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A Policy Analysis of Lead Paint Disclosure Implementation in Residential Homes in Missoula Montana

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A POLICY ANALYSIS OF LEAD PAINT DISCLOSURE IMPLEMENTATION IN RESIDENTIAL HOMES IN MISSOULA MONTANA

By

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Using Weimer and Vining's (2017) framework and interviews with key actors, this policy analysis evaluates the implementation of federal lead paint disclosure requirements in Missoula Montana. Lead based paint was commonly used in homes built prior to 1978. Disclosure requires landlords and any persons selling a home to disclose known lead-based paint hazards to buyers and renters. The policy was enacted to promote informed decisions to avoid or reduce the risk of lead paint exposure. Lead paint disclosure serves a critical purpose to inform citizens of risk of lead paint in older housing, because any lead exposure is particularly detrimental for a child. The toxic inequality of lead exposure is an environmental injustice, revealed by the racial and socioeconomic factors that contribute to a child's likelihood of lead exposure. Weimer and Vining's framework for analyzing policy implementation includes three components: (1) the Logic of the Policy, (2) Assembly, and (3) Availability of "Fixers". Corresponding questions for this analysis include: (1) Is the theory reasonable? (2) Who has the essential elements? and (3) Who will manage the assembly? This analysis incorporates relevant peer-reviewed literature, government reports, and interviews with key informants to answer those three questions and evaluate the effectiveness of lead based paint disclosure implementation in the city of Missoula and identify implementation problems. Recommendations are provided to strengthen lead paint disclosure and include standard leases as well as centralized data collection. Environmental health professionals can benefit from this policy analysis of lead disclosure because their work focuses on implementation, developing programs and recommending policies and public health laws.

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Introduction

The primary sources of lead exposure are: lead paint, contaminated soil/dust, contaminated drinking water, and products made with and containing lead (Bae, 2016; Lanphear et al., 1996 & 1988). The most common source is deteriorating lead-based paint and lead dust found in poorly maintained older housing (Jones, 2012). Lead Paint Disclosure is an important policy that helps provide information to citizens so that they can make informed decisions when it comes to housing. It requires the provision of a signed disclosure to all parties in the rental or sale of residential properties regarding known or unknown lead paint in the home if the home was built prior to 1978. The U.S. Environmental Protection Agency (EPA) implements the policy while the state of Montana plays on a small part in implementation. This paper analyzes the implementation of this policy in Missoula, Montana, using qualitative research methods, interviews, including a policy analysis framework and relevant literature.

This issue is of even greater concern when you consider vulnerable populations include minority and low-income families who are disproportionately impacted (Leech et al., 2016). Lead exposure and the deleterious health outcomes for residents in minority and low-income communities is an incessant indicator of racial, economic (or class) and ethnic health disparities (Oyana & Margai, 2010). These disproportionate exposures and associated health impacts are an environmental injustice, and access to readily-understandable information is just as integral for these families' right to a clean, healthy and safe environment as having more opportunity to participate in the decision-making process.

Children who are victims of elevated Blood Lead Levels (BLLs) and their parents may never know that they suffer from symptoms of this silent threat as most of the signs are not visible. Elevated BLL symptoms like cognitive delays are common in children who do not have

significant exposure to lead, and this can result in an exposure being missed entirely. Testing for lead exposure is limited and largely focused on "high-risk" areas (CDC n.d.-b). Families often have no means take on the burden of moving to a newer or renovated home. Children in poverty continue to suffer from the consequences of the historical use of lead in paint. Without proper funding from the federal government or states, lower income families will continue to face the risk of lead exposure.

The Montana Department of Public Health and Human Services reported a small number children in Montana (n=77) with elevated BLL in 2015 (DPHHS, 2019). Because so little testing is done in Montana, there are likely many undetected and unreported case of elevated BLLs. Missoula was chosen as the specific focus of this study because of its population size and median lead paint risk factors considering U.S. census data and EPA tools as well as being an assessable study area. Interviews were chosen to better understand the policy and the at-risk populations and who in state, local, and federal agencies perform each part of implementation.

The health effects from lead exposure are most pronounced in children, especially young children. Well-documented adverse effects include: damage to the brain and nervous system, slowed growth and development, learning and behavior problems, and hearing and speech problems (CDC, n.d.-a). Those adverse effects can cause lower IQ, deceased ability to pay attention, and underperformance in school (CDC, n.d.-a). The effect lead exposure has on a child is lifelong and will impact their life chances and how they contribute to society. The economic benefits of utilizing expansive lead exposure prevention would be astronomical. Some research has estimated a total annual increase of income earned by children who would no longer suffer the irreversible effects of lead in the range of $43-$110 billion (Grosse et al., 2002). This societal benefit should be enough to encourage more funding for prevention programs but that is not the

case. Lead prevention is an example of where the long-term benefits do not outweigh decision makers' concerns about the upfront costs under tight budget conditions.

Montana does not receive any lead prevention funding from the CDC currently, and therefore it is not required to report any BLL test results (CDC, 2017). Reporting elevated BLLs to the CDC makes it possible to receive funding and in turn the CDC has shown that all 25 states currently reporting are finding cases of elevated BLLs in young children tested varying from less than 1% to over 5% (CDC n.d.-b). Despite the incompleteness, the CDC blood lead level data from its childhood blood lead surveillance system are the most comprehensive and accessible in the US. Medicaid's also has BLL data reported by physicians, compiled by states and shared with the CDC, but Medicaid's data are not readily available. The lack of readily available data in Montana makes it difficult to pinpoint problem areas and exposed populations for analyses like this one. This data would benefit Montana as there are high levels of lead in residential soils in cities like Butte, Anaconda and Helena due to past metal mining and smelting (MT DEQ, n.d.). As discussed below, there is also a large amount of old housing in Montana, which is most likely to have lead-based paint.

This analysis is intended be one of the first steps to show that there needs to be attention on lead exposure risks in Montana. Questions that I will attempt to address are: (1) Is implementation of lead paint disclosure effective in Missoula, Montana?; (2) How are state and local government officials implementing lead paint disclosure?; and (3) What neighborhoods and populations are most at risk from lead-based paint exposure in Missoula, MT?

This professional paper examines the implementation of lead-based paint disclosure and highlights the environmental injustice of continued lead exposure in children. This investigation analyzes implementation of the policy for effectiveness and potential weakness. For the

implementation of a disclosure policy to be effective, persons who are affected by the policy should be informed of the risks involved to be able to make an informed decision. A weakness of disclosure policy includes heavy reliance on self-reporting and voluntary compliance (Bae, 2012). This analysis is an effort to evaluate a law that is intended to protect the most vulnerable populations. Analysis of disclosure is essential because identifying improvements can help strengthen policy and protect children's health.

Existing empirical evidence is limited to certain contexts, not yet able to generalize the effectiveness of disclosure as a policy strategy to reduce environmental health risks (Bae, 2012). In addition, the lead paint disclosure policy is under-investigated, which leads to the question of whether or not it is meeting its objectives (Bae, 2012). This limited understanding of levels of compliance with disclosure and responses to disclosure underscore the need for further study.

This analysis is intended for an audience like members of the Montana Public Health Association and attendees of their annual conference. Attendees and members would include environmental health professionals from around the state of Montana. A health officer for the Missoula City-County Health Department is an example a health professional in Missoula. Professionals like a health officer in Missoula would be my local target audience. Environmental health professionals would benefit from a policy analysis of lead disclosure because they focus on implementation and developing programs as well as on topics like recommending policies and public health laws. MPHA intends to educate professionals to support the health of their communities which would include issues like lead paint exposure. My audience also includes policy makers and public health advocates who seek to reduce the lead exposure by utilized the recommendations of this analysis to strengthen the lead paint disclosure policy.

This analysis will first cover the background of lead paint disclosure. The background was informed by a literature review that covers the lead paint disclosure history, health impacts of lead, environmental justice issues, and lead disclosure policies and related programs. Next, I discuss the analytical approach utilized for this policy analysis, including David L. Weimer's and Aidan Vining's (2017) policy implementation analysis framework, and the methods employed, including the use of peer-reviewed literature, government reports and interviews with implementers. The policy analysis chapter follows where I attempt to analyze the success of the policy and identify weaknesses of lead paint disclosure implementation and the policy itself. Finally, the recommendations formulated from the analysis are presented along with a conclusion.

Literature Review

A literature review of primarily peer-reviewed journal articles, government documents, and NGO reports revealed a few common themes that provide valuable context for my policy analysis of lead disclosure policy implementation. These themes include lead paint disclosure history, lead impacts, environmental justice, and lead prevention policies. Lead has historically been a health and environmental issue that required policies to help curtail exposure. Thus, this literature review describes the history of lead paint disclosure as a policy adopted in 1996 that has led to the current phase of the policy process, which is implementation. In addition, this literature review also covers critiques of lead disclosure policy. My analysis also details the negative impacts of lead exposure and the environmental justice issues. Although elevated blood lead levels in children have continuously declined since the late 1970s, blood lead levels among low income urban children, especially children living in older housing, remains high (CDPH, 2004). As noted above, the most common source of lead exposure in children is deteriorating lead-based paint in poorly maintained older housing (Jones, 2012). Although risks of lead exposure were being identified as early as the 1950's, it was almost two decades later when lead-based paint was banned for use in homes on a national scale in 1971 (HUD, n.d.-b). The ban came about due to reports showing that high levels of lead exposure in children was leading to convulsions, coma, mental disabilities and death (Rabin, 1989).

Lead Paint Disclosure History

In response to the growing recognition of the problem of lead poisoning from lead-based paint, Congress passed the Residential Lead-Based Paint Hazard Reduction Act of 1992, also known as Title X. Section 1018 of the Act required the U.S. Department of Housing and Urban Development (HUD) to promulgate a lead paint disclosure rule. The so-called "1018 Rule" was

adopted in 1996 (Lead; Requirements for Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazards in Housing, 1996; hereafter 40 C.F.R. § 745, 1996). It requires disclosure of information concerning lead-based paint prior to the transfer or lease of residential property. This policy, which is enforced by the U.S. Environmental Protection Agency, with the assistance of the Department of Justice, is meant to protect a home buyer or lessee by requiring all home sellers or landlords to disclose known lead paint in a home built prior to 1978. This disclosure gives the buyer or lessee the opportunity to make an informed decision; i.e., to take advantage of options such as having the home inspected and tested for lead, remediating the lead, taking other protective measures, or choosing not to purchase or rent the home, and thereby mitigating or avoiding health risks of lead, especially to young children.

Before signing a lease or a sales contract, the person leasing or selling the home must disclose any known lead paint found in the home (40 C.F.R. § 745, 1996). If this part of implementation is not completed, the contract can become null and void and a civil penalty may be placed on the seller or landlord (24 C.F.R. § 35 and 40 C.F.R. § 745, 1996). In an instance where lead paint is known to be present by the property owner, full disclosure occurs when several steps are completed: (1) a lead hazard information pamphlet approved by the EPA is provided to the buyer or renter; (2) notice is given to the buyer or renter; (3) records and reports of the lead hazards are made available to the renter or buyer; and (4) a completed and signed Lead Warning Statement and acknowledgement is attached to the sale or lease contract (40 C.F.R. § 745, 1996). Enforcement for failure to disclose a lead paint hazard can result in a fine of up to $10,000 for each violation from HUD or the EPA (40 C.F.R. § 745, 1996). HUD would have jurisdiction in Section 8 housing which is federally funded (40 C.F.R. § 745, 1996). When a willful violation occurs, the EPA can issue a fine of up to $25,000 for each day of violation or

order imprisonment for no more than a year or both. Civil suits seeking compensation can also be sought by the buyer or renter (24 C.F.R. § 35 and 40 C.F.R. § 745, 1996).

Lead paint disclosure policy aims to employ information to reduce environmental risk. Therefore, the goal of disclosure is achieved by giving prospective renters and home buyers access to information regarding environmental risk. This knowledge, if this policy is working perfectly, will cause behavioral change either by the buyer, seller, landlord or renter and ideally will result in reducing or eliminating risk of lead exposure.

In the case of lead disclosure and information-based policies, public understanding can be key to implementation effectiveness. However, according to a report by the National Environmental Education and Training Foundation, few Americans have sufficient knowledge of the environment to be considered environmentally literate (Coyle, 2005). The issue with lead exposure in regard to environmental literacy is that lead is a silent and often undetected and unknown threat. For example, if a person is affected by lead paint exposure, they may have no knowledge of lead policies, health effects, and exposure sources. This lack of knowledge means that renters and buyers would likely not link adverse health effects experiences to lead paint. The EPA recommends but does not require lead testing in children if a known exposure source has been identified. However, lead exposure may not be suspected in children without a known contamination source or a blood lead level test. These tests are not mandatory for children unless a child is on Medicaid, and even then, testing is often inconsistent (Kemper & Clark, 2005). No state has been found to be 100% compliant with federal Medicaid requirements (Safer Chemicals, Healthy Families, 2017). 10 states plus D.C require universal testing for children typically at the ages of 1 and 2 (Safer Chemicals, Healthy Families, 2017). Montana does not require universal testing. Those 10 states came close to meeting 100% compliance for Medicaid

requirements (Safer Chemicals, Healthy Families, 2017). Safer Chemicals Healthy Families also found in their report that universal BLL testing would be more useful and cost effective than targeted BLL testing in children (2017).

Lead Impacts

Although lead exposure does not adversely affect the vast majority of the public, there are still many children nationwide that suffer from elevated blood lead levels to the detriment of their health (CDC, n.d.-a). Lead exposure is preventable and yet there are still many children in the United States that have unsafe or "elevated" blood lead levels (BLL). There are no reliable, national, population-based estimates of the prevalence of elevated BLL among children. In 2017, states that provided BLL testing data reported around 40,000 children under five-years old had unsafe BLL, out of 2 million tested (CDC, n.d.-b). It should be noted that only 25 states provided BLL testing data to the Centers for Disease Control and Prevention (CDC) in 2017, and Montana was not one of them (CDC, n.d.-b). The CDC has the monumental task of defining lead risk and setting national standards. As recently as 2012, the CDC lowered the BLL reference value from 10 micrograms of lead per deciliter of blood (μg/dL) to 5 micrograms per deciliter (Burns& Gerstenberger, 2014). The reference value or level is the 95th percentile of test results. The change is credited to the recommendations of the Advisory Committee on Child Lead Poisoning and Prevention (ACCLPP; Burns & Gerstenberger, 2014). The ACCLPP recommended in addition to the new reference value, discontinuing the term "level of concern" for BLL as there is no safe amount of lead for a child (Burns & Gerstenberger, 2014).

Lead toxicity is known to primarily affect the central nervous, hematopoietic (stem cells), hepatic and renal systems resulting in serious health issues (Flora et al., 2012). The impacts on the nervous system can cause loss of memory, convulsions, paralysis, decreased IQ, brain

damage, fatigue, muscle weakness and death (Flora et al., 2012). Decreased IQ can occur in children from even low levels of lead exposure, i.e., due to the heavy metal's high level of toxicity (Lanphear et al., 2005). In a study of 1,333 children from birth until 5-10 years of age, a 6.9 IQ point decrement was found associated with an increase in BLL from 2.4 to 30 μg/dL and a 3.9 decrement was revealed from an increase in BLL 2.4 to 10 μg/dL (Lanphear et al. 2005). Low levels of exposure can result in and short-term memory impairment, reading problems, and poor school performance among children (Lanphear et al., 2005). Within the hematopoietic system, lead toxicity can cause anemia (Flora et al., 2012). The effects of lead on the renal system can result in renal breakdown, hypertension and hyperuricemia, an excess of uric acid in the blood that causes gout (Flora et al., 2012). Some other deleterious health impacts include cardiovascular disease, coronary heart disease, infertility, changes in serum testosterone, premature delivery, and the storage of lead in soft tissue and bone (Flora et al., 2012). In adults, the most common sign of lead exposure is peripheral neuropathy with foot drop (Volvolakos et al., 2016). Pre-natal exposure has been correlated with antisocial behavior and schizophrenia (Volvolakos et al., 2016). Some of the economic impacts of childhood lead poisoning include $5.9 million in medical care costs as well as $50.9 billion in lost economic productivity as a result from reduced cognitive potential (Trasande & Liu, 2011).

One reason children are more likely than adults to ingest lead is the high rate at which they put their hands and other objects in their mouths (von Lindern et al., 2003). These items may have encountered lead through sources like lead contaminated house dust or may have been painted with lead paint (von Lindern et al., 2003). The risk of harmful exposure from house dust is of great concern because dust consists partially of fine particles which may be the most biologically significant source of ingestion (hand-to-mouth) in childhood lead poisoning (EPA,

1995). Fine dust particles are more likely to stick to a child's hands and therefore would more readily travel to their mouths and in turn lead would then be ingested (EPA, 1995). Lead absorption is inversely related to particle size and fine dust is an ideal size to be absorbed (EPA, 1995). Lead in house dust is also generally more concentrated in the finest particles of dust (EPA, 1995). A child spends most of its time indoors and therefore can easily be exposed contaminated house dust (Zota, et al., 2016.) Considering these factors, house dust is particularly of concern when trying to reduce children's blood lead levels.

National Childhood Blood Lead Surveillance Data compiled by the CDC provides important information for monitoring decreases in elevated BLLs in children (Burns & Gerstenberger, 2014). The surveillance data contains information from each state (that chooses to participate) about the number of children who undergo BLL testing each year, their test results, as well as more specific information for children younger than 72 months (Burns & Gerstenberger, 2014). It is important to note that Montana does not report its BLL testing information for the National Childhood Blood Lead Surveillance Data. The data that is collected by the CDC can then be used to identify communities that exhibit high concentrations of elevated lead exposure and initiate risk reduction measures. To participate in Medicaid, the national health care insurance program for lower income individuals and disabled persons, a child is required to have their BLL tested twice before the age of two. Only a fraction of these children are tested despite research suggesting this group is statistically at higher risk for lead exposure due to their income level and in some circumstances, their race (AAPCEH, 2005). The low number of tests completed to meet the mandatory testing regulation is concerning because the national surveillance relies heavily on this important source of data (Burns & Gerstenberger, 2014). Burns and Gerstenberger (2014) report:

> In addition, the National Toxicology Program's 2012 monograph concluded that there is sufficient evidence to suggest that children with even lower BLLs (< 5 μg/dL) may experience decreases in IQ and academic achievement, as well as a higher incidence of attention-related and other behavioral problems. Research also suggests that the potential risk of IQ loss may be more profound at BLLs below 10 micrograms per deciliter than above, indicating the possibility of a supralinear dose–response relationship. The National Toxicology Program also recognized that limited evidence associates low-level blood lead concentrations with decreased prenatal cognitive function, decreased glomerular filtration rate [kidney function], and delayed puberty. Furthermore, research suggests that children with BLLs well below the previous 10 micrograms per deciliter standard can benefit from aggressive public health interventions. (p. 27)

Environmental Justice

Low-income families and minorities are more likely to live in older rental homes in inner cities (Sampson & Winter, 2016; Bae, 2016). Older rental homes and homes that have not been properly inspected or updated are likely to have lead-based paint. The lack of remediation in racially- and economically-segregated neighborhoods puts disproportionate environmental burdens on these communities, and the legacy of segregation and present-day discrimination has prevented and continues to prevent many minorities and specifically African Americans from escaping poverty and moving to areas free of this and many other environmental health hazards (Benfer, 2017; Mohai & Saha, 2015). A recent study of urban Chicago and Detroit neighborhoods found significant racial disparities in BLLs in children (Sampson & Winter, 2016; Moody et al., 2016). Predominantly Black and Hispanic neighborhoods had much higher prevalence of elevated BLLs at 41% compared to predominantly White neighborhoods

(Sampson and Winter, 2016). The Chicago neighborhoods in Sampson and Winter's 2016 study are a stark but not surprising display of continued environmental racism. The data collected from the study revealed that minority children are victims of the cycle of poverty. It also revealed that African American children who lived in predominantly African American neighborhoods showed a wide range of disadvantages compared to their counterparts in predominantly White neighborhoods as well as children in predominantly Hispanic neighborhoods (Sampson & Winter, 2016). As Sampson et al. stated:

> "…the profound heterogeneity in the racial ecology of what we call toxic inequality is partially attributable to socioeconomic factors, such as poverty and education, and to housing-related factors, such as unit age, vacancy, and dilapidation. But controlling these factors, neighborhood prevalence rates of elevated BLL remain closely linked to racial and ethnic segregation." (2016, p. 279).

