moingeon, B., 1999) and, 3) the management of hazardous systems (Sagan, 1993; Perrow, 1994). He complimented his research using a case study that used interviews and document analysis to gather data from respondents working within the regional oil industry. The report generated by the data he collected provided a highly detailed chronology of events in this policy domain.

Case Two:

Anne Tiernan and Terry Burke are social researchers from the Swinburne University of Technology, Melbourne, Australia who wrote "A Load of Old Garbage: Applying Garbage-Can Theory to Contemporary Housing Policy." I do not interact with these researchers directly, but have colleagues in Australia who are members of the *Leadnet* email group and as such keep the group of subscribed lead professionals informed of the policy adoptions and changes in Australia that correlate with the U.S. EPA lead policies.

According to the Lead Group, Inc., in some areas of Sydney, Australia 1 in 5 children, under the age of five are lead poisoned. It is almost eerie how the housing situation in Australia mimics that of the U.S. even though their early studies of lead poisoned children began in 1904 (The Lead Group, 2004, May 07). The harmful effects from the exposure to lead based paint were first reported in Brisbane, Australia, in 1892. In Queensland, Australia, perhaps because of these early studies, the use of lead paint

on a wall lower than 4 feet from the floor or on porches and stair banisters was banned in 1922 (Christophers, 1999).

Applying the Garbage Can Theory to the contemporary housing policy of Australia is a study using Kingdon's model of agenda setting and alternative specifications for understanding the complexities of policy-making in the housing realm. The Garbage Can Theory rejects conventional policy-cycle models, which visualize policy development processes as rational and underpinned by the logic of problem solving. It assumes a loose relationship between problems and the policy solutions offered by national governments.

This Australian housing policy case study can demonstrate the usefulness of the Kingdon Garbage Can Theory. Here, the authors modified the framework to explain how the housing policy agenda has been narrowed to focus on "safety-net assistance" for the most disadvantaged, while general housing problems continued to worsen. Their study concluded that, in 2002, rent assistance was the major form of housing assistance, yet public housing had been greatly weakened and many housing problems were worse than a decade ago.

The explanations for the failed policy were that "the wrong problems and the wrong policies were coupled together to become the agenda for reform at the beginning of the 1990's. The housing issue began in 1990 and by 2002 remained unsatisfactory. The author's of the study suggested that "little capacity to shift the agenda to policy directions which might create actual improvements in the housing system exist" (p.90). They argued that the chaotic nature inhibits, and arguably precludes, rational decision-

making or problem solving. Discovering pathways out of their policy malaise will be a challenge.

Similarly, there is a challenge to discover why the goals of the U.S. national lead poisoning elimination program have not been met. My study is borne out of this dilemma and the answer to this dilemma may be discovered within the confines of one explanatory case study, the city of Philadelphia Pennsylvania lead poisoning prevention program.

My research used a qualitative case study approach as its basic methodology to ascertain if the implementation of the Philadelphia program had a unique policy infrastructure that is based upon some construct of critical factors which enhanced the program administrators ability to problem solve and decide to detour from the national program guidelines and achieve the "exemplary" status for the their lead program. Differences in the implementation of a public policy can occur for a variety of reasons (Sabatier & Mazmanian, 1980). The reasons for the Philadelphia success story can be researched through an explanatory case study as a complex phenomenon that can culminate in a lesson learned for the fledgling western state lead programs.

Government Policy and Budgeting for Lead Programs

The Lead Contamination Control Act of 1988 authorized the Centers for Disease Control and Prevention (CDC) to initiate program efforts to eliminate childhood lead poisoning in the United States. As a result of this Act, the CDC Childhood Lead Poisoning Prevention Program was created, with primary responsibilities to develop programs and policies, educate the public, provide funding, support research and the formation of collaborative relationships between CDC and its funded partners and other

lead poisoning prevention organizations and agencies (e.g., community-based, nonprofit, and housing groups) for the purpose of eliminating lead poisoning by 2010 (CDC, 1992).

Since its inception, the CDC childhood lead poisoning prevention effort has funded nearly sixty childhood lead poisoning prevention programs, provided technical assistance to state and local screening programs, linked health departments with Medicaid agencies, which, in turn, linked surveillance and Medicaid data, and resulted in 46 states reporting data on blood lead levels (CDC, Lead, 2011).

On November 29, 2011, HUD issued the *Notice of Funds Availability* (NOFA) in the amount of $ 61,000,000 for the Lead Hazard Reduction Demonstration Grant Program and the Lead-Based Paint Hazard Control Grant Programs. To be eligible to apply for funding under this NOFA, the applicant must be a State, a Native American Tribe, city, county/parish, or other unit of local government. Multiple units of a local government (or multiple local governments) may apply as a consortium; however, a principal (lead) applicant must be identified that will be responsible for ensuring compliance with all requirements specified in the NOFA. State government and Native American tribal applicants must have an Environmental Protection Agency (EPA) authorized lead-based paint training and certification program in place.

> The purpose of the Lead Based Paint Hazard Control Program and the Lead Hazard Reduction Demonstration Grant Program is to assist States, Native American Tribes, cities, counties/parishes, or other units of local government in undertaking comprehensive programs to identify and control lead-based paint hazards in eligible privately owned rental or owner-occupied housing, with the exception that the Lead Hazard Reduction Demonstration Grant Program is targeted for urban jurisdictions with the greatest lead-based paint hazard control needs. (HUD-Docket No. [FR-5600-N-04], 2012)

Organizations involved in the elimination of lead poisoning had until January 18, 2012 to apply for up to $2,300,000 to sustain their existing programs, or to initiate new ones (HUD, 2012).

Based on recommendations of an EPA, HUD, and CDC interagency working group tasked to plan the lead elimination goal, the *Federal Strategy for Eliminating Childhood Lead Poisoning* (CDC, February, 2000) built upon the CDC, 1997 recommendations and emphasized the essential need to require action before children were poisoned.

Resources (grants), already provided through the EPA, HUD and CDC, helped state and local health department lead poisoning prevention programs screen children for blood lead levels and perform environmental investigations to determine the source of childhood exposure. The health districts were tasked to follow up with the elevated blood lead cases (EBL) and manage the child and family with either medical chelation treatment or less invasive procedures for removing lead from the child's environment, and providing education and follow up care.

The CDC along with HUD, EPA, U.S. Department of Health and Human Services, the Centers for Medicare and Medicaid and the Office of Community Services cooperated to fulfill the commitment to eliminate lead hazards. This goal was established in 2000 with a projected date for elimination of lead poisonings by 2010.

With all the millions spent and guidance provided; this goal has not been met. As noted, the percentage of children with elevated blood lead levels has dropped from 77.8% to 4.4% in children ages 1- 5 years with BLLs equal to or greater than 10µg/dL (CDC, 2005b) and the known contaminated housing stock is estimated to be less than

30 million, down from 64 million homes (U.S. EPA, 2012). However, certain populations, such as minorities of low income, living in older homes are still at risk and the western state children and housing are still to be assessed.

Within the Federal government, a Federal Interagency Workgroup (FIW) led the Healthy People 2020 development effort. The FIW members include representatives from U.S. Department of Health and Human Service agencies including the U.S. Department of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA). Oddly, the new Healthy People 2020 plan is absent of any lead hazard elimination guidance. This is a very different policy and a disturbing discovery if it indicates that the Federal government will no longer support a national lead poisoning prevention program (Healthy People.gov, 2012)

CHAPTER THREE

METHODOLOGY

This study's research design was based on the qualitative explanatory case study (Creswell, 2003, 2007; Glesne, 2006; Merriam, 1998; Yin, 2003). The focus of this particular type of case study is to reveal the "how" and "why" of a phenomenon within a real-life context. According to Yin (1994) the explanatory case study can be generalized to a broader and complex set of actions. The single case study can be the basis for significant explanations and generalizations.

The Philadelphia lead poisoning prevention program was the single case study purposefully selected based on its exemplary reputation. Miles and Huberman (1994), discuss four aspects regarding the selection of particular participants or sites for study. The *setting* is Philadelphia. The *actors* are those lead professionals surveyed and interviewed. The *event* is the lead poisoning prevention program under study. The *process* is the evolving lead poisoning prevention program of Philadelphia from 2002 to present. (Creswell, 2003, p.185)

Each facet of the study was appropriate to a) define the critical factors relative to the case; b) frame the research study within the boundaries of critical factors, and c) use multiple sources of evidence to validate the explanatory case study to reveal the "how" and "why" the Philadelphia program emanates success.

Yin (2003) suggests that, "an explanatory case study can connect operational links over time, rather than mere frequencies or incidence," thus this study was appropriate to discover "how" the Philadelphia "operation" gained its success and "why"

that program can succeed in the goal to reduce childhood lead poisoning while other states programs struggle with the task. (p.6)

The explanatory case study design can be used to give special attention to completeness in observation, reconstruction, and analysis of the case under study. The results may be generalized and instrumental to lead poisoning programs outside of Philadelphia. Stake (1995) and Yin (2003) identify at least six sources that can be used as appropriate data for evidence collection in case study research. These sources are:

1. Documents
2. Archival records
3. Interviews
4. Direct observation
5. Participant-observation (ethnography)
6. Physical artifacts (Yin, 2003, pp.85-96)

This study incorporated five of the six sources of evidence, excluding only the physical artifacts-- Unless you count a lead-free house or non-poisoned child as an artifact. The research results were triangulated from these sources to produce a valid study. The use of allows for multiple sources of evidence to converge on lines of inquiry and increase the accuracy of the findings or conclusions of the case study (Yin, 2003). The Philadelphia lead poisoning prevention program was the phenomenon reviewed and the use of the explanatory case study was aimed at corroborating information from multiple sources of evidence fundamentally providing multiple measures of the Philadelphia phenomenon. Carrying out a variety of data collection techniques, the investigation can

sample and analyze historical documentation, archival records and include the design and conduction of a survey (Yin, 2003; Yin, 2009).

This study followed a "purposive sampling" scheme (Tiddle & Yu, 2007, p.200; Creswell, 2003, p. 185) and sampled a particular program that represented a unique case that could be compared to other lead programs, particularly those of the western region of the United States. This sampling technique is primarily used to select units associated with answering a research study's questions. According to Maxwell (1997) the units sampled could be, "particular settings, persons, or events deliberately selected for the important information they can provide that cannot be gotten as well from other choices." (p.87)

Research Design

The case study methodology was appropriate for this research because the question being asked investigated a real-life environment. According to Yin (2003),

> An explanatory case study should be used when three conditions are met: (1) the research question asks how or why; (2) the investigator is not required to have control over the event being studied; and (3) the focus is on a contemporary event.
>
> Yin's technical definition of a case study is "an empirical inquiry that investigated a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident... the case study investigation copes with the distinctive situation in which there will be many more variables of interest than data points. As one result relies on multiple sources of evidence, the data needs to converge in a triangulating fashion. (p.13-14)

Designing the Case Study within the Garbage Can Theory

The Philadelphia lead program is a contemporary phenomenon, a unique situation with many variables associated with its organization and function. As a

singular study the data points are not extensive but very relative to the study of the *critical factors* that may explain the success of the program.

Using a case study for theory development includes the potential for achieving a valid and strong procedure for achieving a good hypothesis, which, in turn, is useful in examining the role of the causality in the context of the individual case. This case study method was appropriate for addressing the causal complexity of the Philadelphia program and determining whether or not the program progression was due to the facilitators structuring the program by way of the "building blocks strategies" or in a more serendipitous phenomenon as Kingdon's Garbage Can Theory would suggest. There are several theory building research objectives, and the one that is appropriate for this study is – "building block studies of particular types or subtypes of a phenomenon, which identify common patterns or may be parts of larger contingent generalizations and typological theories" (Alexander & Bennett, 2004, p. 76).

The subtypes of phenomenon studied in the Philadelphia experience were based on the *Building Blocks* document (CDC, 2005), which offered strategies to be followed to eliminate lead poisoning. The report underscored a broad spectrum of strategies categorized as:

- Building Awareness and Public Support
- Building Capacity for Lead Safety
- Collaborations, Partnerships, and Incentives
- Financing and Subsidies
- Lead Safety and Healthy Homes Standards
- Targeting High Risk Housing

- Using Code Enforcement and Other Systems

It was hypothesized that these building blocks could be the *critical factors* for success in a lead poisoning prevention program.

For this dissertation research, the review of the historical data on lead programs revealed the breath of policy issues and the need to address and develop new and more efficient integrated programs for the western region of the nation. The research began with the notion that a successful lead poisoning elimination program, with a reported 51% decrease in lead poisoning cases since 2002, must have some *critical factors* that made the program a success and had the experts from other programs labeling the Philadelphia program "exemplary." The factors used to explore the Philadelphia phenomenon were derived from the list created by the membership of the *Leadnet* which consists of a very diverse group of lead professionals that either instruct for, or assess and abate lead hazards from our nation's housing stock. According to the *Leadnet* facilitators, there are 957 *net* members and the site is maintained by the National Center for Healthy Housing.

Discovery of the Critical Factors

The question *"What are the "critical factors" necessary to create and sustain a successful lead poisoning prevention program?"* was presented to the *Leadnet* membership with no definition as to what a critical factor might be. No member was privy to the research theme and no discussion was offered. The membership was given about a week to respond. The list of factors that were given with the most frequency were categorized and served as the research design *units of analysis* and framed the case study of the Philadelphia lead poisoning prevention program.

