A Targeted Approach to Blood Lead Screening in Children, Washington State

2015 Expert Panel Recommendations

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Executive Summary

A Targeted Approach to Blood Lead Screening in Children, Washington State 2015 Expert Panel Recommendations

Prepared by Washington State Department of Health, Division of Environmental Public Health, Office of Environmental Public Health Sciences, Environmental Epidemiology Section; Childhood Lead Poisoning Prevention Program.

The Centers for Disease Control and Prevention encourages each state to develop their own screening guidelines based on state-specific data. This document summarizes the justifications, clinical recommendations, and tools for a more targeted approach to childhood blood lead screening in children in Washington State.

An Expert Panel consisting of public health and clinical practitioners, academia, health plans, state agencies, and lead poisoning prevention advocates was convened and chaired by the Washington State Health Officer. The Expert Panel reviewed current practice, state specific data, current research on risk factors, and national best practices to identify strategies for targeting screening of children at increased risk of exposure to lead.

The Expert Panel acknowledges that primary prevention (i.e., reducing environmental lead exposures from soil, dust, paint and other sources *before* children become exposed to these hazards) is the only practical approach to preventing elevated blood lead levels. The recommendations put forth in this document are clinical guidelines to assist health care providers in targeting their blood lead testing for children at increased risk for lead exposure. This document includes supporting evidence, a one-page clinical algorithm, a list of risk factors to consider, and a link to an interactive mapping tool for identifying communities by census tract that are at higher risk of lead exposure. Additionally, this document includes reporting requirements, clinical guidance on the medical management of children with elevated blood lead levels.

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Introduction

In 1997, the Centers for Disease Control and Prevention (CDC) withdrew their former recommendation of universal childhood lead screening and encouraged each state to develop their own screening guidelines based on state-specific data. In response to this recommendation, the Department of Health (DOH) convened an Expert Panel in 1999 which concluded "healthcare providers should use clinical judgment to identify children who should be tested." The panel did not recommend universal screening or the use of a risk factor questionnaire. A second Expert Panel was convened in 2008 to review and revise the department's existing guidelines related to lead exposure in children. This panel recommended that the department "adopt and modify a risk factor questionnaire and make it available to physicians and other healthcare providers."

In March 2015, the Department of Health convened a third Expert Panel to develop targeted childhood lead screening recommendations for clinicians in Washington State. The Expert Panel was comprised of representatives from DOH, Department of Ecology, Health Care Authority, Department of Commerce, University of Washington-Pediatric Environmental Health Specialty Unit, health care providers, and local public health jurisdictions. The methods used to develop these targeted lead screening recommendations included reviewing the national literature to identify risk factors for lead poisoning, analyzing and interpreting lead testing data from the DOH Childhood Lead Program, reviewing strategies used in other states, and exploring the use of various tools including a Lead Exposure Risk Index model and risk factor questionnaires. The Expert Panel also developed public health recommendations for follow-up of children with elevated blood lead levels.

Effects of Lead on Child Health

Lead is a heavy metal that occurs naturally in the earth's crust and is also found throughout the manmade world. All people can be affected by lead, but young children and pregnant women are the most vulnerable. Lead has negative impacts on nearly every system of the human body, particularly the nervous (brain), renal (kidney), and hematologic (blood) systems.

Neurodevelopmental effects occur at low levels. At levels below 10 μ g/dL, there is a strong inverse relationship between blood lead level and IQ. Other observed effects include decreased learning ability and attention span, lower school test scores, and reduced fine motor skills. Increased dropout rates, aggressiveness, and delinquency have been associated with lead toxicity in some studies. At high levels, lead can cause problems like anemia, high blood pressure, seizures, and death. There is no known safe level of lead exposure for children.¹

Lead's toxicity primarily stems from its ability to mimic calcium and zinc thus interfering in virtually every organ system in the body.² Our understanding of adverse effects of lead continues to evolve and is best reflected in the incremental lowering of CDC's reference value, the level requiring intervention. As of today, a safe blood lead level has not been identified. The latest CDC reference level of 5 μ g/dL is based on the 97.5th percentile of the National Health and Nutrition Examination Survey's (NHANES) blood lead distribution in children. It represents a level based on the U.S. population of children 1-5 years of age who are in the highest 2.5% of children when tested for lead in their blood.³ This level is not considered a safe threshold; instead it is meant to be a reference level to trigger public health action.