Disproportionately high lead exposure rates perpetuate racial inequality by affecting children of color's developing brains, essentially forcing them to academically fall behind children that have not been exposed to lead (Sampson & Winter, 2016). Sampson and Winter's research is just one example of many studies that show direct links between racial segregation, environmental hazards and poor health outcomes (2016). With lead paint exposure and considering the at-risk populations, the EPA's standard definition of environmental justice points to an environmental injustice. Their definition reads: "The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population should be forces to shoulder a disproportionate share of exposure to the negative effects of pollution due to lack of political or economic strength." (Kuehn, 2000; 10682-83). These racially-segregated

neighborhoods are often in older inner cities with a lot of older housing. The Medicare BLL testing mandate gives minority children, many of whom live in racially segregated communities, a better chance of their elevated BLLs being caught early.

Race is just one factor when looking at who is at risk for detrimental lead exposure. Children living in low income households also are statistically more likely to suffer from the effects of prolonged lead exposure (Benfer, 2017). Lower income families often receive housing assistance. The laws governing the federal rental housing assistance "Housing Choice Voucher Program" are extremely outdated (Benfer, 2017). This program does not require lead hazard risk assessments until a child's BLL is four times the Center for Disease Control and Prevention reference value which would not be discovered unless the child was also being tested under Medicaid requirements. Outdated laws like that, deprive low income and minority children of the opportunity to succeed. This ultimately perpetuates the pattern of generations being unable to break out of the cycle of poverty (Benfer, 2017). With so many factors working against them, including residential segregation, minority and low-income children don't stand a chance to escape the very home environment that may be poisoning them. As Benfer states "discriminatory decision-making and insufficient policy intervention on the part of government actors is responsible for the disproportionate rate of lead poisoning among low-income individuals and communities of color and further perpetuates the cycle of disability and despair" (2017, p. 513).

In one study of metropolitan Detroit neighborhoods, a direct link was reveled between lower income neighborhoods and elevated BLLs (Moody et al., 2016). Neighborhoods that were predominately White but lower income, had higher BLLs than neighborhoods with a higher income (Moody et al., 2016). This was true even if the neighborhood was predominantly African American (Moody et al., 2016). Socioeconomic factors are important indicators of

vulnerability to a child's likelihood to have lead poisoning (Shao et al., 2017). These factors also include housing tenure status of the family, for example, if a family rents or owns their house, as well as the age of the home a child lives in (Shao et al., 2017). Affluent families are more likely to live in a newer home and have more opportunity because they have the means, to test for lead and remedy an issue like lead exposure while less affluent families may depend on government intervention and assistance (Shao et al., 2017). This relationship between socioeconomic status and lead exposure risk is disturbing due to the simple fact that if no intervention is executed, the cycle is likely to continue for many generations. Moody et al. (2016) point out that the problem is glaringly obvious by stating:

> "However, because the epidemic is non-contagious and the children most affected are black and live in segregated and poor socioeconomic neighborhoods, little has been done on a national scale. As lead exposure is related to race through place of residence and neighborhood characteristics, it has become a critical spatial justice and environmental inequality issue." (p. 836).

Housing and economic Census data can help pinpoint neighborhoods that would greatly benefit from intervention and prevention programs by identifying older housing and lower socioeconomic families (Vivier et al., 2011). This method requires limited resources and could make sure that low income and minority neighborhoods with older housing would be targeted first as their need is likely to be much greater (Vivier et al., 2011). Minority and impoverished communities need the most funding and attention at the federal level and have been systematically neglected for decades (Vivier et al., 2011). Despite increased access to healthcare and knowledge of how to prevent lead exposure, many large geographic areas that consist of

low-income families indicate a heightened probability that children in these families will endure preventable differences based on where they live (Vivier et al., 2011).

One study of blood lead levels in children in Rochester, New York, found that African American children at six months of age had blood lead concentrations 26% higher than white children at the same age (Lanphear et al., 2002). Disrepair is especially dangerous in older homes, which can result in lead-based paint being disturbed and residents exposed. This is often an issue with older windows that with repeated use, caused paint to chip and be disturbed as well as fine paint dust particles to accumulate on window sills and to be dispersed in the home. Lanphear et al. also found that a 24-month-old child living in a rental home is likely to have an average blood lead level 44% higher than a child living in an owner-occupied home (2002). The response time that triggers the creation of new policies at the federal or state level to address environmental health hazards is incredibly sluggish, and is often too late for many children and their families to avoid harm (Benfer, 2017).

The Blood Lead Level (BLL) of a child is likely to point to the source of the lead exposure (Shannon & Graef, 2017). For example, a child with BLL between 10 and 25 micrograms per deciliter is likely to have been exposed to deteriorated lead paint, house dust with lead, or lead in soil (Lanphear et al., 1996). Although the prevention of lead exposure is considered costly, the economic benefits from children being protected from the detrimental effects of lead would far outweigh the initial cost (Lanphear et al., 1998). Although lead paint is not the only exposure source, it represents about 70% of childhood exposure (Gould, 2009). Due to this high representation, it is estimated that there would be a net benefit ranging from $124-$188 billion which would result in a $12-$155 return for each dollar invested in lead paint hazard control (Gould, 2009). The $12-$155 would be returned in health benefits, higher lifetime

earnings, increased IQ, tax revenue, reduced spending on special education and reduced criminal activity (Gould, 2009). Thus, lead prevention has societal benefits in addition to benefits for individuals at risk of lead exposure.

From an environmental justice perspective, public access to information, specifically among low income and minority renters, is integral to continue to reduce elevated blood lead levels in low-income children and children of color (Bae, 2012). In a study of 5,000 children aged 1 to 5 years (the data was from the National Health and Nutrition Examination Survey III Phase 1 1988-1991 and Phase II, 1991-1994 were compared to data from the survey period 1999-2004) between 1988-2004, there was a reduction of elevated BLLs from 9% (1988) to 1.4% (Jones et al., 2009). This reduction is further evident in the CDC's data collected between 2012-2016, showing that on average the percentages of children across the U.S. tested for elevated blood lead levels have consistently either dropped or stayed at a low percentage of 2-3% (CDC, n.d.-b). This is due to public education, prevention programs and policies like the lead paint disclosure rule (Bae, 2016). These vulnerable groups are also subjected to procedural injustice especially because they have had little opportunity to be influential and participate in the decision-making process of legislatures and environmental agencies (Kuehn, 2000). Procedural justice also includes public access to information, such as information about environmental risks and preventative measures, in the case of residential lead exposures (Kuehn, 2000).

Residential Lead Exposure Prevention Policies and Programs

As described below there are many residential lead exposure prevention policies and programs at the federal, state and local level. At a national level, the National Lead Prevention Week focuses on awareness and prevention. The CDC also has the "Healthy People 2020" program which includes identifying high-risk areas and developing and codifying specifications

for lead-safe housing treatments. At the local and national level (when Medicare is involved), pediatricians play an important prevention and educational role. At the federal level, HUD monitors and inspects public housing for lead paint as well as offering grants for states to remediate lead paint. In conjunction with HUD, the EPA, the U.S. Department of Energy, U.S. Department of Health and Human Services and the White House Council on Environmental Quality, a collaborative effort was launched as the Advancing Healthy Housing Strategy for Action which aimed to address health hazards in homes. The MT DPHHS at the state level provides information about lead paint to healthcare providers, families and contractors. These programs play an essential role in lead paint exposure prevention efforts.

Exposure to lead paint and lead dust in residential homes is an environmental health issue of concern, yet there is a common perception in communities that lead is not immediate health risk (Harclerode et al., 2016). Promoting public awareness is the core mission behind the National Lead Prevention Week as well as being the core of state lead exposure prevention programs. Lack of awareness of lead risks raises concern about the effectiveness of the implementation of disclosure policies in general. Any weakness in the implementation of lead disclosure policy results in the continued exposure to lead that causes cognitive delays and even permanent cognitive impairment, as well as other harmful effects in children (Bae, 2012; CDC, n.d.-a).

Four main factors influence the level of harm from lead exposure: duration of exposure, frequency of exposure, dose, and individual risk factors (Bryant, 2004). Also in 2012, the CDC announced the program "Healthy People 2020" which has an aggressive goal of lowering the BLLs of all children in the United States below 10 micrograms per deciliter (CDC, 2018). The CDC's Comprehensive Program for Primary Prevention of Childhood Lead Poisoning includes

identifying high-risk areas and populations, developing and codifying specifications for lead-safe housing treatments, evaluating primary prevention progress, and identifying research opportunities (CDC, 2018). Another goal of the Healthy People 2020 program is eliminating above average risk based on race and social class (CDC, 2018). It is important to note that although the CDC is supposed to review the reference value every four years (CDC, 2018), this did not occur in 2016 which now makes the "Healthy People 2020" goal harder to reach and the announcement of a new reference level overdue by four years.

Although parents play a primary role in the prevention of their children being exposed to lead, it is essential that pediatricians make it common practice to educate parents of the dangers of lead exposure on their child's development (Polivka & Gottesman, 2005). Pediatricians often do not test children that are enrolled in Medicaid even though it is a mandatory requirement to receive the benefit (Kemper & Clark, 2005). Although pediatricians are aware of the requirement to test a child enrolled in Medicaid's BLLs, the testing often does not occur because some have the perception that the risk of lead poisoning is low (Kemper & Clark, 2005). This perception is often based off how they perceive what the level of lead exposure is in the community (Kemper & Clark, 2005). Providing pediatricians with more information about their local risk of lead poisoning could overcome the perception that their patients are not at risk. Pediatricians are essential to making sure that Medicaid requirements are followed and educating all parents about the risk of lead exposure in children (Kemper & Clark, 2005).

Under HUD, the Office of Lead Hazard Control and Healthy Homes (OLHCHH) provides funding to state and local agencies to develop effective ways to reduce lead paint hazards (HUD, n.d.-a). The funds come from either the Lead Hazard Reduction grant programs (LHRD) or the Lead-Based Paint Hazard Control Grant program (LBPHC). The LBPHC has the

largest number of grants and funds as well as being open to all jurisdictions (urban, suburban or rural). The LHRD is targeted at urban jurisdictions that have a minimum of 3,500 pre-1940 occupied rental homes. In addition to these grant programs, HUD provides outreach and technical assistance, and conducts technical studies to help protect children and their families from health and safety hazards from lead in the home (HUD, n.d.-a). However, according to a report from the Government Accountability Office, there were several areas for improvement (US Congress GAO, 2018). The reliance on public housing agencies self-certifying compliance with lead paint regulations shows a limitation in HUD's compliance monitoring efforts (US Congress GAO, 2018). They were also found to be non-compliant with annual statutory reporting requirements for its lead reduction efforts (US Congress GAO, 2018).

The Advancing Healthy Housing Strategy for Action was a collaborative effort launched in February, 2013 between HUD, the U.S. Department of Energy, EPA, U.S. Department of Health and Human Services and the White House Council on Environmental Quality (HHP, 2016). This program does not appear to still be a functioning but was an interagency working group that developed a report titled *Advancing Healthy Housing: A Strategy for Action.* The strategy aimed to reduce the number of homes in the U.S. with residential safety and health hazards through five goals. Goals one and two aimed to come up with a consensus regarding the basic concept of a healthy home and encourage adoption of this consensus across federal agencies, tribal governments, state and local governments and non-governmental organizations. Goal three was to create and support training and workforce development to address health hazards in housing. Goal four was to educate the public about healthy homes. Goal five aimed to support research and informs and advances healthy housing in a cost-effective manner (HHP, 2016).

In Montana, the Department of Health and Human Services offers information about lead prevention resources for Montana families (DPHHS, n.d.). The information provided for parents and families points them towards resources regarding lead through the CDC, EPA, and OSHA as well as how to renovate properly. In addition to information for families, they provide information for health care providers as well as employers and contractors. For health care providers there are announcements, resources from the CDC, screening for lead poisoning guidance, and the administrative rules of Montana regarding lead Reportable Condition which includes ARM 37.114.203 and Elevated Blood Lead Level Follow-up ARM 37.114.546. For employers and contractors, they provide relevant lead disclosure rules, as well as contacts for contractor training and certification (DPHHS, n.d.). The present analysis sought to better understand what role DPHHS plays in lead disclosure policy implementation.

In addition to DPHHS efforts, the Montana Weatherization Training Center (MWTC) at Montana State University Extension Office offers a training course for the EPA Lead Renovation, Repair, and Painting Rule (MWTC, n.d.). This training course is for renovation contractors, maintenance workers in multi-family housing, painters, and others in the specialty trades. Participants learn how to assess and work with lead paint hazards in a safe manner. They earn a certification that which is good for five years after which they must complete a refresher course to stay certified (MWTC, n.d.).

Local Missoula government has little to do with lead disclosure. Beyond offering information on lead in drinking water, there are no additional resources offered for lead-based paint by the Missoula County Health Department. Although local government could be utilized to further strengthen lead disclosure, that does not appear to be happening in Montana. There is a lack at the city level of any programs or outreach to educate the public on lead exposure sources

and resources. This is not what is often found with environmental policy where state regulators are responsible for implementing a majority of the policy (Rinfret, et al., 2019).

Disclosure relies on informed risk prevention behavior (Bae, 2012). Disclosure still gives people a choice of living in a home with the knowledge of lead paint. Studies have shown that although the disclosure policy has reduced the amount of families with small children buying homes with known lead paint, it has not eliminated the exposure of small children to lead paint (Bae, 2012). Bae (2012) reports that several studies identified that disclosure policies which simply make information available with a possible fine are not enough to completely achieve their objectives. For disclosure policy implementation to be effective, the disclosed information must be compatible with the user's decision-making process and provide practical opportunities to avoid or reduce lead risks (Bae, 2012). For example, notifying a potential renter of lead paint may be ineffective due to income or housing availability constraints leaving them with little or no ability to act effectively by requesting remediation before moving in or attempting to procure different housing.

Families who struggle with poverty and depend on government programs have less of an opportunity and fewer resources to have control of the situation they are in. This means that even if a lead exposure was brought to their attention, under the current system and depending on the state they live in, they may not have any options to remedy the situation. Localized information on the relationships between children's BLLs and environmental factors (such as the existence of lead contaminated soil) along with reformed policies would help families choose the safest home make ensure their children have every opportunity to succeed from the start (Shao et al., 2017). Without proper policies, the cycle will continue and lead exposure will remain a threat that families living in poverty will fall victim to.

Implementation of any policy is difficult and takes continuous work to achieve favorable outcomes (Weimer & Vining, 2017). An analysis helps reveal how a policy is working and where there are limitations, weaknesses and areas for improvement. If the policy is working well it may take less work to maintain the implementation process (Weimer & Vining, 2017). Policy that is well crafted and has clear objectives make implementation easier for policy implementers such state and local agencies to understand and enforce (Weimer & Vining, 2017). There are many factors like limited resources and political conflict that contribute to or impede the effectiveness of policy implementation. Careful analysis, research and specialized knowledge of the topic are required to understand why effective policy is working.

Policy Analysis Approach

The primary objective of this analysis is to determine what is effective about lead paint disclosure in Missoula and what aspects are not effective, because no lead exposure is good exposure in children. The EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN) was used to select the city of Missoula for this analysis. Missoula is indicated as being above the median in terms of lead paint risk of all populated areas in Montana. According to the EPA's EJSCREEN tool, Census block groups in Missoula fall in the 61st percentile for lead-based paint risk in Montana (EPA, 2018). The 61st percentile is based on rankings of Census block groups in Montana by the percentage of homes built prior to 1960, which are more likely to have lead paint and are therefore determined to be an environmental risk indicator in the EJSCREEN tool (EPA, 2018). For comparison, Billings, Bozeman, Butte, Great Falls, and Helena are ranked in the 61st, 44th, 85th, 77th, and 73rd percentiles, respectfully.