Data Collection

The Philadelphia story was framed within an explanatory case study, but a related theoretical premise was proposed to explore "why" the Philadelphia program achieved success. Could the success be explained through the Garbage Can Theory, which speculates that some series of serendipitous events occurred that allowed the program to be successful?

There were three forms of information collected; (1) historical information, (2) survey results, and 3) an informal interview of the Philadelphia lead poisoning prevention program manager and public health director. The historical data is a series of documents generated by the Philadelphia lead program associates, national blood-lead epidemiology studies and national documents pertaining to the lead poisoning prevention program as it developed in Philadelphia. The survey consisted of the "pilot" question asked of the *Leadnet* experts as to their opinion on what should be the critical factors used to frame the case study.

The informal interviews followed the methods proposed by (Kvale 1996; Yin, 2003; Creswell, 2003) who instruct the researcher to conduct interviews with unstructured and generally open-ended questions that are few in number and elicit views and opinions from the participants with a mutual interest in the topic. (Creswell, p.188)

Limitations and Delimitations

The use of Philadelphia's lead poisoning prevention program as the only case being studied allows for detail and specificity within this case (Yin, 2003). That is not to say that no other lead programs could have been selected from the National Lead Poisoning Prevention Programs established since 1992 and have been successful in reducing lead poisonings. Philadelphia's program was selected as an "exemplary" example of a long-standing, successful program and served as the purposeful sample study due to its historical and quantifiable success rate.

The researcher's present involvement with the lead program could be considered a limitation because of the professional investment, demonstrated over many years, may affect the researcher's perception and prior experience may bias the interviews. This inference perpetuated the need to survey the *Leadnet* professionals and gather their opinion on the definition of the critical factors needed to frame this study.

Yin (2003) suggests that a pilot study can be used methodologically to provide information about relevant field questions and about the logistics of the field inquiry (p.80). With this inquiry method in mind, the framework for this case study was designed from an initial inquiry of lead experts. The members of the *Leadnet* offered a congenial and accessible group of informants that had expert knowledge about lead program organization and could offer a valid answer as to what they thought the *critical*

factors were that may lead to a successful lead poisoning prevention program. Although this was not a formal pilot study, or "trial" case, it did suffice as a procedure to help refine the data collection plans for this case study (Yin, 2003).

The explanatory case study was an excellent research design for the study of the Philadelphia lead program because the methodology offered a holistic and meaningful investigation into a unique and real-life event (Yin, 2003). It allowed this researcher, who was personally interested in the process, to seek an in depth understanding of the program infrastructure, mission, policies and personnel that promoted the success of the Philadelphia lead poisoning prevention program.

CHAPTER FOUR

RESULTS

Determining the Critical Factors

The ultimate goal of this explanatory case study was to discover what *critical factors* are intrinsic to the Philadelphia lead poisoning prevention program and *how* and *why* did these factors contribute to its success. The theoretical framework associated with this explanatory case study was the John Kingdon Garbage Can Theory and as suggested, could this theory be attributed to the program's successful outcomes.

The data collection for this study followed the sources of evidence suggested by (Yin, 2003) and focused on documentation, archival records, interviews, a survey, and direct observation. The archival records gave a historical perspective into the ubiquitous intrusion of lead into our environment and culture. Past studies of lead poisonings and policies, developed to combat the epidemic, revealed the shortcomings of the lead poisoning prevention programs or absence of any coherent program and cultivated the idea for this study.

The professionals, involved in the state lead programs, and who subscribe to the email system "*Leadnet*" were surveyed and given the opportunity to answer this question, "What are the "critical factors" necessary to create and sustain a successful lead poisoning prevention program?" No explanation or prompting was given to define what was meant by "critical factor." It was a simple survey question presented so as to 1) reduce the researcher's bias as to what the critical factors should be, and 2) give credence to the framing of the case study which analyzed the Philadelphia lead poisoning prevention program in light of the factors presented by the lead experts. Guba

and Lincoln (1981), and Miles and Huberman (1994) suggest methods for developing categories that are plausible and help to illuminate the important dimensions of the data. In this case the data is the expert's opinions of what are the critical factors that are essential to the success of a lead poisoning prevention program.

Yin, 1994 suggests that an interview is an important source of case study information and can expand the depth of the study by highlighting the perspectives and causal inferences of the program forerunners. The Project Manager of the Philadelphia Community Lead Poisoning Prevention Program and the Director of the Philadelphia Public Health Department were interviewed in an unstructured manner through email. These two interviewees were selected because of their direct involvement in the change efforts and were key players in the Philadelphia program improvements.

Analysis of the expert's responses revealed emerging themes that were topical in nature and the emerging topics were coded to tally the frequency at which the same responses were presented. A simple coding of (1) through (7) was used to represent (when) the response appeared in the expert's opinion – first through seventh, having seven themes that could be identified.

The Leadnet site was an excellent vehicle to use to survey the experts and provided a quick response time. Anyone subscribing to the *Leadnet* site had the opportunity to answer the question, but those with direct connections to a state or city lead program happened to be the experts who presented an opinion. There were 38 responses in total but only 13 responses could be analyzed for an actual list of factors. Unfortunately, the *Leadnet* members could review the responses given to the researcher so consequentially the more detailed responses presented by the experts

were read by others on the Leadnet site and deemed sufficient answers. This regrettably prompted others to simply respond “they couldn’t add anything to the list; or “the agreed with the response.” Although this could be seen as a positive response to the critical factors that were presented, it did not allow for additional factors to be listed or the frequency of their listing recorded.

The *Leadnet* membership responses that were analyzed are recorded in *Appendix A*. The frequency of the responses, relating to the *critical factors* given, is presented in Table 4.1. The number in the column represents (when) the factor was mentioned in a response. If the responses are examined in the context of (when) the critical factor was mentioned; and the factor that is mentioned first is deemed to be the most important to the respondent, then the factors can be viewed with respect to importance and ranked in that manner.

The first analysis of the comments presented was reviewed for the type of response given and then analyzed to see if the responses could be coded. The answers garnered provided a very consistent and clear list of the *critical factors.* Those factors mentioned with the most frequency were coded using (1) to (7), those being, *enforcement* (1) and *dedication* (2) followed by *primary prevention* (3); a*wareness* (4); *data sharing* (5); *funding* (6); and *blood screening* (7). These were the critical factors selected to bound this explanatory case study and examine the Philadelphia lead poisoning prevention program to determine “how” and “why” it has been successful in reducing lead poisonings and deemed an exemplary program.

Table 4.1

Critical Factors as listed by the Leadnet respondents.

	Respondent's States (n=13)												
Critical Factors	CA	NM	PA1	IA	NJ1	MD	NJ2	DC	NC	OH	IL	PA2	ME
1. Enforcement	3	1	4		1		4	3		3	1	2	
2. Dedication	5	3	3	3	4			5			3	1	3
3. Primary Prevention	1		2		2	1	3	1		2		3	
4. Awareness-Education						2	2	2	1	1	2	5	2
5. Data Sharing	4	4	1	2	5		1						
6. Funding	2				3		6	4				4	1
7. Blood Screening	2			1			5						4

Note. The numbers recorded represent the position in which the critical factor was given in the context of the respondent's opinion.

At first, the emphasis on the "ranking" of the responses was not considered because the researcher placed more emphasis on the actual list of *critical factors* that would be presented by the experts that could be used to frame the case study. But, the ranking of the critical factors in the context of their importance to the success of the Philadelphia lead program could prove to be "both comprehensive and illuminating categories" important to the study (Guba and Lincoln, 1981, p. 95).

Guba and Lincoln also suggest guidelines for developing the categories that are important to the study. They state, "The number of people who mention something or the frequency with which something arises in the data indicates an important dimension.

Certain categories may reveal areas of inquiry, not otherwise recognize, or they may provide a unique leverage on an otherwise common problem" (p.95). Considering these guidelines for this case study analysis, the *Leadnet* member responses were also reviewed in the context of "ranking" them in the order of most important to least important based on (when) the factor was listed in the expert's response.

If the responses are categorized by importance, then the answers could be weighted (1 being the most important and 7 being the least important) relative to how the answers were presented in the expert's response. The number (1) response was weighted with (12 points). Number (2) was weighted with 10 points; (3) 8 points; (4) 6 points; (5) 4 points; (6) 2 points; and (7) 1 point. If weighted in this manner then each response can be ranked as listed in Table 4.2.

Response # = Weighted Rank

1	=	12
2	=	10
3	=	8
4	=	6
5	=	4
6	=	2
7	=	1

Table 4.2

Weighted ranking of the critical factors as listed by the Leadnet respondents.

	Respondent's States (n=13)													
	CA	NM	PA1	IA	NJ1	MD	NJ2	DC	NC	OH	IL	PA2	ME	Rank
Critical Factors														
1.Enforce	3	1	4		1		4	3		3	1	2		
Ranking	**8**	**12**	**6**		**12**		**6**	**8**		**8**	**12**	**10**		**82**
2. Dedicate	5	3	3	3	4			5			3	1	3	
Ranking	**4**	**8**	**8**	**8**	**6**			**4**			**8**	**12**	**8**	**66**
3. Primary Prevention	1		2		2	1	3	1		2		3		
Ranking	**12**		**10**		**10**	**12**	**8**	**12**		**10**		**8**		**82**
4. Educate-Aware						2	2	2	1	1	2	5	2	
Ranking						**10**	**10**	**10**	**12**	**12**	**10**	**4**	**10**	**78**
5. Data Sharing	4	4	1	2	5		1							
Ranking	**6**	**6**	**12**	**10**	**4**		**12**							**50**
6. Funding	2				3		6	4				4	1	
Ranking	**10**				**8**		**2**	**6**				**6**	**12**	**46**
7. Blood Screening	2			1			5						4	
Ranking	**10**			**12**			**4**						**6**	**32**

Stake (1995) explains, "We analyze episodes or materials with a sense of correspondence. We are trying to understand the issue with regard to the particular case... We try to find the pattern or the significance through direct interpretation, just asking ourselves "What did that mean?" (p. 78). It may take this single within-case

analysis and future cross-case analysis to generate a more accurate generalization about what constitutes an exemplary lead poisoning prevention program.

The Philadelphia Story

Another source of evidence included in this case study was the historical documents associated with the Philadelphia program. The reports span two decades and present the programs formation and data collection history. Their multi-faceted campaigns served to significantly change the city's approach to elimination of lead poisoning and reduced the number of homes with lead hazards and ultimately decreased the number of children who are lead poisoned by 51% since 2002.

The first step in the process was to define the critical factors to be used so there would be a consensus and a means by which the Philadelphia program could be explored. The *Leadnet* poll presented a consensus of opinion for what the critical factors were and those who responded were very clear at emphasizing the following themes. The critical factors listed are presented in the order of frequency and calculated importance

<u>Frequency:</u>

1. Enforcement
2. Dedication
3. Primary Prevention
4. Awareness/ Education
5. Data Sharing
6. Funding
7. Blood Screening

Importance:

1. Enforcement
1. Primary Prevention
2. Awareness/ Education
3. Dedication
4. Data Sharing
5. Funding
6. Blood Screening

Comparing these answers to historical responses presented when the lead programs, nationwide, were issuing progress reports between 1997 and 2006, similar critical factors were defined as features of the program but these factors were not ranked, only listed as necessary features of the program. (National Center for Healthy Housing, 2006).

- Primary prevention
- Customer service
- Staffing
- Program management
- Government funding
- Local support (dedication)

One other historical source, commissioned at the time by President Clinton, was the President's Task Force on Environmental Health Risks and Safety Risks to Children. This report was titled, *Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards, 2000*. It listed the following critical factors as actions to take to eliminate lead poisoning.

"By 2010, lead paint hazards in housing where children under six live will be eliminated through:

- Federal grants and leveraged private *funding*
- Identification and elimination of lead paint hazards to produce an adequate supply of lead-safe housing for low-income families with children
- Outreach and public education
- Enforcement and compliance assistance" (p.29).

The critical factors defined by the lead professionals of *Leadnet,* plus the historical documentation, were used to surmise the pathway of success demonstrated by the Philadelphia program. It is the researcher's observation that although the same themes (factors) do carry through the agency reports, the preference given to the factors seems to change over time.

For example, when a program begins, the availability of Federal funding is the catalyst that starts the program. As the program progresses, the funding must be maintained but enforcement of the established program seems to take on a stronger significance.

The historical data, used to trace the developmental pattern of the Philadelphia program, was extracted from the following publications.