Health effects of lead range from sub-clinical effects at the lowest exposure levels to fatal lead encephalopathy after extreme exposure. Acute high dose exposure can lead to symptomatic poisoning often characterized by constipation, fatigue, anemia and neurological disorders. Even though acute high dose exposures still occur in the U.S., these exposures are now rare.

For the low-level lead exposures now observed in the U.S., the most important sub-clinical effect is on the central nervous system and is widely studied using IQ tests. It is estimated that for preschoolers with blood lead levels between 10–20 μ g/dL, each 1 μ g/dL rise in blood lead level is associated with a lower IQ of up to 1 point. Recent evidence suggests that this relationship is steeper at blood lead levels below 10 μ g/dL.^{4,5} In an international pooled data analysis on 1,333 children from seven population based cohort studies, authors found that lead associated IQ decline was significantly greater in populations with a maximum blood level of 7.5 μ g/dL than that of children whose lead level was above 7.5 μ g/dL. These neurological deficits are irreversible and persist in young adulthood, independent of later changes in blood lead

levels. An 11-year follow-up study of children with elevated blood lead levels in childhood found that their impaired neurobehavioral function persisted in young adulthood, which manifested in the form of higher risk of dropping out of school, lower test scores, and increased absenteeism.⁶ Additionally, a study following children with elevated blood lead levels into adulthood showed that blood lead levels were associated with higher rates of total arrests and/ or arrests for offences involving violence.⁷

The primary target organ of non-neurodevelopmental effects of lead in children is the kidney. Lead interferes with activation of vitamin D and increases the risk of children developing hypertension in adulthood.⁸ In addition, lead also interferes with the heme biosynthetic pathway at blood lead levels higher than 18 mcg/dL.⁹

Lead exposure in pregnancy

Maternal lead exposure is also a substantial source of *in utero* lead exposure for children. Evidence from several prospective cohort studies indicates that even at maternal blood lead levels below 10 μ g/dL, prenatal exposure is inversely related to fetal growth and neurodevelopment.¹⁰ These adverse effects are most pronounced in the first trimester. Continuous monitoring of maternal and fetal blood lead levels in 146 pregnant women with blood lead levels lower than 10 μ g/dL, revealed that an increase in maternal blood lead level by one standard deviation in the first trimester was associated with a 3.5 point reduction in the child's mental development index score at 24 months of age.¹¹

In addition to environmental exposures during pregnancy, children are also susceptible to lead stored in the mother's body. Adults with chronic exposure to lead store 95% of their total lead body burden in the skeleton. After chronic exposure, elimination of lead from the body is very slow with a half-life of 25-30 years.¹² This skeletal reserve serves as an endogenous source of lead and is mobilized in events of physiological stress like pregnancy and lactation resulting in pre-and post-natal exposure for the infant even in the absence of environmental lead sources.¹³

Risk Factors for Lead Exposure

Phasing out of leaded gasoline and lead-based paint in the 1970s has led to a dramatic decline in blood lead levels.

Figure 1.Decline in average blood lead levels in US children and in total lead used in gasoline for years 1974-1992. Image: Michigan Network for Children's Environmental Health.



Legacy lead paint and dust remain primary sources of lead exposure in the U.S.¹⁴ However; more than 30% of elevated blood lead levels do not have a lead paint source. These non-paint sources remain insufficiently characterized including but not limited to ethnic remedies and goods, consumer products (imported children's toys and jewelry), and imported ceramics. This section presents environmental and host risk factors for elevated childhood blood lead levels.

Environmental Risk Factors

Age of Housing

Even though lead-based paint was banned in 1978, as of 2000, 38 million households in the U.S. still had lead-based paint and 24 million households had significant lead-based paint hazards.¹⁵

Children living in houses with lead-based paint can attain blood lead levels as high as 20 μ g/dL even without frequently engaging in pica.¹⁶ A 2002 study of 34,798 children found a dose-response relationship between the age of housing (by decade built) and elevated blood lead levels.¹⁷ Notably, for a given housing age, lesser-valued houses were associated with higher blood lead levels suggesting that lesser valued houses had more likelihood of deteriorating paint. Lead dust from chipping paint and home renovations that settles into household soil presents additional risk of childhood exposure. In fact, renovation of older houses is significantly associated with increased childhood blood lead levels in the household.¹⁸ According to a DOH analysis performed in 2009, the proportion of children with blood lead levels at or above 5 μ g/dL declined steadily as age of housing decreased.

