

ALLEGHENY COUNTY LEAD TASK FORCE



December 2017

Final Report & Recommendations

A report commissioned by Allegheny County Executive Rich Fitzgerald

MESSAGE FROM THE LEAD TASK FORCE

County Executive Rich Fitzgerald,

In May of 2017, you commissioned the Lead Task Force and charged us with reviewing county data, examining potential policies, and reviewing strategies and literature related to childhood lead exposure in the county. The Task Force was asked to provide a report and recommendations related to lead sources in our environment.

Specifically, the Task Force was charged with the following:

- Review the current literature and speak with experts on sources of lead and the relative risks to the Allegheny County population
- Review available data to determine what we know and don't know relevant to childhood lead exposure in our county
- Review strategies for assessing the impact of universal lead screening
- Examine possible policies that protect the public from lead exposure
- Make recommendations for interventions and prevention of lead exposure

Since its inception, the Lead Task Force has met eight times and spoken with twenty experts, both national and local, to understand “best practices” for protecting the public’s health, with a focus on primary prevention. We have also reviewed the literature and numerous research studies, and received recommendations from the public and parents.

Our recommendations are based on the best currently available science. Lead is a neurotoxin that can impact childhood development and cause numerous health problems. Lead levels in children have been significantly reduced nationally as well as within Allegheny County due to a variety of public policies aimed at removing lead from gasoline, paint and water pipes. However, given our county’s legacy of industry, old housing stock, and lead pipes, the risk of lead exposure still remains and is preventable. The Flint water crisis has refocused nationwide efforts regarding lead exposure. Here in Allegheny County, several public drinking water systems have exceeded the action level set by the Environmental Protection Agency (EPA) Lead and Copper Rule (LCR), causing public concern and highlighting the risk of lead in drinking water. Lead in paint and dust remains a known hazard, particularly in our most disadvantaged neighborhoods. The legacy of pollution, gasoline use, and housing demolition has also impacted our soil.

Today, we must acknowledge that lead is ubiquitous in our environment. We must address the risk of exposure to this lead in all its forms using both primary prevention and post-exposure intervention strategies. We must also acknowledge lead exposure as a health equity issue that must be resolved. As the Centers for Disease Control and Prevention notes, there is no safe blood lead level in children. Preventing exposure and mitigating risk is critical to protecting our children’s health. We agree with President Obama that it is important to avoid stigmatizing lead-exposed children to ensure that their future is not harmed by preconceived assumptions.

*“We know now what we didn’t know then, which is it can cause problems if children get exposed to lead at elevated levels. But the point is that as long as kids are getting good health care, and folks are paying attention, and they’re getting a good education, and they have community support, and they’re getting some good home training, and they are in a community that is loving and nurturing and thriving, these kids will be fine. And I don’t want anybody to start thinking that somehow all the kids in Flint are going to have problems for the rest of their lives, because that’s not true. That is not true. And I don’t want that stigma to be established in the minds of kids”
President Obama Flint Michigan, 2016.¹*

The Lead Task force is pleased to present this report to you with our recommendations on how best to protect the public’s health. Primary prevention is imperative. Implementation of these recommendations will require cross-jurisdictional efforts, collaboration, and the engagement of multiple partners to achieve. Protecting our children’s health and their future is paramount.

Thank you for this opportunity to serve the public’s interest.

Signed:

The Allegheny County Lead Task Force

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Table of Contents

Message from the Lead Task Force.....	2
Executive Summary.....	4
Introduction.....	8
Background.....	10
Brief History of Lead in the US and Allegheny County.....	10
Health Effects of Lead.....	11
Current Known Data on Childhood Lead Exposure in Allegheny County.....	14
Allegheny County Health Department (ACHD) Approach to Lead.....	15
Surveillance: How ACHD is Tracking Lead Exposure.....	15
Primary Prevention and Education.....	17
Interventions.....	17
Findings from Literature Review and Consultation with Experts.....	19
Residential Lead.....	19
Disclosure Laws.....	19
Water.....	20
Soil.....	22
Best Primary Prevention Strategies to Address Reduction of Residential Lead Exposure.....	24
Monitoring and Reporting Information on Exposure.....	26
Investigating Hazards.....	26
Education and Outreach.....	27
Recommendations.....	28
Paint, Dust, and Other Household Sources.....	29
Water.....	32
Soil.....	34
Alternative Sources.....	36
Monitoring and Reporting Information on Risk and Exposure.....	38
Investigation of Hazards.....	41
Public Awareness and Advocacy.....	43
References.....	45
Glossary.....	50

Executive Summary

Lead is a known neurotoxin and a serious threat to public health, particularly to our children. There is no safe lead level in children, and lead exposure from any source contributes to the lead burden for children. Blood lead levels, a measure of children's exposure, have declined steadily, both nationally and locally, as society has passed major legislation to reduce sources of exposure, including removing lead from gasoline, paint, and plumbing fixtures. However, historical use of lead means that existing sources remain a threat. Continued action is needed to eliminate harmful exposure to lead in our environment. In May 2017, The Honorable Rich Fitzgerald, Allegheny County Executive, commissioned a task force to review data on all sources of lead and provide a set of recommendations for further action.

The Task Force of nine members met regularly throughout the summer and fall of 2017. The Task Force reviewed the scientific literature, interviewed over 20 nationally-recognized and local experts, and obtained input from the public. They then compiled a set of recommendations related to major sources of lead including paint and dust, water, soil, and alternative sources.

The Task Force recognizes that while progress has been made to address lead exposure, the ubiquitous presence of lead in our environment from all known sources continues to represent a threat to human health. The Task Force concluded that both primary prevention (identifying and remediating hazards before children are affected) and intervention strategies (to address children who have experienced exposure) are required. However, only primary prevention will lead to a continuing overall reduction in childhood lead exposure and should, as such, be prioritized.

To address the environmental threat, the Lead Task Force developed a set of recommendations related to the leading sources of lead exposure in Allegheny County. Recommendations were also developed related to monitoring and reporting and related to education and outreach. Implementation of these recommendations will require cross-jurisdictional efforts, collaboration, and the engagement of multiple partners.

Eliminating harmful lead exposure is a long-term process. Protecting children will require the work of multiple agencies as well as individuals. Simple actions such as minimizing dust carried into the home from outside (e.g., leaving shoes at the door) and cleaning dust generated from painted surfaces inside (e.g., window sills and doors) can help reduce a child's potential exposure to lead. Water filters that remove lead can protect against lead in water if a home is serviced by lead pipes or contains lead fixtures. Universal blood level testing will help identify children who have been exposed to lead in their environment so that swift action can be taken to protect the child from further harm. Information on blood lead levels will assist all parties in better understanding where lead hazards are most prevalent and allow for improved targeted interventions.

The Lead Task Force developed a series of recommendations for eliminating harmful lead exposures in Allegheny County. The recommendations are split into four main categories: control sources of lead, monitor and report information on exposure, investigate hazards, and educate the public on community lead hazards.

The ultimate goal of each recommendation is to eliminate harmful exposures to lead. The Task Force recognizes that while there is no safe level of exposure to lead, complete elimination of all lead from the environment is impossible. The Task Force recommends working toward elimination of harmful human-made lead hazards and reducing human exposure to all forms of lead.

(Continued on page 6)

Recommendations are accompanied by additional information pertaining to the partners needed for full implementation, the resources required, the expected timeframe, and the challenges and opportunities inherent in each. This report is not intended to provide explicit policy directives, but to suggest areas that need consideration by many distinct stakeholders.

Recommendations

1. Paint, Dust and Other Household Sources

- 1.1 Increase the supply of a lead-safe/lead-free housing through a lead-safe, lead-free certification program.
- 1.2 Inform homeowners, housing providers and residents of lead hazards and lead exposure routes and provide information on opportunities and requirements for remediation.
- 1.3 Establish programs that financially support lead remediation.
- 1.4 Prioritize settings where children spend substantial portions of time.
- 1.5 Advocate for state and federal resources to support remediation of lead hazards in housing, child care facilities and schools.
- 1.6 Increase the number of lead-safe contractors by expanding training and certification programs.

2. Water

- 2.1 Reduce exposure to lead from water lines by decreasing the presence of lead containing plumbing materials (pipes, solder, fixtures).
- 2.2 Undertake short and medium-term strategies to minimize exposure.
- 2.3 Prioritize settings where children spend substantial portions of time.
- 2.4 Advocate for improved national standards.

3. Soil

- 3.1 Improve demolition standards and conformity to those standards.
- 3.2 Identify and remediate contaminated soil.
- 3.3 Support home owners and housing providers to test and remediate lead in soil.

Recommendations, continued

4. Alternative Sources

- 4.1 Identify and eliminate alternative sources of exposure to lead.
- 4.2 Identify high-risk occupations and hobbies and encourage appropriate lead-safe practices to protect workers and their families.
- 4.3 Advocate for additional federal regulations to identify and eliminate importation of lead containing items that pose risk to children.

5. Monitoring and Reporting Information on Risk and Exposure

- 5.1 Identify communities in the County with high-risk for lead exposure.
- 5.2 Enhance surveillance efforts to address actionable interventions.
- 5.3 Enhance Public Reporting.

6. Investigation of Hazards

- 6.1 Monitor changes to the Center for Disease Control and Prevention's (CDC) guidelines for management of elevated blood lead levels and adjust programming accordingly.
- 6.2 Conduct primary prevention investigations in homes based on risk factors (see recommendation for paint, dust and home hazards).
- 6.3 Provide linkage to resources for all children with elevated blood lead levels based on CDC guidelines.

7. Public Awareness and Advocacy

- 7.1 Reconstitute a community lead advisory committee such as the prior "Lead Safe Pittsburgh" organization as a countywide working group.
- 7.2 Expand education strategies particularly on the hazards of lead and strategies for remediation.

The report begins with a background section that describes a brief history of lead in the United States and in Allegheny County. A short overview of the health effects of lead follows. A summary of current known data on childhood lead exposure in Allegheny County along with a description of current activities of the Allegheny County Health Department related to lead is also included. The report then provides a full discussion of what was learned by the Task Force in each of the recommendation areas. This includes all the main sources as well as information on primary prevention policies, monitoring and reporting, investigation of hazards, and education and outreach. The report concludes with detailed information on the recommendations: goals and activities as well as information on partners required, timeline and challenges and opportunities.

Introduction

Lead is a known neurotoxin and a serious threat to public health, particularly to our children. There is no safe lead level in children, and lead exposure from any source contributes to the lead burden for children. Thus, it is critical that we eliminate harmful exposure to lead from all sources, including paint, soil and water. Blood lead levels in all children tested in Allegheny County have been trending downwards over the last several decades, but we still have work to do. Strategies must include primary prevention of lead exposures as well as interventions when exposures are detected. **Primary prevention** is focused on identifying and remediating lead hazards before a child is exposed. **Intervention** (also called secondary prevention) is focused on implementing measures after a child is identified as having an elevated blood lead level, indicating exposure.²

Lead comes from many sources including paint, dust, soil and water, as well as, less commonly, alternative sources such as toys and other consumer products. All sources pose a risk of exposure. Additional actions to further reduce and ultimately eliminate harmful exposure are required and should reflect evidence-based best practices. Only primary prevention will lead to a continuing overall reduction in childhood lead exposure.

On May 9, 2017, County Executive Rich Fitzgerald announced the formation of a Lead Task Force and charged its members with reviewing county data, examining potential policies, and reviewing literature, and assessing strategies related to childhood lead exposure in the county. He further directed that a report and recommendations be submitted within six months.

Specifically, the task force was charged with the following:

- Review the current literature and speak with experts on sources of lead and the relative risks to the Allegheny County population
- Review available data to determine what we know and don't know relevant to childhood lead exposure in our county
- Review strategies for assessing the impact of universal lead screening, should the recently-adopted Board of Health regulation become law
- Examine possible policies that protect the public from lead exposure
- Make recommendations for interventions and prevention of lead exposure

(Continued on page 9)

Nine members with expertise in various pertinent areas were appointed to the Task Force:

- **Patrick Dowd, Ph.D.**, Executive Director of Allies for Children
- **Richard Ford**, City of Clairton Council Member
- **Bernard D. Goldstein, M.D.**, Emeritus Professor and former Dean of the Graduate School of Public Health at the University of Pittsburgh
- **Karen Hacker, M.D., M.P.H.**, Director of Allegheny County Health Department
- **Deborah Moss, M.D., M.P.H.**, Associate Professor of Pediatrics at University of Pittsburgh, Children's Hospital of Pittsburgh of UPMC Division of General Academic Pediatrics, and Pediatric Medical Director UPMC for You and Medical Director, UPMC for Kids
- **Amy G. Nevin, M.D.**, Pediatrician
- **Valerie McDonald Roberts**, Chief Urban Affairs Officer, Office of Mayor William Peduto
- **Jeanne M. VanBriesen, Ph.D., P.E.**, Duquesne Light Company Professor of Civil and Environmental Engineering and the Director of the Center for Water Quality in Urban Environmental Systems (Water QUEST) at Carnegie Mellon University
- **Sharon Watkin, Ph.D.**, State Epidemiologist, Pennsylvania Department of Health

Over the course of their six-month engagement, the Task Force met eight times from May-November 2017. In addition to regular in person meetings, the Task Force engaged in multiple calls with leading experts and reviewed major national reports and peer-reviewed literature on lead exposure and lead risk. The steps the Task Force conducted included:

1. Reviewed the scientific literature and multiple national reports related to lead exposure and risk
2. Reviewed pertinent federal, state and local regulations in Allegheny County and in other municipalities throughout the U.S.
3. Interviewed over 20 nationally-recognized and local specialists in the field (Refer to Appendix 1 for a listing of all experts who were interviewed)
4. Reviewed and evaluated current and proposed policy and protocols implemented by the Allegheny County Department of Health.
5. Released a request for information from the public on August 30, 2017 and received two responses
6. Interviewed parents of children who had experienced lead exposure

The Task Force then developed a set of specific recommendations through a consensus approach, with review by members with specific content expertise. These recommendations were prepared for presentation to the County Executive.