- Getting the Lead Out, The Philadelphia Story Part One (PCCY, 2006)
- Getting the Lead Out, The Philadelphia Story Part Two (PCCY, 2007)
- Pennsylvania Childhood Lead Poisoning Elimination Plan 2010 (PA-DHCLPPP, 2010)
- PA Lead Snapshot (Pennsylvania Department of Health, 2010)
- Pennsylvania Department of Health Childhood Lead Surveillance Program- 2008, 2009, 2010, (PA-NEDSS, 2012)

- Arizona Public School Association – The Philadelphia Experiment (Martin, 2004)
- National Center for Healthy Housing's Interventions and Health: A Review of the Evidence (NCHH, 2009)
- Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards (CDC, 2000)

Segmenting the Philadelphia program by means of the critical factors is an analytical manipulation of the data that includes "making a matrix of categories and placing the evidence within such categories." This treatment of the data helped to put the evidence in order and present a theoretical proposition about the causal relations—answers to "how" and "why" the Philadelphia lead poisoning program is a success (Yin, 2003, p.111)

Critical Factors for Success within the Philadelphia Program

1. Enforcement

> *"I would say the key factor to having a successful program is the ability to respond quickly and have the power to enforce the laws that are truly protective and don't dance around the problem" (Leadnet ,N.J.)*

Most enforcement of lead hazard reduction measures is accomplished through city or county code enforcement, which protects a homeowner from housing defects, or protects a community from a home that is out of compliance. In some cases, such as in Las Vegas, NV, the health district is the agency with the jurisdiction to investigate and mitigate lead hazards on a property with a defiant owner or landlord. In Philadelphia, the Law Department is in charge of any disputes regarding lead and has developed a *one of a kind* "Lead Court."

The Community Legal Services advocated for a mechanism to enforce lead hazard violation orders. With the formation of the Lead Abatement Strike Team (LAST), in 2002, and the city's decision to provide resources for the court, the Philadelphia Law Department led the way to expedite the creation of the Lead Court. The main function of the court was to initiate action against property owners who were non-compliant with remediation orders issued by the Health Department. The court system was granted legal recourse to force lead contaminated houses to be cleaned, and prevent further lead poisonings. The Lead Court is primarily responsible for ensuring that properties are made lead safe. Unfortunately, with today's budget constraints, this system is in jeopardy. According to the Philadelphia Citizens for Children and Youth (PCCY) report of 2007, there were 50 Court-ordered properties waiting to be made lead safe, with new properties being identified every day.

If the program remains functional then the Court subpoenaed landlord is issued a remediation order which includes information for a lead hazard reduction grant The landlord has 10 days to comply with a re-inspection and again the landlord is made aware of the grant funding that is available in the amount of up to $12,000. According to the Philadelphia Community Development and Block Grant program director, the landlords frequently apply for the grant and since 2003, 767 units have been completed and cleared for re-occupancy. There are no fines associated with the program's non-compliance by the landlord but the city program has the ability to move the occupants out of the contaminated housing and into safe housing. The landlord is charged for the payment for the temporary relocation of the tenants. "Approximately 60% of all tenants self-relocate; the others are assisted by the Office of Supportive Housing, which

manages 11 lead-safe houses. A Childhood Lead Poisoning Prevention (CLPPP) social worker tracks relocation progress and resolves family issues" (HUD, 2009, p.2)

If a child in Philadelphia is lead poisoned, the property where the child resides is reported to public housing so that they can investigate to determine what code violations may exist. The public housing agency can move the family out of the house into a lead safe house while the renovation is finished. The Community Lead Poison Prevention Program (CLPPP) will provide education to the family about how to get their child well and free of lead. If other housing violations are discovered that would exacerbate the lead issue, those violations are reported to the License and Inspection Department. The owner then has 10 days after notification to fix the issue. If they do not meet the recommendation, they could be directed to Lead Court.

Court ordered enforcement, to make a house lead safe, can be subsidized by Federal assistance. Philadelphia did secure $15.77M in HUD grants to conduct lead hazard control work in the homes of qualified property owners. To qualify a property owner must be low income and make no more than $35,000 for a family of four. They must also provide proof that they own the property.

The Philadelphia Citizens for Children and Youth organization (PCCY) would like to see the qualifying application simplified for families. The greatest barrier to achieving a subsidy is proof of ownership. The City had a goal of remediating 1,078 homes, and only had approximately 800 applicants who qualified (PCCY, 2009).

Even though the Philadelphia program has secured more funds than most, they are concerned about future funding and with a lack of funding, the PCCY staff are

concerned that the court ordered renovations will be delayed and exposure to the lead hazards would continue to put the families in harm's way.

2. Dedication

"...is having a belief in the program and states motivated to want to succeed." "Staff needs to know that this is not a 9 to 5 job. It requires compassion, dedication, and a sense of determination to help children and their families." (Leadnet, PA and NJ)

According to the PCCY, the Philadelphia program benefits from an infrastructure comprised of at least (31) advocates who are dedicated to helping the children of Philadelphia and commit resources to the eradication of lead poisoning. Some notable advocates are:

- The Pew Charitable Trust
- Target Stores
- The Philadelphia Department of Public Health
- The Philadelphia Childhood Lead Poisoning Prevention Program
- The Philadelphia Citizens for Children and Youth
- The Commonwealth of Pennsylvania
- Department of Health's Childhood Lead Poisoning Prevention Program
- Children's Hospital of Philadelphia
- City of Philadelphia- Office of Housing and Community Development
- Community Legal Services
- Crozer-Keystone Healthy Start Program
- Temple University – Department of Nursing
- Homeowner's Association of Philadelphia

- Healthy Homes Resources (PA-CLPPP, 2004).

In 2005, the lead program and several partners initiated the Healthy Homes for Childcare program. This program sought to protect children in home-based child care facilities and assess those properties for not only lead hazards, but also for environmental health and safety hazards such as asthma triggers, mold, trip, slip and fall hazards and pest problems. This Healthy Homes pilot program, with additional funding of $1M from HUD and $300,000 from the Non-Profit Finance Fund, made it possible to initially detect lead hazards in more than (30) homes before a child became poisoned. "This could be seen as the equivalent of one kindergarten class of students *not* being lead poisoned" (PCCY, 2007).

In 2002, the Lead Abatement Strike Team (LAST) was created to coordinate efforts across Philadelphia's eight health and housing agencies in order to act quickly and efficiently with property owners to rid homes of lead hazards (Campbell, et.al, 2005). Unfortunately, by 2007, the LAST program's synergy had all but faded but the Lead Safe Babies and Healthy Homes programs expanded their efforts to oversee those begun by the LAST staff (PCCY, 2007).

An unusual advocate for the Philadelphia program is the Philadelphia Law Department who expedited the one of a kind "Lead Court". In 2002, the court heard its first case; and has heard over 2,500 cases since then. The Lead Court's primary responsibility is to ensure that the property is made lead safe on an expedited basis. The judge can order the City's lead program to undertake the work, and then bill the owner. If the owner cannot afford to pay, then the lead program can assist them in applying for HUD grant funds to make the repairs. Unfortunately, the existing funding

resources available for the housing rehabilitation cannot be used for the Court-ordered remediation.

Carla Campbell, a Philadelphia pediatrician and PCCY staff member, along with her colleagues at Drexel University, School of Public Health, studied landlord compliance for the 5-year period before and after the court started. “Before the court, landlords fixed problems within the first year about 7 % of the time. After the court was in operation, that rate rose to about 77 %” (English, 2011, September 23).

Temple University’s nursing department plays a role in the community by offering continuing education credits (CEUs) for their physicians and nursing staff. The subject matter varies, but in 2008, the department issued a series on the hazards of lead, particularly in pregnant woman, to offset the lack of education or mandates for testing in this population. The general purpose of the Temple CEU program was to describe for registered professionals, recommendations for prenatal screening and strategies to implement when lead exposure occurs.

The learning objectives stressed the key factors contributing to the problem of lead exposure outlined the recommended guidelines for screening and options for planning the appropriate interventions for a mother-to-be or child with an elevated lead level.

The most important advocate for the children of Philadelphia and the promotion of the primary prevention program to eliminate lead poisoning is the Philadelphia Citizens for Children and Youth program. In their own words:

Founded in 1980, Philadelphia Citizens for Children and Youth (PCCY) serves as the region’s leading child advocacy organization and works to improve the lives and life

chances of its children. Through thoughtful and informed advocacy, community education, targeted service projects and budget analysis, PCCY seeks to watch out and speak out for children and families. PCCY undertakes specific and focused projects in areas affecting the healthy growth and development of children, including after-school, childcare, public education, child health, juvenile justice and child welfare. PCCY is a committed advocate and an independent watchdog for the well being of children. (PCCY, 2007, p. 1)

Other states have similar advocates, for example in Las Vegas; UNLV is the epicenter for the Nevada Institute for Children's Research and Policy (NICRP). “This institute is a not-for-profit, non-partisan organization dedicated to improving the lives of children through research, advocacy and other specialized services.” Their staff was instrumental in researching the possible legislative avenues available to the Southern Nevada -CLPPP and help to push forward legislation that gave the health district the authority to enforce the codes needed to eliminate housing nuisances; such as chipping lead paint. They also helped to create a Nevada state rule that made it mandatory for all public health and other medical practices to electronically report all lead screenings in the state.

The dedication of these advocates to the eradication of lead poisoning is the driving force of any lead program. Whether it is a parent of a lead poisoned child, or a paid lead program administrator, the two are equally important to sustaining a program that will eventually eliminate lead poisoning; even if they have to strive for a 2020 deadline.

3. Primary Prevention

"Primary prevention using the socio-ecological model ranging from increasing residents' knowledge of lead poisoning, changing their attitude that lead poisoning is a serious, wholly preventable disease, and enhancing their skills to prevent hazards." (Leadnet, N.J.)

In 2005, the Philadelphia lead program was awarded an additional $700,000 to scientifically evaluate the effectiveness of a new program, the "Lead Safe Babies Model." The focus of this program is not to fix the housing once the children are discovered to be lead poisoned, but rather to test the home before children ever enter the home. The homes enrolled in the program that are found to contain lead hazards are remediated and made lead safe before a baby can be introduced into the home.

The program designers estimated that approximately 1,300 fewer children would test positive for lead each year. This program was made possible because the Philadelphia Department of Public Health's Maternal Child Health Division identified pregnant women and newborns within days of their birth and reported that information to the Philadelphia Health Department instead of only to the Pennsylvania State Department. A home visit to assess the lead hazards before the baby arrives is the goal of this program. Seventy-one percent of the lead safe baby participants living in high risk blocks that benefited from interim controls had blood lead levels lower than the geometric mean for the City (Rothman, 2007).

In 2001, 40 families benefitted from the Philadelphia lead poisoning prevention program. Since then, over 6,200 families have benefitted from the program, and nearly 2,800 properties have been made lead-safe for children since 2001. Another special group of Philadelphia citizens, who benefitted from the acquired resources, were the

152,000 immigrants living in the City. U.S. Congressman, Chaka Fattah was able to secure $1million in grant dollars through the U.S. EPA to fund *Lead Safe Communities* for immigrant families. This program was able to provide educational and rehabilitation services to 821 families in its first two years (PCCY, 2007).

4. Awareness

> *"Working in the lead poisoning prevention program of Washington, D.C., the critical issue is exposure." You are always battling to keep the issue present on people's minds, to keep it relevant and a priority" (Leadnet, D.C)*

"Lead went away in the 70's, didn't it?" This is a common response and notion. If more people understood that lead is still a very real and important environmental issue, and a danger to public health, programs may be more successful and sustainable. An early 2006 study performed by the National Center for Healthy Housing (NCHH) reported, "Education and information campaigns were critically important components of efforts to reduce childhood lead poisoning." It was suggested, "well-planned, strategic activities are to be used to raise community awareness and generate housing referrals to lead hazard reduction programs" (NCHH, 2006).

The NCHH surveyed nine established lead programs for the type of outreach that was being used to extend awareness of the lead issue to as many residents as possible. The outreach efforts presented could be categorize as such:

- Community outreach
- Earned media – public television announcements and news stories
- Advertising
- Education campaigns
- Infrastructure support – web sites and telephone hotlines

Pushing awareness on the city administrators and property owners in Philadelphia was unique and a bit more strategic. The Philadelphia Citizens for Children and Youth (PCCY) organization issued its 2002 lead poisoning report at the same time the mayor of Philadelphia released the City budget for the following fiscal year. The intent of this coincidental issuance was to "force" the city to recognize the immediate opportunity to use city funding to support low interest loans to property owners and enhance the efforts to significantly reduce the lead hazardous housing in the city.

PCCY advocates, along with their community partners, initiated a meeting with the City Council members and stimulated a letter writing campaign along with newspaper editorials to expose neighborhoods in plight. This campaign resulted in a city hearing and the lead hazard reduction program successfully became part of the City's budget process. The program was awarded $1.5M to move on a backlog of 1400 houses already assessed to be causing lead poisonings (PCCY, 2006).

Historically, most lead poisoning prevention programs begin by searching public health records and assessing which zip codes have the right demographics and housing that could potentially lead poison children. A screening program is initiated to prove the children are lead poisoned and the numbers of children are recorded. Once the lead poisoned children are found, the funding is sought (based on the possible worse-case scenarios) and the assessment and rehabilitation work, to clean up the housing, begins. The children are case managed by a nursing staff until their lead levels are lowered to below 10μg/dL and the family is educated to the dangers of lead in hopes that the child can be kept living in a safe home.

Philadelphia changed this reactive movement to the more proactive approach in the establishment of the *Lead Safe Babies Campaign.* The goal of identifying and remediating the houses before any child comes to live in the home is genius! The Lead Safe Babies program is a partnership between the Philadelphia Lead Poisoning Prevention Program and the National Nursing Centers Consortium (NNCC), head quartered in Philadelphia. Their nursing staff is able to visit the home, prior to a child's birth, and they are trained to visually assess the home for any obvious structural damage and dust wipes the surfaces for any residual lead dust that may cause lead exposures and subsequent poisonings of the family members (PCCY, 2007).