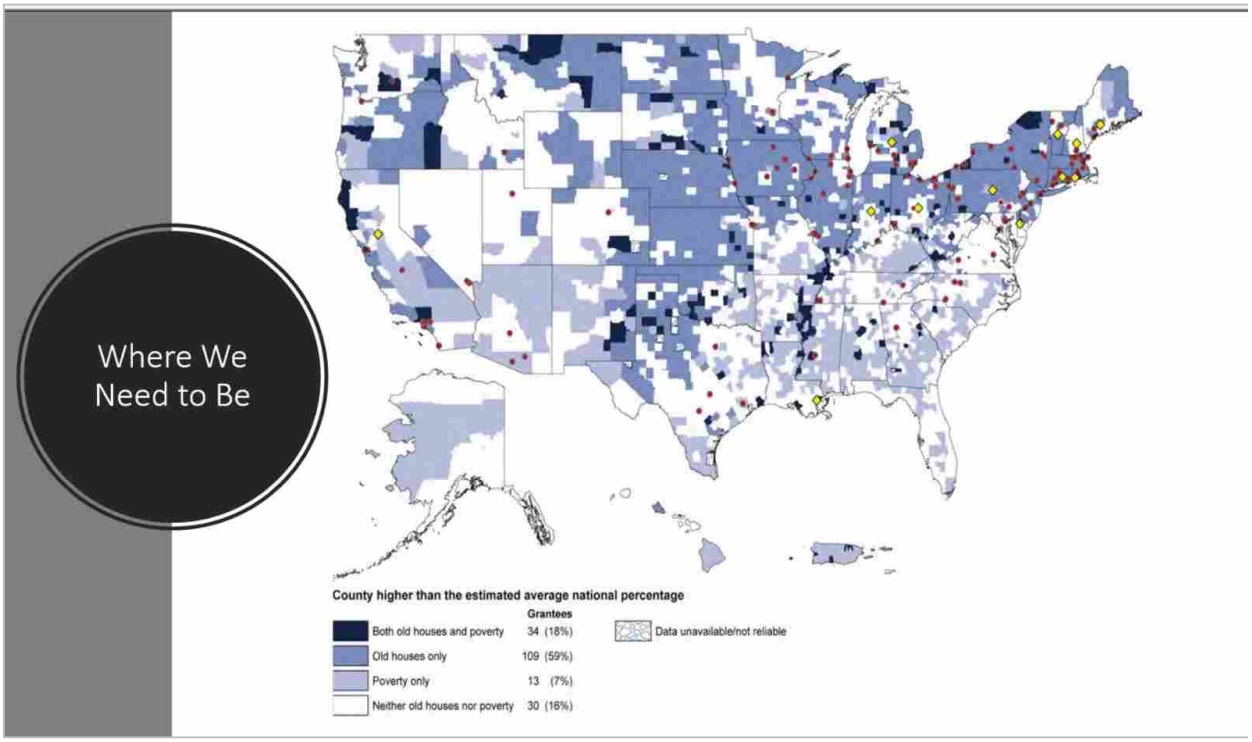
This analysis is an attempt to better inform implementers, policy makers and public health advocates to further strengthen the policy through the recommended actions that were informed by interviews, document analysis and application of an analytical framework. Though lead is still a threat to children as elevated BLLs occur in children all over the U.S., there is not an abundance of research covering disclosure policy implementation.

An analytical framework, interviews, relevant documents, and EJSCREEN were used for this analysis because each contributed to a thorough policy analysis. The analytical framework gave this policy analysis structure and key factors to examine lead paint disclosure implementation. The interviews helped develop an understanding of disclosure policy implementation "on the ground" in Montana. Documents including peer-reviewed articles, government reports and websites helped provide a foundation for developing questions for the interviews and interpreting and contextualizing interview findings. The EJSCREEN informed the

selection of a city in Missoula to narrow the scope of the policy analysis and help answer the question about what areas in Missoula may be most at risk. The map below (Figure 1) was also used to identify Missoula as an area to study. HUD used Census data to identify which counties had higher than the estimated national average for older homes and poverty. Missoula County is shown to have an above-average percentage of older homes.

Figure 1

HUD Map identifying Areas of Concern for Lead-Based Paint



Analytic Framework

The analytic framework used for this study is drawn from David L. Weimer and Aidan Vining's book, *Policy Analysis: Concepts and Practice* (2017). Specifically, this study focuses on their suggested three general factors affecting success and failure of implementation to answer "Is implementation of lead paint disclosure effective in Missoula, Montana?" These three general factors (described below) include logic of the policy, assembly, and availability of

"fixers". Through evaluation, the policy can be adapted to better reduce lead exposure and improve management of lead-based paint disclosure. At-risk populations identified in the analysis can help focus limited resources to the most vulnerable populations. This policy implementation analysis analyzes policy at a local level for the city of Missoula providing policy-makers with localized knowledge to help eliminate lead exposure and reform lead disclosure policy. Many cities in Montana and all over the U.S. operate under the same conditions of limited funds for their health departments in a state that does not have much focus or public awareness on lead disclosure enforcement, education, training or outreach.

Logic of the Policy: Is the theory reasonable?

Compatibility between policies and their intended outcomes is important for a policy to be effectively implemented (Weimer & Vining, 2017). Weimer and Vining (2017) ask "What theory underlies the connection between policy and intended outcomes? Is the theory reasonable?" (p. 281). The theory behind lead paint disclosure implementation is that once lead paint is disclosed to a buyer or renter, they will then make an informed decision about whether to rent or buy the home or ask for additional information to do so. To use this factor, I strip down the theory behind lead paint disclosure which is if information is provided, the decision maker will make an informed decision, and then I analyze if the implementation of this theory is reasonable. I will also look at the logic from an environmental justice perspective and how the policy impacts the fair treatment of people of all races, cultures, incomes and educational levels.

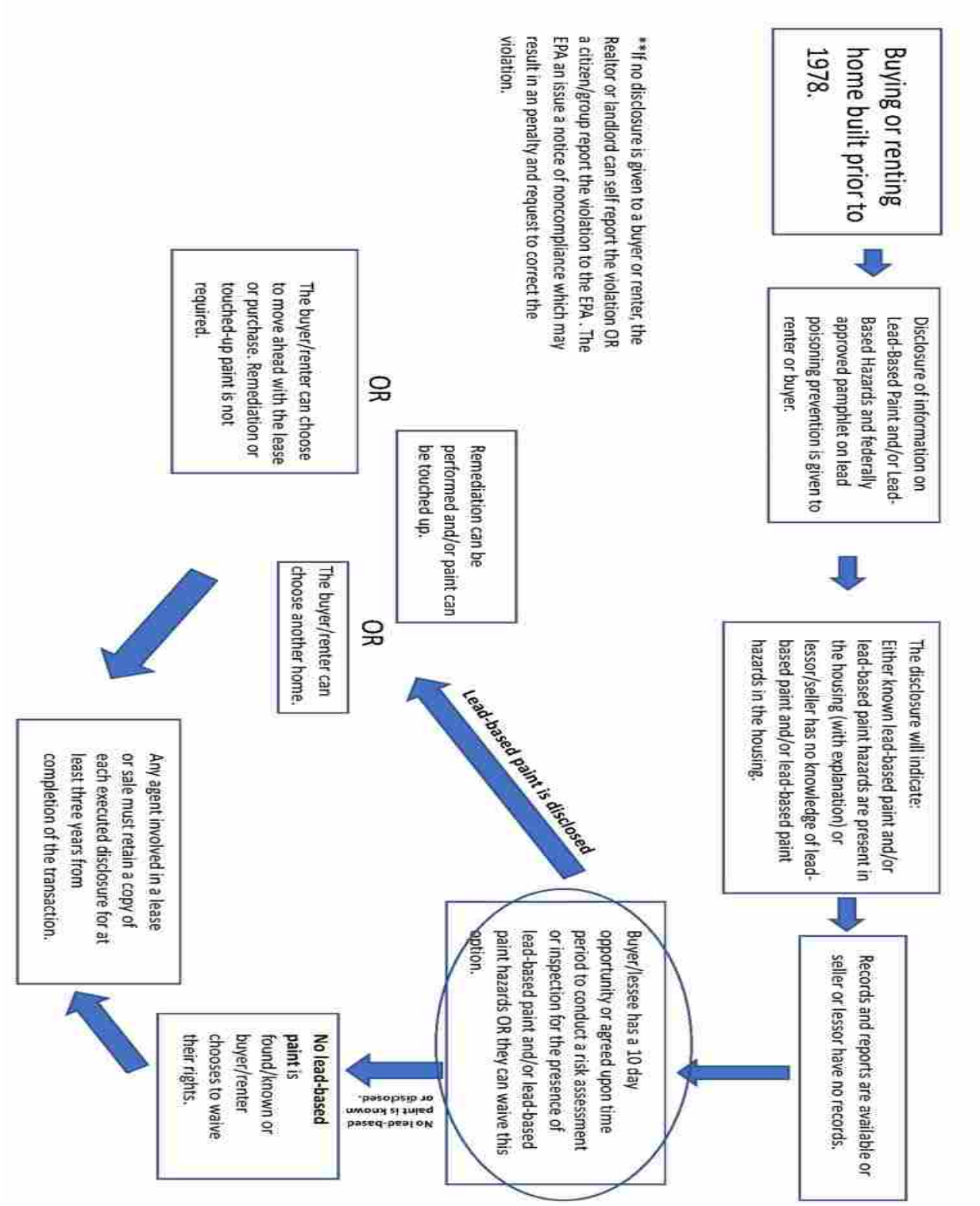
All housing built before 1978 may contain lead-based paint and unless remediated, requires that a disclosure along with a pamphlet approved by the EPA be provided to the renter or buyer. This process is portrayed in the diagram (Figure 2) below. Lead paint disclosures suggested for use cover both disclosure for a lessor (Appendix A) and a seller (Appendix B)

(EPA, n.d.-b). The informed decision should be made based upon the inspection if requested or required (as in the case of home sales with mortgages) and the information provided in the required pamphlet about lead paint and the hazards it presents to children especially. Ideal intended outcomes would include remediation or the renter or buyer not renting or buying the home and choosing a different housing option. Another outcome could be ensuring all lead-based paint is covered with a coat of paint that is maintained. This theory is reasonable on the surface; however, many factors can contribute to a family with small children living in homes with lead paint that has not been covered or remediated securely like a home with window sills where the new paint would likely wear down over time. Some of these factors include the high cost of remediation, limited availability of affordable housing and lack of understanding of the literature provided. If lead-based paint disclosure is not performed and that failure is reported, there are fines that the EPA can levee upon landlords or realtors. Reports of such failures are the only way the EPA would know there is an issue as there are no random checks performed to ensure compliance (40 C.F.R. § 745, 1996). There is no penalty to rent or buy a home with lead paint, and there are no penalties when no remediation is performed as long as lead paint disclosure has taken place (40 C.F.R. § 745, 1996).

The logic behind policies is similar to a chain of hypotheses (Weimer & Vining, 2017). In order for a policy to be implemented as intended each part of the chain must be true (Weimer & Vining, 2017). When the theory or logic forming the foundation of a policy is broken down into parts, a policy analyst can efficiently look for a weak link that can make implementation ineffective. Analyzing the logic as pieces can assist in achieving a better understanding rather than attempting to apply a singular logic to examine implementation of a policy.

Figure 2

Diagram of the Lead Paint Disclosure Process



Weimer and Vining (2017) state that hypotheses are often false or not universally true. The higher the likelihood that a hypothesis is false, the higher the probability of implementation failing; and false hypotheses can also produce inaccurate data. It is therefore important to analyze whether the logic behind each hypothesis in the chain is reasonable. It is equally important to distinguish whether a hypothesis is not universally true but may be true enough to be effectively implemented.

There are a few factors that assist in predicting whether a hypothesis underlying a policy is likely to be true, including the characteristics of the policy and the circumstances of its adoption (Weimer &Vining, 2017). Weimer and Vining also state, "In general, the greater the legal authority the adopted policy give implementation managers, the greater is their coercive capacity to compel required behavior" (p. 285). Thus, an implementer's ability to compel a behavior is directly impacted by how much legal authority they have to enforce the policy. Strong political support for a policies and punitive goals lend to the ability of the implementer to secure the desired behavior needed to achieve the sought-after policy outcome. A policy can be identified as illogical if a chain of behavior that leads to the desired outcome cannot be identified (Weimer &Vining, 2017).

Assembly: Who Has the Essential Elements?

Weimer and Vining (2017) contend that an important question to answer in evaluating policy implementation is what essential elements are needed for implementation to be carried out effectively. It is necessary to understand who controls those elements. Once it is clear who controls the essential elements, their motivations must also be understood (Weimer& Vining, 2017). The underlying motivations and incentives of an implementer can either support or hinder

implementation. Implementers must also have resources such as money, staffing, and support available to enable them to provide the essential elements. If the essential elements are not obtained in a timely way or at all, what consequences result for the implementers? Consequences can include implementation not functioning as intended due a delay of funding or inadequate staffing, which could result in negative outcomes that the policy was intended to prevent.

Efforts to secure the elements needed for implementation will often typically involve politics (Weimer & Vining, 2017). Key actors who control the essential elements must be convinced to provide them. There needs to be a reason for these key actors to move forward with implementation that mimics a series of adoptions (Weimer & Vining, 2017).

These essential elements (i.e., funding, staffing, and professional expertise) also include clear legal authority, which is one of the most valuable resources for an implementer to possess (Weimer & Vining, 2017). However, by itself clear legal authority may not be enough; it must be paired with support and other essential elements for implementation to move forward. Those who hold clear legal authority can hinder implementation through one of three common tactics: tokenism, delayed compliance, or blatant resistance (Weimer & Vining, 2017).

Hindering implementation through tokenism can occur through hasty adoptions of inadequate plans (Weimer & Vining, 2017). Tokenism can satisfy small groups of constituents or higher-up political appointees for short time periods. The utilization of tokenism by the regulated community can cause difficulties because it shows compliance in form, but an implementer may then have difficulty gaining political and legal support for regulatory (policy) compliance and broader implementation (Weimer and Vining, 2017).

Delayed compliance is a tactic that is used to buy time without causing a legal challenge against the implementer to occur (Weimer & Vining, 2017). This will give the regulated

community time to possibly mobilize political support to block a policy or parts of a policy from being fully implemented. This strategy can sometimes cause enough time to pass for there to be a change in public opinion and or an election to take place. This can make it easier for constituents to pressure policy makers to repeal or change legislation or policies they don't want to see implemented. This strategy is favorable as policy actors affected by the policy have little to lose but can at least have a chance to let the political circumstances change (Weimer & Vining, 2017).

Blatant resistance from a regulated community is a tactic that may be detrimental to the regulated actors as the legal actions pursued by an implementer may be costly (Weimer & Vining, 2017). Blatant resistance has the opportunity to succeed though an implementer pursuing a legal route. They may face political and fiscal costs in attempting to prevent delays to implementing the policy. There is also the potential for the government to attempt blatant resistance by refusing to perform an action or provide an essential element. Blatant resistance by key actors must be challenged in order to prevent future or encourage continued use of the tactic (Weimer & Vining, 2017).

There are several delay or resistance tactics that can be used to prevent or slow implementation. Massive resistance is rare compared to blatant resistance but can work well if done by those in a position to make it costly for the implementer to try and force compliance (Weimer & Vining, 2017). Tokenism and purposeful delays are more common to try and force delay (Weimer & Vining, 2017). Massive resistance would take organization and buy-in from those in a position to make it costly for the implementer (such as a corporation CEO). Employees of the key actor, especially those in the civil service sector can also play a large role in delaying implementation. One of the tactics they can utilize to slow or halt implementation includes

contributing to the effort halfheartedly or leisurely (Weimer & Vining, 2017). They hold the potential ability to be a huge threat when they must be relied upon to make implementation effective over a drawn-out period of time (Weimer & Vining, 2017).

Due to the use of tactics to hinder implementation of a policy, implementers holding clear legal authority to demand compliance may not receive compliance at a suitable level for effective implementation (Weimer & Vining, 2017). Securing program elements is political, and therefore, implementers must mobilize allies in addition to reaching agreements with those who may have opposing interests. Implementers need to be prepared to use political strategies for implementation to be effective and to assemble program elements and ensure they stay engaged. These strategies include co-option of and compromise with non-complying actors (Weimer & Vining, 2017).

Although delay tactics leading to noncompliance are intentional, noncompliance can sometimes be unintentional (Weimer & Vining, 2017). Unintentional noncompliance can come from incompetence, lack of training, or the lack of ability to get others to provide the necessary support. Even issues such as scheduling, local time-consuming procedures, and routine delays can prevent implementation from occurring in an acceptable time frame (Weimer & Vining, 2017).

Too much diversity among key actors providing similar elements can cause issues with implementation (Weimer & Vining, 2017). Diversity makes it difficult to predict how much unintentional noncompliance will occur. Unintentional non-compliance has a greater chance of occurring when a policy requires certain steps to be completed and diversity among staff of key actors is great (Weimer & Vining, 2017).

Implementers must understand the landscape of who holds the essential elements in order for effective implementation to occur. The interests of key actors need to be clearly understood by the implementers so they can have a plan to move forward if tokenism, blatant resistance or delays are utilized (Weimer & Vining, 2017). The implementers must also have reasonable expectations of those who provide the key elements (Weimer & Vining, 2017). In my analysis, I identify what the essential elements are and who controls them as well as the lack of any elements. I also examine if the access to essential elements is environmentally just and fair for all people and that no population shoulders a disproportionate share of exposure to the negative effects of pollution due to the lack of political or economic strength.

Availability of "Fixers:" Who Will Manage the Assembly?

At a local level there must be a reliance on "fixers" who Eugene Bardach describes as those who can intervene in the assembly process to help gain needed elements that are being withheld (Bardach, 1977). Fixers may include administrators of organizational units, a legislature's staff, interest groups who support the policy, and local administrators (Weimer & Vining, 2017). These fixers are those who interact with implementation and spend time, energy and resources to put a policy into effect (Weimer & Vining, 2017). Fixers in Montana may be found in local departments at the county level, state legislature, and in local government offices. Allies like local environmental, public health, or housing advocates can help advocate for policy implementation and /or monitor and report non-compliance of lead disclosure. In a more "grassroots" effort, local supporters of lead disclosure may be able to provide information that can assist in finding and countering noncompliance as well as designing tactics to combat these issues. In the present analysis I identify "fixers" as well as determine the greater absence of fixers. From an environmental justice lens, I also analyze if there are fixers that can help

overcome barriers that prevent the fair treatment for peoples of all race, income and educational levels.

Grassroots efforts can have the ability to inform local citizens not only about a policy but also about the resources that are available to the public. With an issue like lead paint, because it is not something that is on many people's minds and is not currently a "hot topic" issue, there may be no grassroots efforts currently underway. The lack of fixers can create problems as they can compensate for the failings of implementers. Fixers can also help in the assembly process if essential elements are being withheld (Weimer & Vining, 2017).

Staff in the implementers' offices also often play an essential role (Weimer & Vining, 2017). The staff are considered fixers because they have direct access to implementers. The staff are often key as they have inside access to information about the implementation process and timeline. Staff may have the ability to negotiate compromises with those that are non-compliant with the policy. Staff can also help motivate an implementer if they are unmotivated (Weimer & Vining, 2017).

Fixers at the local level often play an important role in implementation of polices (Weimer & Vining, 2017). These fixers have a better understanding for how things operate at the local level and can be a necessary resource to adjust centrally managed policies to local conditions (Weimer & Vining, 2017). Fixers can be extremely effective if they utilize incentives (Weimer & Vining, 2017). Incentives can be utilized to motivate local actors to have a mild interest in actively supporting a policy (Weimer &Vining, 2017).

Interviews

I utilized information-gathering interviews to get an inside understanding of what implementation looks from the perspective of what is outlined in the policy as well as to help

answer key questions and address Weimer and Vining's three factors for effective implementation. Some of the questions I asked interviewees gathered responses to help me understand what problems or challenges exist in successful implementation of lead disclosure policy in Missoula Montana and how those problems/challenges exist in the policy. These interviews help frame who the fixers are and what the current political landscape is for lead paint disclosure in Montana and Missoula more specifically. Speaking with those who implement disclosure as well as hold the essential elements informed my analysis and helped inform my recommendations.