At the present time, housing age, as an indication of potential residential lead hazards, is the most established risk factor for lead poisoning. Washington State ranks 17th in the nation in number of homes built prior to 1950 and in number of pre-1978 homes.¹⁹ Residential lead hazards include chipping, peeling, and cracking paint, interior settled dust, contaminated soils, and the activities of remodeling and repainting buildings built prior to 1978.

Table 1. Estimated number of housing units with lead hazards by housing age.Source:Washington State Department of Ecology Lead Chemical Action Plan, 2009.

Age of Housing	Lead-Based Paint	Lead Hazards ²⁰	Housing Units in Washington State	# Housing Units in Washington State with Lead Hazards
All Housing	40%	25%	2,451,075	472,035
Pre-1940	87%	68%	307,078	208,813
1940-1959	69%	43%	414,555	178,259
1960-1977	24%	8%	661,598	52,928

Parental Occupation

Children of workers in lead-related industries have a higher risk of lead absorption, primarily due to inadequate use of protective equipment and taking work clothes home resulting in elevated lead dust levels at the household that could be potentially inhaled and ingested by children.^{21,22} According to the Occupational Safety and Health Administration (OSHA) approximately 1,642,000 workers in the U.S. are exposed to lead in several industries including construction, manufacturing, transportation and remediation.²³ Jobs or hobbies that may involve working with lead or being exposed to dust or fumes from lead include: construction (particularly remodeling or renovating); painting, indoor target practice or bullet making; mining, smelting or battery recycling; soldering and welding work; stained glass work; and making fishing weights.

Use of Imported Goods Containing Lead

Some other sources of lead exposure include imported goods like ceramic pottery with lead glazing used for food consumption, foreign cosmetics and foods contaminated with lead and traditional folk medical remedies. For example, laboratory analysis of *kajal*, a traditional eye-cosmetic from Afghanistan, revealed a lead content of 54% and was association with elevated blood lead levels in refugee children residing in New Mexico.²⁴ Similarly, many traditional remedies can have high lead content. Greta and Azarcon (also known as alarcon, coral, luiga, maria luisa, or rueda) are Hispanic traditional medicines taken for an upset stomach (empacho), constipation, diarrhea, and vomiting. They are also used on teething babies. Greta and Azarcon are both fine orange powders with lead content as high as 90%. Ghasard, an Indian folk medicine, has also been found to contain lead. It is a brown powder used as a tonic. Ba-baw-san is a Chinese herbal remedy that can also contains lead. It is used to treat colic pain or to pacify young children. Some cosmetics such as Kohl, Kajal, Surma and Sindoor may also contain lead.

Lead has been found in some consumer candies imported from Mexico. Certain candy ingredients such as chili powder and tamarind may be a source of lead exposure. Lead sometimes gets into the candy when processes such as drying, storing, and grinding the ingredients are done improperly. Also, lead has been found in the wrappers of some imported candies. The ink of these plastic or paper wrappers may contain lead that leaches into the candy.

Host Risk Factors

In addition to the environmental risk factors presented above, several host risk factors have been shown to be associated with elevated blood lead levels. Since 1976, blood lead data from the National Health and Nutrition Examination Surveys (NHANES) have been used to characterize children's blood lead levels. The most recent analysis performed by CDC concluded that despite progress in reducing overall blood lead levels in the 1-5 year age groups, difference between the geometric mean blood lead levels of different racial/ethnic and income groups still persist. The analysis concluded that children at highest risk are non-Hispanic Black, live in housing built before 1950, and are from poor families.^{25, 26}

Age

Young children 6 – 36 months of age are especially susceptible to lead exposure because of their higher metabolism relative to body weight, ongoing neurological development, poor hygiene status, and lack of control over their environment.²⁷ Blood lead levels are known to peak around two years (24 months) of age. Children under 3 years (36 months) of age expose themselves to lead more readily by spending time on the floor and exhibiting hand to mouth behavior which increases dust and soil intake.