At a minimum, the nurses can also offer cleaning supplies and educate the family about mitigating the lead dust and, hopefully, eliminate lead poisoning the new arrival. The unique feature of this program is that the nurses can then go back to visit the family when the new baby is home and ensure that the baby receives its first blood lead test between nine and twelve months of age. They can also refer the family to a rehabilitation program if the home requires further repairs (Rothman, 2007).

Philadelphia's program offers a very diverse array of fact sheets and brochures through the Philadelphia Department of Health web site:
http://www.phila.gov/health/childhoodlead/EducationOutreach.html.
"Clicking" on the heading of: "Education and Outreach." You may download the training flyers printed in a variety of languages (*Appendix C*). It is worthwhile to note the variety of languages that the brochures are available in. The recent immigrants to Philadelphia were found to be a population at a higher risk of lead poisoning. These

flyers are available at the free clinics and community health fairs so having a computer to access the information is not essential.

In Philadelphia, education on how to use lead safe work practices is given as a *free* information session to homeowners. In the newer lead programs of the west, there is no large-scale program in the region that offers such a "free" program. In the western region, of those who have a program to educate homeowners, none can do it as well, and to the extent that, Philadelphia offers. An example of the Philadelphia free training sessions is presented in (*Appendix D)*.

Just recently, the Las Vegas-based Community Lead Poisoning Prevention Program partnered with the new Healthy Homes Program to offer free cleaning materials, as simple as a mop, bucket and detergent to afford homeowners the tools they need to clean well enough to reduce the amount of dust that may be accumulating in the household. The City of Phoenix community services program will lend a High Efficiency Particulate Air (HEPA) vacuum to homeowners to help with the cleaning efforts. One member of the *Leadnet*, on his own accord, offered a Saturday morning do-it-yourself "DIY" program through Home Depot. It was a short-lived service. Although valiant efforts, these are just interim- control measures of the hazard, until something more permanent can be enacted.

Another website that the Philadelphia Health Department maintains answers the *"Most Frequently Ask Questions"* (FAQ) and is found at: http://www.phila.gov/health/FAQ/FAQ_LeadPoisPrev.html. This site provides citizens with an excellent list of educational materials, appropriately titled—"Lead Poisoning 101." (*Appendix E*)

Infrastructure support for the Philadelphia lead poisoning prevention program provides an excellent amount of information from the web site: http://www.phila.gov/health/childhoodlead/. From this site, the citizen can learn about the dangers of lead; how to renovate a home safely; where their child can get tested for lead poisoning; and how to contact the Lead Court if there is a legal issue to contend with. Legal matters require that the citizen make a phone call, as opposed to being informed only by the web site.

In one single campaign 2,175 Philadelphian citizens received the message about lead hazards and the available health and housing programs, due in large part to the participation of numerous partners in the *Philadelphia Campaign for Lead-Safe Children Partners* (*Appendix F*).

Compared to western regional states, Philadelphia far exceeds any of them for its list of partners; particularly in the private sector. Most partnerships are developed through the Community Lead Poisoning Prevention Program (CLPPP). Nevada (Las Vegas) has a well-established Community Lead Poisoning Prevention Program (CLPPP) as does Arizona (Phoenix) with partnerships between City, County, Health, and Housing officials. A CLPPP for Idaho, Wyoming, or Montana has not been established to date.

This researcher worked with Idaho (Boise) to begin a CLPPP. There were dedicated people ready to move in the direction of primary prevention, but with a lack of funding the CLPPP did not materialize. There are partnerships starting up between the cities of Boise and Nampa, Idaho and their housing authorities. Together they use available resources to rehabilitate housing and, at least, temporarily control the lead

hazards with painting and repairs. Montana, particularly the Montana State University Extension program, has been working to eliminate lead exposure through the EPA Renovation program since early 2000 and has even produced a nationally recognized video on using lead safe work (LSW) practices http://weatherization.org/lswx.html (Montana University, 2008)

5. Data Sharing

... "Lead is a multi-faceted health issue that public health needs to secure data from non-traditional sources – such as housing." "We need to remove the deficits and barriers of lead level reporting and use the modern technologies available through electronic reporting and standardized spreadsheets. (Leadnet, NJ and NM)

In 1988, CDC published Guidelines for Evaluating Surveillance Systems to promote the best use of public health resources through the development of efficient and effective public health blood lead surveillance systems. This system satisfied the need of providing data entry, of maintenance and reporting that could integrate surveillance and health information systems, to establish data standards, and allow the electronic exchange of health data to better respond to the needs of the public health sector.

Blood lead screening would be only one of many data base layers that would be developed in the system. The CDC has been implementing the National Electronic Disease Surveillance System (NEDSS) to better manage and enhance the large number of current surveillance systems which would allow the public health community to respond more quickly to public health threats (e.g., outbreaks of emerging infectious diseases and bioterrorism).

Additionally, the Health Insurance Portability and Accountability Act of 1996 (HIPAA) mandated that the country adopt a national uniform standard for electronic transactions related to health issues and to ensure that the electronic exchange of health data inherently involves the protection of patient privacy (CDC- MMWR, 2001).

It is important that the surveillance data is "an ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health" (Teutsch & Thacker, 1995; Thacker, 2000, p.4). Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses. For example, data from a public health surveillance system can be used to:

- Guide immediate action for cases of public health importance;
- Measure the burden of a disease (or other health-related event), including changes in related factors, the identification of populations at high risk, and the identification of new or emerging health concerns;
- Monitor trends in the burden of a disease (or other health-related event), including the detection of epidemics (outbreaks) and pandemics;
- Guide the planning, implementation, and evaluation of programs to prevent and control disease, injury, or adverse exposure;
- Evaluate public policy;
- Detect changes in health practices and the effects of these changes;
- Prioritize the allocation of health resources;
- Describe the clinical course of disease; and

- Provide a basis for epidemiologic research (MMWR, 2001,p 1).

"The evaluation of public health surveillance systems should involve an assessment of system attributes; including simplicity, flexibility, data quality, acceptability, sensitivity, predictive value, representativeness, timeliness and stability. With the continuing advancement of technology, and the importance of information architecture and related concerns, inherent in these attributes are certain public health informatics concerns for public health surveillance systems" (CDC, 1999).

The Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS) attempts to provide a single, integrated Web-based application to:

- Improve the timeliness of disease reporting;
- Provide access to complete and accurate public health data for the Commonwealth;
- Consolidate the number of existing surveillance systems into a single data repository to enhance reporting and analysis;
- Provide access to DOH, County Health Departments and Municipal Health Departments, physicians, laboratories, and hospitals to near "real-time" data through a secure system (Pennsylvania Department of Health, 2012).

Philadelphia's most recent lead screening data is compiled through the Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS). However, data related to the age of housing and population was extracted from the U.S. Census Bureau's 2010 Census summary file tables, located at http://www.census.gov. The PA-NEDSS should be integrated to include Geographical Information System data but this compilation of data to one integrated system is still being developed. The 2011-12

NEDSS report will be the first in a series of transitional annual reports that will incorporate the 2010 Census data for the age of housing and population.

This new data will allow for the updating of a number of reports, the potential for the inclusion of new reports and incorporate new ways of presenting the data. Just as the lead program is transitioning from a focus on lead poisoning prevention to *Lead and Healthy Homes*, the report for 2012 will create new data analysis opportunities including the Healthy Homes reports.

Pennsylvania is also incorporating the Environmental Public Health Tracking Network (PA-DHEPHT, 2012). This data system is an effort to collect, analyze, document, and provide information on suspected links between environmental hazards such as air pollution, contaminated water, and toxic substances, including pesticides and lead, and their impact on the health of citizens. Pennsylvania's Department of Health (DOH), Bureau of Epidemiology, Division of Environmental Health &Epidemiology- Health Tracking Section is responsible for the development of this environmental tracking system. The Philadelphia Childhood Lead Surveillance Program continues to participate in its planning and development efforts, and annually delivers a childhood lead dataset in accordance with project requirements (PA-DHCLPPP, 2012).

In 2010, a number of significant changes related to the use of PA-NEDSS occurred. Namely, the surveillance staff assumed responsibility for one entry of older paper reports to the PA-NEDSS. To date, nearly 8,000 paper reports have been entered to the system. The PA-Bureau of Laboratories is responsible for blood lead analysis and reporting levels greater than 10µg/dL (now 5µg/dL with the new CDC 2012 mandate). The laboratories now have access to the new data base and this change will

result in more control over data quality, and faster entry of the information into PA-NEDSS.

Upon logging into the PA-NEDSS system, data such as this can be accessed: In 2010, there were 148,617 Pennsylvania children less than seven years of age reported to have been tested for lead. Of those children, 2,595 or, (1.75%) were reported to have confirmed elevated blood lead levels (EBLLs) greater than 10µg/dL. Because of the program's focus on children under three years of age, that age cohort has the highest testing rate. Over 25% of Pennsylvania's population, under the age of three was tested for lead in 2010; compared to a testing rate of just less than 14% for children less than seven years of age.

But, even with all of the advancements to the system, it's the data physically being entered into the system by the case workers or laboratory personnel that is crucial to the demographic statistics that could describe a cohort in need of assistance, or one that is showing improvement. The reporting of ethnicity on the PA-NEDSS continues to be problematic. Patient ethnicity was reported as "unknown" or left blank on two-thirds of the children reported to have been tested for lead in 2010. With only 33 percent of the patient ethnicity data known, the ability to provide an analysis that is representative, meaningful or statistically reliable for the overall population is marginalized (PA Department of Health, 2012-01). This is a nation-wide issue and will be a program detail to be addressed by the western states.

The state's childhood lead surveillance staff participated in discussion and planning for the Environmental Public Health Tracking Network (EPHTN) at the Department of Health; at a time when the old PA Legacy (PAL) system had ceased

operations. This streamlined the process of importing lead reports into PA-NEDSS. Additional lead reporting laboratories also began reporting through the streamlined Pennsylvania Electronic Laboratory Reporting (PA-ELR) system. Pennsylvania's reporting regulations remain in the review process. The lead program continues to seek support for the approval of proposed reporting regulation revisions which would tighten the reporting requirements, and ultimately serve to improve the accuracy and timeliness of the information received (PA Department of Health, 2012)

The issue of design, data entry and consistency in the national public health database emulates the same issues that the states have. In Philadelphia, the short-comings in the database design does not allow for estimates in smaller geographic areas, or for identifying risk in certain sub-populations such as recent immigrants. The database does not identify the sources of lead exposure and in many instances the data given only presents one or two stratifications, which may be related to exposure such as race/ethnicity or the age of a residence (PCCY, 2007).

It typically takes an act of legislation to force the issue of reporting. In Pennsylvania, the lead surveillance data mandates have existed for decades for the Medicaid recipients but, like most states, the data was not reported with any consistency. In the year 2000, state level mandates to improve the laboratory reporting requirements to include all lead test results, not just the elevated levels did help to increase the testing numbers. A policy to offer incentives to the Medicaid HMO's also increased the screening rates. In 1999 the number of children in Philadelphia tested was 29,131; in 2000, the number increased to 41,014 (PCCY, 2006). The incentive offered to the Medicaid HMO's was the use of federally available funds of $350.00 per

child tested focusing on children at 12-months and 24-months, or between 36-72 months if there was no proof of prior screening.

The Philadelphia 2008 – 2010 surveillance data identified previously, showed that the percentage of screenings in Philadelphia are higher than any other Pennsylvania county, and certainly higher that any western region state. Even Clark County, being the most proactive area of Nevada, screened between 6% and 7% of the children of age compared to the 30% of the Philadelphia children.

Comparing Philadelphia's program, to those of the western region states, the difference is clearly evident and obvious that the west needs to pick up the pace. In 1989, Arizona adopted a state law that requires physicians and clinical laboratories to report all elevated blood lead levels >10 µg/dL in children and > 25 µg/dL in adults. This includes the reporting of venous and finger stick screening, diagnostic, and follow-up tests. Reports must be made to the Arizona Department of Health Services (ADHS) within 5 days of the elevated result. Even with the significant progress in this western state for lead screening, it is still estimated that only 4% of Arizona's children are being tested (ADHS, 2011).

In Montana, there is only one study recorded which states that the young of the Chippewa and Cree tribes on the Rocky Boy Reservation near Box Elder, Montana were screened for lead. Since most children living on the reservation participate in WIC and Head Start, the tribes were able to identify and screen close to 100 percent of young children living on the reservation. Screening results indicate that the average blood lead level for children age 1–5 was not significantly different from that of children of the same age nationally. The initiative also showed that Indian families willingly

participate in programs that may improve their children's health. Funding for the study was provided by the Environmental Protection Agency (Howell & Russette, 2004).

6. Funding

"Critical to our program are government grants and funds to abate lead immediately" (Leadnet, ME)

According to the Centers for Disease Control and Prevention (CDC), Philadelphia ranked 5th in the nation as a city with a high number of children with lead poisoning. In all of Pennsylvania, 80% of the housing stock is defined as target housing; those being built before 1978 and 55% built prior to1960. For Philadelphia, the 2000 census recorded 25.1% of families living in poverty, and 92% of those families are occupying target housing (PA-CLPPP, 2004).