Interviews were conducted with individuals from eight agencies or departments who either implement or interact with lead-based paint disclosure in Montana generally and Missoula specifically. The interviews included a few individuals from agencies who play a secondary role with implementation. Secondary roles include an actor who assists renters and a county health official who refers people to the EPA. Interviewees were selected based on their professional experience either past or present with lead-based paint disclosure in Montana. Due to the EPA playing the primary role in implementation of the disclosure policy, the two interviewees who revealed most professional interaction and experience with lead disclosure work for the EPA Region 8, headquartered in Denver, Colorado. The interviews were conducted between November 2019 and April 2020. They lasted an average of 30 minutes each and were recorded using TapeACall. I used an informed consent statement for all interviews since they were recorded (see Appendix C). The questions including "What is lead based paint disclosure policy?" and "What are the issues outlined in the policy and the intended outcomes?" (Appendix D), and were all aimed at gathering information focusing on lead paint disclosure policy. The interviews are Institutional Review Board exempt as this type of interview is not considered

human subject research since I did not ask questions that gathered personal information or opinions. The agencies and/or departments the individuals who were interviewed are from are described below.

1. The Regional Lead Office for EPA Region 8 and is based in Denver - This office interfaces with lead based paint disclosure in a few ways. Keeping lead on peoples' minds is essential to help eliminate lead exposure sources and limit the opportunity for high risk exposure. They inform the public of the risk of lead exposure and commons sources of exposure in and around the home. They also coordinate opportunities for lead inspectors to receive proper training to inspect for lead as well training for contractors to abate lead exposure sources like chipping lead-based paint.
2. The Toxics Enforcement Unit of the Office of Enforcement Compliance and Environmental Justice Environmental Protection Agency – They investigate lead exposure tips and concerns as well as enforce compliance of lead-based paint disclosure. When a tip is made to the EPA from a concerned citizen or from another agency like the Montana Department of Public Health and Human Services, this office will begin looking into the tip. For example, if no lead-based paint disclosure had been given to the person making the tip and lead-based paint is found in the home, they will work to bring the offender into compliance.
3. The Environmental Health Division of the Missoula County Health Department. This county department has minimal interaction with lead-based paint disclosure. If a tip about lead based paint is made to a local agency like the Missoula County Health Department, a referral is made to EPA's Toxics Enforcement Unit. This county

department and state officials cannot investigate lead-based paint tips, because the disclosure rule is handled at the federal level.

4. Development Services for Missoula County. This program inspects homes that have been referred to the Voluntary Residential Inspection Program which is a program that is offered through and is unique to the City of Missoula. Referrals can come from a variety of sources. Through this program, homes are inspected where there are concerns about substandard living conditions and residents' health. The inspectors inspect the homes and advise residents on the next steps they should take to protect their health and eliminate any hazardous living conditions if they exist.
5. The Renters Center - This program offer resources to students with low income, affordable housing and other services to Missoula County residents who qualify. The center also advises students at UM of their rights as renters and also connects concerned renters with programs like the Missoula County Voluntary Residential Inspection Program.
6. The U.S. Department Housing and Urban Development's (HUD) Denver, Colorado - HUD ensures that all housing under their jurisdiction; e.g., publicly-financed housing, has been tested for lead exposure sources. They are one of the only federal organizations that have this requirement. They ensure that the lead inspection requirement is being followed and that housing conditions are safe for all residents.
7. The Public Health and Safety Division of Montana DPHHS - The primary role is health assessment which includes applying and managing grants from the CDC to provide education and lead poisoning prevention information to Montanans. This division helps to maintain public awareness of the ongoing lead issues.

8. Lewis and Clark County Lead Education and Assistance Program – This program is the point of contact for East Helena residents concerned about any lead related issues in their community. This program works in conjunction with the East Helena Superfund Site. The program's interaction with lead disclosure gave insight into the benefits and weaknesses of the policy in Montana.

The information collected in these interviews helped build the landscape of where implementation is at currently and better inform the policy analysis. Interviews with those implementing and enforcing lead-based paint disclosure with the EPA in the Region 8 office helped answer key questions of who handles implementation at the state level, who local fixer groups are and who the affected populations are. These interviews were crucial to identify where possible problems exist with disclosure and understand the key actors involved. Some of the interviews shed light on how implementation looks to a renter as well as what enforcement of the policy entails. Key actors interviewed shared what the main intentions of the policy are from well as where weaknesses exist that are intended to be addressed. Each interviewee interacted with lead-based paint disclosure in different ways from federal, to local, and to state level. These different interaction points with lead disclosure implementation give an inside perspective of how disclosure is functioning. These perspectives led to understanding the logic theory behind lead-based paint policy. They also helped identify who holds the essential elements and what those elements are as outlined in the policy. The interviews assisted in gaining perspective of who the fixers are and what they do. However, some interviews like those with the Voluntary Lead Inspection Program and the Renters Center were shorter in length and did not provide much information that differed from other interviews and/or sources or the information was not

an area of study for this analysis. It was key to examine what is required from the key actors of the lead-based paint disclosure policy.

EJSCREEN

As noted above, EJSCREEN was used to identify areas of the city of Missoula that may be most at risk from lead paint exposure. EJSCREEN uses Census data which as mentioned previously, can help pinpoint neighborhoods that would greatly benefit from intervention and prevention programs by identifying areas of older housing and lower socioeconomic families (Vivier et al., 2011). EJSCREEN's mapping feature allows one to create a map of Census block groups by their percentile ranking of all block group in the state in terms of the percentage of older housing. This allowed me to offer a more focused analysis of specific neighborhoods where lead paint risks are likely to be the greatest and examine population characteristics of those areas to assess whether there are environmental justice concerns in these high-risk areas (i.e., a disproportionate percentage of vulnerable populations).

Concluding Comments

This analysis examines the effectiveness of lead paint disclosure policy and attempts to shed light on potential environmental injustices related to lead paint exposure in Missoula, MT. By critically analyzing housing and Census data for Missoula, socioeconomically-vulnerable renters were identified as having fewer housing options as well as facing the financial strain from the price of housing. This was in addition to examining government documents, and peer-reviewed literature to understand the implementation landscape. An analysis of lead paint disclosure can provide useful insights about whether implementation of the lead-based paint disclosure policy is likely to be preventing lead-based paint exposure and if not, what steps can be taken to improve implementation.

Policy Analysis

To understand the current lead paint disclosure landscape, examining what implementation looks like now after being enacted over two decades ago was critical. The literature review, interviews, and as mentioned above Weimer and Vining's policy analysis framework for implementation were utilized to analyze three main factors or themes of effective implementation: (1) Logic of the Policy: Is the theory reasonable? – what theories are behind lead paint disclosure policy (2) Assembly: Who has the essential elements? – federal, state and local roles and resources for implementation (3) Availability of "Fixers "Who will manage the Assembly? – what fixers exist in Montana to ensure implementation is being managed. Also incorporated into this analysis is some document analysis of government reports and policies. In addition, Census data and housing reports were utilized to analyze implementation challenges. It is important to note that Bae, (2012) is one of the only evaluations of lead paint disclosure.

Lead paint disclosure requirements were intended to be a tool for public health awareness about lead paint exposure risks (Bae, 2012; Lanphear et al., 1998; EPA, n.d.-a). Lead paint still exists in tens of millions of homes in the US, which is why continued awareness is still very important for public health. A lot of people who rent and buy homes are unaware of that fact that lead paint may exist in their home, or of the risks of exposure to lead paint and dust. Disclosure is an attempt to make people at least aware of lead paint. If children's IQs points are reduced due to exposure, as an adult, they are no longer contributing to society at their full potential, they may not earn as much as they could, they may rely on resources like healthcare and community programs more, and they also don't contribute as much to the tax systems. If people understood the true cost of lead exposure, they would be more likely to support upfront preventative actions, and they cannot do that if it is not on their radar. Having lead paint in the home is not inherently a problem unless there is chipping or an exposure source (EPA, n.d.-a). This fact should also

encourage more compliance if paint can be properly maintained and tenants or homeowners are properly informed.

According to an individual interviewed from the EPA, 99% of the issues with lead disclosure not being followed arise from rentals versus a home that was purchased (phone interview, November 14, 2019). This percentage pertains to EPA Region 8 which serves Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations (EPA, n.d.-g). Although the diversity of the populations in each of the states in Region 8 vary greatly, after speaking with the individuals from the EPA, it was clear the most at-risk populations for lead exposure were those that were renting and more specifically those renting from private landlords (phone interview, November 14, 2019).

In Missoula, 53% of the population rent their home versus owning (Data USA, n.d.). The number of private landlords in Missoula is unknown. Many landlords are simply unaware of the requirements to provide lead paint disclosure to renters (EPA Toxics Enforcement Unit, Office of Enforcement Compliance and Environmental Justice (hereafter EPA Toxics Enforcement Unit), phone interview, November 14, 2019). They may also choose to select the box on the lead paint disclosure "No Lead Paint is Known" (EPA n.d.-a). A renter is a particularly vulnerable as their housing options are likely to be limited (Leech et al., 2016; Kuehn, 2000; Shao et al., 2017; Sampson & Winter, 2016). If a renter lacks affordable housing options, they are going to be less likely to turn down a rental. In 2018 for rental housing, Missoula had a low annual vacancy rate of 3.9% (MOR, 2019). In the same year, there was a 4% decline in the median income for a renter which brought it to $29,793 (MOR, 2019). In Missoula, 19% of the population lives below the poverty line (Data USA, n.d.). In addition, in 2017, 49% of Missoula renters spent more than 30% of their income on housing which is the generally accepted percent of a household's gross

monthly income that should be spent on housing (MOR, 2019). This data shows that there is a shortage of affordable housing in Missoula and that many renters are financially strained. These facts in addition to the growing waitlist of 1,777 households for one of the 774 available section 8 vouchers, highlight the housing crisis in Missoula; limiting options for safe and affordable housing (MOR, 2019). Homes built prior to 1940 have an 80% chance of having lead paint in the home and therefore should typically have a disclosure upon renting the home but this is not always the case (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). The U.S. Census Bureau's 5-year estimates for 2018 report that 13% of homes in Missoula, or about 4,000 were built before 1940 (American Community Survey, n.d.). It also shows than an estimated 57% of housing was built before 1980 or about 19,000 housing units (American Community Survey, n.d.).

What does implementation look like now?

Giving a renter or buyer a lead- based paint disclosure and/or the pamphlet is only part of implementation. As stated in the policy, complaints can be made to the EPA and those complaints are investigated to ensure the policy is being followed. Any person can make a complaint or tip that they have a concern about lead based paint in their home (EPA, n.d.-a). This is usually prompted by other health risk factors like mold or just an observation that paint is chipping or peeling (EPA Toxics Enforcement Unit, phone interview, November 14, 2019).

These tips or complaints can be submitted through the general tips and complaints hotline or a form on the EPA website (EPA, n.d.-a). Sometimes people call the lead hotline and this will sometimes get filtered to the general information person in EPA Region 8, Education and Outreach. If this office thinks there is an issue that needs to be investigated, they will refer it to investigation and enforcement for a follow-up. Therefore, direct calls or email from a concerned

citizen or tips from contractors usually occur when lead based paint exposure is of concern in a home.

When a tip or complaint is made to the EPA, investigation and enforcement of lead based paint disclosure will look first at the location of the residence (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). Location is key to examine at the start of the investigation because the office that deals with lead based paint disclosure non-compliance is small and they investigate other environmental health concerns like asbestos. Due to limited resources, after the location's distance from headquarters is assessed, they will decide to visit the location or do a remote investigation. If the location is close enough to the Region 8 headquarters in Denver, Colorado, they will typically visit the site. If the location is somewhere like Missoula, the EPA investigator would not go to the site as there are just not enough resources and person power to conduct in person investigations (EPA Toxics Enforcement Unit, phone interview, November 14, 2019).

Its easiest to conduct the investigation remotely because the investigation is almost entirely paperwork related (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). In both cases, an investigator will contact the person who made the tip and gather information to start the investigation. Next, an official records request letter is sent to the suspected violator which is typically a landlord or property management company but is sometimes a realtor. The records that are usually requested are leases, real estate documents and any lead based paint disclosures if they exist (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). Again, it is important to note that 99% of these tips/complaints are lease/rental related and not typically sales. This is likely due to many agents or agencies belonging to the state or local board of Realtors and are affiliated with the National Association

of Realtors (NAR; Sold Montana, n.d.). This means they required as part of their licensing to follow a strict code of ethics beyond state license laws (Sold Montana, n.d.). There is the option on the lead paint disclosure form to report no lead paint exposure known; therefore, it is in a realtors' best interest to provide the disclosure following the law and marking that box. By choosing that option on the disclosure, they are not claiming there is no lead in the home, they are simply stating that they have no knowledge of lead paint exposure sources in the home.

For larger tips/complaints that concern a management company, the records request would ask the company to provide a list of all rentals for houses/units built prior to 1978. A second request will be sent based off the list provided and ask for around 10% of the leases for the rentals listed. This sample of leases usually provides the EPA investigator with enough information to assess whether or not the property management company is in compliance with lead-based paint disclosure (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). Penalties are a maximum one year in prison and a fine of up to $25,000 for each day of the violation for an individual as well as up to $100,000 per count and organizations can be fined up to $200,000 per count (EPA, n.d.-a). In these cases, an administrative settlement company will be brought in to handle settling and closing the case (EPA Toxics Enforcement Unit, phone interview, November 14, 2019).

Larger cases that have not occurred in Region 8 but do occur occasionally in other Regions, can follow the judicial route of implementation of lead based paint disclosure. The judicial process pursued on larger cases if the EPA and the violator cannot come to a settlement agreement (EPA, n.d.-a). The judicial process requires that the EPA files a legal complaint against the violator. The violator will have the right to appeal and the case will go in front of a judge. In these larger cases that go before a judge, there is typically a monetary settlement (40

C.F.R. § 745, 1996). Two separate processes that lead based paint disclosure violations can take (they can be concurrent) are civil administrative side and criminal side (EPA, n.d.-a). If the EPA sees a particular egregious violation like particular knowledge that was ignored or knowingly violated the law, then it can be refereed straight to the criminal investigation division (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). Once the EPA completes their own process taking criminal action, the violation may be egregious enough to get jail time or a hefty fine (EPA, n.d.-a). Since these are two separate paths a violator may have both a civil and criminal settlement for a particular violation (EPA, n.d.-a).

One problem with enforcing lead based paint disclosure policy is that verifying whether a landlord was aware of problem or not is extremely difficult to do (Bae, 2012). Unless there is a paperwork trail that can prove the landlord knew there was lead in the rental, there is little verification that can be done (Bae, 2012; Sampson & White, 2016). The verification process is part of a standard investigation and landlords are asked to provide the sale papers for the home or the lease for a rental unit (EPA, n.d.-a). The investigator will look for any proof that the landlord had received a positive lead based paint disclosure when they purchased the home or units (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). These landlords would then need to provide their renters with a lead-based paint disclosure form and informational pamphlet to be in compliance (EPA, n.d.-a).

Landlords are not required to remediate lead paint (40 C.F.R. § 745, 1996). In the policy, under "Assessment of Benefits" remediation is discussed as a benefit if the policy prompted a landlord or home owner to remediate lead paint (40 C.F.R. § 745, 1996). A landlord or home owner may also choose to do lead abatement or remediation if requested by a buyer or renter or EPA or had a lead paint inspection and decided to on their own. General housing inspections that

are required for purchases with mortgages can reveal lead paint and disrepair that can also prompt a buyer to request a lead inspection and abatement. A few options for lead abatement methods include: enclosure by covering the lead paint with a wall covering, replacement which removes the door or window and replacing it, paint removal, and encapsulation which seals the affected area with a specific coating (EPA, n.d.-f).

The only certified abatement firm in Missoula is Abatement Contractors of Montana, LLC (EPA, n.d.-f). The EPA estimates that the average cost for lead paint abatement is $8 to $15 per square foot while the average house can cost around a minimum of $10,000 (EPA, n.d.-f). The EPA's Lead Renovation, Repair and Painting Rule (RRP Rule) requires firms performing repair, renovation and painting that disturbs lead paint in homes, pre-schools and child care facilities built before 1978, be certified by EPA and use certified renovators who are trained by the EPA as well as follow lead-safe work practices (EPA, n.d.-f).

Logic of the Policy: Is the theory reasonable?

Compatibility between policies intended to reduce lead exposure and their intended outcomes is important for these policies to be effectively implemented (Weimer & Vining, 2017). It is necessary to understand what theory underlies the connection between policy and intended outcomes. In addition, the reasonableness of the theory needs to be analyzed to predict or assess success of policy implementation. The theory underlying lead based paint disclosure is that by providing information to the decision maker (i.e., the renter or buyer) an informed decision will be made causing lead based paint exposure prevention. This theory relies upon a landlord, seller or Realtor, making the lead based paint in a home known and the renter or buyer making an informed decision to rent/buy the home (Bae, 2012). The renter or buyer can also request a landlord or seller to address and exposure source if there is one (See Figure 2). On the

surface, this preventative informed decision making theory behind the policy does seem reasonable. However, there are many factors that influence a renter or buyer's decision making processes. In addition, the option to choose the no known lead paint known, does not inform the buyer or renter and therefore they are then unable to make a truly informed decision. For an informed decision to occur, a lead inspection would need to be conducted. This is because there may not be any known lead but that may be due to the home never having been inspected for lead. This option also shows the lack of quality of information of actual risks that some may receive.

The logic behind policies is similar to a chain of hypotheses (Weimer & Vining, 2017). The logic behind lead based paint disclosure policy is a chain of hypotheses where each part of the chain is true for implementation of function as intended. Within Weimer and Vining's framework, they suggest in order for a policy to be implemented as intended each part of the chain must be true (2017). Informed people are supposed to make better decisions than prior to being informed which is the goal behind the lead based paint disclosure policy. This assumes that the person being informed understands the information they are given.