Background

Brief History of Lead in the US and Allegheny County

Lead has been present in the United States in many different forms for hundreds of years including in gasoline, paint, pipes and for various industrial applications. Since the early 1970s, there have been significant policy decisions and legislation that have dramatically reduced exposure, as measured by the mean blood lead level observed in children.³

Lead has been used in paint for thousands of years. Adding lead creates a highly durable and washable paint, which was desirable for use as both an interior and exterior paint. In 1978, federal legislation removed lead from all residential paint, which protected new construction and renovation projects, but did not require removal of existing lead paint found in many homes and businesses. Pennsylvania ranks 4th in the U.S. for total housing units built before 1978.⁴ In Allegheny County, more than 80% of homes were built prior to lead being removed from paint, and 41% of homes were built before 1950, when lead-based paint was used more frequently.⁵ These homes can, and most likely do, still contain lead paint.

Lead can also be present in water when it is transported from water treatment facilities to homes through pipes that contain lead, or when it travels within the home through plumbing fixtures that contain lead. Lead is highly ductile and long-lasting. It was preferred for pipe materials for many years.^{6,7} The Safe Drinking Water Act (SDWA) prohibits the “use of any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, after June 1986, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free.”⁸ Section 1417 of the SDWA originally established the definition for “lead free” as solder and flux with no more than 0.2% lead and pipes with no more than 8% lead. The rule was strengthened in 1996 to require plumbing fittings and fixtures (e.g. faucets used within households) to be “lead free” as well. In 2011, the Reduction of Lead in Drinking Water Act (RLDWA) revised the definition of lead free, reducing the allowable lead content from 8% to 0.25% in pipes and fixtures. Fixtures in non-potable uses were exempt (e.g. toilets, tub fillers); fire hydrants were later exempted as well. Due to these many changes, pipes and plumbing fixtures in current use throughout Allegheny County may contain variable amounts of lead.

To protect consumers from lead that might enter the water from existing plumbing, The Environmental Protection Agency (EPA) passed the Lead and Copper Rule (LCR) in 1991. This regulation requires corrosion control treatment to be applied by water utilities to reduce the release of lead (and copper) from pipes and fixtures. The LCR requires corrective action if the lead concentration exceeds an action level of 15 ppb in more than 10% of samples taken at customers taps (the copper action level is 1.3 ppm). Corrective action may include removal of lead pipes in the system and changes to corrosion control chemical dosing. The action level, however, is not health-based.^{9,10}

There are 35 community public water systems in Allegheny County that are responsible for treating drinking water and delivering it to homes. Many of these utilities do not know exactly how many lead service lines are

(Continued on page 11)

still in place, connecting homes to the water distribution system. Water service lines are split in their ownership – with water authorities generally owning to the “curbside” of homes, after which pipes are considered private property and are owned by homeowners. Even if water authorities are aware of the locations of all lead pipes within their distribution systems, they may be unable to replace the full length of a service line without customer permission and participation.

Another source of lead in Allegheny County comes from airborne emissions, which also contribute to lead in soil. Allegheny County has had a significant industrial presence since the early 1800s. Smelters and other facilities produced airborne lead emissions as a byproduct of manufacturing processes. The Allegheny County Health Department (ACHD) Air Quality Program continues to monitor lead in emissions as an air toxin and as a criteria air pollutant (regulated under the Clean Air Act). Because of the unique and hilly topography of Allegheny County, these historic emissions settled in greater concentrations in low-lying valleys, rather than dispersing as they would in flatter terrain. As such, Allegheny County is home to areas with higher levels of lead in soil. Beginning in the 1920s, lead was added to gasoline, and tailpipe emissions contributed lead to the environment, particularly in close proximity to roads, until lead was banned from gasoline in 1996.¹¹ This resulted in an additional source of airborne lead, which also contributes to the legacy issues of lead in Allegheny County soil. Further, workers exposed to lead in their workplace can carry lead dust home on their persons and clothes, which poses additional hazards in homes.

Lead can also enter the soil from a variety of sources including ammunition at shooting ranges and the demolition of pre-1978 buildings that contain lead paint. Demolition can lead to higher concentrations of lead-containing soil, particularly at the center of properties where houses stood. EPA has set standards for lead concentrations in soil: 400 parts per million (ppm) for soil that children might have contact with, and 1200 ppm for soil that affects adults.¹² As in the case of most federal standards, states and other local authorities are permitted to set more stringent standards.

Other sources of lead also exist and may include cosmetics, toys, jewelry, ceramics, and candy when these products are made in countries where lead regulations do not exist. Some standards exist in the United States for some of these “alternative” sources of lead, but they are not comprehensive and only apply to products made and sold in the U.S. The United States Food and Drug Administration’s recommended maximum lead level in candy is 0.1 parts per million (ppm).¹³ In 2011, the United States Consumer Product Safety Commission lowered the limit for total lead content in children’s products sold in the U.S. to 100 ppm.¹⁴ Thus, we must stay alert to products entering the USA from foreign countries that do not restrict the use of lead.

Over the last 40 years, with a commitment to eliminating harmful lead exposure in all areas – paint, water, soil – through policies and regulations, our nation and county have successfully made progress as illustrated in the downward trend in childhood blood lead levels (Figure 1). This threat is not eliminated yet, and there is still work to be done.

Health Effects of Lead

As noted by the American Academy of Pediatrics (AAP), there is no safe lead level in children.¹⁵

The health effects of lead are well known.^{16,17} Lead impairs brain development and children under the age of six are particularly vulnerable to its effects. At extremely high levels of lead exposure, which are rare in the United States and Allegheny County, lead can cause seizures, coma, and even death. Increasingly, studies are

(Continued on page 12)

showing adverse effects of lead at lower and lower levels. Lead can cause significant detriments to cognition, neurologic function and behavior, for children in particular, as their neurological systems are still developing. High lead levels are also a health concern to people of all ages.

The recent AAP report, "Prevention of Childhood Lead Toxicity," states that even low blood lead levels, such as 5 µg/dL and lower, can lead to impaired cognition.¹⁷ Numerous studies have confirmed the broad spectrum of childhood health disorders that are manifested as a reaction to lead toxicity. Low level lead exposure can lead to diminished intellectual abilities, increased rates of hyperactivity and attention deficit disorder, and lower birth weights. Impacts to cognitive functions seen by exposure to lead can be measured by IQ scores and academic performance.^{18,19} The impacts of lead toxicity on the neurological system appear to be irreversible, although there is evidence that other factors including nutrition and neurodevelopmental supports, can influence outcomes.^{20,21}

The exact biological mechanism of the neurological impact of lead is not fully understood, but lead may compete with other metals that are critical for a child's growth and development, such as calcium, iron, and zinc. These metals are key in developing brains, helping to build healthy brain cells and healthy nervous systems.³ Lead exposure also compromises the other systems of the body including the cardiovascular, immune, endocrine, renal and hematological systems, and reproductive systems. Lead causes harm in adults such as renal issues, fertility issues, digestive problems, and memory and concentration issues. Lead can also harm the developing fetus.³

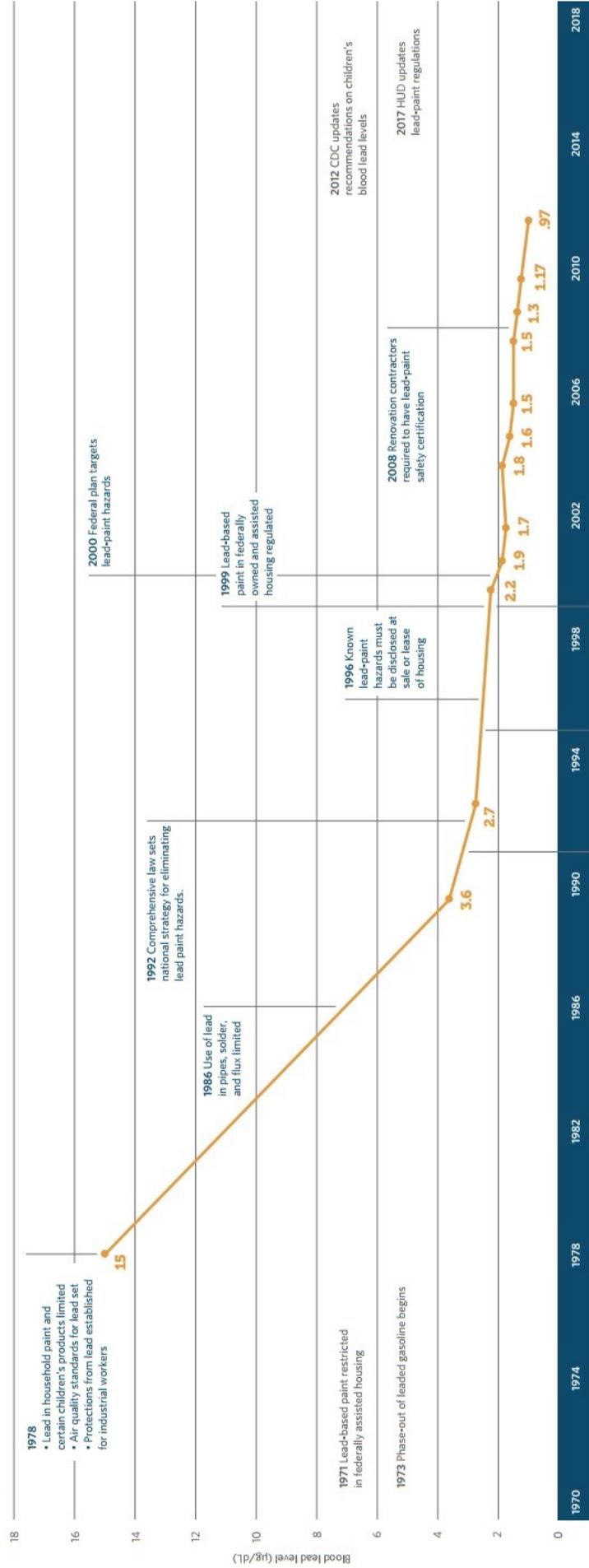
Compounding the problem is the disproportionate effect of legacy lead issues on disadvantaged communities. Children in inner city disadvantaged areas, which in Allegheny County are predominantly African-American communities, are more likely to be living in dwellings with residual lead paint, older water pipes and plumbing fixtures, and outdoor soil contamination from previous demolitions. Further, inner city residents may also suffer from nutritional deficiencies (e.g., insufficient iron) that alter the absorption of lead, increasing the risk from lead exposure.

The growing body of evidence was reviewed by the Advisory Committee on Childhood Lead Poisoning Prevention for the Centers for Disease Control and Prevention (CDC). Acknowledging research that shows negative outcomes at lower levels of lead exposure than previously considered,²² the Committee recommended in its 2012 report that "CDC should use a childhood BLL reference value based on the 97.5th percentile of the population BLL in children ages 1-5 (currently 5 µg/dL) to identify children and environments associated with lead-exposure hazards. The reference value should be updated by CDC every four years based on the most recent population based blood lead surveys among children."¹⁶ Further, it noted "public health and environmental policies should encourage actions to reduce all lead exposure, to the extent feasible and, should specifically focus on minimizing disparities in childhood BLLs." The CDC has provided guidance for follow-up and case management of children based on confirmed blood lead levels.²³ It is important to note that the 97.5th percentile of the population BLL has decreased since the report written but the CDC has not changed the reference value.

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Figure 1. Policies that have impacted blood lead levels in children. PEW Charitable Trust Report³

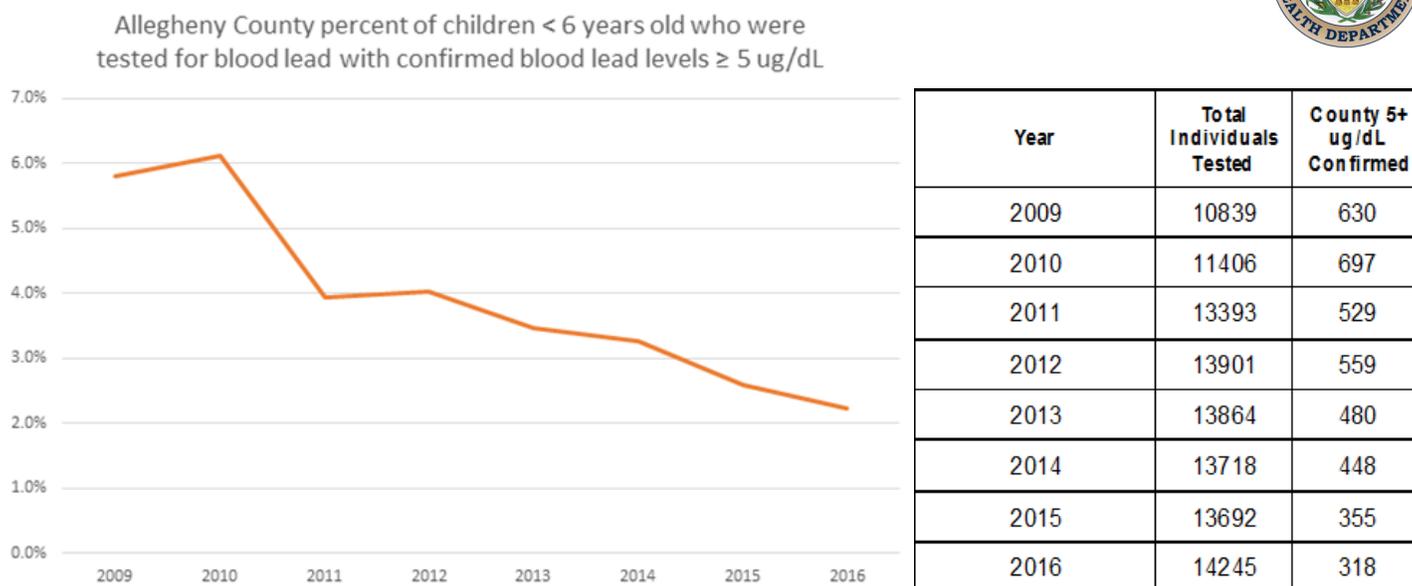
Exposure Prevention Effectively Lowers Children's Lead Levels
Average blood lead levels in children 1 to 5 and federal policies



Sources: Reproduced and modified from Mary Jean Brown & H. Falk, "Toolkit for Establishing Laws to Control the Use of Lead Paint. Module C.iii. Conducting Blood Lead Prevalence Studies," Global Alliance to Eliminate Lead Paint (2016); President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts" (November 2016), https://ptfch.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf ©



Figure 2. Percent of Children < 6 years of age tested for lead with confirmed* tests in Allegheny County $\geq 5 \mu\text{g}/\text{dL}$



Data from PA NEDSS System

*CDC case definition defines a confirmed elevated blood lead level as one venous blood lead test $\geq 5 \mu\text{g}/\text{dL}$, or two capillary blood lead tests $\geq 5 \mu\text{g}/\text{dL}$ drawn within 12 weeks of each other (but not on the same day) <https://wwwn.cdc.gov/nndss/conditions/lead-elevated-blood-levels/case-definition/2016/>

Current Known Data on Childhood Lead Exposure in Allegheny County

In general, lead levels in children under age six in Allegheny County have been trending downwards as they have in the rest of the nation. In 2016, the percent of children under six years of age with confirmed blood lead levels $\geq 5 \mu\text{g}/\text{dL}$ (the current reference level defined by the CDC) decreased to 2.3% among children tested, marking a drop of over 50% since 2009 (Figure 2). In addition, the number of children with blood levels $\geq 10 \mu\text{g}/\text{dL}$ has been decreasing annually. In 2016, there were 74 children countywide (0.5% of children tested) with confirmed blood lead levels at or above $10 \mu\text{g}/\text{dL}$ compared to 166 in 2010 (1.4% of children tested).