According to the "scorecard" a web-based pollution hazard indicator, supported by the Alliance for Healthy Housing, the Philadelphia county area ranked fourth among all U.S. counties with the highest number of housing units with a high risk of lead hazards (Green Media Toolshed, 2006). A large number of children, who live below the poverty level, reside in the older, deteriorating housing of the city. A price tag of $288 *billion* was placed on the resources needed to rehab these housing units causing the highest rate of lead poisoning (PA CLPPP, 2004).

In the initial stages of any lead program, the first step is to "find the lead poisoned kids." Unfortunately this is what federal funding is predicated upon. Philadelphia health officials recommended screening all children for blood lead at one year, two year and three years old; with continued screening occurring to six years of age old if the child was not tested at an earlier age. In 2002, the Pennsylvania health district results

revealed that 13.5% of the 71,657 children tested in that year were lead poisoned. Nation-wide the national average had dropped from 88.2% during the 1976-1980 National Health and Examination Nutrition Survey, (NHANES) to 2.2% during the 1999-2000 NHANES (MMWR, 2003). As with the rest of the nation, this significant drop was attributed to the conversion to unleaded fuel. Even though the number of children tested in one year in Pennsylvania was more than the western states tested in five years, the health department reported that it only represented 10% of the children in the state in the one-year to three-year age group (PCCY, 2006).

It is in the best interest of the program to diversify the funding sources and build on whatever statistics are necessary to apply for all of the available resources. In reports from the General Accounting Office, (1999), children in the Medicaid services program are in a high risk group for lead exposure and the resulting elevated blood lead levels. They estimated that 60% of children aged 1-5 years, with elevated blood lead levels, were enrolled in the Medicaid insurance program.

The Philadelphia lead program developers recommended that the health care providers *stress* the need for the mandated Medicaid screening of the 85,000 children living in poverty. The screening would focus on children at 12-months and 24-months, or between 36-72 months if there was no proof of prior screening. This would use resources already available through the Federal Medicaid system ($350.00/child), and increase the screening rates. It is important to note that Philadelphia made it a mandatory requirement to electronically transmit all positive lead levels of 20µg/dL or higher or two tests of 15-19µg/dL, to a central database. The rates at which blood lead levels are reported are vital to all future funding for the lead programs.

In 2005, Philadelphia revised its official definition of lead poisoning and the reporting included children with lead levels greater than 9µg/dL. Lowering the standard by which children are made eligible for program assistance had a skewed effect on the data making the number of poisoned children in 2006 look equal in number to the children in 2001. Testing in 2006, involved 38,367 children. That was only 32% of the Philadelphia children under 6 years of age, but, the number of children with blood lead levels of 19µg/dL or higher, dropped from 601 to 258 since 2001. Program advocates complain that more children could be tested using the public insurance program as a resource. Although the Federal Medicaid program mandates that tests be performed at 12 and 24-months, the rule is not enforced. This is a consistent and common problem nation-wide.

In 2006, with increased funding sources, 492 homes were made lead safe as compared to 131 homes in 2001, an increase of almost 200%, bringing the total since 2001 to 5,448 homes. The Philadelphia Citizens for Children and Youth report for 2006 emphasized that there are many reasons for this success. The factors noted are:

- Increased public awareness
- Advocacy
- Public investment
- Intra–government collaboration
- Strong partnerships
- Ability to present concrete data

Compared to the western states of (Arizona, Idaho, Montana, Nevada, New Mexico and Wyoming), the Philadelphia program has been in existence longer and has

acquired $15.77M through a combination of Federal, State, and Foundation contributions since 2002. It is noteworthy to report that in 2011, CDC funds were presented to Arizona in the amount of $417,618; New Mexico, $594,000; Nevada $591,697; and Montana, $491,976 for their Healthy Homes program; a “spin off” of the lead poisoning prevention program.

These dollar amounts are equal to the Pennsylvania total of $594,000 (CDC, 2011). Needless to say, the western states may have finally received equal recognition, but still have a lot of ground to make up. Overall, Philadelphia has received $3,766,623 since 2004 for their Lead Safe Babies and Communities Programs, which promote primary prevention. To finish the tally of states that are receiving recognition and those that still need further help; in 2011, Wyoming and Idaho did not receive any funding. (CDC, 2011)

Monetary resources to the Philadelphia program for 2006 were reported at $7M with 62% of that funding being provided by the federal government, 24% being donated through city funds and 14% coming from state coffers. Since 2003, Philadelphia has been very successful in the procurement of funding from the Department of Housing and Urban Development (HUD); in the amount of $15.77M, all targeted for the removal of lead hazards from homes occupied by children who are at risk of being lead poisoned (PCCY, 2007).

Despite Philadelphia’s success, they themselves look to other states for innovative techniques to obtain more resources for their lead hazard reduction program. They identified three particular programs. Rhode Island, offered to its residents, a state tax rebate of up to $5000 for lead hazard mitigation a homeowner completed on their

home since 1994 (R.I. Law 44-30.3-1). New Jersey enacted a tax on paint sales through the *Lead Hazard Control Assistance Act* to accumulate funds to set aside for lead hazard reductions; S-1384/Rice, A1947/Weinberg (NJ Citizen Action, 2004). Massachusetts Department of Revenue developed and enforces regulations that prevent leaded properties from being sold (MDR 830 CMR 62.6.3, 2003).

Resources for the Philadelphia program do stem from a successful advocacy for lead poison prevention interventions and close collaboration, cooperation and communication among health, housing and city representatives. This infrastructure ensures that the remediation of lead hazards will continue to benefit all families who may move into a property that is deemed lead safe, and thus virtually stop the incidence of any future lead poisonings. "The original remediation work is a *secondary* prevention practice that ultimately leads to a *primary* prevention practice because the property no longer poses a threat to the present day or future occupants" (PCCY, 2007). This proactive approach saves resources, directing them away from lead poisoning intervention and finding a more practical use for the funds, which is investing in healthy housing.

7. Blood Screening

"Without an aggressive screening program for children combined with data collection and analysis. North Carolina would not have gotten anywhere without the data in hand to support our agenda." (Leadnet, N.C.)

From 1993 to 2002, Philadelphia screening data compiled from Medicaid and Pennsylvania Health Department records, registered 421,369 children as being tested for elevated blood lead level. Estimates of elevated blood lead children (EBLL)

recorded by the Philadelphia Department of Public Health (PDPH) reached a peak of 52% in 1993. In 2002, 42,583 children were test and only 12.2 % of the children tested had blood lead levels of 10µg/dL or higher (Campbell, 2005).

In more recent tests, the children examined were put in age categories: 1 and 2 years old, less than 3 years old, less than 6 years old, less than 7 years old and less than 16 years old. For the years 2008 through 2010, the number of children screened in Philadelphia, as reported by the Pennsylvania Lead Surveillance Program (PDHLS, 2012) was as follows:

- 2008: 43,063 children
- 2009: 43,275 children
- 2010: 44,719 children

The number of children with confirmed elevated blood lead levels was:

- 2008: 1,410 @ 3.27%
- 2009: 1,194 @ 2.76%
- 2010: 1,134 @ 2.53%

Of those tested, 233 still had severe lead levels of greater than 20µg/dL. There were (109) babies, in the 1 to 2 years old category with severe lead levels. This is the age at which lead has the most damaging effects.

Of all the counties in Pennsylvania, Philadelphia had the highest percentage of children under the age of 7 years old tested for lead poisoning.

- 2008: 30.01%
- 2009: 28.91%
- 2010: 28.72%

To put this into some perspective, the 2009, goal of the Southern Nevada Health District (SNHD) in Clark County, Nevada was to screen 7.95 percent of the children under the age of 6. The District missed their goal slightly but did test 6.12 percent of the children. Although the percentages are low, there were a total of 1,124 children tested (SNHD, 2010).

When the U.S. EPA engaged the UNLV Harry Reid Center for Environmental Studies to participate in the Lead program in 1992, there were 2 children registered in the health district database for being lead-tested. So, success may be relative. The Nevada State Health Department reported that between August 2004-February 2006, 4753 pediatric screenings, 52% Hispanic (2505) with 1220 (25.6%) having elevated blood lead levels and of those, (20%) were Hispanic (Fredrick, 2006). These results prompted the CDC to fund Nevada to continue the studies and allowed for the Southern Nevada CLPPP to be established.

The comparison of the screening values is the basis for comparing the success of the Philadelphia lead poisoning prevention program to the more novice programs of the U.S. western regions. In Philadelphia, several sites offer free lead testing:

The following Philadelphia, Pennsylvania clinics offer free blood lead testing for children under age 6 from Monday through Friday, 8:00 a.m. to 4:30 p.m.

Centers available for free blood testing are positioned throughout the city.

Health Center #2 **1720 S. Broad Street** **215-685-1803**	**Health Center #3** **555 S. 43rd Street** **215-685-7500**
Health Center #4 **4400 Haverford Avenue** **215-685-7600**	**Health Center #5** **1920 N. 20th Street** **215-685-2933**
Health Center #6 **321 W.Girard Avenue** **215-685-3803**	**Health Center #9** **131 East Chelten Avenue** **215-685-2253**
Health Center #10 **2230 Cottman Avenue** **215-685-0639**	**Health Center #11** **2840 Dauphin Street** **215-685-2424**

(http://www.epa.gov/reg3wcmd/lp-leadtestingphila.htm)

In comparison The Southern Nevada Health District (SNHD) offers testing for $20.00/ person on Wednesdays, from 1p.m. to 4:30p.m. No other free or low cost testing programs were indicated on the western region web sites.

Implications

Philadelphia's proactive approach to combating lead poisoning began several decades ago, before the CDC existed. Yet, even without the influence of a national health organization, the city advocates had an "Elimination Plan." In 2002, as a CDC grantee, the City established partnerships with the Pennsylvania Community Lead Poisoning Prevention Program (CLPPP); the Philadelphia CLPPP; county health agencies; physicians, advocates; landlord groups; lawyers; the Pennsylvania Bureau of Laboratories; and, of course parents. The Community Lead Poisoning Prevention Program has about 65 members and offers a "one-stop shop" approach to assisting families with lead issues.

Their lead screening statistics are superior, at 40,000 / 100,000 children as compared to a western program, such as Nevada, that had only two children recorded in the state health reports when the research of the lead issue began in 1994. With all of the excellent efforts made by this extensive advocacy group, Philadelphia still had 1,134 children under age 16 with elevated blood levels reported in 2010, that required a case file be opened for them. Of these case files, (598) of them involved children in that critical age bracket of 1 to 2 years old.

Funding for the Philadelphia program far exceeds that of any western program. The figure of $15.77M, presented in the 2007 PCCY annual report is three times that of most western states. With this level of funding, Philadelphia can continue to screen children and provide education and outreach through medical providers and community events. Philadelphia certainly has an advantage by realizing there is a $350.00/child allocation from Medicaid insurance reimbursements, plus the medical community seems to have a much more aggressive approach toward screening children for blood lead levels.

In the Philadelphia program, medical staff can perform lead testing in a child home, at health fairs, at group sites, including WIC and day care centers, as well as walk-ins to a medical facility. It is also advantageous that Pennsylvania has a law which mandates that the testing results be electronically recorded for the future statistical needs, which usually fosters additional funding.

Garbage Can Theory of Agenda Setting

John Kingdon implicates the government in his Garbage Can Theory as the organization with an agenda. He states that “subjects that do not appear on a general

agenda may be very much alive on a specialized agenda... Why do some subjects rise on agendas while other are neglected? Why do some alternatives receive more attention than others? The answers to these questions concentrate on the participants" (Kingdon, 2003, p.196). Kingdon goes on to say that it is "people who recognize problems, generate proposals for public policy change, and they engage in activities to move the agenda forward and develop a process to put their policy in place (Kingdon, 2003, p. 197).

A complete linkage of the Garbage Can Theory to the Philadelphia story occurs within all three streams—problems, solutions and participants. in a serendipitous manner by which the advocates for the lead poisoned children and the communities in desperate need of rehabilitation took full advantage of a political propitious moment – the legislative budget meeting at the Philadelphia's mayor's office—and claimed that their proposal of proactively rehabilitating the properties before any child lived there --- would be the solution to the pressing problem of lead poisoning. The Philadelphia advocates took advantage of the political receptivity and pushed their policy to solve their problem. The complete joining of all three streams dramatically enhanced the odds that the subject of rehabilitation and prevention would take the place of the old policy of finding the lead poisoned children and managing the disease and became firmly fixed on the decision agenda (Kingdon, 2003; PCCY 2007).

Future Challenges

While being an exemplary program, there are two problems still to be addressed within the Philadelphia program. First, the Community Lead Poisoning Prevention Program cannot offer a family support unless the blood lead level was proven by a

venous draw. Today, most children can be tested with the *Lead Care Analyzer II,* which uses just a capillary tube amount of blood drawn from a finger prick. This is a much more comfortable testing procedure for the child and one a parent is more likely to consent to. This capillary blood draw results should be able to stand as an accurate account of the child's blood lead level.