Environmental literacy is required for lead disclosure to be effective and promote environmental justice. It is important for residents in older homes to understand how lead paint can affect their health so they can understand the true risk. An individual with Lewis and Clark County Lead Outreach and Education Program said that many times with their work, environmental literacy is a huge challenge especially for low-income populations (phone interview, April 27, 2020). As White et al. (2014) stated, "Developing programs to educate communities about environmental hazards affecting their health and quality of life is an essential component for a community to understand true risk" (p.24). Environmental education paired

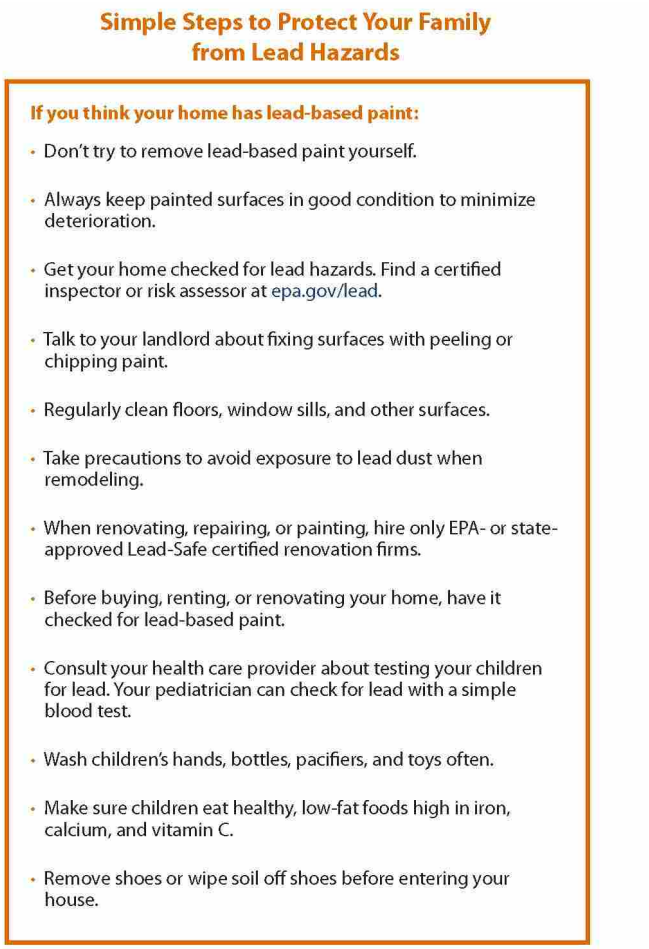
with health and risk education, supports behavior change and social action (White et al., 2014). Residents choosing a home need to have access to environmental health and risk education to make an informed decision about what is the best housing option for their families. White et al. (2014), stated. "Health literacy supports individuals making informed decisions that can reduce health risks and ultimately increase their quality of life. Incorporating environmental information with health concepts can assist communities in achieving environmental justice through scientific, environmental, and civic literacy" (p. 24). Any renter or home buyer receiving lead disclosure must be able to understand the material in addition to receiving it for the informed decision making logic of the policy to truly be effective and eliminate environmental literacy injustice.

In one study of reducing environmental risks by information disclosure, Bae found when a home buyer was given a lead paint disclosure, it increased the probability of them testing for lead (2012). Lead disclosure also had a positive impact on a homeowners' paint maintenance behavior, decreasing the probability of peeling paint in the home (Bae, 2012). Knowledge gives a decision maker power because of the information held. Bae found that lead testing and maintenance behaviors were lower in the target high risk populations who have less information power. Even if disclosure is given, it still requires additional resources such as time and costs to conduct a lead inspection and/or maintenance (Bae, 2012). This is a huge barrier for residents especially in Montana according to the individual interviewed with the Lewis and Clark County Lead Outreach Education and Assistance Program (phone interview, April 27, 2020). This is because in Montana, there are few who are certified to be a lead inspector (DPHHS, n.d.). A landlord may also refuse to pay for an inspection which would prevent a renter from having all the information before making a decision.

When a disclosure is given to a renter or buyer with indication that there is known lead in the home, the EPA's Healthy Homes pamphlet must also be provided (EPA, n.d.-a). This pamphlet covers a wide variety of lead exposure risks in the home and intends to better inform the recipient beyond the disclosure notice (EPA, n.d.-a and Appendix E). The lead exposure risks covered in the pamphlet for lead paint include tips (Figure 3) like keeping up maintenance to prevent chipped paint or lead dust especially on window sills where paint chips from the window sliding up and down. The Healthy Homes pamphlet is one component of the EPA's implementation of lead disclosure through preventive education (EPA, n.d.-a). This pamphlet is available in six languages including Spanish (EPA, n.d.-a).

Figure 3

Page 1 EPA Protect Your Family From Lead in Your Home Pamphlet



Simple Steps to Protect Your Family from Lead Hazards

If you think your home has lead-based paint:

- Don't try to remove lead-based paint yourself.
- Always keep painted surfaces in good condition to minimize deterioration.
- Get your home checked for lead hazards. Find a certified inspector or risk assessor at epa.gov/lead.
- Talk to your landlord about fixing surfaces with peeling or chipping paint.
- Regularly clean floors, window sills, and other surfaces.
- Take precautions to avoid exposure to lead dust when remodeling.
- When renovating, repairing, or painting, hire only EPA- or state-approved Lead-Safe certified renovation firms.
- Before buying, renting, or renovating your home, have it checked for lead-based paint.
- Consult your health care provider about testing your children for lead. Your pediatrician can check for lead with a simple blood test.
- Wash children's hands, bottles, pacifiers, and toys often.
- Make sure children eat healthy, low-fat foods high in iron, calcium, and vitamin C.
- Remove shoes or wipe soil off shoes before entering your house.

A positive impact of the outreach and education portion of lead based paint disclosure is that it is an official way to get the word out that lead has a negative impact on human health and it helps promote environmental literacy (EPA, n.d.-a; White et al., 2014). There is also the message with the disclosure and pamphlet that lead is often in indoor living environments and there are precautions that renters and home buyers need to take against lead as it is an almost silent toxin (Appendix E). Renters and home buyers do not often know they are at risk because of the almost silent delayed feedback loop or latency period associated with lead exposure at low levels causes (Lanphear et al., 2005). A delayed feedback loop refers to the delayed health effects that lead exposure can cause. Due to the delayed feedback, lead gets often overlooked as risk.

Although some renters or buyers will perform the intended outcome of making an informed decision that maintains or improves the health of the occupants of the residence, some will make the decision that could potentially expose the themselves to lead based paint (Bae, 2012). This would be a result of a hypothesis being occasionally false. The higher the likelihood that this hypothesis is false, the higher the probability of lead based paint disclosure failing. Due to the probability that for some an underlying hypothesis of lead-based paint disclosure is false, it is important that the theory in and of itself is reasonable.

Just as it is important to look at those renters or buyers who make an informed decision hypotheses false, it is also important to distinguish whether a hypothesis is not universally true but may be true enough to be effectively implemented. This is important for disclosure to be effectively implemented because prevention relies upon the people performing the action to prevent unknown exposure. A better-informed decision would be to not only choose housing based upon factors such as location and price point but to also weigh that against the information

received on the lead paint disclosure (Bae, 2012). If there is lead, asking for additional testing and/or abatement to further inform a decision would lend to a better-informed decision. Using the factors suggested by Weimer and Vining to assist in predicting whether a hypothesis underlying a policy is likely to be true, we can better understand how likely it is that implementation is effective (2017). Through persistent education and outreach, awareness about lead issues can help renters and buyers make informed positive behavioral changes when choosing a home to prevent lead exposure if lead paint is disclosed.

Weimer and Vining (2017) state that the greater the legal authority the adopted policy gives implementers, that is the EPA, the greater their capacity to compel hypothesized behavior of executing lead paint disclosure and families making an informed decision. Therefore, an implementer's ability to compel a behavior is directly impacted by how much legal authority the EPA has to enforce the policy. The EPA has adequate authority to implement the policy through their ability to investigate and enforce the policy through fines as well as civil and criminal referrals. A policy is logical because a chain of behavior that leads to the desired outcome can be identified (Weimer and Vining, 2017). Since testing is not required, there is a break down in the logic of the policy as a preventative policy. The option to choose no lead is known does not give the person receiving the disclosure any information about lead in the home and the actual risks; it only gives them the known information.

Strong political support for lead disclosure policy and its punitive goals lend to the ability of the EPA to secure the desired behavior of disclosure needed to achieve the sought-after policy outcome of informed decision making. The federal government showed political support to the EPA by first passing the policy and then by continuing to provide essential elements like funding

and staffing. Political support is evidenced by policy makers providing the essential elements which are discussed in the following section.

The logic of lead paint disclosure is outlined below for renters and buyers (Table 1). The logic of the policy follows a bit differently for each. The flow is the ideal outcome if the policy can be and is followed perfectly. The highlighted flaws or potential flaws in the policy show that there are several false assumptions with lead paint disclosure. These logical flaws inform and shape the recommendations in this analysis.

Table 1

Logic of Lead Paint Disclosure: Flow and Flaws

	Logic of the Policy	Flaw in Logic	Flow in Logic
Renters	Makes an informed decision when choosing a home to rent and chooses a home without lead hazards as the ideal outcome.	• The option to choose 'no known lead paint' on the disclosure does not properly inform the individual. • An individual may not understand the risks even when disclosed and an EPA informational brochure is given. • Outside factors such as housing affordability and availability may prevent an individual from making a positive informed decision. • Inspection availability can prevent renters from requesting one.	• A renter makes an informed decision and chooses another home if lead paint is disclosed. A renter requests and receives the result to a lead inspection.
Buyers	Makes an informed decision when choosing a home to purchase and chooses a home without lead hazards as the ideal outcome (may include a remediated home).	• The option to choose 'no known lead paint' on the disclosure does not properly inform the individual. • An individual may not understand the risks even when disclosed and an EPA informational brochure is given. • Outside factors such as housing affordability and availability may prevent an individual to make a positive informed decision. • Inspection availability can prevent buyers from requesting one.	• A buyer makes an informed decision and chooses another home if lead paint is disclosed. A buyer requests and receives the result to a lead inspection. The buyer abates the lead paint as needed. The buyer changes their paint maintenance behaviors.

Assembly: Who Has the Essential Elements?

An essential part of analyzing the lead paint disclosure policy for effective implementation is to understand who holds the essential elements (Weimer & Vining, 2017). The essential elements of lead based paint disclosure include resources like money, trained professional staff, person-power and clear authority for implementation. As well as having adequate staffing and funding where it is needed, data about lead disclosure is an essential element. Such data include BLL test results, listings of homes that have had a lead inspection (and the results), have received a disclosure, report lead on a disclosure, and have had lead abatement/remediation. Another essential element is environmental/compliance monitoring. Health surveillance and reporting systems are also an essential element.

Staff in the Region 8 EPA are the implementers and play an essential role. The staff in the EPA's Region 8 office oversee the effort of informing the public about lead exposure, the enforcement of lead paint disclosure, and the training of professionals to inspect/abate lead paint (EPA, n.d.-a). The staff who investigate noncompliance, work with offenders to get them compliant. Both divisions in the EPA that deal with lead paint disclosure, due to their location and staffing, make spot checking for disclosure or investigating more cases in person, impossible (EPA, n.d.-a). The CDC recommends using Geographic Information Systems (GIS) help to direct the limited staffing and funding (CDC, 2004). The challenge to policy makers and health practitioners is to not just react to lead poisoning but to prevent it from occurring in the first place (CDC, 2004). GIS could be used in conjunction with additional data, to identify areas where children are at risk and then interventions could be directed to specific properties to address lead hazards (CDC, 2004).

Data collection and management is not cohesive across EPA Region 8 which is concerning as this is an essential element. This essential element was mentioned as weakness or

an area for improvement by several of the actors interviewed as well as the CDC (CDC, 2004). There is a lack of a centralized surveillance system to monitor health and track reporting specifically for lead disclosure that includes housing and disclosure data (CDC, 2004; Bae, 2012). Environmental monitoring and compliance under the EPA's authority, involves investigating complaints and tips made by concerned citizens (EPA, n.d.-a). There are two types of populations considered most at risk and according to the cases typically investigated by the EPA, one population are renters living in older housing (phone interview, November 14, 2019). The other most at-risk population typically seen are those from lower income rentals (Bae, 2012; Lanphear et al., 1998; Sampson & Winter, 2016). When the EPA Toxics Enforcement Unit was asked about vulnerable or at-risk populations in Missoula, an individual said based off their professional experience, there are not enough tips and complaints that come from real estate sales to be significant enough consider buyers to be an at-risk population (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). There are no random audits or disclosure checking process that occurs with private home sales or home sales in general to provide data to verify the accuracy and completeness of information on disclosure statements. It is reasonable to presume though that a person selling their home themselves may not be aware of real estate laws as a Realtor and could miss the lead paint disclosure requirement.

Smaller property management companies and landlords with few renters are the biggest violators (EPA Toxics Enforcement Unit, phone interview, November 14, 2019). There is no requirement for landlords to fix issues even if they are identified. Even if the landlord was in compliance with the rule, more often than not the EPA has no knowledge if the disclosure is accurate. The landlord is not required to fix an exposure source and the renter may not have the financial means to fix it, or be able to get approval from the landlord even if they did. From an

enforcement perceptive, it is difficult to verify whether the landlord did have knowledge of lead paint if there is an issue with the disclosure. There is no database to record if a test has ever been performed at a property. Unless under a legal proceeding in a civil or criminal case and documents are found that the landlord did have knowledge of lead paint, it is hard to verify (EPA Toxics Enforcement Unit, phone interview, November 14, 2019).

In addition to understanding what the essential elements are and who holds the essential elements, it is necessary to understand who controls those elements (Weimer & Vining, 2017). The EPA controls most of the essential elements for lead based paint disclosure. The federal government in a broader sense controls money as a resource which gets allocated in the yearly budget by the President and Congress, which is then dispersed to implement the policy, funding to staff offices and enforcement. The federal government decides how much the budget is allocated to agencies such as the EPA.

Once it is clear who controls the essential elements their motivations must also be understood (Weimer & Vining, 2017). Motivations behind an implementer can either support or hinder implementation. The motivations of Congress when passing Title X and tasking the with EPA with implementing lead paint disclosure were to build the infrastructure necessary to eliminate lead-based paint hazards in all housing as expeditiously as possible as well as encourage effective action to prevent childhood lead poisoning by establishing a workable framework for lead-based paint hazard evaluation and reduction (EPA, 2017). One of the reasons this policy has had some success with lowering blood lead levels and thereby preventing childhood lead poisoning was that the resources needed for EPA to provide the essential elements were allocated (EPA, 2017). Having resources available can either promote success or failure of policy implementation (Weimer &Vining, 2017). If these resources were not made

available when this policy was first being implemented, there may have been a delay to implementation which causes issues with a policies' likelihood of long-term success (Weimer & Vining, 2017).

Clear legal authority is one of the most valuable resources for an implementer to possess (Weimer & Vining, 2017). The EPA has clear legal authority currently because it is an agency of the federal government and lead paint disclosure is a federal policy. Lead based paint disclosure is one of the few policies that is not monitored or enforced in any way at the state or county level (EPA, n.d.-a). Federal regulation has a positive impact on implementation because there is a standard policy that does not vary state to state. There are regional offices in each of the 10 EPA regions throughout the United States that investigate and enforce lead paint disclosure policy (EPA, n.d.-a). By itself clear legal authority may not be enough, but paired with support and other essential elements implementation can move forward (Weimer & Vining, 2017).

In speaking with both staff from the EPA Region 8 office, neither individual interviewed alluded to or stated any blatant resistance to the policy as being a common action taken by a landlord or person selling a home. Blatant resistance is sometimes a tactic that may be detrimental and cause high legal cost and burden to the EPA as well as the U.S. Department of Justice as the implementers to enforce the policy (Weimer & Vining, 2017). Even though massive resistance is rare, it also does not appear to be encountered when enforcing compliance. There also did not seem to be any sort of delays occurring in the Region 8 office when it came to the staff supporting and enforcing implementation. Lead paint disclosure does have the value of being around for a few decades and thus implementation has been occurring for a long time. When speaking with the EPA Lead Education and Outreach Office, it was evident that the requirements of the policy from their positions help drive lead paint disclosure forward to benefit

environmental health and justice (EPA Lead Education and Outreach, phone interview, November 4, 2019).

Although delay tactics leading to noncompliance are intentional, noncompliance can sometimes be unintentional and with lead paint disclosure, and this can come from uninformed landlords. Unintentional noncompliance can come from incompetence or lack of education (Weimer & Vining, 2017). This can occur because of limited resources like staffing and funding makes it difficult to target lead disclosure policy education and outreach materials to landlords. Many locations in EPA Region 8 may see small routine delays which prevents implementation from occurring in an acceptable timeframe when EPA investigates tips/complaints, because of the location of its office in Denver, Colorado. If an investigator needed to visit a complaint site for example, the time to coordinate and travel would add additional time especially if the site was in a remote area. Due to the small amount of staffing that deals with complaints and enforcement of lead based paint disclosure, the burden to self-monitor falls upon realtors, landlords, tenants, home buyers and contractors (EPA, n.d.-a) In addition, affordable housing service and advocacy organizations can help bring issue to light.

Although Weimer and Vining warn that too much diversity among key actors providing similar elements can cause issues with implementation, because the key actors lie within one agency, there is not an issue with too much diversity (2017). There is a large diversity in the greater political landscape among states and cities in the actual risk and knowledge and perceptions of risk among political leaders and the public which can affect compliance as well as the renter's awareness of the issue. Diversity can also be found in how a home is sold which could be by a real estate agent or by owners which could cause issues ensuring lead disclosure is

given to the home buyer. The diversity found in renting homes includes large property management companies, private landlords, and section 8 housing.

Prevention of lead hazards is also a focus of the EPA, CDC and DPHHS (EPA, n.d.-a; Bae 2012; CDC, 2012; DPHHS, n.d.-a). For individuals and companies such as contractors and construction firms that could disturb paint in a home older than 1978, the EPA provides ways that they can become certified to prevent causing further lead hazards (EPA, n.d.-e). The EPA works closely with training programs and abatement programs to make sure that all certification and training programs follow federal policy requirements (EPA, n.d.-e). In Montana, the firms/organizations approved by EPA to provide training are the MSU Extension program and I.C. Environmental in North Dakota (DPHHS, n.d.-a). Providing these training opportunities is key to making progress towards the long-term goal of eliminating lead hazards and preventing lead paint as well as lead dust exposure.

Licensed home inspectors in Montana must be trained and certified to test homes to know where the lead in the home is located if there is lead in the home (EPA, n.d.-e). This requires special training to become a certified lead risk assessor (EPA, n.d.-e). A certified lead risk assessor also has the ability to assess if the paint is a hazard or will become a hazard in the future (EPA, n.d.-e). With lead based paint, the lead risk assessor will first look at what shape the paint is in (EPA, n.d.-e). They then take other factors into consideration like if there will be a toddler in the home that can disturb the paint and create a hazard (EPA, n.d.-e). However, the cost to obtain the certification is on the inspector which means travel to get the training in addition to the cost of the training. Lewis and Clark County Lead Education and Outreach Program said with so few certified to inspect for lead, the 10-day period that lead disclosure policy allows a

renter or buyer to request and conduct an inspection is not realistic in Montana (phone interview, April 27).

For abatement or containment to occur, there is a reliance on the property owner to pay for abatement unless the property is in a jurisdiction that has received a grant for the LHRD or LBPHC program (Lead; Requirements for Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazards in Housing, 1996; HUD, n.d.). The funding needed by a property owner to abate lead paint exposure is not guaranteed. Lower income property owners often do not have the means to do renovations or keep the property in good condition or have the awareness that lead paint can be an issue in older properties. This can cause delays in a known lead exposure source being identified and addressed, thereby perpetuating the exposure cycle. Those renting older homes are often victims of not understanding the risks as discussed previously or more typically not knowing about lead paint in the home at all. Oftentimes landlords of older rentals will have no knowledge of the disclosure requirement as well (EPA Toxics Enforcement Unit, phone interview, November 14, 2019).