These data suggest progress in primary prevention of lead exposure and the associated risk to children’s health in the county. However, it is important to note that lead testing has been voluntary (except for children with Medicaid insurance, where it is required). Therefore, not all age-eligible children are tested in a given year, and the children that are tested may not be representative of all children in the county. While some children are never tested, other children receive capillary tests (a finger stick screening test generally conducted in a doctor’s office, that is prone to false positive error^{24,25}). When a capillary test is high, this is considered an unconfirmed test unless the test is followed up by a more accurate venous blood draw test conducted in a laboratory.²⁶

While the overall percent and number of children with confirmed elevated blood lead levels is decreasing, some areas of the county are disproportionately affected. Figure 3 shows census tracts in the county between 2012 and 2016, revealing which areas of the county had the highest proportion of children with blood lead levels of $5 \mu\text{g}/\text{dL}$ or above.

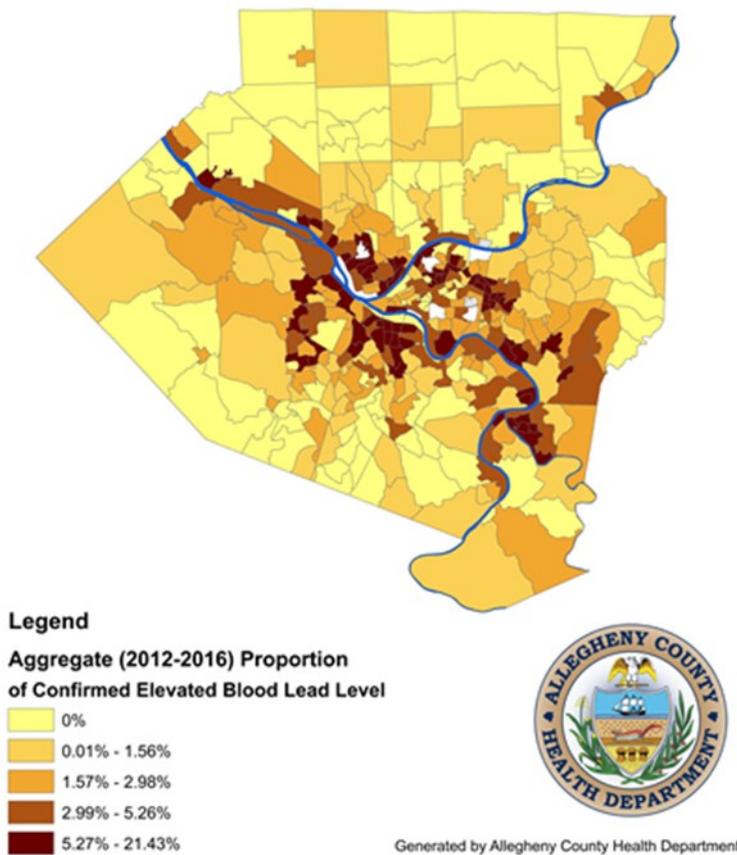
Allegheny County Health Department (ACHD) Approach to Lead

The ACHD has spent decades addressing the problem of lead exposure in our county through investigation of elevated blood lead levels in children, enforcement actions when hazards are identified, and education to help families reduce childhood exposures. However, ACHD efforts have been hampered by reductions in resources.

In 2012, reductions to CDC funding eliminated some components of the Federal Childhood Lead Poisoning Prevention Program and dollars were transferred to the Maternal and Child Health Bureau in Health Resources Services Administration (HRSA) for the Healthy Homes Program. Then in 2016, the Healthy Homes Program shifted away from lead entirely. Even though funding for lead programming was eliminated in 2016, ACHD maintained its lead investigation program and proactively strengthened the standard for investigation from $\geq 15 \mu\text{g/dL}$ to $\geq 10 \mu\text{g/dL}$ in December of 2016.

Figure 3. Allegheny County census tracts with high proportions of confirmed* elevated blood lead levels

Allegheny County Aggregated (2012-2016)
Proportion of Confirmed Elevated Blood Lead Levels ($\geq 5 \mu\text{g/dL}$)
by Census Tract for Children Under Six Years of Age



Data from PA NEDSS System.

*CDC case definition defines a confirmed elevated blood lead level as one venous blood lead test $\geq 5 \mu\text{g/dL}$, or two capillary blood lead tests $\geq 5 \mu\text{g/dL}$ drawn within 12 weeks of each other (but not on the same day)

Today, ACHD is expanding its efforts to address lead in a more comprehensive manner. The ACHD's comprehensive lead strategy has three main parts: tracking information on lead exposure (surveillance), education and primary prevention, and intervention. These strategies have been made possible by local foundation support; their continuation will depend on funding.

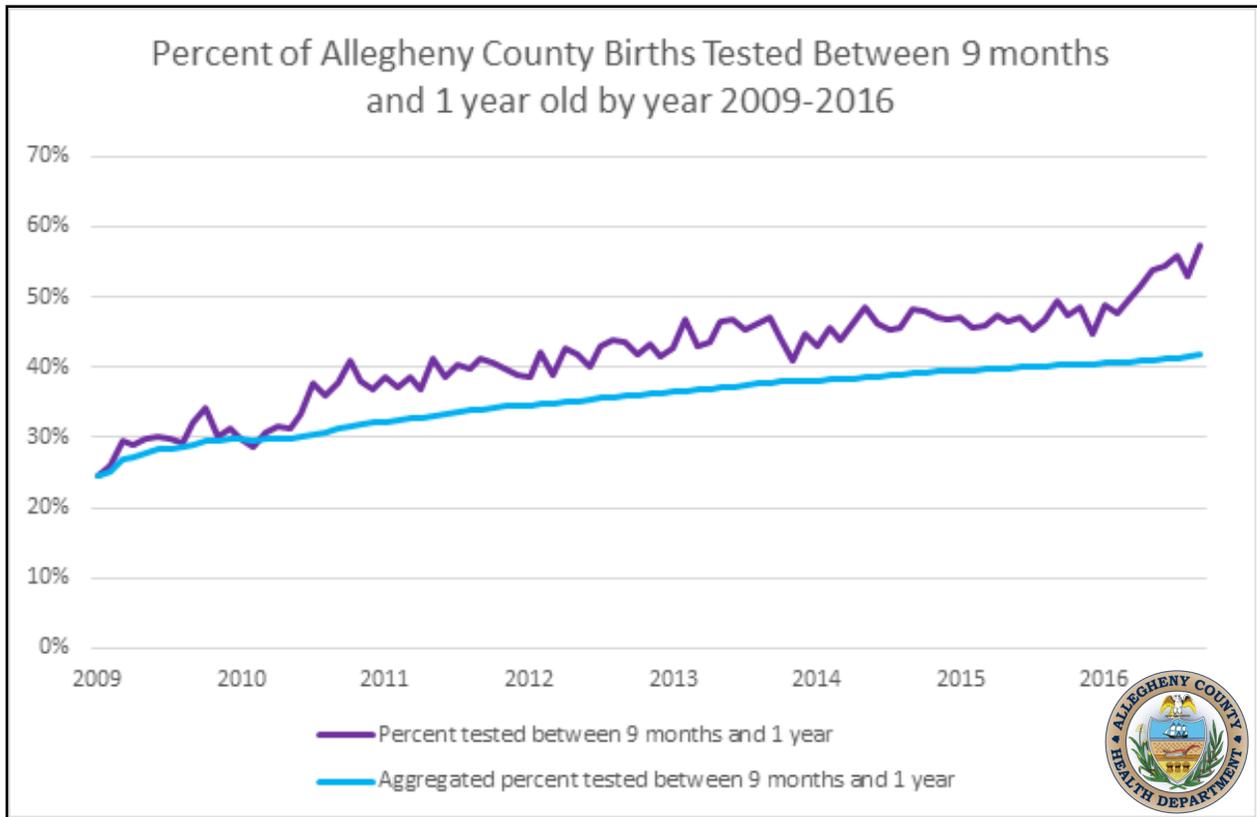
Surveillance: How ACHD is Tracking Lead Exposure

In Pennsylvania, all blood lead test results are reportable to the state through the Pennsylvania National Electronic Disease Surveillance System (PA NEDSS), and most come in through electronic laboratory results. In the past, ACHD generally used Pennsylvania Department of Health statewide reports to monitor lead exposure in our region. Access to these reports was regularly delayed by multiple years, making timely assessment impossible. Further, since lead testing was only mandated for Medicaid-insured children, many children in the State (and county) were not tested. In Allegheny County, while the number of children tested has increased since 2009, it remains under-representative of the total population of children.

Recent data (Figure 4) shows that about 47% of children between nine months and one year were tested in 2016.

(Continued on page 16)

Figure 4. Percent of children born who were tested for blood lead in Allegheny County between 9 and 12 months*



Data from PA NEDSS System.

*9 months-1 year time frame is defined as 270 and 412 days for analysis purposes

On July 5, 2017, the County Council approved a first of its kind in Pennsylvania regulation requiring universal lead testing for young children. As a result, beginning in January 2018;²⁷ all children are required to be tested for lead exposure at approximately 9-12 months old and again at approximately 24 months old.* This increased surveillance will assist ACHD with monitoring lead levels in all Allegheny County children and will inform the optimal, targeted screening and intervention strategies to reduce and eliminate on-going and future lead exposure. It is interesting to note that the percent of age-eligible children who received lead testing increased in 2016. This is likely due to the increased attention to lead in the news, the discussions that ACHD has had with pediatric providers about lead testing, and the impending regulation.

ACHD is now monitoring elevated blood lead levels (EBLLs) in real time by extracting data from the PA NEDSS system directly. This surveillance has allowed ACHD to examine exposure over time and identify patterns of exposure using ArcGIS mapping. It will allow ACHD to determine the percent of children who received lead testing and what type they received. In addition, ACHD is now able to identify children with elevated capillary tests that do not have venous confirmation. Data is also used for identifying high-risk communities that bear an undue burden of children with EBLLs. It also allows ACHD to look at other factors including the presence of lead water lines (when available), the age of housing and economic determinants of lead exposure.²⁸

Finally, surveillance improvements will progressively allow more up to date data to be shared in a more transparent manner with the public through the ACHD website. An annual lead report is already planned and will be available.

(Continued on page 17)

*Moral or religious exemptions are possible

Primary Prevention and Education

Given the loss of resources previously described, efforts in primary prevention slowed in the last decade. The prior “Lead Safe Pittsburgh” stakeholder advisory coalition disbanded in the early 2000’s and represented a loss of citizen focus on the issue. ACHD is renewing efforts to address lead exposure and recognizes that primary prevention must be a critical focus. ACHD is developing a new comprehensive communications strategy to educate Allegheny County residents on the risks of lead exposure, including how to prevent and mitigate it. ACHD has an active set of web pages with information on lead’s health impact, existing sources and programs that are currently offered. Links to national resources are also available, as is information on data, investigation procedures, water issues, and partial lead line replacements.²⁹

Allegheny County Economic Development (ACED) recently received a three-year U.S. Department of Housing & Urban Development (HUD) grant the Lead Safe Homes Program-that provides financial resources for lead mitigation to families who meet income guidelines and have children < 6 years living in or spending significant time in the home or have a pregnant woman in the home. These resources are targeted for prevention and are not dependent on having a child with an EBLL. Working with ACED and CountyStats, ACHD is using data to identify priority communities for outreach and education for the Lead Safe Homes Program. Letters were recently sent to new parents living in these high-risk communities with information on the Lead Safe Homes program. In addition, ACHD released a Request for Proposals to engage community partners in expanding educational efforts to high-risk communities. The grantees will be chosen in December to start work in January 2018.

The ACHD Safe and Healthy Homes²⁹ program is also available to those who meet income requirements and have children. It can provide home visits and education for a variety of in-home hazards, including lead, prior to any identified exposure. ACHD has integrated lead assessment into other existing programs by cross-training ten housing inspectors as lead inspectors and educating maternal and child home visitors and Women Infants and Children (WIC) staff to recognize and educate about lead hazards during their regular home visits. For example, when a housing inspector visits a home to investigate a health hazard, they also can visibly assess lead hazards and refer the family to educational materials, suggest their children be tested for lead exposure, and provide referrals to the Lead Safe Homes program and Safe and Healthy Homes program.