The other issue is that of screening hard-to-reach populations. According to the Philadelphia school district, there are over (90) languages being spoken in the homes of students. In this case, the community plays a vital role in reaching these families. The benefits of having community advocates are that they are a trusted part of the community. They have an expertise in lead hazards, and can communicate the dangers of lead in their native language. Their sweat equity is a valuable resource to the program. The PCCY reports that funding these community groups would be advantageous (PCCY, 2009)

Child screening rates could be increased if the Medicaid data could be shared with the Philadelphia CLPPP results. This data sharing relationship is in the process of being cultivated. Communications with the property owner and any medical results, regarding the lead poisoning at a particular address are uploaded to a new software program named "Paradox." This database allows the data of the child, both environmental and medical, to be saved and queried. "Paradox" can allow for data sharing, with a client's consent, and release information to public housing, insurance companies and medical personnel. The data can also be used to build a Geographic Information System map and identify high-risk neighborhoods, down to the block level.

The modernized data base can be used to show changes over time and it can certainly reveal the elevated blood lead level relationship to other socio economic data, like income or age of homes. There is also the remaining challenge of security and "talking" with other (IT) systems. The labor it takes to check the data for completeness and accuracy is daunting – this is a nation-wide issue. It would be a great advantage to the nation if there was one electronic data system that was dedicated to lead screening. (Personal Communications with the Chief of Staff City of Philadelphia Department of Public Health, 03/2012)

The home assessments completed by the Philadelphia CLPPP are done only for children with blood lead levels at 20µg/dL or with 2 tests within 6 months of each other that resulted in levels at 10µg/dL or higher. The CDC recently recommended that the level of concern for children's blood lead levels be lowered to 5µg/dL. Philadelphia, as well as the other lead programs across the nation has not come to grips with this significant change in case management. Just a notation, the Las Vegas CLPPP decided to take action with any child above 5µg/dL from the inception of the program in 2006 anticipating the change. It could be said that this is the only place where a western city is "one up" on Philadelphia.

As with most lead poisoning prevention programs, the infrastructure of the Philadelphia program is heavily subsidies by Federal funds. The local regulations and support are mandatory as the program progresses because the Federal funds do diminish over time. The lead coalitions must remain dedicated to the cause and advocate for more local funding and solicit whatever Federal funds become available.

It does advance the program if the state regulators recognize the importance of preventing lead poisoning and plan to have coordinating health codes, housing codes, ordinances and consent decrees with the Federal agencies all working together to actually eliminate any future lead poisonings in our nation's citizenry (Personal Communication with the Program Director, Philadelphia Department of Public Health Childhood Lead Poisoning Prevention Program – 2011).

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSIONS

"You are the best definition of a good intention." – Jason Mraz

For thousands of years, there have been those with good intentions of ridding our society of lead poisoning, yet today we are still struggling to eliminate this 100% preventable disease from our citizenry. One of the *Leadnet* respondents stated "Most important is that the loss of any child's full potential, mentally or physically by a preventable poison is without rationality" (*Leadnet*, Newark, N.J.) Dr. Bellinger, (2008), who advocates lowering the hazardous level of lead in a child to less than 5µg/dL, states "no level of lead exposure appears to be 'safe', and even the current 'low' levels of exposure in children are associated with neuro-developmental deficits. Primary prevention of exposure provides the best hope of mitigating the impact of this preventable disease." (p.1)

When I began my graduate studies over 20 years ago I initially focused my study on the risk of environmental exposures; particularly from pesticides. I began one of my publications with a quote attributed to writer and activist, Ms. Rita Mae Brown. She wrote, "Insanity is repeating the same mistakes and expecting different results." I found out later that she actually borrowed the quote from Narcotics Anonymous material, but, either way, it is so apropos to this lead poisoning dilemma.

It is irrational that we protect workers from lead mining exposures only to put lead in our house paint and let it dust into our living environments. It is not a sane notion to develop consumer products with a chemical that polluted the entire world and destroyed the brain capacity of millions; without realizing what a continuing tragedy we are

perpetuating. Likewise, allowing lead to be sprayed onto our fruits and vegetables, thus perpetuating the exposure is also ludicrous. Where lead in our atmosphere has diminished by 95% over the years due to the elimination of leaded gasoline, as a common consumer product, the levels of lead contamination in our food and on other consumer products has increased. This defies any level of sagacity.

When the U.S. EPA promulgated the new housing renovation rule in 2010, they detracted away from the original lead abatement regulations of 1996; so much so that when I met with the agency officials in the summer of 2011 to review the new rule, I blurted out "*ARE YOU ON LEAD!"* The new rule allows a contractor to commence the rehabilitation of a home without conducting a lead test, yet they can assume it is there and use lead-safe work practices. When the rehabilitation of the home is complete, the contractor is allowed to clean the area where the work was performed, wipe the area with a dry white rag—thus performing the white glove test. This procedure supposedly clears the home of any lead hazard in their work area.

Armed with the facts that have been presented previously, how does the white glove test assure a family that their home is lead safe, cleared at the 40µg/ ft^2 for dust on the floor; it doesn't. The 40 millionths of a gram unit is equal to about 15 grains of sugar spread evenly over two-thirds of a professional football field! There is simply no way a white glove test can determine a clearance level of 40µg/ ft^2. It seems appropriate to use this analogy to demonstrate the extent to which the government namely the EPA has simply wiped or "dusted" over this issue for years. Authors Cohen, March and Olsen refer to it as "fuzzing" over the political issue (Cohen, March & Olsen, 1972).

Having "*enforcement"* being cited as the most frequently mentioned critical factor, it can be said that this issue is primary on the minds of the program participants. As such, enforcement is the big "white elephant" in the room. The Federal and State government entities are not enforcing the rules with any consistency that would help to eliminate lead poisoning. A study written by David Jacobs, a long time "Healthy Homes" advocate spoke of a rehabilitation project performed by a contractor, who was not dedicated to the cause, and contaminated the property he was working on by dry sanding 3,000sf of exterior siding on a well-maintained, 75 year old house. The hard cost of repairing that home after the contamination was then $195,000.

The lead-safe work practices required for that project are well documented. The contractor had the opportunity to gain certification through training, and even if he was unaware of the U.S. EPA rules, the OSHA lead-safe work rules have been mandated since 1972. If enforcement of the law came subsequent to the act and the contractor was fined out-of-business, this routine repainting project caused irreparable harm to the family as well as to the entire neighborhood block area (Jacobs, Mielke, & Pavur, 2002).

In Philadelphia, the City has 11 contractors, each with multiple certified teams, enabling them to work on up to 25 units at one time. It is essential to the lead safe program to keep qualified contractors ready for work by guaranteeing a steady flow of jobs and timely payment. Contractors must agree to work within a negotiated pricing list, which eliminates the need for bids. The Philadelphia Housing Authority sponsors training for owners and contractors, but they must still obtain certification through the U.S. EPA Lead program (HUD, 2009).

With all of this government regulation in place to protect families from lead poisoning, even Philadelphia, with its exemplary program still reports over 1000 children per year who have been found to have elevated blood lead levels. It is for this exact reason that most "leadnetters" remain in the business of lead awareness and outreach. Children and their families need to be protected from good intentioned contractors, with no sense of conscience when it comes to preventing lead poisoning. According to the Philadelphia Lead Program's, Chief of Staff, "the Philadelphia program is more successful because of the dedication of its staff and the belief that we must prioritize a quick and effective response to children with elevated blood lead levels with nutritional and lead risk reduction, education through home visitations."

Unfortunately there are not enough "*funds"* within the federal, state or foundation budgets to rid the millions of homes across America that still have lead paint as a hazard or potential hazard if any interim controls fail. The National Conference of State Legislators (NCSL) reported in a cost/ benefit analysis for the EPA 402-404 Training and Certification Rule that substantiates a pro-active course of action as being the most prudent and cost effective means to mitigate lead hazards. The 402-404 Rule of the Toxic Substance Control Act sought to develop a national strategy to establish the infrastructure necessary to eliminate lead-based paint hazards in all housing, public and commercial buildings and steel structures. It also encouraged effective action to prevent childhood lead poisoning by establishing a workable framework for lead-based paint hazard evaluation and reduction.

With the assumption that lead abatement commenced immediately following its discovery, the 50-year measurable benefits outweighed the cost 2**:**1. After the initial

cost of abatement, which supports "*primary prevention"*, children are forever protected from being lead poisoned by the abated property. The benefit equaled $21.6M; the cost was $10.5M. When applying the same cost / benefit scenario to public and commercial buildings, the results do not favor the benefit -side as much. The reason being is that there are no children to protect. You could certainly consider the acquired benefit to the workers and nearby environment; but these aspects were not considered. The greatest benefit to the citizenry was the $11B savings realized by not affecting the intelligence and learning ability of children (NCSL, 1998).

Another study published in Environmental Health Perspectives asserts for lead hazard control is for every one dollar spent for building rehabilitation, anywhere from $17 - $221 dollars would be returned in the form of health benefits, increased IQ, higher lifetime earnings, tax revenue, reduced spending on special education, and reduced criminal activity. This would result in a net savings of $181B - $269B (Gould, 2009).

There is a lot to say for sweat equity and volunteerism, but laws that force the responsible parties to clean up the problem is the more environmentally fair manner to approach this dilemma.

The government is the number one culprit for lead existing in our living environment. Just as guilty in the housing sector, are the paint companies. I realize the actual members of this administration or those who own our present day paint companies did not do the crime, but they are the keepers of the legacy waste and should be held responsible for its clean up just like the Superfund site contributor.

The research question posed for this study was *"What are the critical factors necessary to create and sustain a successful lead poisoning prevention program?"* The

most frequently answered factor was enforcement. I have been working for the U.S. EPA Lead Program since 1992 and the need for enforcement has been the mantra through the years. But, if you read back to Pekkanen's article as to "Why our children are still lead poisoned," why would the government want to enforce regulations that make them pay to clean up a perpetual environmental hazard that those in the government in the 1930's created?

Instead the EPA, HUD and OSHA laws have moved the responsibility of the cleanup of this environmental toxin to the contractors hired to rehabilitate the contaminated housing. The EPA charges an abatement company approximately $1000.00 per worker to be certified by the EPA to work in target housing abatement. That proved too much for the contractors to bare, especially in this economy, so the EPA partnered with HUD to ease the regulations and now only charge the individual company $300.00 for a (5) year certificate so that company can be contracted to work on target housing using trained and certified renovators (U.S. EPA 40-CFR 745.90, 2011) Home owners or volunteers are not mandated to the same certification standards.

How can the state entities or advocates begin to believe that enforcement by the EPA or HUD is going to diminish this issue? With all their good intentions put forth with the Lead Poisoning Reduction Act of 1992, the Federal program has not won the battle against lead poisoning. The Toxic Substance Control Act Public Housing Rule, initiated 20 years prior, and established the lead rehabilitation programs, also failed.

The critical factor, "*dedication*" makes more sense when considering the importance of the factors that allow the Philadelphia program to be successful. It is true that they have $15.77M worth of reasons to be dedicated but, as reported by the

Program Director of the Philadelphia Department of Public Health Childhood Lead Poisoning Prevention Program, if 1,080 homes are completely rehabilitated and abated of all the lead paint and components at a cost of $50K per house; the total cost amounts to $51.7M (PCCY, 2007). Their $15.77M in available funds will cover only a portion of the ultimate cost.

There are 38 million houses in America that the EPA claims are occupied and still pose a lead threat to the occupants. Using the lowest rehab estimate of $10K per house, the ultimate cost of the rehabilitation would be $380B. At this cost, it is unlikely that this level of rehabilitation will ever occur. There are not enough contractor fees to be collected in America to fill the EPA coffers with sufficient certification dollars to meet that bill!

Recommendations

The Philadelphia Citizens for Children and Youth organization offered a challenge to their constituents, “Imagine a world and a city where children are safe from lead poisoning and then help get us there” (PCCY, 2007). The *critical factors* of a successful lead program, most frequently mentioned, were “*enforcement*” and “*dedication* “and those ranked to be most important were “*enforcement*” and “*primary prevention”*.

It is this researcher’s opinion that enforcement is first on the minds of the experts because it is not apparent to them that the rules are being enforced by those responsible for doing so. It is important for those dedicated to the program that they see the results of their labors. Philadelphia, on the other hand, is enacting enforcement through the Lead Court and through the housing authorities applying pressure on

shoddy landlords to rehab their properties' to be lead safe. But, more important than *enforcement* is the advocacy for the sake of children. The City partners have developed an infrastructure that does help protect their citizens from lead poisoning. It is as follows:

- Temporary relocation provided by the Office of Supportive Housing (OSH).
- Enforcement provided through the support of the Lead Court.
- Roofing and plumbing repair work, performed through the Housing Development Corporation, is designated as "matching funds" to help procure other funding for lead remediation.
- Licensing landlords who maintain safe housing by the Department of Licenses and Inspections.
- Social issues, peripheral to lead poisoning, are addressed by the Department of Human Services.
- Insurance and contract concerns, particularly prompt payment to contractors, are handled by the Philadelphia Health Management Corporation.

If the western states' lead poisoning prevention programs want to excel in the development of their programs and actually lower the occurrence of lead poisoned children, then following Philadelphia's program goal of reducing the prevalence of children with elevated blood lead levels by increasing the availability of lead-safe housing is the strategy to follow. The program can be guided by the *critical factors* that are necessary for a successful program, as demonstrated by the Philadelphia program.