Environmental/compliance monitoring as well as health surveillance and reporting systems are essential elements. Environmental compliance helps ensures that all aspects of lead disclosure are being followed. Health surveillance and reporting systems can act as an alert system to help pinpoint problems and bring resources to those most in need. Reporting systems also help further the study of lead exposure as well as assist in the possible discovery of solutions. Health surveillance of BLL helps reveal the scope of the issue and can reveal lead exposure sources as well as high-risk populations.

Availability of "Fixers:" Who Will Manage the Assembly?

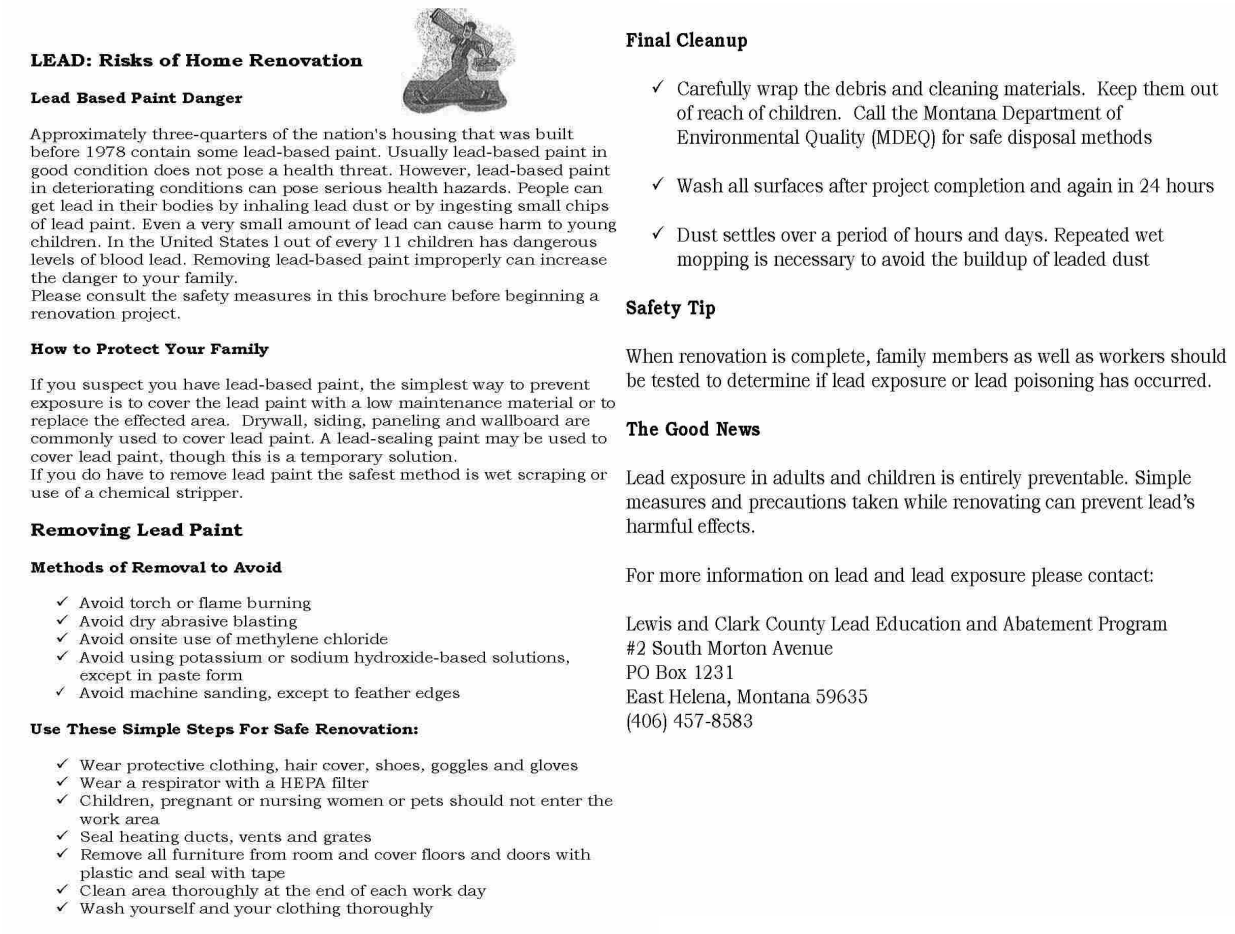
Even though at a local level there is often a reliance on "fixers" who can intervene in the assembly process and help gain essential elements, fixers for issues like lead paint risk, that are not the forefront of peoples' concerns, are difficult to find or non-existent in Missoula. Fixers tend to be more prevalent in states and cities with significant lead issues. With lead-based paint disclosure, fixers at the administrative state level in EPA Region 8 are found in the Montana DPHHS, offering training and helping inform the public. These fixers have obtained additional resources by applying for grants from the CDC supplying funding for things like programs aimed at prevention and BLL testing.

Fixers in Montana can be found in some local departments at the county level in addition to those at the state level. Although this type of fixer was not identified in Missoula, it can be found in Helena in the Montana Lead Education and Assistance Program. This program was put into effect after the local lead smelter was declared a Superfund site. The services they provide include BLL screening for children, residential environmental assessments, and education of the public, including presentations to schools, daycares, professional organizations and other groups (Lewis and Clark County Montana Environmental Health, n.d.-a). This program also helps connect locals to testing of ground water to ensure that the process of cleaning up the old smelter is effective and that residents are safe to utilize ground water on their property (Lewis and Clark County Montana Environmental Health, n.d.-a). Their education on lead paint (Figure 4) includes some information on lead paint and explains the risks of lead paint when conducting home renovations (Lewis and Clark County Montana Environmental Health, n.d.-b). The program helps increase awareness about lead, sources of exposure and has positive health impacts (EPA, n.d.-c).

Unfortunately, lead-based paint is not a primary health concern in Montana, which helps explain why I did not find local environmental group efforts focusing on lead based paint disclosure or lead in general in Missoula. There is an evident absence of a more "grassroots" effort, where local supporters of lead disclosure may be able to provide information that can

Figure 4

Lewis and Clark Lead Education and Outreach Informational Material on Lead Paint



LEAD: Risks of Home Renovation

Lead Based Paint Danger

Approximately three-quarters of the nation's housing that was built before 1978 contain some lead-based paint. Usually lead-based paint in good condition does not pose a health threat. However, lead-based paint in deteriorating conditions can pose serious health hazards. People can get lead in their bodies by inhaling lead dust or by ingesting small chips of lead paint. Even a very small amount of lead can cause harm to young children. In the United States 1 out of every 11 children has dangerous levels of blood lead. Removing lead-based paint improperly can increase the danger to your family.
Please consult the safety measures in this brochure before beginning a renovation project.

How to Protect Your Family

If you suspect you have lead-based paint, the simplest way to prevent exposure is to cover the lead paint with a low maintenance material or to replace the effected area. Drywall, siding, paneling and wallboard are commonly used to cover lead paint. A lead-sealing paint may be used to cover lead paint, though this is a temporary solution.
If you do have to remove lead paint the safest method is wet scraping or use of a chemical stripper.

Removing Lead Paint

Methods of Removal to Avoid

- ✓ Avoid torch or flame burning
- ✓ Avoid dry abrasive blasting
- ✓ Avoid onsite use of methylene chloride
- ✓ Avoid using potassium or sodium hydroxide-based solutions, except in paste form
- ✓ Avoid machine sanding, except to feather edges

Use These Simple Steps For Safe Renovation:

- ✓ Wear protective clothing, hair cover, shoes, goggles and gloves
- ✓ Wear a respirator with a HEPA filter
- ✓ Children, pregnant or nursing women or pets should not enter the work area
- ✓ Seal heating ducts, vents and grates
- ✓ Remove all furniture from room and cover floors and doors with plastic and seal with tape
- ✓ Clean area thoroughly at the end of each work day
- ✓ Wash yourself and your clothing thoroughly

Final Cleanup

- ✓ Carefully wrap the debris and cleaning materials. Keep them out of reach of children. Call the Montana Department of Environmental Quality (MDEQ) for safe disposal methods
- ✓ Wash all surfaces after project completion and again in 24 hours
- ✓ Dust settles over a period of hours and days. Repeated wet mopping is necessary to avoid the buildup of leaded dust

Safety Tip

When renovation is complete, family members as well as workers should be tested to determine if lead exposure or lead poisoning has occurred.

The Good News

Lead exposure in adults and children is entirely preventable. Simple measures and precautions taken while renovating can prevent lead's harmful effects.

For more information on lead and lead exposure please contact:

Lewis and Clark County Lead Education and Abatement Program
#2 South Morton Avenue
PO Box 1231
East Helena, Montana 59635
(406) 457-8583

assist in finding and countering noncompliance as well as designing tactics to combat these issues. It is almost entirely upon the EPA Region 8 office to find and counter non-compliance and to design tactics to combat those issues.

Housing service organizations and advocacy groups can also be considered fixers in Missoula, Montana. The National Center for Healthy Housing is one of these groups who describe the HUD Lead-Based Paint Hazard Reduction and Financing Task Force mandated by Title X to be established by the secretary of HUD (National Center for Healthy Housing, n.d.). They also provide resources such as "Essential Maintenance Practices for Property Owners" as well as "Standard Treatments" for lead paint (National Center for Healthy Housing, n.d.). Homeword is a group that specializes in low-income home owner education in Missoula (Homeword, n.d.). This group could help educate and inform this high-risk population of low-income home buyers on the risks of lead exposure, lead disclosure policy and lead inspections. The National Multifamily Housing Council is a housing advocacy group for renters that inform families of lead-based paint exposure risks (National Multifamily Housing Council, n.d.).

Although state or county officials and offices play no formal role in implementation of lead-based paint disclosure, they do still have important roles. The role state or local officials play is to act as a referral source for concerned citizens as well as to serve in the critically important role of public health educator (EPA Lead Education and Outreach, phone interview, November 4, 2019; Missoula County Health Department Environmental Health, phone interview, November 4, 2019; EPA Toxics Enforcement Unit, phone interview, November 14, 2019; Lewis and Clark County Lead Education Assistance Program, phone interview, April 27, 2020, Voluntary Residential Inspection Program, phone interview, November 8, 2019). Their referrals send citizens to the EPA Region 8 office to investigate their tips and concerns. State and local agencies do not have any legal authority to investigate lead paint exposure concerns or enforce the lead paint disclosure policy. The burden to implement this policy is solely at a federal level and is in contrast with many other environmental policies, like the Clean Air Act

and Clean Water Act, that have a formal implementation role for states, carried out through cooperative federalism.

While grassroots efforts can have the ability to inform locals not only about a policy but also about the resources that are available to the public, this kind of effort does not appear to exist in Missoula with regard to lead or lead paint disclosure. However, the Lead Education and Assistance Program in Helena informs the public about lead policy and risks and resources that are available to them, its outreach focuses on Helena residents. Again, because lead based paint is not something that is on many peoples' minds and is not currently a "hot topic" issue, there are no grassroots efforts currently underway in Missoula, Montana. Lead is not even identified as a priority in the current Montana state health improvement plan (DPHHS, 2020).

There is a concentrated effort on the program side that coordinates lead exposure risks outreach and education (EPA, n.d.-a). The outreach and education efforts include training and certification. The EPA ensures the lead inspectors, abatement firms, and contractors out in the field interacting with lead based paint are trained and certified to locate and handle lead hazards (EPA, n.d.-e). Another part of the lead based activity rule is to provide training for lead abatement service providers (EPA, n.d.-e). Abatement would occur after the lead hazards like large areas chipped or peeling paint have been identified (EPA, n.d.-e and Lead; Requirements for Disclosure of Known Lead-Based Paint and/or Lead Based Paint Hazards in Housing, 1996).

Although fixers at the local level play an important role in implementation of polices according to Weimer and Vining, there are few local fixers in Missoula (2017). Even at the local environmental and public health level, outside of education and outreach, there is just the referral of issues up to the federal level currently taking place (Missoula Country Health Department Environmental Health, phone interview, November 4, 2019). As Weimer and Vining suggest,

fixers have a better understanding for how things are operating at the local level and can be a necessary resource to adjust centrally managed policies to local conditions; therefore, a lack of fixers as this level can lead to a disconnect between the communities and implementation. This resource helps adjust centrally managed policies to local conditions (Weimer & Vining, 2017).

The Region 8 staff could be more effective with ensuring compliance if they utilized incentives to those that do report violations or are able to correct them. Weimer and Vining suggest that incentives can be utilized to motivate mild interest in local actors to actively support a policy (2017). For a landlord, real estate agent, or property manager, it will not serve them to find out they have lead in the property (i.e. it will only cost them money). This is because a home with lead becomes less desirable and then the home becomes harder to sell/rent (Bae, 2016). It is difficult when the regulated entity, landlords and real estate agencies in this case, do not have it in their best interest unless they are concerned about public health. The lack of incentive means there is no encouragement to get the home tested (Bae, 2012; Lead; Requirements for Disclosure of Known Lead-Based Paint and/or Lead-Based Paint Hazards in Housing, 1996). The lack of incentives causes the continued issue of lead exposure. Unless you test and inform decisions on how to reduce any exposure risks found, the prevention of lead exposures cannot happen (Bae, 2012).

Another fixer at the federal level is the Department of Housing and Urban Development. This is because Section 8 housing and public housing authority housing funded by HUD must have passed lead testing (HUD n.d.-a). HUD also offers Lead-Based Paint & Lead Hazard Reduction Demonstration Grant Programs (HUD, n.d.-a). HUD has more stringent requirements than simple disclosure if problems with chipping or peeling paint exist (HUD, n.d.-a). HUD addresses lead paint exposure sources through abatement or remediation (HUD, n.d.-a).

Pediatricians could also be considered a fixer as they play a direct role in prevention and education of health effects in children caused by lead exposure (Kemper & Clark, 2005). Medicaid requires pediatricians to administer a BLL screening on all children age 12 to 24 months (Kemper & Clark, 2005; Lanphear et al., 2002). Pediatricians can inform parents on the health impacts of lead exposure (Lanphear et al., 2002; Shannon & Graef, 2017; AAPCEH, 2005). Since early detection is key, pediatricians play a critical role in identifying an issue early and preventing additional harm to children in the home (AAPCEH, 2005). The BLL testing that pediatricians conduct for Medicaid were one source for recent results revealing 77 cases of elevated BLL in Montana in 2015 (DPHHS, 2019).

At-Risk Areas in Missoula

A goal of this analysis was to research which neighborhoods were most at risk in Missoula, Montana. Figure 5 below shows an EJSCREEN map of where the highest lead paint risks are in Missoula, Montana. The table below (Table 2) includes housing and population data for the Census block groups in the 90th-100th percentile which is reflected on the EJSCREEN map. The data includes percentages of vulnerable populations such as children and low-income households comparing Missoula to Montana as a whole. Even though the five Census block groups that are in the 90th-100th percentile for the percentage pre-1960 housing, there are no higher percentages of minorities or low-income households compared to Missoula as a whole. Those block groups also have a lower percentage of renter occupied housing units than Missoula overall (42% vs. 52%) and lower percentages of children under 5 and under 18. This reveals no environmental injustice finding as low-income and minority populations are typically considered high-risk for lead paint exposure. It should be noted that a large neighborhood with older housing in Missoula is the University District which has a high value owner occupied

housing. This could explain some of the lack of disproportionate percentages of low-income populations in this area.

Figure 5

EJSCREEN of Missoula Census Blocks Showing Lead Paint Indicators State Percentiles

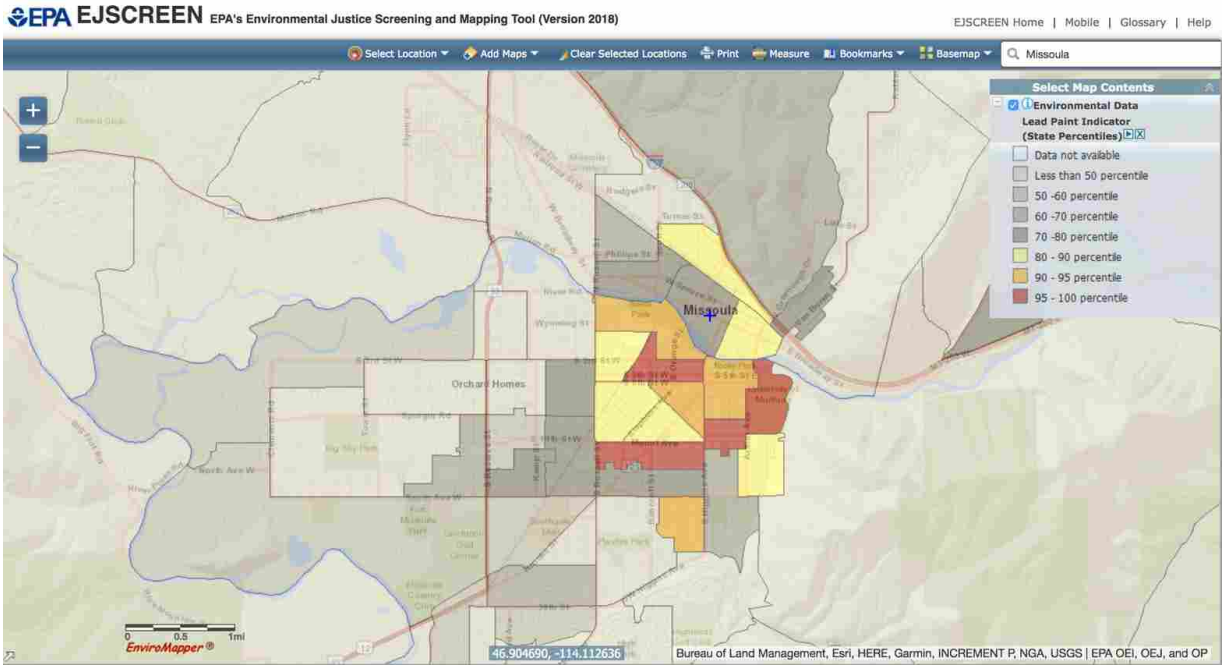


Table 2

Comparison of Vulnerable Populations in Five High Risk Block Groups, City of Missoula, and State of Montana

Variable	High Risk Block Groups*	City of Missoula	Montana
Population	5,890	70,875	1,062,305
# of Housing Units	1,988	32,810	510,408
% Renter Occ. Housing	42%	52%	31%
% Children 0-17 yrs.	14%	17%	22%
% Children <5 yrs.	3%	5%	6%
% Pre-1960 Housing*	73%	30%	29%
% Pre-1950 Housing	58.7%	19.5%	18.8%
Per Capita Income	$30,389	$30,500	$29,428
% Household Inc < $25K	21.9%	30.4%	21.9%
% Low Income*	29%	39%	34%
% Minority	11%	11%	13%

* From EJSCREEN. All other data from U.S. Census Bureau's American Community Survey 2017 1-year estimates.