Race and Ethnicity

Within the 1-5 years age group, blood lead levels are associated with race and ethnicity.²⁸ Even though the gap is narrowing with time, Black non-Hispanic children have disproportionately higher blood lead levels. Among children aged 1–2 years participating in the National Health and Nutrition Examination Study (NHANES)²⁹ in 2007–2010, 7.7% (CI 4.0–12.4) non-Hispanic Black children had blood lead levels 5 μ g/dL or higher compared to 1.6% (CI 0.7–3.0) Mexican American and 3.2% (CI 1.2–6.0) non-Hispanic, White children.

Poverty

Low income children are at particular risk for lead exposure.³⁰ According to the analysis of recent NHANES data among children aged 1-2 years, differences in the prevalence of blood lead levels $\geq 5 \ \mu g/dL$ were observed by poverty levels; 6.0% of children living in a household with a poverty-to-income ratio of <1.3 had blood lead levels $\geq 5 \ \mu g/dL$, compared to 0.5% of children living in a household with a poverty-to-income ratio of ≥ 1.3 .³¹

Table 2. Number and percentage of children 1-2 years with blood lead levels $\geq 5 \ \mu g/dL$, by poverty. Source: National Health and Nutrition Examination Survey, US 1999-2010.

Income-to-poverty ratio*	Number	%	(95% CI)
<1.3	430	6.0	(3.7-8.9)
≥1.3	309	0.5	(0.1-1.2)

*Income-to-poverty ratios represent the ratio of family or unrelated individual income to their appropriate poverty threshold. Source: US Census Bureau. Current population survey [CPS] – definitions. Washington, DC: US Census Bureau 2014. <u>http://www.census.gov/cps/about/cpsdef.html</u>

Immigrant and Refugee Status

In addition to the mentioned environmental factors, foreign birth is also a known risk factor for elevated blood lead levels in children.³² A matched case-control study of 203 pairs of New York City children revealed that the blood lead levels were strongly associated both with foreign birthplace and recent immigration. Many migrant children are exposed to lead in their native countries and their blood lead levels may rise after coming to the U.S. due to lead contamination in their new environment or use of imported goods.

Refugee children originating in all regions of the world, especially those from resource-poor countries are at risk of having elevated blood lead levels upon arrival to the United States.³³ In areas of the world where many refugees originate, potential lead exposures include lead-containing gasoline combustion, industrial emissions, ammunition manufacturing and use, burning of fossil fuels and waste, and lead-containing traditional remedies, foods, ceramics, and

utensils. Malnourished children may be at increased risk for lead poisoning, likely through increased intestinal lead absorption mediated by micronutrient deficiencies. Poor nutritional status of children can also lead to higher lead uptake through increased absorption from the gastrointestinal tract.³⁴ The best-studied micronutrient deficiency related to lead levels is iron deficiency. Iron-deficient children are at increased risk for developing lead poisoning. Deficiencies in calcium and zinc may also increase a child's risk.³⁵

Lead Testing Data from Washington State

The Department of Health has been conducting lead surveillance since 1993 and continues to receive, record, and analyze blood lead results reported as a requirement of the Washington State notifiable condition rule (WAC 246-101). While the number of blood lead tests has increased in Washington State over the past decade, the proportion of children screened in Washington State remained well below the national average (Table 3). Table 3 compares Washington State data to U.S. data using the CDC definition of a confirmed case; defined as a venous test or two elevated capillary tests performed within 12 weeks of each other that are $\geq 5 \mu g/dL$.

Table 3: Estimated proportion of children under 6 years old screened for lead and proportion of confirmed blood lead results > 5μg /dL in Washington State and the United States. Source: CDC National Lead Poisoning Surveillance Data (1997-2013).

Year	Estimated % of WA children screened	Estimated % of US children screened	Proportion of WA tests ≥10 μg/dL	Proportion of US tests ≥10 μg/dL	Proportion of WA tests ≥5 μg/dL	Proportion of US tests ≥5 μg/dL
2007	1.3%	15.9%	0.48%	0.94%	*	*
2008	2.4%	17.1%	0.31%	0.72%	*	*
2009	3.0%	17.2%	0.28%	0.61%	*	*
2010	3.5%	16.7%	0.23%	0.60%	3.02%	6.64%
2011	3.1%	15.2%	0.15%	0.56%	2.40%	5.81%
2012	3.4%	10.5%	0.10%	0.62%	2.60%	5.42%

*Prior to 2010 tests ≤10.0 µg/dL were not considered elevated

Screening rates vary by county from 0% in Garfield to 25% in Adams County. Figure 2 shows that the variability in screening rates does not seem to correlate with risk from an older housing stock and greater likelihood of lead risks in homes.