Program Guidelines

Enforcement: There are laws already in place designed to protect our children and workers from lead exposures; they need to be enforced. But in addition to that, a dedicated enforcement division needs to be established within the state that can react quickly and efficiently to violations that are reported. The practices of the Philadelphia Lead Court can be incorporated into each lead program.

Primary Prevention: Use this as the first line of defense to prevent poisonings by making all properties lead-safe before a child occupies the space. Follow the philosophy of the Philadelphia "Lead Safe Baby Program".

Dedication-- Federal, state, county, city and neighborhood advocates need to keep the lead issue current and in the forefront of the public eye and help petition for in kind or monetary support. In Philadelphia groups such as day care centers, faith-based units, neighborhood associations, and cultural specific advocates, for example, the Black Women's Health Project and Council of Spanish Speaking Organizations, Inc. are central to the program's success. The advocates, along with conscientious families and contractors, can work together to protect the children from lead poisoning.

Awareness/ Education – Aggressively publicize the hazards of lead and the incidents of lead poisoning. Train construction crews to work safely and solicit the involvement of politicians so they learn first-hand how important it is to fund lead abatement projects which will protect their constituents and raise the property values of their communities.

Funding-- Sweat equity only goes so far. Substantial funding is necessary to reconstruct and clean up the environmental toxic legacy waste which was created by the poor decisions of industry and government.

Data collection and sharing-- A standardized and detailed Environmental Public Health Tracking Network (EPHTN) must be developed and utilized to catalog the blood screening and demographic data necessary to identify areas in need, or to record those homes that are now lead-safe following their rehabilitation. The ability to access the blood lead data of children, as well as adults, is vital in the consideration of funding and prioritization. The data should be able to identify an address where the abatement of an immediate hazard is necessary, or it may highlight the geographical area (zip code or block census track) where citizens would reap the greatest benefit from primary prevention.

Blood Screening- Medicaid's child health component, known as the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program (U.S. Department of Health and Human Services, 2012), has been shaped to fit the standards of pediatric care and to meet the special physical, emotional, and developmental needs of low-income children. Since 1967, the purpose of the EPSDT program has been "to discover, as early as possible, the ills that handicap our children", and to provide "continuing follow-up and treatment so that handicaps do not go neglected." Medical professionals who treat children who are not from low income families also need to assess their patients who have the potential to be exposed, such as those living in vintage housing as well as those who are subjected to their parent's hobbies that involve lead, typically antiquing and hunting and do-it-yourself home component rehabilitation.

“The program requires leadership, funding, and an infrastructure that can provide a timely lead exposure prevention and hazard control with an eye toward the future integration with Healthy Homes.” (Chief of Staff, Philadelphia Department of Public Health)

This excerpt is taken directly from the Healthy People 2020 guideline related to the lead issue; the EH stands for Environmental Health and the 8 – 8.1 are the objective numbers. It states:

- EH-8: Reduce blood lead levels in children.
- EH-8.1 Eliminate elevated blood lead levels in children.
- Target: Not applicable
- Baseline: 0.9 percent of children had elevated blood lead levels in 2005-2008.
- EH-8.2 Reduce the mean blood lead levels in children.

  Target: 1.4 µg/dL average blood lead level in children aged 1 to 5 years.
- Baseline: Children aged 1 to 5 years had an average blood lead level of 1.5µg/dL in 2005-08.
- Target setting method: 10 percent improvement.

The number of children with elevated blood lead levels in the U.S. is steadily decreasing. As a result, determining stable national prevalence estimates and changes in estimated prevalence over time using NHANES is increasingly difficult. Eliminating elevated blood lead levels in children remains a goal of utmost importance to public health. The sample sizes available with the currently structured NHANES are too small to produce statistically reliable estimates and preclude the ability to have a viable target for Healthy People (HP) 2020 (see Objective 8.1). Efforts must and will continue to

reduce blood lead levels and to monitor the prevalence of children with elevated blood lead levels. (Healthy People.gov, 2012)

This is now the Federal government's statement concerning lead poisoned children in America and the goals for 2020. The estimation of lead poisoned children is now at 9%, down from the last NHANES recorded national average of 1.7% (CDC, 2011). This is remarkable, and would imply that the lead poisoning prevention program for America is working. But, that is not the reality for some in our nation. Recalling the fact that there are 17% - 25% of the children in Las Vegas who have tested positive for lead, the discrepancy is glaring. The national average of less than 2% does not represent all populations in the U.S. The suspected high-risk populations need to be identified and their specific situations highlighted so that these disproportionate at-risk populations are advocated for and their percentages do not get diluted within the national average.

Conclusions

Finally, the remedy to lead poisoning, according to the Philadelphia lead program administrators is the removal of all lead hazards from children's houses so their deteriorating home cannot poison them. In Philadelphia, as in most parts of the country, children have been used like the "canaries in the mines" except in this case to detect the presence of lead in their homes. This is an immoral and unacceptable practice. Houses, not children need to be tested for lead. And, when lead is found, it needs to be removed from the child's environment.

Philadelphia PCCY has been working for almost two decades to prevent children from being poisoned by lead. In 2002, PCCY and other advocates united in a multi-

faceted campaign to increase public awareness, advocacy, political commitment, new local and federal resources and collaboration among public agencies. This campaign and the resulting initiatives, stimulated significant change within the city which has reduced the number of homes containing lead hazards and has ultimately decreased the number of lead poisoned children poisoned by 51%.

In addition to the lead threats from pre-1978 housing, the western regional states also experience lead contamination exposures arising from mining operations, cultural practices and consumer products. It will take years of assessment to determine where the children are most at risk and put all of the *critical factors* to work in order to protect our western regional children. At this time, advocacy is the single most important element necessary to initiate a successful lead program for the novice states.

As John Kingdon (2003) would have it, one of the prime stimulants for policy development and change is “dissatisfaction with the organization”. In the Garbage Can Model process, there are exogenous factors, time-dependent arrivals of decision-making opportunities, problems, solutions, and decision makers which all affect the outcome. Problems and solutions are attached to choices, in large part because of simultaneity. The western regional states must simultaneously coalesce to develop a policy that will protect the citizenry of their states from any further lead poisoning. It is possible to build a successful and sustainable program, using the Philadelphia experience, and work to truly eliminate lead poisoning prior to the publication of the 2020 report. Should the western regional states fail to enact any lead program the 2020 reports will record yet another decade of failure. More tragic than that, will be the number of children who have been poisoned and left undetected.

APPENDICES

A. Leadnet member responses for the list of Critical Factors

City	State	Comments
Los Angeles	CA	So far good answers. There is a decent ACCLPP written set of recommendations -mind you led to eliminating the "level of concern" jargon but it goes to primary prevention and comprehensive overhaul of how we currently deal with LPP. I can't emphasize the need a for a stream of funding that is not subject to political whims, and constant litigious threats from industry (Sinclair paints and Shell oil have tied our FEES up for years -they lose but while they are in litigation they have the right to withhold the funding until the case is decided; it goes on for decades) As well as what folks have said: political will, enforcement, data sharing, caring.
Sante Fe	NM	I think the responses have covered the majority of shortfalls. In addition to the enforcement and increased screening, I have noticed that the deficits and barriers of lead level reporting/testing for clinics and Headstart programs for children is the lack of manpower. A lot of these facilities are understaffed and don't necessarily recognize the value of testing and reporting blls. Even though we have developed strategies to minimize the amount of labor (like electronic reporting or standardized spreadsheets) involved in collecting data from children and parents, I think it is still viewed as a bit of a nuisance, especially when reporting levels fall under the action level.

Philadelphia	PA	1. Good data, 2. Active community participation. 3. Cooperation and active participation of all agencies involved 4. A strong and aggressive enforcement program
Des Moines	IA	I've seen a number of replies to this, and I'm not sure that I have anything to add. However, one thing I've noticed (and you probably noticed it, too) is that some people are answering only from the HUD/EPA legal / enforcement RRP/PRE abatement side of the program, and some are answering from the CDC program perspective of blood lead testing, data management, case management, and getting hazards repaired in the home of an individual lead-poisoned child. In reality, it takes all of these for a good program. However, in most cases, different programs will be housed in different agencies, which can be difficult to overcome.
Bergen Co.	NJ	I would say the key components to having a successful CLPPP is the ability to respond quickly, the power to enforce, laws that are truly protective and don't dance around the problem, emergency relocation housing, apartments in all areas of the city where folks live), funds to abate lead immediately, and staff that knows this is not a 9 to 5 job. It requires compassion, dedication, and sense of determination to help children and their families. Most importantly, the authority to make all these things happen without disrupting the process, having seamless service.
Baltimore	MD	Talking to pregnant women about their homes and lead hazards; repairing hazards safely if found BEFORE the baby is born.
Trenton	NJ	Thanks for the opportunity to comment! I've been the health educator for the nearly past 12 years (since July 2000) for the New Jersey CLPP. I think a good program has many components. 1. Data and data sharing. Lead is such a multi-faceted

		health issue that public health needs to secure data from non-traditional partners (such as housing). 2. Primary prevention using the socio-ecological model ranging from increasing residents' knowledge of lead poisoning, changing their attitude (based on Health Belief Model) that lead poisoning is a serious wholly preventable disease, and enhancing their skills to address or prevent hazards, to agencies that inquire about the age of housing and how keep it maintained, to protective public policies that are able to be complied with strong enforcement. 3. To follow-up with item 1, data should include all blood lead test results regardless if elevated or not to identify trends and to ensure timely case management and environmental investigation. 4. Financial resources to aid both owner-occupied and tenant-occupied interventions. As you know, the cost to abate is so expensive. Some people want to do the right thing, but the finances aren't readily available. Low cost loans and grant monies (when indicated due to low household income) should be made readily available. NJ has the Lead Hazard Control Assistance Act of 2004, which provides financial assistance. However, the application process is long and some applicants are denied due to requirements such as not being current on back taxes or mortgage payments.
Washington	DC	The National Center for Healthy Housing, under a subcontract to Howard University, prepared an update in 2006 on Lessons Learned for HUD lead hazard control programs. It might be a start in these discussions. This is pre-RRP, but it contains observations about programs that might hire contractors to do work, so may be relevant to the discussions <http://www.nchh.org/Portals/0/Contents/LessonsLearnedUpdate.pdf> HUD's Healthy Homes Program Guidance Manual - Pre-Release draft was built on lessons learned from

		HUD lead and healthy homes programs, as well as other kinds of programs, so may also be useful. <http://cirrus.mail-list.com/leadnet/24545534.html>
Charlotte	NC	#1 overall is awareness.....getting information to people so they realize lead, at any concentration, damages their body and it is 100% preventable. Too many people don't understand what lead does to the body or don't believe it.
Akron	OH	Awareness - contractors, property owners (rental) etc Awareness - residents of the building Education - part of awareness Training - both the contractor for lead work safe practices and the resident of the unit, on proper daily maintenance to control dust and manage the environment Enforcement of the laws with the contractors in a proactive limited fining way. If the contractor is fined out of business what does EPA accomplish? The resident is the bigger and tougher challenge, education is critical there. Followed by reeducation. Vacuum cleaners should come with an informative pamphlet on dust control. Not sure how deep you want to go on the education side but think RRP class materials.
Chicago	IL	Very Good Question!! Enforcement 1) Landlords, Property Management, Realtors (The White Collar types) 2) All contractors A to Z Large & Small (The Blue Collar types) Awareness K though 12 (in Health & Safety classes) Then more enforcement on State & Local agencies. (At the Counter)

Pittsburgh	PA	A belief in the program. Motivation of state and students to want it to succeeded. Federal promotion. Monetary enforcement. Most important is that the loss of any child mentally or physically by a preventable poison is without rationality.
Fairfield	ME	Gov't programs, grants, high public awareness and caring enough about it, and public health focus on it.

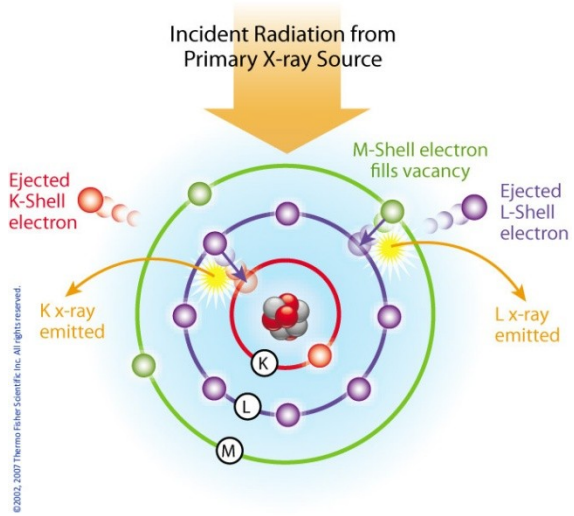
B. X-ray Florescence

This excerpt is the Niton Corporation's definition of XRF.

Each of the elements present in a sample produces a unique set of characteristic x-rays that is a "fingerprint" for that specific element. XRF analyzers determine the chemistry of a sample by measuring the spectrum of the characteristic x-rays emitted by the different elements in the sample when it is illuminated by x-rays. These x-rays are emitted either from a miniaturized x-ray tube, or from a small, sealed capsule of radioactive material using Cadmium ^{109} as its energy source.