Limitations

While conducting this analysis there were a few limitations. The first limitation was not having access to child BLL for Missoula which would have helped understand the scope of the issue of elevated BLLs in children. While some data for Montana as found, this data was limited in itself. Due to implementation happening at the federal level, it was difficult to find interviewees that had experience with lead based paint disclosure. Although information provided by the two interviews with the EPA was in depth, some other interviews yielded limited information about specific aspects of the policy. There was also no assessment of implementation effectiveness from the perspective of low-income renters or landlords. Finally, there was not an exhaustive attempt to identify "fixers" which may mean there are additional fixers that could be identified.

Discussion

The theory behind lead disclosure of disclosure leading to informed decision making when choosing a home is on the surface logical. Informing homebuyers and renters of lead exposure health risks through outreach and education is effective at causing home buyers to make positive informed decisions. However, barriers to the policy, such as access to the resources needed to get a lead inspection and the lack of environmental literacy from vulnerable high risk populations, show gaps in the theory and room for improvement to the policy. Since the policy has an option to choose no known lead paint, this is a clear breakdown in the logic of giving information to buyers and renters to help them make an informed decision. The essential elements for effective implementation include data collection/management, clear legal authority by the EPA, training to conduct abatement, and outreach and education. The EPA has primary control over many of the essential elements which offers a single source for consistency but also

reveals the heavy reliance on their resources. There is a reliance on their budget and staffing to provide education and outreach, training opportunities for certified lead inspectors and lead abatement contractors as well as enforcement. Fixers identified included home advocacy groups and pediatricians among others. There was a clear absence of fixers at the local state and county level in Missoula, Montana. This highlights a disconnect between local government agencies as well as the community and the EPA as the implementer of the policy.

Although lead disclosure may be given to a family, there are additional factors that have an impact when choosing a home. This points to a weakness in the theory of informed decision making behind the policy. These factors are issues such as inability to access additional required resources or a lack of environmental health literacy (i.e., the ability to understand the information given to them). Another factor is limited housing options in Missoula due to housing affordability and low vacancy rates. The policy does have a positive impact on homebuyers/owners leading to an increase in lead testing and changed paint maintenance behaviors. Another gap in the policy is that it does not require any abatement or remediation to occur if lead is disclosed. The lack of data collection and management of lead inspections, disclosures issued, and completed remediation/abatement is an issue for the professionals that need to utilize this information as well as preventing the ability for accurate study. The recommendations that follow aim to address some of these gaps.

Recommendations

Several recommendations were clear after conducting this analysis including addressing lead inspection accessibility, the need to utilize GIS and Census data to target efforts, education and outreach for fixers, a policy change to require abatement or remediation, and stronger centralized data collection an analysis.

Lead Inspections

Offering lead inspections through a state-funded program that could be managed by DPHHS would eliminate the costs and time barriers that are preventing lead paint disclosure from having a greater impact on at risk populations. There also could be a free inspection that could be paired in Missoula with the Voluntary Residential Inspection Program. Making lead inspections accessible to renters and specifically low-income or minority renters would help disclosure be more effective at giving renters all the information to make an informed decision. Requiring lead inspections with all home sales and leases for homes built prior to 1978 would ensure that each new renter or buyer would be receiving all relevant lead paint information. This would also help eliminate the barrier of having a limited number of certified lead inspectors in Missoula where certified lead inspectors are not readily available. More inspectors would be needed if there was a required lead inspection with all sales and leases which would increase the demand significantly possibly encouraging more inspectors to become certified. Addressing accessibility issues with lead inspection could help lead to an additional policy at the state level requiring lead paint inspections when selling and renovating a home which would address the quality of information that buyers and renters receive. The requirement for renovations could be included in the renovation permits issued by Missoula Development Services as it is not currently a requirement.

Targeting Lead Education and Prevention Programs

DPHHS or even county health departments with limited funding and staffing could utilize a system like GIS to identify locations with risk populations and target their education and prevention efforts. If GIS and Census data in general were consistently utilized as a primary tool this way, lead education and prevention programs which are often grant funded by the CDC could be more effective by more accurately targeting at risk populations. Targeting efforts in Missoula to those living in older housing would also help improve environmental literacy through environmental health education about lead exposure risk. These efforts could include group presentations, pamphlets, and short informational videos. This would be one step to help improve environmental justice for vulnerable low-income and minority populations.

Education and Outreach for Fixers

To close the gap between the EPA as implementer and fixers like pediatricians and home advocacy groups like the ASUM Renter Center and Homeword, the EPA could coordinate with fixers in areas with high risk populations (such as those living in older housing and low-income household and minorities) with their lead education and outreach efforts. Using education and outreach with pediatricians could help keep lead issues on a pediatrician's minds and continue to educate them on the resources and referrals they can offer families in areas identified as high-risk areas. By targeting education and outreach efforts to healthy home advocacy groups, lead risks could then be communicated to community members utilizing these groups. This would help connect the EPA with local communities and close any disconnect with the federal agency and the community.

Requiring Lead Abatement and/or Remediation

An additional policy overseen by the state of Montana and requiring lead abatement and/or remediation to occur, would over time eliminate lead paint as a primary lead exposure source in children. The policy currently does not require either action to take place and instead assumes that disclosing the presence of lead will prompt the homeowner or landlord to take voluntary action. A policy requiring lead abatement and/or remediation could be accompanied by an option to apply for a small grant. This would remove the burden that is currently on the homeowner, and the lifetime economic benefits of fewer children suffering from permanent cognitive damage of lead exposure, would be a monumental return on these small grants.

Data Collection and Management

Data collection in an accessible database for use by the EPA and agencies like DPHHS of which houses have been inspected for lead paint as well as which have had abatement or remediation is recommended. Abatement specialists and lead inspectors would report the data to DPHHS. This would help lead paint disclosure see more success in the allocation of limited resources. This information is not currently accessible but could be in a data management system like Oracle. This would also provide an opportunity to oversee data like which houses have had abatement and which homes are more likely to have lead based paint locally and at the state level. It would be beneficial for county officials to have access to the data so they could better pinpoint outreach and education. A data management position at both the state level in DPHHS and in the EPA Region 8 office would be necessary. The DPHHS data manager would input data into the system and the EPA data manger would oversee the data input at the state level and inform the EPA of where to focus efforts. There would be both a fiscal and administrative burden to both have a data management position and to enter and manage the data itself as well

as purchasing the software. Another source for data for lead inspections/lead testing could be the renovation permits issued by Missoula Development Services. This could be incorporated into a new Missoula county or city policy. In their efforts to provide educational information to the public, the EPA could target homes known to have lead and provide them with both information on lead paint disclosure policy in addition to the Healthy Homes Pamphlet.

Further Investigation and Analysis

The lack of a standard lease for rentals that consistently includes lead disclosure needs to be further investigated as it seems to be an issue that has been mostly addressed in the selling of homes but not in renting them. In addition, landlord awareness should also be studied. Comparisons between Missoula and other cities in Montana and comparable cities across the nation to further evaluate the issue would lend to a broader understanding of the issue and possible solutions. Looking at TITLE X with a broader scope to specifically analyze the 1018 Rule regarding lead paint abatement and remediation would be beneficial to complete at a later date. Compliance of Realtors needs to be further investigated to confirm there is broad spread compliance or reveal the gaps of home buyers received disclosure. Finally, there needs to be an analysis of the EPA's budgeting levels and region allocation over the last 20 years to understand the essential elements of resources such as staffing, that the EPA provides the policy.

Conclusions

Since 1996 when the lead paint disclosure policy was created, the policy has provided millions of Americans with important information regarding lead paint in their homes and the risks of lead exposure. Unfortunately, there are still many homes, primarily rentals, for which the landlords do not follow the policy. This seems to typically occur because they simply do not know the policy exists. The objective of this analysis was to understand how this policy is being implemented in Missoula, Montana, who the vulnerable populations are, what environmental justice concerns may exist, and how are state and local officials are interacting with implementation of this policy. In addition, this analysis used Weimer and Vining's (2017) framework to reveal ways implementation of this policy is effective, identify implementation problems, and consider ways of improving implementation.

Montana state and local Missoula city and county officials do not have a primary role with implementing lead paint disclosure. They are also not identified directly as a "fixer" as they mainly refer concerns, tips and complaints to the EPA. They do however play a role through some outreach and education for at risk populations. Vulnerable populations in Missoula consisted of those living in older homes because of the abundance of older housing and limited housing options. Lower-income families renting homes in Missoula are specifically vulnerable because their informed decision making power is limited by their options. Although environmental justice concerns regarding lead paint exposure and the unbalanced burden on low-income and minority populations exist, these issues did not appear to be a primary concern in Missoula. Environmental literacy was found to be the primary environmental justice concern for families receiving disclosure, but who may be unable to understand the risks associated in living in a home with lead paint.

Strengths of disclosure include informed decision making and positive behavioral changes in home owners. Disclosure also gives anyone receiving the information, if environmental literacy is present, informed decision making power. Effective implementation of lead disclosure has contributed to the continual decrease in BLLs for children since the policy was adopted. Some shortcomings of implementation that were revealed in this analysis include a lack of data collection and management, no consistent utilization of GIS to target high risk populations, no requirement for remediation or abatement, lack of education and outreach targeted towards fixers, and the accessibility of lead inspections.

Recommendations making lead paint inspections a requirement, targeting lead education and prevention programs, education and outreach for fixers, requiring lead paint abatement and/or remediation and data collection and management, which would help focus resources to vulnerable populations of primarily renters. These recommendations would benefit both lower income and minority populations and address environmental justice concerns by ensuring they would have the knowledge and resources needed to make an informed decision when it comes to choosing a safe home for their families. Each of these recommendations would help strengthen the theory behind lead paint disclosure furthering its impact and how effective it is. The EPA is in a position to help achieve the goal of eliminating lead exposure from lead based paint as well as bringing justice to our most vulnerable communities.

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APPENDICES

APPENDIX A . EPA Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards (Lessor)

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement

Housing built before 1978 may contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant women. Before renting pre-1978 housing, lessors must disclose the presence of known lead-based paint and/or lead-based paint hazards in the dwelling. Lessees must also receive a federally approved pamphlet on lead poisoning prevention.

Lessor's Disclosure

(a) Presence of lead-based paint and/or lead-based paint hazards (check (i) or (ii) below):

(i) _____ Known lead-based paint and/or lead-based paint hazards are present in the housing (explain).

_____

_____

(ii) _____ Lessor has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

(b) Records and reports available to the lessor (check (i) or (ii) below):

(i) _____ Lessor has provided the lessee with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list documents below).

_____

_____

(ii) _____ Lessor has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Lessee's Acknowledgment (initial)

(c) _____ Lessee has received copies of all information listed above.

(d) _____ Lessee has received the pamphlet *Protect Your Family from Lead in Your Home.*

Agent's Acknowledgment (initial)

(e) _____ Agent has informed the lessor of the lessor's obligations under 42 U.S.C. 4852d and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy

The following parties have reviewed the information above and certify, to the best of their knowledge, that the information they have provided is true and accurate.

Lessor	Date	Lessor	Date
Lessee	Date	Lessee	Date
Agent	Date	Agent	Date

APPENDIX B . EPA Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards (Seller)

Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards

Lead Warning Statement

Every purchaser of any interest in residential real property on which a residential dwelling was built prior to 1978 is notified that such property may present exposure to lead from lead-based paint that may place young children at risk of developing lead poisoning. Lead poisoning in young children may produce permanent neurological damage, including learning disabilities, reduced intelligence quotient, behavioral problems, and impaired memory. Lead poisoning also poses a particular risk to pregnant women. The seller of any interest in residential real property is required to provide the buyer with any information on lead-based paint hazards from risk assessments or inspections in the seller's possession and notify the buyer of any known lead-based paint hazards. A risk assessment or inspection for possible lead-based paint hazards is recommended prior to purchase.

Seller's Disclosure

(a) Presence of lead-based paint and/or lead-based paint hazards (check (i) or (ii) below):

(i) _____ Known lead-based paint and/or lead-based paint hazards are present in the housing (explain).

_____

(ii) _____ Seller has no knowledge of lead-based paint and/or lead-based paint hazards in the housing.

(b) Records and reports available to the seller (check (i) or (ii) below):

(i) _____ Seller has provided the purchaser with all available records and reports pertaining to lead-based paint and/or lead-based paint hazards in the housing (list documents below).

_____

(ii) _____ Seller has no reports or records pertaining to lead-based paint and/or lead-based paint hazards in the housing.

Purchaser's Acknowledgment (initial)

(c) _____ Purchaser has received copies of all information listed above.

(d) _____ Purchaser has received the pamphlet *Protect Your Family from Lead in Your Home.*

(e) Purchaser has (check (i) or (ii) below):

(i) _____ received a 10-day opportunity (or mutually agreed upon period) to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead-based paint hazards; or

(ii) _____ waived the opportunity to conduct a risk assessment or inspection for the presence of lead-based paint and/or lead-based paint hazards.

Agent's Acknowledgment (initial)

(f) _____ Agent has informed the seller of the seller's obligations under 42 U.S.C. 4852d and is aware of his/her responsibility to ensure compliance.

Certification of Accuracy

The following parties have reviewed the information above and certify, to the best of their knowledge, that the information they have provided is true and accurate.

Seller	Date	Seller	Date
Purchaser	Date	Purchaser	Date
Agent	Date	Agent	Date

APPENDIX C . Participant Information and Consent Form

SUBJECT INFORMATION AND INFORMED CONSENT

Title: Disclosure of Lead Paint in Residential Homes: A Policy Analysis of Implementation in Missoula, MT

Investigator: Marissa Lehner
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Faculty Supervisor: Dr. Robin Saha
University of Montana
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Rankin Hall 018; Tel. 406-243-6285

Special Instructions: This consent form may contain words that are new to you. If you read any words that are not clear to you, please ask the person who gave you this form to explain them to you.

Purpose: The purpose of this research study is to analyze policy implementation of lead-based paint disclosure. You have been asked to take part in this analysis because your current or former position may have given you exposure to lead-based paint disclosure policy.

Procedures: Our conversation will last less than an hour. You will be asked about your professional work relationship with lead-based paint disclosure.

Risks/Discomforts: There is no anticipated discomfort for those contributing to this analysis, so risk to participants is minimal. If at any time you feel uncomfortable answering a question you may simply say so and that question will be left blank.

Benefits: There is no promise that you will directly benefit from taking part in this analysis.

Confidentiality: Your identity will be kept private if you so choose. Records of our conversation will be kept confidential and will not be released without your consent except as required by law. If the results of this research are written in a scientific journal or presented publicly, your name and any identifying details will not be used. Your initials_____indicate your permission to be identified by name in publications or presentations. If you do not wish to be acknowledged by name in publications or presentations, please initial here:_____. Research data will be stored on a password-protected computer that will be with me or in my (locked) home. All voice data files, interview transcriptions, and notes will be destroyed at the conclusion of this project.

Voluntary Participation/Withdrawal: Your decision to take part in this p0olicy analysis is entirely voluntary. If you wish to stop participating in the interview at any time during our conversation, you may

simply say so.

Questions: If you have any questions about the research now or during the study, please contact:

Dr. Robin Saha; Faculty Supervisor
Professor of Environmental Studies
University of Montana
robin.saha@mso.umt.edu | 406-243-6285

Statement of Your Consent: I have read the above description of this analysis. I have been informed of the risks and benefits involved, and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any future questions I may have will also be answered by a member of the research team. I voluntarily agree to take part in this study. I understand I will receive a copy of this consent form.

_____
Printed Name

_____ _____
Signature Date

Statement of Consent to be Audiotaped: I understand that audio recordings may be taken during the analysis. I consent to being audio recorded. I understand that if information from our conversation is used for presentations or publications of any kind, names and other identifying information will be omitted.

_____ _____
Signature Date

APPENDIX D . Interview Questions

1. What is lead-based paint disclosure policy?
2. How does your position (past or present) interact with the lead disclosure policy?
3. What does implementation of the policy require of your position?
4. Does lead disclosure require anything from your position?
    a. If so, please describe.
5. What are positive aspects of lead disclosure policy?
6. What problems or challenges exist in successful implementation of lead disclosure policy in Missoula/Montana?
    a. How do those problems/challenges exist in the policy?
7. What types of neighborhoods, specific neighborhoods, or populations are most at risk from problems with implementing lead disclosure?
8. Does the policy have any interaction with the Montana DEQ / Environmental Protection Agency or Housing and Urban Development in regards to the lead disclosure policy?
9. Is there anyone you recommend that could speak about lead based paint disclosure policy in Missoula and/or Montana?

APPENDIX E. EPA Healthy Homes Pamphlet

Protect Your Family From Lead in Your Home

United States Environmental Protection Agency

United States Consumer Product Safety Commission

United States Department of Housing and Urban Development

January 2020

Are You Planning to Buy or Rent a Home Built Before 1978?

Did you know that many homes built before 1978 have **lead-based paint**? Lead from paint, chips, and dust can pose serious health hazards.

Read this entire brochure to learn:

- How lead gets into the body
- How lead affects health
- What you can do to protect your family
- Where to go for more information

Before renting or buying a pre-1978 home or apartment, federal law requires:

- Sellers must disclose known information on lead-based paint or lead-based paint hazards before selling a house.
- Real estate sales contracts must include a specific warning statement about lead-based paint. Buyers have up to 10 days to check for lead.
- Landlords must disclose known information on lead-based paint or lead-based paint hazards before leases take effect. Leases must include a specific warning statement about lead-based paint.

If undertaking renovations, repairs, or painting (RRP) projects in your pre-1978 home or apartment:

- Read EPA's pamphlet, *The Lead-Safe Certified Guide to Renovate Right,* to learn about the lead-safe work practices that contractors are required to follow when working in your home (see page 12).

Simple Steps to Protect Your Family from Lead Hazards

If you think your home has lead-based paint:

- Don't try to remove lead-based paint yourself.
- Always keep painted surfaces in good condition to minimize deterioration.
- Get your home checked for lead hazards. Find a certified inspector or risk assessor at epa.gov/lead.
- Talk to your landlord about fixing surfaces with peeling or chipping paint.
- Regularly clean floors, window sills, and other surfaces.
- Take precautions to avoid exposure to lead dust when remodeling.
- When renovating, repairing, or painting, hire only EPA- or state-approved Lead-Safe certified renovation firms.
- Before buying, renting, or renovating your home, have it checked for lead-based paint.
- Consult your health care provider about testing your children for lead. Your pediatrician can check for lead with a simple blood test.
- Wash children's hands, bottles, pacifiers, and toys often.
- Make sure children eat healthy, low-fat foods high in iron, calcium, and vitamin C.
- Remove shoes or wipe soil off shoes before entering your house.