Interventions

ACHD has done home investigations to identify lead hazards for children with EBLLs for decades using federal funding. As noted, when federal resources were discontinued, ACHD continued investigations and lowered the threshold for investigation from 15 µg/dL to 10 µg/dL by converting an empty position to a lead inspector position. The quality of lead paint risk assessments has improved over time and conforms to federal standards. Investigations involve education; visual inspection; testing for lead-based paint, contaminated lead dust, water, and soil, if appropriate. According to the CDC, ACHD is one of the few programs that includes water sampling in investigations.³⁰

If initial water samples are elevated above the LCR action level, additional samples are taken. Starting in 2017, inspectors also check for lead lines at the water meter and advise families to contact their water authority to determine if they have lead service lines. They counsel families to use NSF International-certified (NSF) filters or bottled water and appropriate flushing techniques. Between 2014 and 2017, home investigations for EBLLs

(Continued on page 18)

have not found water to be the primary source of exposure but water may have been an additional contributor to childhood lead exposure. Of the 137 investigations conducted in this time-frame, there have only been three cases (2%) where water lead levels were above the LCR Action level. In all three cases, the child was ingesting lead from other sources and in one case, the family was using an NSF-certified filter.

The information garnered in a lead investigation is shared with both parents and health care provider. In the case of landlords, citations are issued, and enforcement takes place if landlords do not comply with mandated remediation. This year so far, there have been 25 citations issued and enforcement efforts are ongoing. From January to November 2017, ACHD was notified of 85 cases of confirmed blood lead levels ≥ 10 $\mu\text{g}/\text{dL}$. Of these, 6% (5) are in process, 54% (46) received home investigation, 16% (14) were not able to be contacted after multiple tries, and 24% (20) of families refused services (reasons included; moving, knowing where the lead was located and not needing help, and none).

As recommended by the CDC,²³ ACHD has adopted the CDC reference level of $5\mu\text{g}/\text{dL}$. In July, in addition to lead home investigations for children with confirmed blood lead levels of $10\mu\text{g}/\text{dL}$ and above, ACHD began contacting parents of children with confirmed blood lead levels of $5-9\mu\text{g}/\text{dL}$ to conduct an assessment via a lead source questionnaire (see Appendix 3). Based on the information obtained, ACHD provides education on sources, remediation, access to resources including the Lead Safe Homes and Safe and Healthy Homes program, and referral to early intervention programming.

In support of the recently passed universal lead screening regulation, ACHD will be offering blood lead level testing to children who are uninsured or underinsured starting in 2018. Notification will be available through the education program as well as doctor's offices, community groups, child care centers, etc.

Last year, in response to the CDC's adoption of the reference level of $5\mu\text{g}/\text{dL}$ representing an EBLL in children, and in conjunction with the Allegheny Department of Human Services, ACHD successfully lobbied at the state Department of Human Services to change eligibility criteria for children's access to Early Education Intervention. Children with EBLs of $5\mu\text{g}/\text{dL}$ are now eligible in addition to those with higher blood lead levels.

Findings from Literature Review and Consultation with Experts

In the recent AAP report “Prevention of Childhood Lead Toxicity”,¹⁷ the leading childhood lead exposures include lead-paint dust (from wear and tear and renovation in homes built prior to 1978 with existing lead based paint), water, and soil (see Figure 5).^{31,32} Here is what the Lead Task Force learned about these sources over the course of our engagement.

Residential Lead

“Lead-based paint and lead contaminated dust are the most hazardous sources of lead for U.S. children.”³³ While all sources of lead are hazardous and must be considered, lead paint and dust in older dilapidated homes built prior to 1978, are the primary source of childhood lead exposure.^{31,34} Points of friction, where frequent and repeated movement across lead paint occurs, are critical exposure areas. These areas include windows, doorways, and porches. Moving windows up and down or closing and opening doors deposits lead containing dust on the floor where it can be tracked around home environments.³⁵ Window sills are common sites for lead paint dust deposits. In addition, gnawing activities on window sills is not uncommon in teething children, leading to direct exposure through unintended consumption. Lead paint can have a sweet taste, which can increase this behavior in children. Porches are areas where children play in the summer and deteriorated paint can also be a source of exposure either through dust or paint chips.

Disclosure laws

Many homeowners and renters may be unaware of the presence of lead paint in their homes. U.S. EPA’s Lead Residential Lead-Based Paint Disclosure Program³⁶ requires all home sellers and housing providers to disclose all known lead hazards (presence of lead paint, lead-contaminated soil and lead pipes and fixtures) to prospective buyers and renters and to provide educational information on identifying and controlling those hazards. However, disclosure of lead paint relies on the home seller or provider having knowledge of the presence of lead hazards.

Abatement or remediation of lead-based paint requires expertise. Pursuant to federal law and the Pennsylvania Lead Certification Act 44 of 1995,³⁷ only lead certified contractors, supervisors and workers may engage in removing lead paint hazards. Additionally, the EPA Lead Renovation, Repair and Painting Rule (RPR Rule) requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in homes, child care facilities and pre-schools built before 1978 have their firm certified by EPA (or an EPA authorized state), use certified renovators who are trained by EPA-approved training providers and follow lead-safe work practices.”³⁸ Untrained and uncertified individuals who attempt to remove lead paint hazards or disturb lead painted surfaces during renovation work may inadvertently create a greater lead paint hazard, by creating excess lead dust. Renovation can contribute to approximately 10% of EBLLs in children.^{31,39}

In addition to lead paint dust from windows, doors, and porches due to deteriorated lead-based paint, or from renovation, lead dust may also be tracked into the home on shoes from leaded soil. Proper cleaning of

(Continued on page 20)

horizontal surfaces, particularly uncarpeted floors and windowsills, with damp rags can help to safely remove lead dust from these surfaces. It is also recommended that a vacuum cleaner with a high efficiency particulate arresting (HEPA) filter be used regularly to remove lead-contaminated dust from the home.⁴⁰

Efforts to provide cleaning services to residents and/or to train residents in cleaning techniques to reduce lead exposure have not always been successful in preventing elevated blood lead levels.⁴¹

Water

Compared to other drinking water contaminants, lead is unique because it is not usually present in the water as it leaves the water treatment plant. Instead, potable water can be contaminated with lead due to the corrosion of lead-bearing plumbing materials such as pipes, faucets, fittings, and solder. Most lead in drinking water systems in the United States is found in lead pipe that connects each home to the water main in the street; these connecting pipes are called service lines. Estimates suggest drinking water contributes approximately 20% of the overall lead exposure to children.^{31,42} As noted by EPA, “Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water”⁴³ and recent studies have documented that lead in water can be a major contributor to EBLLs.^{42,44,45}

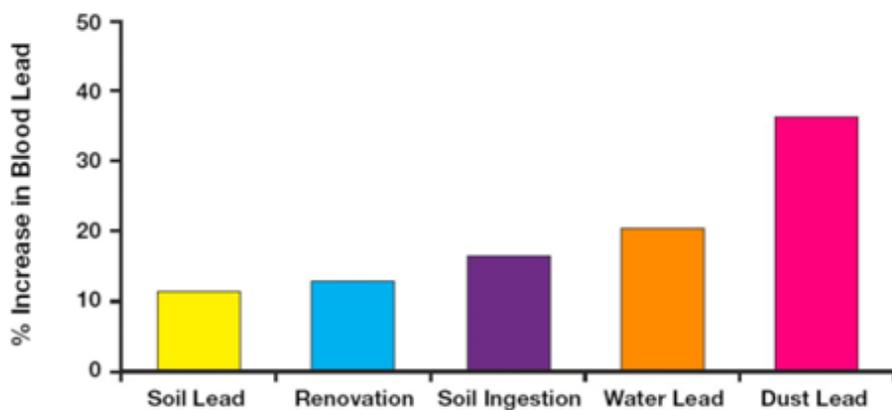
Lead is released from water pipes and fixtures due to dissolution of the primary material or through routine or episodic detachment of lead-containing scale particles that form on the pipe. Lead-containing pipe scale can become dislodged by disruption (excavation, repairs, partial line replacements), resulting in larger, but less frequent, doses of lead.⁴⁶ Lead in water is not only a risk when the water is consumed directly; contaminated water used to cook food (e.g. rice or pasta), or to reconstitute juice or infant formula, will also result in direct exposure to lead. Within the home, lead can be removed from water using NSF-certified⁴⁷ water filters approved for removing lead, such as faucet filters or pitcher filters. Filters must be changed regularly to

maintain efficacy and prevent potential growth of bacteria. Filtered water must be used for all consumption (drinking and food preparation) to reduce exposure.

The EPA has set a maximum contaminant level goal (MCLG) for lead of zero, recognizing that there is no safe level of lead in water.¹² The MCLG is a health-based, non-enforceable value. EPA did not set an enforceable maximum contaminant level (MCL) for lead in water, but rather required drinking water utilities to optimize corrosion control to reduce lead in water; this is called a treatment

Figure 5. Contribution of lead exposure to children’s blood lead concentration

Contribution of lead exposure to children’s blood lead concentrations.



technology (TT) requirement. The LCR requires water utilities to monitor drinking water at customer's taps. If this monitoring shows the lead concentration exceeds the action level (15ppb) at more than 10% of sampled customer's taps, the utility must take action to reduce lead, including, but not limited to, replacement of lead service lines (LSLs).

Thus, in general, water utilities attempt to control the release of lead from lead-bearing materials and scales by maintaining water chemistry conditions (i.e., pH and alkalinity) that reduce lead release or by adding corrosion inhibitors (e.g., phosphate).^{48,49} However, even in well-maintained systems with optimized corrosion control plans, there is still the potential for elevated water lead levels.⁵⁰

The majority of the lead exposure from tap water comes from LSLs, which connect each home to the main water line in the street.⁵¹⁻⁵³ A recent study estimated that as many as 22 million Americans living in 6.2 million homes have a partial or full LSL.⁵⁴ However, it can be very challenging for a water utility to identify the locations within its distribution system that contain lead pipe. In many cases, records of the type of pipe installed do not exist. Residents can check the incoming pipe using a simple "scratch test" (scratching the incoming line to the water meter to see if it is lead, copper or other substance) to determine its contents but in some homes interior access to assess the pipe entering the home may not be feasible. Non-invasive methods to determine pipe materials from the street-side are under development, but at present, there is no easy way to identify service line material.

The service line is often (but not always) a single piece of pipe. But in most locations, it has two owners. The utility owns the portion from the water main to the connection point on the homeowner's property (near the street). The homeowner owns the pipe from that connection to the home. Either or both sections of pipe can be made of lead. The utility has responsibility for maintaining (and replacing if necessary) its portion of the service line, but because the customer-owned part of the service line is private property, the utility has neither the responsibility nor often the authority to replace the customer-owned part of the service line.

For water authorities to remove and replace customer-owned lead lines would require customer permission and a source of funding. It might also require changes to local or state regulations that restrict access to private property. Since many utilities are not permitted to spend general funds from water fees on replacement of privately owned pipes, if a homeowner is not able to pay for replacement of the pipe, work on the private side of the pipe cannot be completed. However, recent research suggests that partial lead line replacement instead of full lead line replacement can pose increased risk of lead in water.^{30,55} Given the risk, several cities have stopped partial lead line replacements and passed regulations allowing replacement of private pipes by water authorities, using various funding models.³

The RAND Corporation recently provided a summary of policy options for water supply lead remediation in Pittsburgh and reviewed the costs, regulatory barriers, and feasibility of options.⁵⁶ As they note in a subsequent commentary,⁵⁷ "flushing and filtering, coupled with effective corrosion control, could cost-effectively help to reduce lead exposure in the near-term while a more permanent solution is developed." However, "in the long term, full service line replacement is the only option that would permanently resolve the risk of lead in water." Table 1 summarizes the options for drinking water lead hazard mitigation.

In Flint, Michigan, federal and state funding is supporting removal of all lead pipes in what is being called the FAST START Initiative. Full line replacement is being conducted with resident's permission.⁵⁸ They are using a technique that was implemented in Lansing, Michigan for trenchless replacement of service lines which allows for copper pipes to be threaded through existing lead pipes rather than removing the original lead pipes.

Table 1. Summary of the Options for Lead Mitigation and Decision Criteria

Policy Option	Impact on Lead Remediation	Cost Per Residence	Technical Feasibility	Legal or Regulatory Barriers	Time Frame
Status quo	Continued risk of lead exposure to residents	\$26–\$43 per year; \$260–\$430 over ten years	No technical requirements, but requires residents to consistently comply with flushing instructions	None	Immediate
Filters	Provides short-term protection from lead in water, but only for those who sign up for the Safe Water Program or procure their own filters	\$80–\$1,290 in the first year; \$580–\$2,400 over ten years	Procuring and distributing water filters is feasible, but filters must be maintained and replaced regularly	None	Safe Water Program rolled out quickly, but will only last three to six months
Optimal corrosion control	If administered correctly, should protect water from lead pipes, but it is an ongoing operations strategy rather than a permanent fix	–	Study currently under way to determine most effective anticorrosive; Blue Ribbon Panel assessing management changes	Legal challenges ongoing over unlawful change	Dependent on the amount of time the study will take; will need ongoing oversight and regulation
Partial replacement of service lines by PWSA	Has been shown to increase amount of lead leaching into the water supply. Only effective in coordination with property owners to replace private portions of lines.	\$1,125–\$12,720 one-time cost	Labor- and resource-intensive, but new technologies exist	PWSA must replace 7 percent of lines per year, but only until 90th percentile drops below 15 ppb; from curb to house, service lines are private—must generate resident buy-in	Will take PWSA about ten years to replace all LSLs
Full replacement of LSLs by PWSA	Permanently removes key source of water-based lead exposure in safe manner	\$2,425–\$20,650 one-time cost	Labor- and resource-intensive, but new technologies exist	Municipal Authority Act being contested to allow for PWSA to replace private portion of LSLs	Very time-intensive; estimates of 14 years for widespread replacement

Performance Key

High

Medium-high

Medium-low

Low

From May LW, Fischbach JR, Abbott M. *Informing Pittsburgh’s Options to Address Lead in Water. Perspective* ⁵⁶

Soil

Lead in soil comes from many sources. Lead is naturally present in soil as well as due to known sources of contamination. Although the phase out of leaded gasoline began in 1975, it was not banned in the United States until 1996. Emissions from vehicles powered by leaded gasoline would often settle in soil around garages, alleys, and busy intersections. Runoff from these areas has transported lead to the edges of properties.⁵⁹

In the past, federal standards to control air emissions of lead from industrial facilities were also less stringent,⁶⁰ resulting in areas with higher concentrations of lead in soil surrounding specific facilities. Due to the unique topography of Allegheny County, both industrial emissions and gasoline emissions tended to settle near the points of emission, rather than blowing further away. Industrial sources in valleys, for example, could be expected to have higher concentrations of lead in the soil than sources in higher elevations and more open areas.