Figure 2. Proportion of pre-1950 housing and 2012 screening rates by county, Washington State vs. U.S. average. Sources: U.S. Census Bureau, American Community Survey (ACS), 2014 and DOH Lead Registry.



Washington State's Childhood Blood Lead Prevention Program has been under resource constraints that limit the ability to enter non-elevated tests into the database in a timely matter. Figure 3 shows that the total test numbers are not available after 2012.

Figure 3. Childhood lead screening tests and elevated results in children <6 years old in Washington State, 2008-2014. Source: DOH Lead Registry.



Childhood blood lead surveillance data collected by the Department of Health (DOH) have several limitations. First, healthcare providers in Washington State often do not either perform confirmatory testing or report confirmatory test results after identifying a child with an elevated capillary result. Therefore, DOH includes all elevated results in data summaries which would include probable and false positive tests. The type of blood draw is important for interpreting a blood lead test result; however draw type data is missing for approximately 45% of tests. In addition, data collected by DOH represent a non-random sample of 3–4% of children in the state. Having the child's address is important for understanding likely exposure; however addresses are only available for approximately 60% of the children screened. Other demographics such as insurance status and race/ethnicity are also rarely reported.

Approximately 2000-3000 new refugees arrive in Washington State annually. Starting July 1 2013, DOH implemented universal screening among refugees entering Washington State. Many of the refugees that resettle to Washington State come from countries such as

Afghanistan, Iraq, and Burma; all countries that still use leaded gasoline and may pose a risk to exposure. When comparing the crude rates of elevated blood lead levels ($\geq 5 \mu g/dL$) between refugees and non-refugees aged 0-16 years, for the time period July 1, 2012 – December 31, 2012, refugees had a rate of 16.7% compared to 3.4% for non-refugee children (DOH Lead Registry).

Figure 4. Proportion of elevated blood lead tests by country of origin for refugee children aged 6 months – 16 years, screened July 1, 2013 – December 31, 2014 in Washington State. Sources: DOH Lead Registry and DOH Refugee Health Program.



Risk of Elevated Blood Lead Levels in Washington State and the United States

The prevalence of elevated blood lead levels has decreased dramatically in the United States and Washington State since the 1970's. Some data suggest the risk of childhood lead exposure in Washington State may be lower than the risk of lead exposure in other states. In 1999, DOH conducted a statewide survey that estimated 0.9% (95% Cl 0.3–2.7) of 1- to 2- year old children in Washington State had blood lead levels of 10 μ g/dL or higher. During the same time period, the national prevalence estimate among 1- to 5- year olds participating in the National Health and Nutrition Examination Survey was 2.2%. Since 1999, the proportion of elevated blood lead levels in Washington State has remained lower than the proportion elevated in the U.S. as a whole. From 1999 to 2012, the proportion of blood lead levels \geq 10 µg/dL decreased from 0.9% to 0.1% in Washington State compared to 5.0% to 0.6% in the US.³⁶

In addition, a study performed by the Department of Housing and Urban Development between 1998 and 2000 showed that the prevalence of lead hazards in housing in the Northeast and Midwest was approximately double the prevalence of lead hazards in homes in the South and West.³⁷ In contrast, a study performed in Multnomah County, Oregon in 2001 showed that 71% of homes built prior to 1930 had lead dust levels above the federal standard which was similar to the results found in Rochester, NY in 1996.³⁸

Recommendations for Lead Screening in Children, Washington State

The Centers for Disease Control and Prevention (CDC) and the Department of Health concur with the Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) that primary prevention (i.e., ensuring that all homes are lead-safe and do not contribute to childhood lead exposure) is the only practical approach to preventing elevated blood lead levels in children. Prevention requires reducing environmental exposures from soil, dust, paint, and water before children are exposed to these hazards. Efforts to increase awareness of lead hazards and nutritional interventions to increase iron and calcium, which can reduce lead absorption, are other key components of a successful prevention policy.³⁹ Additionally, healthcare providers should annually educate parents of children 6 months to 6 years of age by providing lead anticipatory guidance during routine check-ups, as detailed in Figure 5 below. Bright Futures and the American Academy of Pediatrics recommend healthcare providers assess a child's risk for lead exposure and provide anticipatory guidance around lead hazard identification when children are 6 months, 9 months, 12 months, 18 months, 24 months, 3 years, 4 years, 5 years and 6 years of age.⁴⁰

Figure 5. Lead anticipatory guidance for parents of young children.