1

Lead Gets into the Body in Many Ways

Adults and children can get lead into their bodies if they:

- Breathe in lead dust (especially during activities such as renovations, repairs, or painting that disturb painted surfaces).
- Swallow lead dust that has settled on food, food preparation surfaces, and other places.
- Eat paint chips or soil that contains lead.

Lead is especially dangerous to children under the age of 6.

- At this age, children's brains and nervous systems are more sensitive to the damaging effects of lead.
- Children's growing bodies absorb more lead.
- Babies and young children often put their hands and other objects in their mouths. These objects can have lead dust on them.

Women of childbearing age should know that lead is dangerous to a developing fetus.

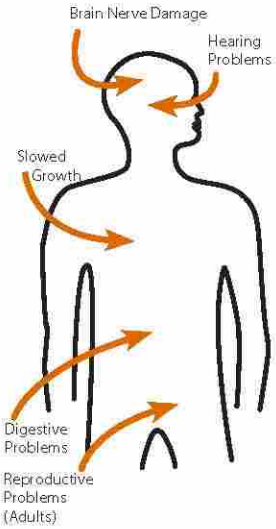
- Women with a high lead level in their system before or during pregnancy risk exposing the fetus to lead through the placenta during fetal development.

Health Effects of Lead

Lead affects the body in many ways. It is important to know that even exposure to low levels of lead can severely harm children.

In children, exposure to lead can cause:

- Nervous system and kidney damage
- Learning disabilities, attention-deficit disorder, and decreased intelligence
- Speech, language, and behavior problems
- Poor muscle coordination
- Decreased muscle and bone growth
- Hearing damage



While low-lead exposure is most common, exposure to high amounts of lead can have devastating effects on children, including seizures, unconsciousness, and in some cases, death.

Although children are especially susceptible to lead exposure, lead can be dangerous for adults, too.

In adults, exposure to lead can cause:

- Harm to a developing fetus
- Increased chance of high blood pressure during pregnancy
- Fertility problems (in men and women)
- High blood pressure
- Digestive problems
- Nerve disorders
- Memory and concentration problems
- Muscle and joint pain

Check Your Family for Lead

Get your children and home tested if you think your home has lead.

Children's blood lead levels tend to increase rapidly from 6 to 12 months of age, and tend to peak at 18 to 24 months of age.

Consult your doctor for advice on testing your children. A simple blood test can detect lead. Blood lead tests are usually recommended for:

- Children at ages 1 and 2
- Children or other family members who have been exposed to high levels of lead
- Children who should be tested under your state or local health screening plan

Your doctor can explain what the test results mean and if more testing will be needed.

Where Lead-Based Paint Is Found

In general, the older your home or childcare facility, the more likely it has lead-based paint.[1]

Many homes, including private, federally-assisted, federally-owned housing, and childcare facilities built before 1978 have lead-based paint. In 1978, the federal government banned consumer uses of lead-containing paint.[2]

Learn how to determine if paint is lead-based paint on page 7.

Lead can be found:

- In homes and childcare facilities in the city, country, or suburbs,
- In private and public single-family homes and apartments,
- On surfaces inside and outside of the house, and
- In soil around a home. (Soil can pick up lead from exterior paint or other sources, such as past use of leaded gas in cars.)

Learn more about where lead is found at epa.gov/lead.

[1] "Lead-based paint" is currently defined by the federal government as paint with lead levels greater than or equal to 1.0 milligram per square centimeter (mg/cm^2), or more than 0.5% by weight.

[2] "Lead-containing paint" is currently defined by the federal government as lead in new dried paint in excess of 90 parts per million (ppm) by weight.

Identifying Lead-Based Paint and Lead-Based Paint Hazards

Deteriorated lead-based paint (peeling, chipping, chalking, cracking, or damaged paint) is a hazard and needs immediate attention. **Lead-based paint** may also be a hazard when found on surfaces that children can chew or that get a lot of wear and tear, such as:

- On windows and window sills
- Doors and door frames
- Stairs, railings, banisters, and porches

Lead-based paint is usually not a hazard if it is in good condition and if it is not on an impact or friction surface like a window.

Lead dust can form when lead-based paint is scraped, sanded, or heated. Lead dust also forms when painted surfaces containing lead bump or rub together. Lead paint chips and dust can get on surfaces and objects that people touch. Settled lead dust can reenter the air when the home is vacuumed or swept, or when people walk through it. EPA currently defines the following levels of lead in dust as hazardous:

- 10 micrograms per square foot ($\mu g/ft^2$) and higher for floors, including carpeted floors
- 100 $\mu g/ft^2$ and higher for interior window sills

Lead in soil can be a hazard when children play in bare soil or when people bring soil into the house on their shoes. EPA currently defines the following levels of lead in soil as hazardous:

- 400 parts per million (ppm) and higher in play areas of bare soil
- 1,200 ppm (average) and higher in bare soil in the remainder of the yard

Remember, lead from paint chips—which you can see—and lead dust—which you may not be able to see—both can be hazards.

The only way to find out if paint, dust, or soil lead hazards exist is to test for them. The next page describes how to do this.

Checking Your Home for Lead

You can get your home tested for lead in several different ways:

- A lead-based paint **inspection** tells you if your home has lead-based paint and where it is located. It won't tell you whether your home currently has lead hazards. A trained and certified testing professional, called a lead-based paint inspector, will conduct a paint inspection using methods, such as:
  - Portable x-ray fluorescence (XRF) machine
  - Lab tests of paint samples

- A **risk assessment** tells you if your home currently has any lead hazards from lead in paint, dust, or soil. It also tells you what actions to take to address any hazards. A trained and certified testing professional, called a risk assessor, will:
  - Sample paint that is deteriorated on doors, windows, floors, stairs, and walls
  - Sample dust near painted surfaces and sample bare soil in the yard
  - Get lab tests of paint, dust, and soil samples
- A combination inspection and risk assessment tells you if your home has any lead-based paint and if your home has any lead hazards, and where both are located.

Be sure to read the report provided to you after your inspection or risk assessment is completed, and ask questions about anything you do not understand.

Checking Your Home for Lead, continued

In preparing for renovation, repair, or painting work in a pre-1978 home, Lead-Safe Certified renovators (see page 12) may:

- Take paint chip samples to determine if lead-based paint is present in the area planned for renovation and send them to an EPA-recognized lead lab for analysis. In housing receiving federal assistance, the person collecting these samples must be a certified lead-based paint inspector or risk assessor
- Use EPA-recognized tests kits to determine if lead-based paint is absent (but not in housing receiving federal assistance)
- Presume that lead-based paint is present and use lead-safe work practices

There are state and federal programs in place to ensure that testing is done safely, reliably, and effectively. Contact your state or local agency for more information, visit epa.gov/lead, or call **1-800-424-LEAD (5323)** for a list of contacts in your area.[3]

[3] Hearing- or speech-challenged individuals may access this number through TTY by calling the Federal Relay Service at 1-800-877-8339.

What You Can Do Now to Protect Your Family

If you suspect that your house has lead-based paint hazards, you can take some immediate steps to reduce your family's risk:

- If you rent, notify your landlord of peeling or chipping paint.
- Keep painted surfaces clean and free of dust. Clean floors, window frames, window sills, and other surfaces weekly. Use a mop or sponge with warm water and a general all-purpose cleaner. (Remember: never mix ammonia and bleach products together because they can form a dangerous gas.)
- Carefully clean up paint chips immediately without creating dust.
- Thoroughly rinse sponges and mop heads often during cleaning of dirty or dusty areas, and again afterward.
- Wash your hands and your children's hands often, especially before they eat and before nap time and bed time.
- Keep play areas clean. Wash bottles, pacifiers, toys, and stuffed animals regularly.
- Keep children from chewing window sills or other painted surfaces, or eating soil.
- When renovating, repairing, or painting, hire only EPA- or state-approved Lead-Safe Certified renovation firms (see page 12).
- Clean or remove shoes before entering your home to avoid tracking in lead from soil.
- Make sure children eat nutritious, low-fat meals high in iron, and calcium, such as spinach and dairy products. Children with good diets absorb less lead.

Reducing Lead Hazards

Disturbing lead-based paint or removing lead improperly can increase the hazard to your family by spreading even more lead dust around the house.

- In addition to day-to-day cleaning and good nutrition, you can **temporarily** reduce lead-based paint hazards by taking actions, such as repairing damaged painted surfaces and planting grass to cover lead-contaminated soil. These actions are not permanent solutions and will need ongoing attention.
- You can minimize exposure to lead when renovating, repairing, or painting by hiring an EPA- or state-certified renovator who is trained in the use of lead-safe work practices. If you are a do-it-yourselfer, learn how to use lead–safe work practices in your home.
- To remove lead hazards permanently, you should hire a certified lead abatement contractor. Abatement (or permanent hazard elimination) methods include removing, sealing, or enclosing lead-based paint with special materials. Just painting over the hazard with regular paint is not permanent control.

Always use a certified contractor who is trained to address lead hazards safely.

- Hire a Lead-Safe Certified firm (see page 12) to perform renovation, repair, or painting (RRP) projects that disturb painted surfaces.
- To correct lead hazards permanently, hire a certified lead abatement contractor. This will ensure your contractor knows how to work safely and has the proper equipment to clean up thoroughly.

Certified contractors will employ qualified workers and follow strict safety rules as set by their state or by the federal government.

Reducing Lead Hazards, continued

If your home has had lead abatement work done or if the housing is receiving federal assistance, once the work is completed, dust cleanup activities must be conducted until clearance testing indicates that lead dust levels are below the following levels:

- 40 micrograms per square foot (µg/ft^2) for floors, including carpeted floors
- 250 µg/ft^2 for interior windows sills
- 400 µg/ft^2 for window troughs

For help in locating certified lead abatement professionals in your area, call your state or local agency (see pages 14 and 15), or visit epa.gov/lead, or call 1-800-424-LEAD.

Renovating, Repairing or Painting a Home with Lead-Based Paint

If you hire a contractor to conduct renovation, repair, or painting (RRP) projects in your pre-1978 home or childcare facility (such as pre-school and kindergarten), your contractor must:

- Be a Lead-Safe Certified firm approved by EPA or an EPA-authorized state program
- Use qualified trained individuals (Lead-Safe Certified renovators) who follow specific lead-safe work practices to prevent lead contamination
- Provide a copy of EPA's lead hazard information document, *The Lead-Safe Certified Guide to Renovate Right*

RRP contractors working in pre-1978 homes and childcare facilities must follow lead-safe work practices that:

- **Contain the work area.** The area must be contained so that dust and debris do not escape from the work area. Warning signs must be put up, and plastic or other impermeable material and tape must be used.
- **Avoid renovation methods that generate large amounts of lead-contaminated dust.** Some methods generate so much lead-contaminated dust that their use is prohibited. They are:
  - Open-flame burning or torching
  - Sanding, grinding, planing, needle gunning, or blasting with power tools and equipment not equipped with a shroud and HEPA vacuum attachment
  - Using a heat gun at temperatures greater than 1100°F
- **Clean up thoroughly.** The work area should be cleaned up daily. When all the work is done, the area must be cleaned up using special cleaning methods.
- **Dispose of waste properly.** Collect and seal waste in a heavy duty bag or sheeting. When transported, ensure that waste is contained to prevent release of dust and debris.

To learn more about EPA's requirements for RRP projects, visit epa.gov/getleadsafe, or read *The Lead-Safe Certified Guide to Renovate Right.*

Other Sources of Lead

Lead in Drinking Water

The most common sources of lead in drinking water are lead pipes, faucets, and fixtures.

Lead pipes are more likely to be found in older cities and homes built before 1986.

You can't smell or taste lead in drinking water.

To find out for certain if you have lead in drinking water, have your water tested.

Remember older homes with a private well can also have plumbing materials that contain lead.

Important Steps You Can Take to Reduce Lead in Drinking Water

- Use only cold water for drinking, cooking and making baby formula. Remember, boiling water does not remove lead from water.
- Before drinking, flush your home's pipes by running the tap, taking a shower, doing laundry, or doing a load of dishes.
- Regularly clean your faucet's screen (also known as an aerator).
- If you use a filter certified to remove lead, don't forget to read the directions to learn when to change the cartridge. Using a filter after it has expired can make it less effective at removing lead.

Contact your water company to determine if the pipe that connects your home to the water main (called a service line) is made from lead. Your area's water company can also provide information about the lead levels in your system's drinking water.

For more information about lead in drinking water, please contact EPA's Safe Drinking Water Hotline at 1-800-426-4791. If you have other questions about lead poisoning prevention, call 1-800 424-LEAD.*

Call your local health department or water company to find out about testing your water, or visit epa.gov/safewater for EPA's lead in drinking water information. Some states or utilities offer programs to pay for water testing for residents. Contact your state or local water company to learn more.

* Hearing- or speech-challenged individuals may access this number through TTY by calling the Federal Relay Service at 1-800-877-8339.

Other Sources of Lead, continued

- **Lead smelters** or other industries that release lead into the air.
- **Your job.** If you work with lead, you could bring it home on your body or clothes. Shower and change clothes before coming home. Launder your work clothes separately from the rest of your family's clothes.
- **Hobbies** that use lead, such as making pottery or stained glass, or refinishing furniture. Call your local health department for information about hobbies that may use lead.
- Old **toys** and **furniture** may have been painted with lead-containing paint. Older toys and other children's products may have parts that contain lead.[4]
- Food and liquids cooked or stored in **lead crystal** or **lead-glazed pottery or porcelain** may contain lead.
- Folk remedies, such as **"greta"** and **"azarcon,"** used to treat an upset stomach.

[4] In 1978, the federal government banned toys, other children's products, and furniture with lead-containing paint. In 2008, the federal government banned lead in most children's products. The federal government currently bans lead in excess of 100 ppm by weight in most children's products.

For More Information

The National Lead Information Center
Learn how to protect children from lead poisoning and get other information about lead hazards on the Web at epa.gov/lead and hud.gov/lead, or call **1-800-424-LEAD (5323).**

EPA's Safe Drinking Water Hotline
For information about lead in drinking water, call **1-800-426-4791**, or visit epa.gov/safewater for information about lead in drinking water.

Consumer Product Safety Commission (CPSC) Hotline
For information on lead in toys and other consumer products, or to report an unsafe consumer product or a product-related injury, call **1-800-638-2772,** or visit CPSC's website at cpsc.gov or saferproducts.gov.

State and Local Health and Environmental Agencies
Some states, tribes, and cities have their own rules related to lead-based paint. Check with your local agency to see which laws apply to you. Most agencies can also provide information on finding a lead abatement firm in your area, and on possible sources of financial aid for reducing lead hazards. Receive up-to-date address and phone information for your state or local contacts on the Web at epa.gov/lead, or contact the National Lead Information Center at **1-800-424-LEAD.**

Hearing- or speech-challenged individuals may access any of the phone numbers in this brochure through TTY by calling the toll-free Federal Relay Service at **1-800-877-8339**.

U. S. Environmental Protection Agency (EPA) Regional Offices

The mission of EPA is to protect human health and the environment. Your Regional EPA Office can provide further information regarding regulations and lead protection programs.

Region 1 (Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont)

Regional Lead Contact
U.S. EPA Region 1
5 Post Office Square, Suite 100, OES 05-4
Boston, MA 02109-3912
(888) 372-7341

Region 2 (New Jersey, New York, Puerto Rico, Virgin Islands)

Regional Lead Contact
U.S. EPA Region 2
2890 Woodbridge Avenue
Building 205, Mail Stop 225
Edison, NJ 08837-3679
(732) 906-6809

Region 3 (Delaware, Maryland, Pennsylvania, Virginia, DC, West Virginia)

Regional Lead Contact
U.S. EPA Region 3
1650 Arch Street
Philadelphia, PA 19103
(215) 814-2088

Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)

Regional Lead Contact
U.S. EPA Region 4
AFC Tower, 12th Floor, Air, Pesticides & Toxics
61 Forsyth Street, SW
Atlanta, GA 30303
(404) 562-8998

Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)

Regional Lead Contact
U.S. EPA Region 5 (LL-17J)
77 West Jackson Boulevard
Chicago, IL 60604-3666
(312) 353-3808

Region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, Texas, and 66 Tribes)

Regional Lead Contact
U.S. EPA Region 6
1445 Ross Avenue, 12th Floor
Dallas, TX 75202-2733
(214) 665-2704

Region 7 (Iowa, Kansas, Missouri, Nebraska)

Regional Lead Contact
U.S. EPA Region 7
11201 Renner Blvd.
Lenexa, KS 66219
(800) 223-0425

Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)

Regional Lead Contact
U.S. EPA Region 8
1595 Wynkoop St.
Denver, CO 80202
(303) 312-6966

Region 9 (Arizona, California, Hawaii, Nevada)

Regional Lead Contact
U.S. EPA Region 9 (CMD-4-2)
75 Hawthorne Street
San Francisco, CA 94105
(415) 947-4280

Region 10 (Alaska, Idaho, Oregon, Washington)

Regional Lead Contact
U.S. EPA Region 10 (20-C04)
Air and Toxics Enforcement Section
1200 Sixth Avenue, Suite 155
Seattle, WA 98101
(206) 553-1200

Consumer Product Safety Commission (CPSC)

The CPSC protects the public against unreasonable risk of injury from consumer products through education, safety standards activities, and enforcement. Contact CPSC for further information regarding consumer product safety and regulations.

CPSC
4330 East West Highway
Bethesda, MD 20814-4421
1-800-638-2772
cpsc.gov or saferproducts.gov

U. S. Department of Housing and Urban Development (HUD)

HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. Contact to Office of Lead Hazard Control and Healthy Homes for further information regarding the Lead Safe Housing Rule, which protects families in pre-1978 assisted housing, and for the lead hazard control and research grant programs.

HUD
451 Seventh Street, SW, Room 8236
Washington, DC 20410-3000
(202) 402-7698
hud.gov/lead

U. S. EPA Washington DC 20460
U. S. CPSC Bethesda MD 20814
U. S. HUD Washington DC 20410

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IMPORTANT!

Lead From Paint, Dust, and Soil in and Around Your Home Can Be Dangerous if Not Managed Properly

- Children under 6 years old are most at risk for lead poisoning in your home.
- Lead exposure can harm young children and babies even before they are born.
- Homes, schools, and child care facilities built before 1978 are likely to contain lead-based paint.
- Even children who seem healthy may have dangerous levels of lead in their bodies.
- Disturbing surfaces with lead-based paint or removing lead-based paint improperly can increase the danger to your family.
- People can get lead into their bodies by breathing or swallowing lead dust, or by eating soil or paint chips containing lead.
- People have many options for reducing lead hazards. Generally, lead-based paint that is in good condition is not a hazard (see page 10).