Lead paint can enter the soil through demolition debris which could be buried or left in abandoned properties. This usually results in higher concentrations of lead-contaminated soil in the center of properties. Lead can also enter soil around the edges of the house due to paint chips falling to the ground and years of unsafe scraping and sanding exterior house paint when preparing to apply new coats of paint. The so-called “drip line” usually extends 2-3 feet out from the foundation wall of the house.

Demolition standards are set by the state in the Pennsylvania Construction Code Act of 1999.⁶¹ Municipal governments are required to adhere to state standards but can create stronger regulations.⁶² The only portion of demolition that ACHD has authority over where lead is concerned is air quality. Experts we spoke to had questions about whether municipalities are adequately enforcing current demolition regulations and/or using the latest best practices for lead remediation (including the amount of organic cover needed to cover foundations).⁵⁹

Lead-contaminated soil can be consumed, whether through direct ingestion or the inadvertent hand-to-mouth behavior of children. Airborne/ soil dust may also pose a risk in areas with little grass cover like urban yards and spaces. However, this is not considered to be the primary risk of lead-contaminated soil exposure. The greater risk is tracking contaminated soil into homes where children often spend a greater majority of their time. Soil tracking can be reduced by taking shoes off when entering a home as well as home cleaning strategies.⁴⁰

EPA has set standards for lead concentrations in soil: 400 parts per million (ppm) for children, and 1200 ppm for adults. These are considered to be too lenient by local experts.⁵⁹

Levels of lead in soil can be measured through soil sample tests and though x-ray fluorescent (XRF) analyzers, but often this does not provide a complete analysis of an entire property.⁵⁹ Concentrations of lead can vary in soil only a few feet apart, so while soil testing can be helpful, due to the high variability it can be challenging to make general assumptions about levels across large areas. Isotopic analysis of soil samples can also be conducted, which can identify the original source of the lead (e.g., gas, paint, industrial smelting). Testing conducted in Allegheny County by the Allegheny County Conservation District using XRF has shown paint to be the primary source of lead found in soil samples.⁶³

There is concern that consumption of plants grown in lead-contaminated soil poses a risk, particularly from certain plants that extract heavy metals from soil (i.e. mustard greens and certain root crops, such as carrots, radish, and turnips). However, these levels are often low, and of more concern is the dust on the plant itself, which can be eliminated by washing before consumption.

Crops that are grown entirely above ground have minimal transport of lead into the edible part of the crop. Soil pH levels in Allegheny County tend to be alkaline (pH>7), and this feature inhibits transport of lead into plants.⁵⁹

The primary methods to control lead in soil are to maintain neutral or alkaline pH, build soil organic levels by using organic composting materials, boost soil phosphorous levels, and maintain contaminate-free top soil such as turf sod and mulch.⁶⁴

Best Primary Prevention Strategies to Address Reduction of Residential Lead Exposure

There are numerous housing-based primary prevention policies that have been implemented at the local level (generally at the municipal level) to address lead hazards. Unfortunately, not all have been evaluated for

(Continued on page 24)

impact, and implementation resources are critical to success.⁶⁵ Based on several reports and articles that used case studies,^{3,65} the Task Force contacted informed experts from five major cities (New York, Philadelphia, Chicago, Milwaukee, and Rochester) to understand their approach to lead and its success and review their ordinances. These cities have employed a variety of strategies to conduct primary prevention often using existing municipal inspectors to conduct lead-free, lead-safe certification inspections. As noted by *Kormacher and Hanley*,⁶⁵ there are critical elements that are important to assess prior to determining housing-based primary prevention policies:

1. *Physical environment (geographic targeting)*
2. *Health status and systems: What percentage of high-risk children receive blood lead tests? What percentage of these have elevated blood lead levels?*
3. *Public awareness (by residents, landlords, and community leaders) of the connection between lead poisoning and health, educational, and social outcomes.*
4. *Economy/housing market*
5. *State legal environment: Does the locality have the authority to implement a local lead law?*
6. *Case law: What are the relevant court rulings and settlements related to lead hazards, duty to maintain properties, inspections, and landlord liability?*
7. *Implementation resources: What is the public (city inspectors) and private (number of certified risk assessors and sampling technicians) capacity for conducting proactive inspections?*⁶⁵

While several communities have developed lead-safe/lead-free certification programs, not all effectively enforce their ordinances. The Task Force was particularly impressed with efforts in Rochester, NY. In 2005, Rochester, NY passed an ordinance that required regular inspections of most rental units built before 1978 for lead hazards as part of their existing certificate of occupancy process.⁶⁶ Property owners must correct any lead hazard violations before they can obtain a certificate of occupancy. The Rochester process for code enforcement generally runs on a 2–3-year cycle but homes in high-risk areas, or those in which lead hazards have been identified, are inspected more frequently. Investigations also occur on a complaint-driven basis, and when EBLLs are identified in a child residing at a particular address. To date, Rochester has inspected over 141,000 homes.³ Rochester operates a searchable database of lead-safe units, certificates of occupancy issued since 2006, property maps with violations, and code enforcement data. Rochester has also been extremely successful at obtaining HUD dollars to remediate property identified as containing lead hazards. Data from Rochester (figure 6) suggests that this strategy has directly impacted blood lead levels.

New York City also has strong enforcement and inspection policies that are conducted by the City's housing department.⁶⁷ New York City began conducting investigations of homes with children under six years of age with elevated blood lead levels, and when hazards were found, investigative services were offered to any family with a young child in the same building. Inspectors found that in New York City's high multi-occupancy building environment, one child with an EBLL in a building indicated poor building maintenance, and identified lead hazards in one unit were often found in other units. New York City also has a searchable database listing every housing unit in which a prospective renter or buyer can find a list of violations, including lead violations, and their current status.⁶⁸ Education is a strong component of New York City's lead hazard abatement strategies, and residents appear to be aware of how and when to reach out to the housing agency with concerns. Any identified hazards must be remediated by the owner of the building. If owners do not fix issues

(Continued on page 25)

Figure 6: Children's blood lead level results, City of Rochester, July 2004-2008⁶⁶

Level of blood lead	Preimplementation of lead law		Postimplementation of lead law	
	Year -2 1 July 2004–30 June 2005	Year -1 1 July 2005–30 June 2006	Year 1 1 July 2006–30 June 2007	Year 2 1 July 2007–30 June 2008
No. of children screened	7,256	7,420	7,146	6,528
Mean BLL (µg/dL)	4.73	4.21	4.00	3.73
Median BLL (µg/dL)	4.00	3.00	3.00	3.00
No. of children with BLL ≥ 10 µg/dL	604	490	403	284
Percentage of children with BLL ≥ 10 µg/dL	8.3	6.6	5.6	4.4

BLL, blood lead level.

*These results are based on health department BLL data from the 2 years before and 2 years after implementation of the lead law (see Boyce et al. 2008).

Source: Reproduced and modified from Katrina Smith Korfmacher, Maria Ayoob and Rebecca Morley. "Rochester's Lead Law: Evaluation of a Local Environmental Health Policy Innovation." *Environmental Health Perspectives*, Vol. 120.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3279433/>

within the required timeline,⁶⁷ they are referred to an emergency repair program in the housing agency.⁶⁹ The agency then makes the repairs, and the owner is billed. A lien may be put on the property until the bill is paid. New York City also has money from New York State, which is focused on primary prevention. Some of this funding provides training for certification of lead-certified construction workers.

In Milwaukee, using HUD grant dollars, the health department has successfully remediated almost 18,000 homes over a 20-year period, averaging 1000 per year, with a strong focus on window remediation in particular.⁷⁰ In Illinois, the CLEAR-WIN Program provided pilot funding for installation of 8,000 windows in 466 housing units between 2010 and 2014. The program proved effective in reducing lead hazards based on levels of indoor lead dust. It is now before the state legislature for full implementation.^{71,72}

In Chicago, health department staff used predictive modeling to identify risk factors for lead hazards in the home.⁷³ Based on this information, they reached out to WIC clients living in homes with characteristics suggesting potentially elevated exposure. Attempts were made to investigate homes that were considered high-risk. Unfortunately, the response rate was relatively low.⁷⁴

Philadelphia's Lead Paint Disclosure and Certification Law passed in 2012 requires landlords to obtain certification prior to renting to tenants with children under age 6.⁷⁵ However, the law is largely unenforced. Staff estimate that of the over 18,000 rental units, only 2000 have been certified. When a child has an elevated lead level and the home is inspected, a citation is issued if there is no lead-safe certification.⁷⁶

Broadly, cities reported low uptake of lead home investigations if the child did not have an EBLL. Even with a child with a confirmed EBLL, cities reported rates of parental refusal of home investigations that range from 25-50%. Thus, cities are trying multiple strategies to address primary prevention, usually based on grant funding and generally focused on high-risk neighborhoods. Rochester's approach is the most promising and has the evaluation data to demonstrate its success.

Monitoring and Reporting Information on Exposure

Monitoring and reporting information on lead exposure poses unique challenges, which have been tackled in a variety of ways across the United States. Under Pennsylvania Code, Title 28, Chapter 27, all blood lead test results on both venous and capillary specimens for persons under 16 years of age are reportable regardless of result, to the state Department of Health.⁷⁷ Patient blood lead levels are protected health information, and are subject to HIPAA rules, as well as the Pennsylvania Disease Prevention and Control Law of 1955. Thus, data are shared with the ACHD but remain private. Summary data are provided to the community (e.g., Figure 3) without identifying individuals.

Currently ten states, and the District of Columbia (DC) require universal testing.⁷⁸ Pennsylvania requires testing for children on Medicaid insurance, but not for other children.⁷⁹ Even so, Medicaid notes that only about 70% of Medicaid-insured children in Pennsylvania are being tested. Recently, the governor called for regulation to require universal lead testing of children in Pennsylvania. Universal testing of blood lead levels will enable health care providers to act when elevated levels are seen and allow for better targeting of primary prevention efforts. Some physicians and pediatricians are unaware of testing requirements and necessary follow-ups or think that children are not at-risk due to their housing.⁸⁰ Thus, universal testing will provide an extra layer of safety for children who might not be identified for testing by their health care provider. Moving to universal testing will also require additional education for providers and the use of standardized terms for reporting.

There are two methods of testing for blood lead levels: capillary tests, which utilize a finger prick method; and venous tests, which extract blood directly from a vein. While capillary tests can be used to effectively identify children without lead exposure, they have a high risk of returning an incorrect elevated result, or false-positive, as lead may be present on the skin surrounding the finger prick. Therefore, confirmatory venous tests are recommended for any elevated capillary tests since venous tests are much more accurate than capillary. Further, a false positive capillary test due to site contamination can indicate lead in the child's environment and underscores the need to educate the public on community risks.²⁶ The majority of cities we reviewed require validation of capillary tests with venous tests prior to initiating an investigation of the child's home. In addition, consultants agreed that venous tests should be used to confirm capillary tests.^{81,82}

Widespread blood lead level testing can provide useful information to identify regional "hot spots" where lead exposure is prevalent and where interventions can be directed with consideration to limited resources. Methods such as predictive modeling can assist investigators in identifying risk factors that may lead to lead exposure (age of home, condition of home, presence of lead pipes, presence or absence of children who have been exposed, etc.).⁷⁴

Investigating Hazards

Lead hazard investigations take different forms and follow different standards in various states, counties and municipalities. The CDC recommends a series of action steps depending on blood lead levels but leaves interpretation of some actions up to local authorities depending on available resources.²³ The majority of health departments tackling lead as an issue use threshold confirmed blood lead level values to trigger environmental (home) investigations. However, there is tremendous variability in the trigger values, ranging from levels of 5 µg/dL to 20 µg/dL. Generally, departments triggers are based on available resources (see appendix for trigger levels used by a sample of communities for assessment and home investigations). For example, in some communities home investigations are taking place for selected age groups of children with lower blood lead levels. In New York City home investigations are being conducted for children < 15 months of age with lead levels over 8 µg/dL, for children 16 months to 6 years of age at levels of 10-14 µg/dL and for all other children up to age 18 at a level of 15 µg/dL.⁶⁹ In Chicago, investigations are being conducted for children < 1 year of age with levels ≥ 6 µg/dL and for all other children at levels of 10 µg/dL.⁷⁴ Recently, New Jersey added \$10 million dollars to the state budget to assist with local investigation and Newark NJ set its trigger for home investigations at 5 µg/dL.⁸³ While a few other communities have recently lowered their levels for home investigation to 5 µg/dL, other communities (Philadelphia, Cincinnati, and the State of Rhode Island) continue to use a threshold of 10 µg/dL. Connecticut and Virginia use 20 µg/dL as a trigger for a single confirmed test and 15 µg/dL if there are two consecutive confirmed tests.

(Continued on page 27)

Typically, families of children with reported blood lead levels of 5-9 µg/dL receive educational outreach, alerting them to the levels reported by their child's most recent blood lead test, and providing information on how to reduce lead exposure. There was disagreement among experts consulted as to whether home investigation should be done for levels of 5-9 µg/dL since there has been no published scientific evidence detailing the effectiveness of these home investigations.⁸⁴ In addition, lab error can be as much as 2 µg/dL, making it difficult to measure with confidence changes at low blood lead levels.⁸⁵ However, early evidence (unpublished study)⁸⁶ from one city suggests that home visits for children with blood lead levels of 5-9 µg/dL can have significant impact.

Home investigations themselves, even when conducted by EPA-certified lead risk assessors, also vary across communities. There are different standards for what tests are conducted, what sources are analyzed, what tools are used, and so on. The cities we spoke to did not test water but were considering strategies to do so. ACHD has been testing water for lead for many years.