Lead Anticipatory Guidance for Parents of Young Children

- 1. Keep your child away from peeling paint and home repairs that disturb lead paint.
- 2. Report peeling paint to your landlord. If your landlord does not make repairs, contact your local tenant's rights organization.
- 3. Frequently wash hands, toys, pacifiers, bottles, and other items your child places in his or her mouth.
- 4. Clean floors, windowsills, and dusty places often with wet mops and wet cloths.
- Avoid using health remedies (such as azarcon, greta, paylooah) and eye cosmetics (such as kohl, kajal, surma) from other countries. Some of these products have been found to contain high levels of lead.
- 6. Use caution when using candies, spices, snack foods, and children's toys and jewelry made in other countries. These items may contain lead.
- Use only cold water for making baby formula, drinking, and cooking. Let the water run for at least
 60 seconds before use.
- 8. Keep your child away from work clothes and tools of household members who do construction work or other work and hobbies that may expose them to lead.
- 9. Wash work clothes separately from other laundry. Remove shoes and work clothes before entering your home.
- 10. Use safe work methods when doing home repair that disturbs paint. For information on lead-safe work methods, see <u>EPA's lead webpage</u> at <u>www.epa.gov/lead</u>.

Screening Recommendations for Children 12 and 24 Months of Age

Healthcare providers should assess all children for risk of lead poisoning at 12 and 24 months of age. The Department of Health recommends performing a blood lead test based on the following guidance. If the parent or caregiver does not know if the child has one of the following risk factors, a blood lead test should be performed. See Appendix A for one-page clinical algorithm for targeted screening recommendations.

The Department of Health recommends testing children with any of the following risk factors:

- □ Lives in or regularly visits any house build before 1950.*
 - The risk of lead exposure is highest to children living in low income housing built prior to 1950.
- □ Lives in or regularly visits any house built before 1978 with recent or ongoing renovations or remodeling (i.e., within the past six months).
- □ From a low income family (defined as incomes <130% of the poverty level).**
- □ Known to have a sibling or frequent playmate with an elevated blood lead level.
- □ Is a recent immigrant, refugee, foreign adoptee, or child in foster care.
- □ Has a parent or principal caregiver who works professionally or recreationally with lead.
 - Examples: remodeling & demolition; painting; works in or visits gun ranges; mining; battery recycling; makes lead fishing weights or shotgun pellets; hobbies involving stained glass, pottery, soldering, or welding.
- □ Uses traditional, folk, or ethnic remedies or cosmetics.
 - Examples include Greta, Azarcon, Ghasard, Ba-baw-san, Sindoor and Kohl

*Screening may not be indicated if the home has previously undergone lead abatement or tested negative for lead after remodeling.

**Apple Health in Washington State Medicaid covers children with family incomes up to 300% of the federal poverty level. If family income is unknown, testing should be offered.

Note: Healthcare providers are encouraged to use the Department of Health Lead Exposure Risk Index found at <u>https://fortress.wa.gov/doh/wtn/WTNIBL/</u> to better understand which areas in their community are at higher risk for lead exposure. See Appendix B for further information.

Healthcare providers <u>should</u> <u>consider</u> testing additional children per clinical judgment, including:

- Children whose parents have concerns or request testing (including older children that have risk of exposure).
- Children living within a kilometer of an airport or lead emitting industry, or on former orchard land.
 - Information about lead emitting industries in WA can be found on <u>EPA's web</u> site.
 - Information about former orchards is available on the <u>Washington State</u> <u>Department of Ecology's website.</u>
- □ Children with pica behavior.
- Children with neurodevelopmental disabilities or conditions such as autism, ADHD, and learning delays.