A fluorescent x-ray is created when an x-ray of sufficient energy strikes an atom in the sample, dislodging an electron from one of the atom's inner orbital shells. The atom regains stability, filling the vacancy left in the inner orbital shell with an electron from one of the atom's higher energy orbital shells. The electron drops to the lower energy state by releasing a fluorescent x-ray, and the energy of this x-ray is equal to the specific difference in energy between two quantum states of the electron.

When a sample is measured using XRF, each element present in the sample emits its own unique fluorescent x-ray energy spectrum. By simultaneously measuring the fluorescent x-rays emitted by the different elements in the sample, handheld Thermo Scientific Niton XRF analyzers rapidly determine those elements present in the sample and their relative concentrations – in other words, the elemental chemistry of the sample. (Niton, 2012)



C. Education and Outreach Brochures

Philadelphia provides training flyers printed in a variety of languages.

- Easy Household Hints to Prevent Lead Poisoning brochure; (English, Spanish, Arabic, French, Khmer, Portuguese, and Vietnamese).
- Foods That Help Prevent Lead Poisoning; (English and Spanish)
- Prevent Lead Poisoning with Good Food; (English and Spanish)
- Top Ten Facts About Lead Poisoning; (English, Spanish, Arabic, Chinese, French, Khmer, and Vietnamese).
- Lead Poisoning and Smelting;(English)
- Facts About Mold; (English/Spanish)
- Green Cleaning Tips (English)
- Household Cleaners from Mother Nature (English)
- Lead-Safe Childcare (English)
- Learn How to Reduce the Risks in Your Home (English)
- Possible Sources of Lead in Your Home (English/Spanish)
- Possible Sources of Lead in Your Home (Vietnamese)
- Seven Tips for Keeping a Healthy Home (English)
- Toy Recall Information (English/Spanish)

D. Free Training Advertisment

RENOVATING?

Make sure your home is lead-safe!

Renovation, repair and painting create a lot of dust.

In older homes, this dust can contain lead.

Lead and lead dust is toxic—to you and your family.

Learn how to prevent lead poisoning during renovations and repair.

FREE Lead Safe Work Practices Training

Every 3rd Wednesday of each month
Free to all who wish to attend
1 p.m.– 3 p.m.

Course topics

• The House as a System: Causes of paint failure and related environmental problems

• Identifying the Hazards: Techniques for inspections

• Doing the Work Safely: Prohibited and recommended practices, personal protection

• Fixing the Problems: Techniques for components and spaces

• Rules and Regulations: Disclosure, code violations, environmental laws

• Areas of Responsibility: Landlords, inspectors, contractors

Philadelphia Department of Public Health

Childhood Lead Poisoning Prevention Program

2100 West Girard Avenue, PNH Building #3

Philadelphia, PA 19130

Free parking - Entrance on Corinthian Street

Call Steve Rice or Ricardo French at (215) 685-2788 to reserve your space.

E. Lead Poisoning 101

- What is the primary cause of lead poisoning?
- How does lead enter the body?
- How many children are affected by lead in the U.S.?
- What are the symptoms of lead poisoning in children?
- Why are children at higher risk for lead poisoning?
- How do I know if my child is lead-poisoned?
- What can I do now to protect my family from lead?
- Can adults become lead poisoned?
- What are the symptoms and health effects of lead poisoning for adult?
- Testing & Treatment
- Who should be tested for lead poisoning?
- Where can my child get tested?
- How often should my child be tested?
- What is the treatment for lead poisoning?
- Lead Hazards in the Home
- When is the likely to be a hazard?
- Lead Hazard Removal
- How can lead hazards be removed safely?
- Is there help to remove the lead hazards in the home?
- Can you recommend someone to remove lead hazards?
- Education
- Can someone come out to a community event or talk to a group?
- Advertising for the lead poisoning prevention program consists of billboard-type advertisements.

F. Community Partners

Philadelphia Campaign for Lead-Safe Children Partners

Health Agencies:

- Ayuda Community Center - 6th and Cayuga in Logan
- Children's Hospital of Greater Philadelphia HMA Health Plan
- HOPE Worldwide
- LaSalle Neighborhood Nursing Center Philadelphia College of Physicians
- Philadelphia Department of Health
- Regional Nursing Centers Consortium
- Temple Health Connection

Hardware Stores:

- Home Depot - 4640 Roosevelt Blvd., Columbus and Washington Avenue. and Mount Airy
- Fairmount Hardware - 2011 Fairmount Ave.
- A's Hardware-1229 Point Breeze St.
- Barlow's- Island and Lindbergh Ave.
- Bob's- 2548 W. Lehigh Ave.
- Chelten Hardware- 1049 Chelten Ave.
- Copper & Fitton – 5601 Chew St.
- Cox Hardware- 5000 Parish St.
- Hidell Hardware- 5109 Woodland Ave.
- Kim Young Hardware - 3520 Germantown Ave.
- Lee Byung Ki Hardware- 5506 Chester Ave.
- Mike's- 4118 Lancaster Ave.
- Paek Hong Ki – 1320 Point Breeze St.
- Seidman's - 3364 Kensington Ave.
- Joe Enhorn- 4174 Germantown St.
- New Deal Lumber- 52nd & Lancaster Ave.
- Pik-A-Panel- 5000 Germantown Ave.
- Son Myung Hardware- 2800 W. Dauphin St.
- Venango Hardware- 3655 Old York Rd.
-

Local Businesses:

- Shop-Rite- Chelten and Pulaski Streets
- Cousins- 5th and Lycoming St.
- Rite-Aide Stores - 5th and Olney Ave. and Chelten Ave.

Advocacies:

- 5th Street in Lagoon and other members of Philadelphia Hispanic Chamber of Commerce
- National Association of Hispanic Elderly
- Northwest Regional Library Philadelphia Citizens for Children and Youth
- Redevelopment Authority of the City of Philadelphia
- US Environmental Protection Agency Region 3
- Women, Infant and Children (WIC) Centers at Logan and Germantown

Painting Stores and Association:

- Painting and Decorating Contractors of America
- MAB Paint - 23 E. Chelten Ave., 5520 N. 5th St., 3377 Aramingo St., 2100 N. Broad St. and Germantown Ave.
- Duron Paint -700 S. Broad St., 111 E. Erie Ave., 5000 Ridge Ave., 827 Spring Garden Ave.
- Sherwin-Williams- 2301-07 E. Venango St.
- Old City Paint- 210 W. Girard St.

Schools:

- Harrison School,
- Hill Creek Elementary School,
- Birney Elementary School,
- Girls High School,
- William Penn High School
- Village of the Arts

G. Interview Transcripts

Chief of Staff: City of Philadelphia Department of Public Health

The Philadelphia program is more successful because of the dedication of its staff and the belief that we must prioritize a quick and effective response to children with elevated blood lead levels with nutritional and lead risk reduction, education through home visitations. We must continue the environmental lead hazard control in the homes of children who have been exposed through conditions in their homes.

Engaging in a comprehensive lead poisoning prevention program we are able to focus on evidence- based efforts, 1) increase the number of at-risk children (e.g., those enrolled in Medicaid) and test them in a timely manner making certain to perform a lead-blood screening; 2) Enforce the new renovator, remodeling, and painting program and make certain the contractors use lead-safe work practices when remodeling the older homes; 3) continue to reduce the risk of lead poisoning exposure through educating pediatricians, parents/guardians and property owners, *including* landlords.

We need to ensure that the program maintains its leadership, funding and infrastructure to provide timely, lead prevention and lead hazard controls with an eye toward future integration with the new Healthy Homes Program.

Director, Community Lead Poisoning Prevention Program, Philadelphia Department of Public Health.

We have been a separate program since 1969. I have been with the Department since 1981 & here at Lead since 1989, so I can answer all of your questions. The CLPPP has been a distinct Program within the PDPH since 1970.

There are over 100,000 children under six years of age in Philadelphia. Each year, more than 40,000 are screened for lead. Philadelphia has a very diverse population, with almost half being Black. Almost 25% of the population lives in poverty, the highest rate of the 10 largest U.S. cities.

Our mission is to prevent children from being lead-poisoned, and to provide case management services to children with elevated lead levels to prevent further harm. We utilize community outreach and education; outreach and education are key components. Lead screening and surveillance; and home inspection and hazard identification are our best method of primary prevention if we can get the family help quick enough.

We do have the capability of getting some support through code enforcement, which helps us to get some lead hazard control with the help of other agencies. In addition to housing, we also have the physicians, city program nursing and the health departments to help with case management.

Program works with local legislators to pass laws for primary prevention.

The City has an increasing immigrant population, with the School District recognizing over 80 different languages spoken in the homes of their students so we are very fortunate to be able to collaborate with many neighborhood groups and attempt to reach the families in need.

Our budget for this year (2011) is $5.7M with funds coming predominantly from our federal grant, but we have access to state and local funds as well that make up about 50% of the overall amount.

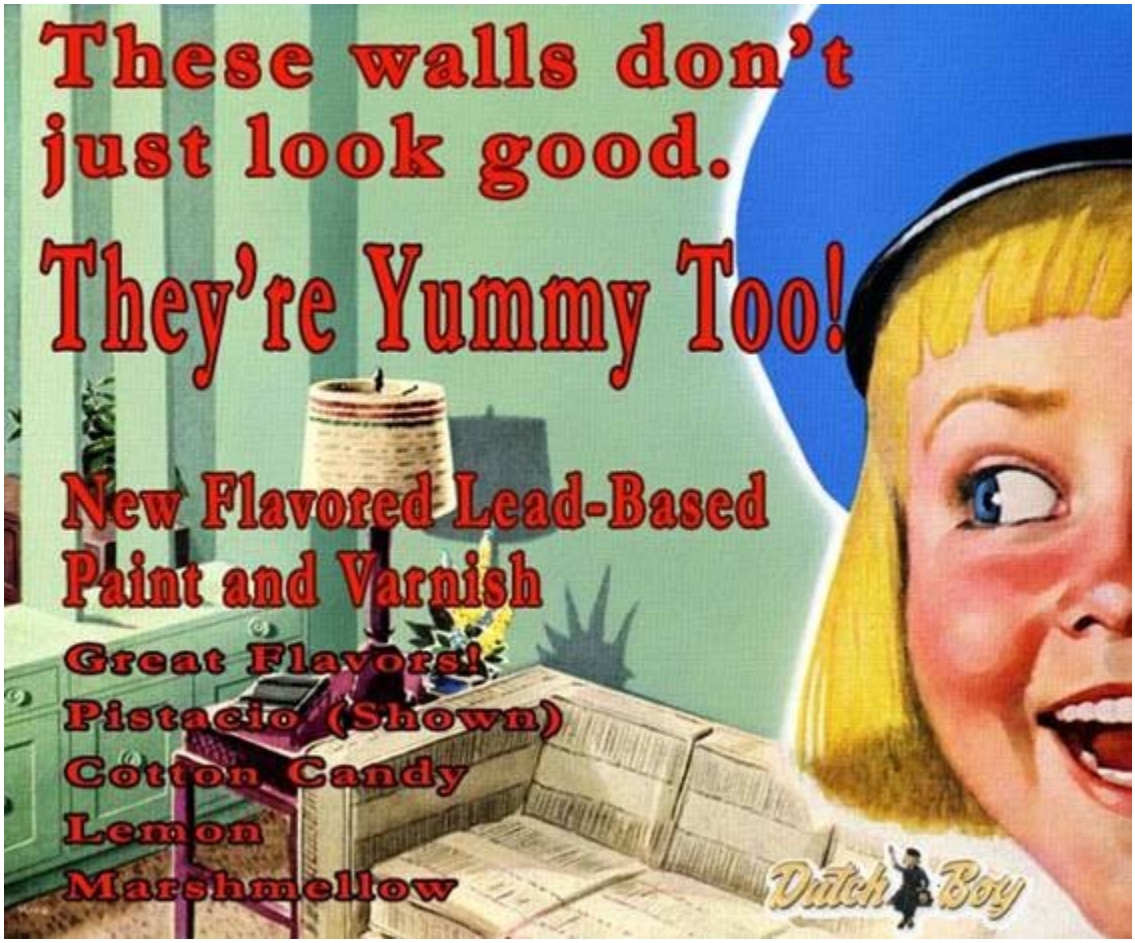
Our success is related to our prevalence rates which are children with elevated blood lead levels greater than10 µg/dl. That is now less than 4%, where it was once above 80%. That 4% represents about 1,000 children.

Our focus is going to be changing to Healthy Homes and we'll still include lead, but add asbestos, radon, mold, carbon monoxide, pest, pesticide, and general housing safety. You know this is really to deter asthma cases that are always increasing.

This program will be initiated and expanded to environmental health and safety interventions made available for home-based family childcare providers in Philadelphia. In 36 months we hope to assess 100 childcare provider homes and complete remediation on at least 50 of them.

The Philadelphia Lead Safe Homes (LSH) Study will continue to offer parental education, home evaluation, and lead remediation to the families of urban newborns. The home visits that we conduct at the baseline, six months and 12 months is still our number one method of increasing our primary prevention practices and reducing our number of lead poisoned children.

H. Dutch Boy Advertisement



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