The number of lead investigators employed by Health departments and other agencies that investigate lead hazards are limited by available resources. We found great variability in funding for individual departments. Some (such as New York) received state-specific dollars for prevention programming while others maintained small lead investigation staff such as Milwaukee. In addition, most communities used HUD grants to pay for remediation and were dependent on these funds to support primary prevention efforts.

Other than public health access to investigation staff, another big challenge facing lead investigations is the growing number of families that refuse investigations as mentioned previously. A household with a child with an EBLL may not allow investigators to enter the home or conduct an investigation. There are no requirements that give investigators the authority to enter private property to conduct an investigation. This issue must be addressed. Building trust with community members and developing better strategies to allow for home entry and uptake of remediation programs is critical.

Education and Outreach

Population based lead education campaigns have been conducted in many jurisdictions at varying times. In New York City, for example, residents have been privy to educational campaigns for many years that encourage renters to call a local number to report any peeling paint or other lead hazards.

Health departments and communities often maintain lead prevention education materials on their websites. In addition, education is often conducted in alignment with home lead investigations, and is generally provided to families with children who have reported blood lead levels that do not meet the level of household investigation.

A few studies have looked at the efficacy of educational campaigns that teach families how to clean their homes to reduce lead dust. Unfortunately, education alone does not appear to lower blood lead levels.⁸⁷

RECOMMENDATIONS

The Lead Task Force has developed a series of recommendations for eliminating and mitigating lead hazards in Allegheny County. These recommendations are split into four main categories:

- *control sources of lead,*
- *monitor and report information on exposure,*
- *Investigate hazards,*
- *educate the public and others on community lead hazards.*

Recommendations are given with additional information pertaining to the partners needed to fully implement recommendations, the resources required, the expected timeframe, and the challenges and opportunities inherent in each. This report is not intended to provide explicit policy directives, but to suggest areas that need consideration by many distinct stakeholders. Additional work is needed to achieve the recommendations included in this report. ***Implementation of these recommendations will require cross-jurisdictional efforts, collaboration and the engagement of multiple partners to achieve.***

The ultimate goal of each recommendation is to eliminate harmful exposures to lead. The Task Force recognizes that while there is no safe level of exposure to lead, complete elimination of all naturally-occurring lead is impossible. The Task Force recommends working toward elimination of harmful human-made lead hazards and reducing human exposure to all forms of lead.

1. Paint, Dust, and Other Household Sources

Goal: Eliminate harmful exposure to lead from paint, dust, and other household sources.

Recommendations: Paint and dust continue to be major sources of exposure in housing across Allegheny County. To make Allegheny County a safer place to live and raise children, we must prioritize primary prevention by reducing these areas of exposure and preventing the harmful effects of lead before they occur. Therefore, the Lead Task Force recommends the following actions.

1.1 Increase the supply of a lead-safe/lead-free housing

- a. Establish a mandatory and enforceable lead-safe/lead-free certification program for all rental housing (including federally funded Section 8 housing or those supported by the county Department of Human Services) based on the Rochester model. We believe that unlike other programs, the Rochester program appears to adhere to a high standard supported by monitoring and enforcement that has been shown to be successful.
- b. Establish a voluntary lead-safe/lead-free certification program for owner-occupied housing.
- c. Provide financial incentives to support lead-safe/lead-free housing programs, prioritizing up-front incentives over tax credits, and supporting alternative housing when tenants are displaced.
- d. Provide a registry of lead-safe/lead-free housing to the public.
- e. Continually review and revise standards for lead-safe/lead-free housing to be consistent with current research, best practices, as well as state and federal standards.
- f. Actively engage housing providers and housing provider associations in the process of the above recommendations, emphasizing positive messaging, as per Rochester model.

1.2 Inform homeowners, housing providers and residents of the potential of exposure from lead hazards and lead exposure routes and provide information on opportunities and requirements for remediation

- a. Establish a process for housing providers to attest to providing federally mandated materials, such as Lead Hazard Information, to residents.
- b. Share current HUD and EPA information and materials, such as Protect Your Family from Lead in Your Home, with home owners and residents.
- c. Focus these efforts on communities known to have higher exposure to lead.

(Continued on page 30)

1.3 Establish programs that financially support lead remediation

- a. Establish resources for remediation such as low interest loans, community funds, and grants.
- b. Prioritize programs that offer low-cost replacement for windows and doors installed in a manner consistent with federal guidelines.
- c. Focus these efforts on communities known to have higher exposure to lead.

1.4 Prioritize settings where children spend substantial portions of time

- a. Identify resources to address lead identification and remediation in sites where young children are frequently present.
- b. Assuming financial support is available, work with the State to require child care sites to be lead-safe or lead-free as part of licensing.

1.5 Advocate for state and federal resources to support remediation of lead hazards in housing, child care facilities and schools

- a. Home owners, renters, and municipal and county leaders should advocate collectively for resources to support and encourage remediation of lead hazards in Allegheny County communities.
- b. Increase the number of housing inspectors in ACHD for primary prevention purposes.
- c. Identify strategies to train and fund municipal housing inspectors in lead investigation.

1.6 Increase the number of lead-safe contractors by expanding training and certification programs

- a. Home owners, renters, and municipal and county leaders should advocate collectively for resources to underwrite tuition and training costs for these programs.

Additional Considerations

Partners

To meet these primary prevention goals will require a collaborative effort involving homeowners, housing providers, residents, child care providers, multiple county agencies (health department, economic development, human services) and municipal and county leadership. Homeowners should have their homes certified as lead-safe or lead-free. Housing providers must inform their residents of lead hazards and certify their housing units as lead-safe or lead-free. County agencies and municipalities should collaborate with municipal leaders and other appropriate agencies to establish policies that create certification programs, maintain records, and provide enforcement of certification. Institutions like the Institute for Politics (IOP) can be helpful in determining the best strategy to implement a lead-safe, lead-free primary prevention program in Allegheny County by bringing all parties together. Local educational institutions can expand their efforts to

(Continued on page 31)

train and certify additional lead-safe contractors. Across the country, in communities where this has been most successful, significant cross-jurisdictional collaboration exists across all sectors and information is widely available for the public. Advocacy agencies can assist with educational efforts and advocate for needed resources for remediation and necessary staffing.

Resources

County officials, municipal leaders and appropriate agencies must work together to secure resources to support and incentivize remediation efforts as well as to provide enforcement measures.

Timeframe

This will be a multi-year effort. The first step will involve building the support necessary to develop and implement certification programs. Designing and implementing these programs will take time but will have dramatic impacts on the quality and value of housing. The goal should be to complete this process in under five (5) years, as it has been accomplished in this timeframe in other communities.

Challenges & Opportunities

Efforts to adopt and implement a primary prevention program with effective enforcement will require collaboration on many levels. There are numerous challenges inherent in cross-jurisdictional efforts. Regulation will be required at either the county and/or municipal level. Implementation and enforcement will require coordination with existing rental registries where they exist and with existing inspectional services. In the words of John Zilka, President of Applied Systems, “without effective enforcement any ordinance is a “toothless tiger.” Currently, a variety of municipalities in the county have regulations related to inspection, registration and/or certification programs for rental housing and this represents a significant opportunity. The IOP, with support from the ACHD and other county agencies, can bring together municipalities for the purposes of evaluating the existing ordinances and practices as well as determining the best approach for replicating a mandatory and enforceable lead-safe/lead-free certification program for all rental housing based on the Rochester model. The cost of remediation is also a challenge. In the past, grants from HUD have been available to support remediation but Allegheny County has not always applied for these opportunities. Collective advocacy at the state and federal levels will be required and should encourage support for remediation efforts. This is the time to convene municipal leaders, raise awareness, and work collaboratively on the promulgation of appropriate ordinances.

2. Water

Goal: Eliminate harmful exposure to lead from water.

Recommendations: Lead pipes, solder and household fixtures continue to be a source of lead exposure in Allegheny County. Several of our water systems have recently exceeded the national LCR action levels. Utilities that meet the LCR may still provide water that contains lead, especially at homes with a lead service line. Therefore, the Lead Task Force makes the following recommendations.

2.1 Reduce exposure to lead from water lines by decreasing the presence of lead containing plumbing materials (pipes, solder, fixtures)

- a. Water systems should conduct a comprehensive inventory of their lead service lines and commit to replacing them over the long-term. Replacement schedules should prioritize homes with elevated water lead levels and those with sensitive populations (children and pregnant women). Blood lead level surveillance data may help with prioritization.
- b. Water systems should be encouraged to share lead line inventory with the public via maps.
- c. Water Systems should not conduct partial lead line replacements given the risk that they pose to the public.
- d. Communities and water systems should develop strategies and identify funding to ensure that only full lead line replacement practices are employed.
- e. Individuals should assess the use of lead plumbing and fixtures within their own homes, (by means of scratch-tests or professional evaluations of pipe content), and replace or mitigate to reduce exposures.
- f. The proposed lead-safe lead-free certification program (see recommendation under housing) should include all sources, including water, in the screening process.

2.2 Undertake short and medium-term strategies to minimize exposure

- a. Encourage utilities to enhance corrosion control to further reduce lead levels in drinking water.
- b. Water systems should offer customers with lead or unknown service lines (private or public) access to free water testing and to NSF-certified filters and education regarding their use and maintenance (with a particular focus on vulnerable populations such as infants and pregnant women).
- c. Water systems should inform customers of potential risk and simple actions to decrease exposure, including how to identify lead lines in the home, the use of routine flushing, and the use of filters for water consumed for drinking and food preparation.

(Continued on page 33)

2.3 Prioritize settings where children spend substantial portions of time

- a. Encourage school water testing and replacement of lead containing fixtures and plumbing.
- b. Encourage child care settings to identify lead service lines, test water, and provide appropriate mitigation strategies if necessary (NSF-certified filters and/or bottled water for formula and food preparation).
- c. Encourage any other settings that predominantly provide services to children and pregnant women to identify lead service lines, test water, and provide appropriate mitigation strategies if necessary (NSF-certified filters and/or bottled water for formula and food preparation).

2.4 Advocate for improved national standards

- a. Encourage the EPA to revise the LCR to include: the development and adoption of a “health-based” standard; improved sampling protocols including higher frequency; eliminating partial line replacements as a mitigation strategy; and revising the action level to incorporate new information on health risk associated with lower levels of lead exposure.⁸⁸

Additional Considerations

Partners

Water systems and municipalities will need to work together to realize these action steps. Homeowners will also need to be involved, particularly where line replacement is taking place, to accept line replacement and coordinate actions. The public needs to be informed about the use of funds and the progress made by water systems in a transparent manner (online information on lead lines as they are identified and removed, for example). State government will need to be involved given the large investment required for replacement and the need to change regulations regarding access to customer-owned service lines. State agencies will also need to work with water systems to ensure corrosion control meets standards. For prioritization of sites where children and pregnant women may be at risk, school systems, child care providers, after-school providers, hospitals, state department of health and human services, as well as other organizations that care for children will need to be involved. Advocacy organizations and other non-profits also have an important role to play in monitoring progress and advocating for additional resources and change in regulation.

Resources

Resources needed for elimination of lead containing plumbing apparatus will be required. Use of utility-specific funds will likely lead to increased water bills for customers. State and federal funds (through the state-revolving fund) should be available for projects. For short-term temporary solutions (such as NSF-certified filters) funding strategies should be considered that recognize the burden on disadvantaged populations. Removal of customer-owned lead service lines should be incentivized through targeted financing options (e.g., low interest loans or public funding). Identification of lead lines will help with targeting resources.

(Continued on page 34)

Timeframe

Removal of lead service lines is a long-term effort (multiple decades). Short and medium-term strategies such as enhanced corrosion control, newly emerging techniques for lead line replacement, and use of NSF-certified filters, should be considered as part of lead exposure reduction plans.

Challenges & Opportunities

The EPA LCR currently requires specific actions of any water system that exceeds the action level (currently 15 ppb) in ten percent of samples. The rule does not provide a health-based level for action. Thus, reducing lead exposure via water through compliance with the LCR alone will remain a challenge for the immediate future. Aging infrastructure is a major challenge for water systems and will require financial strategies as well as identification of lead service lines. Small water systems will require technical assistance to communicate information about water lead levels and ways consumers can reduce their risk from this source. The alternatives available for mitigation of this risk (such as threading existing lead pipes with copper pipes) should be explored for safety, feasibility and cost effectiveness.

3. Soil

Goal: Eliminate harmful exposure to lead from soil.

Recommendations: Exposure to lead from soil poses a serious threat to the residents of Allegheny County, particularly young children. Soil often contains lead from gasoline and from legacy industrial processes involving lead. Demolition of old structures containing lead paint and dust as well as years of scraping and sanding external lead-based paint can further increase the exposure to lead from soil. Improved demolition practices combined with increased soil testing and remediation strategies will significantly reduce the threat of lead exposure from soil. Therefore, the Lead Task Force recommends the following actions, focusing on primary prevention.

3.1 Improve demolition standard and conformity to those standards

- a. Conduct a review of demolition standards across all municipalities and recommend lead safe standards for all municipalities and Allegheny County.
- b. Improve enforcement of lead safe demolition standards.
- c. Regularly review and update these standards as research becomes available, as well as communicating and partnering with the demolition industry, expecting that EPA recommendations for lead concentrations in soil will become more stringent.

(Continued on page 35)

3.2 Identify and remediate contaminated soil

- a. Provide funding to conduct tests of vacant and blighted lots, particularly those with condemned or demolished structures near schools, childcare centers, parks and playgrounds, and provide funding for remediation.
- b. Encourage the use of more diverse cover seed mixes on demolished lots to build soil health as well as storm water holding capacity while diluting soil lead content.
- c. Improve and enforce standards related to the application of clean fill in support of soil remediation.
- d. Advocate at the state and federal levels for cleanup standards for soil that reflect current research.
- e. Educate the public of the risk of lead in empty lots with prior structures, and the risk of tracking lead-contaminated soil into the home.

3.3 Support home owners and housing providers to test and remediate lead in soil

- a. Create programs to assist with soil testing for lead.
- b. Provide affordable recommendations for residents with elevated levels of lead in soil, include community-composting programs that provide free or discounted organic material that can be used to dilute, immobilize and otherwise improve health of contaminated soils.

Additional Considerations

Partners

In the near term, community organizations like the Allegheny County Conservation District, universities, municipalities and county agencies can work together to enhance and extend existing soil testing programs, prioritizing those communities with higher concentrations of elevated blood lead levels in children and higher concentrations of blighted lots. Most immediately, home owners, housing providers and residents can be engaged to understand the risk of lead in soil and conduct soil testing. The Institute for Politics (IOP) can assist with examining demolition policies and best practices while municipal government can adopt and enforce these policies and practices. The Conservation District can provide guidance to municipalities, neighborhoods, and residents on best practices to mitigate exposure to contaminated soil.

Resources

Resources are needed to support soil testing. The Allegheny County Conservation District along with municipalities should collaborate to improve demolition standards and enforcement as well as soil remediation and increasing public awareness. Resources for mitigation will also need to be identified.

Timeframe

Working with municipalities to identify effective and practical approaches will require analysis and time. Initial efforts will involve analysis of existing ordinances and practices as well as education efforts for residents. Within a few years, municipalities must, where necessary, adopt improved standards for demolition and increase enforcement of these standards.

(Continued on page 36)

Challenges & Opportunities

The IOP, and the Allegheny County Conservation District along with support from county agencies can bring together municipalities to evaluate local demolition ordinances. With the assistance of the Conservation District and other soil-interested organizations, parties can educate on best practices and establish new standards for demolition and compliance as needed. Together they can work with municipalities, especially those with areas of concentrations of high blood lead levels, universities, and community organizations, to improve access to testing and remediation. ACHD can help raise awareness of the hazard of lead in soil. However, enforcement of standards is key in the primary prevention of lead exposure from soil and there will be challenges in resources to conduct enforcement activities. Some of the challenges will be financial and others may be staffing. Individual municipalities must at a minimum adhere to state policies; however, they can be more stringent than the state. Passing more stringent regulations will also have challenges.

4. Alternative Sources

Goal: Eliminate harmful exposure to lead from alternative and unexpected sources.

Recommendations: While the majority of lead exposure comes from the three major sources already mentioned, there are a variety of alternative sources that must also be recognized, monitored and eliminated on a continual basis as they are identified. Therefore, the Lead Task Force recommends the following activities.

4.1 Identify and eliminate alternative sources of exposure to lead

- a. Monitor air sources of lead, identify and intervene in airborne sources of lead exposure.
- b. Identify alternative sources such as jewelry, tile, candy, toys, cosmetics, etc. during EBLL investigations of children's homes.
- c. Educate families and providers about alternative sources.
- d. Maintain awareness of alerts and advisories from FDA and Consumer Protection and investigate any reports of new consumer risk (presence of candy, toys) and remove them from shelves.

4.2 Identify high-risk occupations and hobbies and encourage appropriate lead-safe practices to protect workers and their families

4.3 Advocate for additional federal regulations to identify and eliminate importation of lead containing items that pose risk to children

(Continued on page 37)

Additional Considerations

Partners

The Allegheny Health Department along with community organizations, pediatric providers, and the public, must be aware of these alternative sources and if discovered, report their presence to ACHD and/or the Pennsylvania Department of Health for investigation.

Resources

Educational materials for providers, home visitors, and families need to include information on alternative sources. This can be done with existing resources.

Timeframe

This can be done in the short term, much of which is already happening.

Challenges & Opportunities

There are ongoing opportunities to identify all potential sources of lead in the environment and remove them whenever possible. However, communities need to develop more awareness about both alternative and other sources to best protect themselves and their children.

5. Monitoring and Reporting Information on Risk and Exposure

Goal: Assure surveillance and public reporting of lead exposure in Allegheny County.

Recommendations: Historically, lead surveillance has been based on reported blood level tests in children on an annual basis. Often, release of the data has been delayed for up to two years, making any real-time surveillance impossible. The Lead Task force believes that it is important to monitor childhood lead exposure on a population basis (in addition to an individual basis) to determine temporal and spatial trends that will improve exposure prevention and enable improved decision making, particularly as it pertains to issues of health equity. In addition, it will be important to establish performance measures and follow them regularly to evaluate progress towards goals. These data and measures of progress should be available to the public in a transparent and timely manner, while protecting individual privacy in health records. We should follow new emerging evidence on reference levels for these analyses. The Lead Task Force recommends the following activities related to monitoring and reporting on lead risk and exposure:

5.1 Identify communities in the county with high-risk for lead exposure

- a. Utilize BLL data, housing data, other known risk factors as well as explore the use of investigation data on where lead hazards exist (paint, soil and water) to identify and map communities with high - risk in the county and to spatially resolve risk factors.
- b. Encourage compliance with child testing particularly in high-risk communities.
- c. Provide information via maps to the public when available on lead-safe, lead free housing.
- d. Utilize analytic tools such as predictive models and indices to target efforts for education and intervention.
- e. Utilize ACHD-owned datasets and/or other datasets to improve information about sensitive sub-populations. (For example, link EBLL case level data for children to adult EBLL case level data by name and address to determine adults who may have potential take home exposures; potentially link EBLL data with refugee data sources at the state).
- f. Monitor consumer reports and FDA sites for recalls involving products that are alternative sources.

(Continued on page 39)

5.2 Enhance surveillance efforts to address actionable interventions

- a. Conduct ongoing surveillance using timely data.
- b. Use blood lead level testing results as surveillance to address issues as they emerge (i.e. clusters of EBLLs).
- c. Follow children eligible for blood lead level testing from birth to test date to determine whether the universal testing regulation improves testing rates.
- d. Reduce unconfirmed capillary tests by identifying them (no additional venous after 12 weeks) and reaching out to primary care providers and families to encourage follow-up venous tests.
- e. Increase testing and messaging by working with pediatric primary care providers, including messaging that requires test results to be entered into PA NEDDS database. Assure that certified laboratory methods are being used.

5.3 Enhance Public Reporting

- a. Provide information to the reconstituted “lead-safe” task force to oversee county-wide progress.
- b. Provide an annual lead report to the public and provide community-based data as requested. Utilize standardize terms to increase understanding and provide data to the public in a transparent manner such as on a public website.
- c. Work with water systems to encourage them to report water testing results in an interactive manner to the public.
- d. Make reports of high-risk areas and provider testing rates readily available to pediatric providers.

Additional Considerations

Partners

The work of reporting and surveillance falls mostly in the purview of the Allegheny Health Department and the Pennsylvania Department of Health. However, for some data, other partners will hold the responsibility for reporting (i.e., insurance companies, health care organizations, housing organizations, water systems, etc.) Partners include the State Department of Health, pediatric primary care providers, medical societies, laboratories, universities and other academic institutions, managed care organizations, and community organizations. ACHD has already utilized university partnerships to evaluate pilot projects and has an opportunity to continue this work.

Resources

Much of the work identified in this section is being implemented. However, resources for continued surveillance must be secured and over time, stabilized to ensure that these efforts are sustained over time.

Timeframe

The universal testing regulation is being implemented in January 2018. The activities leading up to this implementation must be accomplished by that time. It is critical that most of these activities are completed over the next 1 year period and integrated into existing work plans.

(Continued on page 40)

Challenges & Opportunities

The refocus on lead has offered an opportunity to reconsider and address communities at highest risk. The Task Force see the lead issue as an issue of environmental justice and community-wide importance. We urge stakeholders to consider lead as but one component in the challenge to address health inequities and to remember there are numerous other environmental issues that should be considered. Therefore, while the challenge is mostly in accumulating and consolidating data, there is opportunity to embed lead work with other health equity issues, encompassing primary prevention of lead exposure as part of addressing adverse childhood experiences overall. Challenges also exist in the informatics infrastructure needed to effectively combine data from remediation assessment with clinical data and other environmental data. In addition, data from insurance organizations and clinical providers is HIPAA-protected and these organizations will need to consider how best to inform the public of their work. Currently, investigation data is not housed in PA NEDDS and therefore is difficult to obtain. Improved data management would require additional resources at the state and local level and offers potentially high returns as comprehensive data structures often enable improved decision-making. Finally, there are challenges inherent in educating providers and increasing their engagement in testing and reporting.

6. Investigation of Hazards

Goal: Investigate and mitigate known home lead hazards.

Recommendations: ACHD has been conducting lead investigations for multiple decades. Along with increased primary prevention efforts, secondary intervention for children with Elevated Blood Lead Levels is required. Current investigation efforts are strong and follow HUD and EPA guideline but could expand. The Lead Task Force recommends further action as follows:

6.1 Monitor changes to the CDC guidelines for management of elevated blood lead levels and adjust programming accordingly

- a. Adjust the level for home investigation and assessments based on CDC guidelines and available resources.
- b. Seek funding to increase the number of inspectors at the ACHD to meet the changing demand.
- c. Continue education and outreach for children with confirmed EBLL of 5-9 µg/dL.
- d. Conduct a pilot of home investigation for confirmed EBLs of 5-9 µg/dL in high-risk communities. Assess the impact and determine feasibility of lowering investigation level to 5 µg/dL (including financial reimbursement from insurers).
- e. Check for lead water lines as part of home investigation and if present (either public or private)

provide filters approved for removing lead along with education regarding safe and effective filter use.

6.2 Conduct primary prevention investigations in homes based on risk factors (see recommendation for paint, dust and home hazards)

- a. Set goals and identify resources for annual primary prevention home investigations in high-risk neighborhoods and in high-risk homes. Hire new inspectors to carry out this work.
- b. Assess need to train non-ACHD staff to conduct lead investigations (municipal inspectors).
- c. Investigate strategies, with community engagement, to improve access to homes for lead investigation. Improve acceptance rates of services offered to lead-affected families by offering incentives to allow visits for education and inspection, such as pairing home evaluation with free window replacement.
- d. In multi-unit buildings where a child with EBLL is identified and a home-based exposure is identified through investigation, consider investigations of other children (<6 years) inhabited units in the building, as is done in the NYC program.

6.3 Provide linkage to resources for all children with elevated Blood Lead Levels based on CDC guidelines

- a. All young children with a confirmed blood lead levels of 5 µg/dL or above should be offered quality early childhood services (Early Intervention for children aged birth to age 3).
- b. Refer eligible families to existing lead hazard remediation programs when lead hazards are identified.

Additional Considerations

Partners

Currently, home investigations for confirmed EBLLs are the purview of the ACHD. However, there may be opportunities to train other municipal staff to conduct lead investigations. Housing providers and home owners are critical partners in this effort. Advocacy organizations and other community organizations play an important role in education of residents on testing, mitigation and primary prevention. Agencies including insurance companies, health care providers, schools and child care providers can educate and refer families to existing programs.

Resources

Expansive primary prevention programs that conduct risk assessments in buildings without identified children with EBLLs will require new resources in the form of inspectors and support for remediation. In order to adjust to changing levels of EBLL investigations, additional inspectors may be needed, as well as resources for remediation. Resources from managed care organizations, county government, state and federal government,

(Continued on page 42)

educational institutions, and municipal government are required to obtain the additional training required for lead-safe construction tradesmen, inspectors and other lead abatement occupations. In addition, the development of the necessary information technology to link enforcement to monitoring activities will be required.

Timeframe

Home investigations are currently being provided for children with confirmed EBLLs of 10 µg/dL and above. To expand to a confirmed levels of 5 µg/dL will require resources not yet available, but a pilot could be launched in 2018.

Challenges & Opportunities

The ACHD will require resources for additional lead inspectors. Because lead inspections are voluntary and homeowner acceptability is not universal, the challenge is to gain access and provide inspection services to as many homes as possible. To be effective will require strengthened relationships with existing municipal inspectors and community groups and leaders. It will also require new information technology to ensure that information on inspections and remediation is appropriately handled for monitoring purposes.

7. Public Awareness and Advocacy

Goal: Raising public awareness and sustaining advocacy.

Recommendations: Raising and sustaining public awareness is essential to the goal of eliminating harmful exposure to lead in Allegheny County. Providing wide access to information and regular review of progress will generate public advocacy to propel leaders to rally Allegheny County to achieve its goal. Therefore, the Lead Task Force recommends the following actions:

7.1 Reconstitute a community lead advisory committee such as the prior “Lead Safe Pittsburgh” organization as a countywide working group

- a. Monitor progress towards implementation of task force recommendations.
- b. Provide regular reports to the public containing standard terms and measures to ensure everyone is working toward common objectives.

(Continued on page 43)

7.2 Expand education strategies particularly on the hazards of lead and strategies for remediation

- a. Educate residents on the risks of lead exposure from all sources and the impact of lead on health. Prioritize high-risk neighborhoods, areas where children spend substantial amounts of time and populations likely to be at risk.
- b. Provide information to the public on all sources of exposure, screening, follow up confirmatory testing, strategies for mitigating risk, and benefits of good nutrition.
- c. Educate health care providers on risks of lead exposure from all sources, resources for referral, case management, screening, and use of PA NEDSS for reporting.
- d. Educate homeowners and tenants on the potential sources of lead in drinking water, and what actionable steps they can take to minimize this exposure.
- e. Educate water systems about methods to identify lead service line and actions to take to lower lead levels in water.
- f. Develop materials for health care providers about universal screening and resources (screening at 9-12 months and again at 2 years).
- g. Educate homeowners and housing providers about current Environmental Protection Agency and Housing and Urban Development disclosure laws.
- h. Inform residents about exposure to lead in soil and the value of cleaning of shoes and outer wear, washing vegetables and controlling dust, all of which can contribute to the reduction of exposure to lead.

Additional Considerations

Partners

The broader public has an important role to play in advocating for policy and practice changes and monitoring progress toward the goals and objectives. To reconstitute a community advisory committee will take county leadership and citizen engagement. Education of the public will require participation from state and county agencies (health, human services, economic development) schools, organizations that interface with children, health care providers, water systems, municipal leadership, landlord and tenant organizations, housing providers, community organizations addressing conservation and soil quality, real estate agents, foundations, non-profits, and advocacy organizations.

Resources

Gathering information, producing the materials to elevate public awareness and engaging in advocacy will require resources. This should be funded by a combination of public and private funds and sustained over time.

Timeframe

The recommendations involve short-, intermediate- and long-term goals. The community lead advisory committee- Lead Safe Allegheny- should function until the Allegheny County has eliminated the threat of harmful exposure to lead.

(Continued on page 44)

Challenges & Opportunities:

The primary challenge is lethargy. For years and until the crisis in Flint, Michigan, local governments and largely, the public, assumed our nation had done what was possible to reduce harmful exposure to lead. A community lead advisory committee-Lead Safe Allegheny- for Allegheny County can establish goals, share information, produce reports and advocate effectively to ensure we maintain public vigilance until we have achieved our overall goal of protecting children by eliminating harmful exposure to lead in all sources.

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Glossary

Abatement: Any measure or set of measures designed to permanently eliminate lead-based paint hazards.

Blood Lead Test: Any blood lead draw (capillary, venous or unknown sample type) on a child that produces a quantifiable result and is analyzed by a Clinical Laboratory Improvement Amendments (CLIA)-certified facility or an approved portable device. A blood lead test may be collected for screening, confirmation, or follow-up.

Capillary Test: A blood lead testing method where a patient's blood is drawn at the fingertip using a capillary tube.

Corrosion Control: A treatment used by water systems designed to reduce the corrosivity of water toward metal plumbing materials, particularly lead and/or copper

Elevated blood Lead Level (EBLL): A single venous blood lead test at or above the current CDC reference range value of 5 µg/dL established in 2012.

Housing Provider: Any entity that provides housing to individuals, such as landlords and property management companies.

Lead-Free: The circumstance in which the interior and exterior surfaces of a property do not contain any lead-based paint and the property contains no lead- contaminated soil or lead contaminated dust

Lead exposure: In toxicology, exposure is defined as any detectable level in blood; thus, lead exposure in this document means any detectable level of lead in blood.

Lead Hazard: any condition that causes exposure to lead from lead-contaminated dust, lead contaminated soil, lead contaminated water, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

Lead-based paint: paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm² or 0.5 percent by weight. (Equivalent units for the weight concentration are: 5,000 µg/g, 5,000 mg/kg, or 5,000 ppm by weight.) Surface coatings include paint, shellac, varnish, or any other coating, including wallpaper that covers painted surfaces.

Lead poisoning: An acute or chronic poisoning caused by the absorption of lead into the body.

Lead Safe: The circumstance in which a property is free of a condition that causes or may cause exposure to lead from lead-contaminated dust, lead contaminated soil, deteriorated lead-based paint, deteriorated presumed lead-based paint, or other similar threat of lead exposure due to the condition of the property itself.

Lead service Lines: A service line made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line.

Microgram: A unit of measure equal to one millionth (1×10⁻⁶) of a gram.

NSF –certified filter: A water filter which has received third-party certification that a product complies with all standard requirements listed.

Pennsylvania National Electronic Disease Surveillance System (PA NEDSS): Pennsylvania's electronic disease reporting system, allowing for healthcare system to report diseases and investigative findings to the PA Department of Health.

Primary Prevention: reducing or eliminating all harmful sources of lead in the environment of children before exposure occurs.

Glossary

Public Water System: A system which provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. A public water system may be publicly or privately owned.

Risk Assessment: an on-site investigation to determine the presence, type, severity, and location of lead-based paint hazards (including lead hazards in paint, dust, and soil) which is performed by an EPA-certified risk assessor.

Unconfirmed Test: An elevated capillary blood lead test that has not been followed-up with a more accurate venous blood draw test.

Venous Test: A blood lead testing method where a patient's blood is drawn directly from a vein.

Appendix 1: List of Experts Consulted by the Lead Task Force

Name	Organization	Subject	Date of Call
Larry Swanson	Executive Director, ACTION-Housing	Residential Policies	6/23/2017
Bruce Lanphear, M.D., M.P.H.	Clinician Scientist at the Child & Family Research Institute, BC Children's Hospital and Professor in the Faculty of Health Sciences at Simon Fraser University	Residential Sources	6/30/2017
John Zilka	President, Applied Systems	Residential - Home Investigations	7/6/2017
Philip Landrigan, M.D., M.Sc	Dean for Global Health, Professor and Chair of Preventive Medicine, and Professor of Pediatrics at Mount Sinai School of Medicine	Data	7/13/2017
George Rhoads, M.D., M.P.H	Professor Emeritus, Rutgers University, School of Public Health	Data	7/20/2017
Kristen Kurland	Professor of Architecture, Information Systems, and Public Policy at Carnegie Mellon University's Heinz College of Information Systems and Public Policy and School of Architecture	Data - Mapping	7/25/2017
Marc Edwards, Ph.D.	Charles P. Lunsford Professor, Environmental and Water Resources Engineering, Virginia Tech University	Water Sources	7/31/2017
Nancy Love, Ph.D.	Borchardt and Glysson Collegiate Professor, Civil and Environmental Engineering, University of Michigan	Lead Filters and bacteria	7/31/2017
Jeanne VanBriesen, Ph.D.	Duquesne Light Company Professor of Civil and Environmental Engineering and the Director of the Center for Water Quality in Urban Environmental Systems (Water QUEST) at Carnegie Mellon University	Water Sources	8/17/2017
Cara Ciminillo	Executive Director, Pittsburgh Association for the Education of Young Children	Child Care Facilities	8/24/2017
Brigadier General Michael McDaniel	Professor and Director of Homeland and National Security Law Programs at the Western Michigan University Thomas M. Cooley Law School	Lead Pipe replacement prioritization	8/27/2017
Eric Potash, Ph.D.	University of Chicago's Harris School of Public Policy.	Data	8/31/2017
Jonathan Burgess	Policy Director Policy Director, Urban Agriculture Program Lead, Allegheny County Conservation District	Soil	8/31/2017

Appendix 1: List of Experts Consulted by the Lead Task Force

Name	Organization	Subject	Date of Call
Richard Stehouwer, Ph.D.	Professor of Environmental Soil Science, College of Agricultural Sciences, Penn State University Extension	Soil	9/12/2017
Angela Hagy	Director of Public Health Planning and Policy, City of Milwaukee Health Department	Water Sources	9/18/2017
David Jacobs, Ph.D.	Chief Scientist, National Center for Healthy Housing	Residential Policies	9/18/2017
Katrina Korfmacher, Ph.D., and Gary Kirkmire	University of Rochester Medical Center and City of Rochester	Lead policies	9/25/2017
Jeaneen Zappa, MBA	Executive Director, Conservation Consultants, Inc	CCI Lead Recommendations	10/10/2017
David Weber, Caster Binion, and Frank Agazzio	City of Pittsburgh Housing Authority and Allegheny County Housing Authority	Housing Policies	10/31/2017

Appendix 2: Assessment of Blood Lead Level Action Levels for Home Investigations in Other Jurisdictions (As of December 2017)

Location	Responsible Agency	BLL Action Level for In-Home Investigations (µg/dL)	Notes
Austin, TX	Austin Public Health	5+	
Pontiac, MI	Oakland County	5+	
Cleveland, OH	Cuyahoga County	5+	
Newark, NJ	City of Newark	5+	NJ recently passed \$10 million dollar budget item to support expansion of investigations
Chicago, IL	Chicago Health Department	6 to 10 (age dependent)	Children under 12 months receive investigations at levels of 6 µg/dL and above. Children older than 12 months receive investigations for levels of 10 µg/dL and above.
Rochester, NY	City of Rochester / Monroe County	8+	City conducts proactive testing in homes related to Certificate of Occupancy inspections regardless of BLL. County Health Department investigates for reported EBLLs 8 µg/dL and higher.
New York City, NY	New York City Department of Health	8 - 15+ (age dependent)	Children under 16 months receive investigations at levels between 8-9 µg/dL. Other children under 6 receive investigations for levels between 10-14 µg/dL. Inspections are mandated for all ages up to 18 when levels are 15 µg/dL and higher.
Ann Arbor, MI	Washtenaw County	9+	Education is provided in collaboration with local nursing students. Levels of 9+ µg/dL will trigger case management services, which includes a home visit by a nurse and coordination of environmental investigations to determine lead sources.
Columbus, OH	Franklin County	10+	
Oakland, CA	Alameda County	10+	For levels 5 -9 µg/dL, educational materials are mailed and a phone consultation is conducted. Suggested retest within 6 months. For levels 10 -19 µg/dL, a home visit occurs within 30 days, and a retest is suggested within 1-3 months. For levels 20-44 µg/dL, a home visit occurs within 7 days, and a retest is suggested within 1-2 months.

Appendix 2: Assessment of Blood Lead Level Action Levels for Home Investigations in Other Jurisdictions (As of December 2017)

Location	Responsible Agency	BLL Action Level for In-Home Investigations (µg/dL)	Notes
Philadelphia, PA	Philadelphia County	10+	
Milwaukee, WI	City of Milwaukee Health Department	10+	For levels 5-9 µg/dL, educational materials are mailed to families. Levels 10 µg/dL and higher will receive a home investigation. For levels 20 µg/dL and higher, children receive a case manager.
Rhode Island	State of Rhode Island	10+	For levels 5 µg/dL and higher, children receive non-medical case managers, similar to lead assessors, as well as nutritional information and referrals to evaluations. For levels 10 µg/dL and up, if the family is Medicaid eligible, they receive a full inspection. Non-Medicaid eligible families will receive home investigations depending on available funding.
Cincinnati, OH	City of Cincinnati	10+	
Connecticut	Connecticut Department of Public Health	20+, or 15-19 for two tests within a 3 month period	Levels are state requirements, but local jurisdictions are allowed to set more stringent standards.
San Francisco-Oakland-Hayward MSA, CA	Contra Costa County	20+, or 15-19 for two tests within 6 months	Home investigations occur at levels of 20 µg/dL and higher for a single test, or at 15-19 µg/dL if tested twice within 6 months.
Washington-Arlington-Alexandria MSA, VA	Fairfax County	20+, or 15+ if second test is 15+	Home investigations occur at levels of 20 µg/dL and higher for a single test, or at 15-19 µg/dL if tested twice.

Appendix 3

ALLEGHENY COUNTY HEALTH DEPARTMENT OUTREACH TO FAMILIES OF CHILDREN WITH CONFIRMED BLOOD LEAD TEST RESULTS BETWEEN 5 µg/dl and 9 µg/dl

Family name _____

Address _____

Phone _____

Name of person contacted and relationship to child _____

Child Name _____ Age _____

Blood Lead level _____

Additional Children in Home and ages _____

Any other child BLL test results _____

House built before 1978: yes _____ or No _____

Owner Occupied or Rental _____

Section 8 property? _____

Call attempt history (dates/times) _____

NOTE: Call Protocol is to make a minimum of 2 calls to the family at different times, on different days, leaving messages both times. With no return call within 48 hours, mark the form as such under “call attempt history” and turn in. Confirm each topic has been discussed by using the check boxes.

1. Confirm blood test results/age of child. If parent/guardian does not know if test was venous or capillary, tell them to call the physician to confirm and get advice on when child should be tested again. Tell them the ACHD recommends an elevated capillary be followed up immediately with a venous test.
2. Recommend follow up blood test in 2-3 months if they know the test was venous.
3. Review with the parent guardian child behavior
- a. Play areas – interior and exterior
 - b. Chewing on window sills or guard rails

- c. Any bare soil play area
- d. Painted floors or porches

4. Review standard hazards:

- a. Dust,
- b. bare soil,
- c. defective paint
- d. water

5. Review common mode of ingestion- hand to mouth

6. Ask about property history:

- a. planned or recently completed renovations and associated risks
- b. For owner-occupants – any past lead testing or identified lead hazards?

7. Review potential alternative sources of lead exposure

- a. Occupation/Hobbies of parents/guardians
- b. Putting nonfood items in mouth (paint chips, soil, etc.)
- c. Any other residence that might contain lead (built before 1978)

8. Talk about ways to limit lead exposure

- a. Frequent hand washing for children
- b. Regular weekly wet cleaning of horizontal surfaces,
- c. Stress the need for regular wet cleaning of horizontal surfaces, especially child play areas twice per week plus use of HEPA VAC
- d. Note areas of deteriorated paint and friction surfaces/keep children away
- e. Contact water provider to see if there is a record of a public lead service line and ask to have water tested. Explain how to check for an interior lead service line.
- f. Flush water (not always effective), use a NSF filter approved for removing lead, and/or use bottled water
- g. Partial lead line replacements are not acceptable- might temporarily increase lead levels
- h. For any renovation work, direct to EPA site for using Lead safe work practices.

10. Stress the role nutrition plays. Good diet with calcium and iron and give examples of food groups

- a. lean red meat, low fat pork(iron)
- b. dried beans and peas, raisins(iron)
- c. iron fortified cereals and iron fortified formula
- d. milk, yogurt, low fat cheese, (calcium)
- e. ice cream and pudding (calcium)

11. Talk about ACED Grant Program- Encourage Application

- a. Remodeling using lead safe work practices
- b. Free Grant covers risk assessment
- c. Contractors hired by the County
- d. Ask permission to give name and number to Action Housing. If no, offer Action Housing intake number 412 227 5700: Verbal permission granted? _____

12. Talk about ACHD Healthy Homes Program

- a. Includes visual inspection and discussion of potential lead hazards and other hazards
- b. Free supplies
- c. No enforcement- voluntary participation
- d. Ask permission to give name and number to Healthy Homes. If no, offer Healthy Homes phone number 412 350 4048: Verbal permission granted? _____

13. Give phone number for Early Educational Intervention---

1-800-692-7288

- 14. Would they like a mailing including Protect Your Family from Lead Booklet and/or ACED Allegheny Lead Safe Homes Grant Brochure and SHHP info (if interested)? ___Y ___N

Interviewer Comments:

Nature of questions from the family:

Family Receptive to the call and suggested referrals to EI and HH: ___Y ___N Comment

Mailing? ___Y ___N If yes, date mailing sent? _____ Clerical Staff Initials _____

Employee Name: _____ Employee Signature: _____

Interview Date: _____