Note: Other consumer products that have been found to have lead risk are informally imported foods and spices. Some candies imported from Mexico have been found to contain lead. Certain ingredients used in the candies, such as chili powder and tamarindo, are found to be the most common source of exposure. Lead has also been found in the ink of some imported candy wrappers as well as in nonregulated imported spices such as turmeric.

Implementation of Screening Recommendations

This guidance is primarily based on published national research studies and may be challenging to implement as stated in a clinical setting. Since every clinic serves a different community, healthcare providers are encouraged to develop implementation plans which work best for their patient population. These plans will likely vary from clinic to clinic. For example, clinics that serve very low income children may decide to perform universal testing, rather than attempting to determine if children have any of the risk factors stated above. As mentioned above, children living in low income or deteriorating housing built prior to 1950 are among the highest risk groups. While it is ideal to try to determine the age of the patient's home, some healthcare providers may feel the only reasonable way to assess risk is to understand the lead risk in their community (see below) and ask the patient in which part of community they live.

Risk Geographically – Lead Exposure Risk Index Model

To assist providers with understanding lead risk in the communities they serve, the Department of Health created a Lead Exposure Risk Index model which can be accessed at: <u>https://fortress.wa.gov/doh/wtn/WTNIBL/</u>. The model combines lead risk from housing and poverty and displays it on a map in deciles from 10 where there is the greatest risk from these two factors to 1 where there is the lowest risk. (See Appendix B for Methods.

There are many other factors that influence lead exposure that are not included in the map, such as take home occupational exposure and risk from lead emitting industries. If high quality data becomes available they may be added to the map in the future. Providers and clinics should use the risk map in addition to other information when deciding on their screening protocol.





Screening Recommendations for Children 3 – 17 Years Old

Healthcare providers should also consider performing blood lead testing on older children at increased risk for lead poisoning, including those who have hobbies that potentially expose them to lead (e.g., shooting guns) and those who use traditional, folk or ethnic remedies or cosmetics imported from abroad.

The Centers for Disease Control and Prevention recommends performing blood lead level testing of all refugee children 6 months–16 years of age upon their arrival in the United States. Within 3–6 months post-resettlement, a follow-up blood lead test should be conducted on all refugee children aged 6 months–6 years of age, regardless of the initial screening blood lead level.⁴¹

Diagnostic Blood Lead Testing

Blood lead testing should also be considered as part of a diagnostic work-up of any child regardless of age with the following symptoms:

- **Behavioral problems:** aggression, hyperactivity, attention deficit, school problems, learning disabilities, excessive mouthing or pica behavior, and other behavior disorders.
- **Developmental problems**: growth, speech and language delays and/or hearing loss.
- Symptoms or signs consistent with lead poisoning: irritability, headaches, vomiting, seizures or other neurological symptoms, anemia, loss of appetite, abdominal pain or cramping or constipation.
- Ingestion of foreign body.

Testing Types

Blood lead testing is the only acceptable laboratory test for screening and confirming lead poisoning. Venipuncture is preferred for specimen collection, but finger stick (capillary) collection is acceptable if care is taken to properly clean and prepare the finger. Capillary samples are easier to contaminate because of the possibility of lead containing dust and dirt on

the hand or under the fingernails. Children with capillary specimens testing 5 μ g/dL or higher on a point of care test should undergo confirmatory testing, ideally with a venous specimen.

Reporting Requirements

<u>WAC 246-101-201</u> requires laboratories performing blood lead testing to report all blood lead test results to the Washington State Department of Health. Healthcare providers using a capillary point of care machine (LeadCare®II) are also required to report all results. All elevated blood lead levels (5 μg/dL or higher in youths under age 15, and 10 μg/dL or higher in adults) must be reported to the Department of Health within two business days. All other test results must be reported within one month. Information reported must include: specimen type; name and telephone number of laboratory; date specimen collected; date specimen received; health care provider's name and telephone number or address; test result; name of patient; sex; date of birth of patient; and patient's address. Additional information on reporting is available on the <u>DOH web site</u>.

Clinical Management of Children with Elevated Blood Lead Levels

Medical Management of Children with Lead Exposure and Poisoning

Healthcare providers should manage children with blood lead levels $\geq 5 \ \mu g/dL$ per the recommendations from the Pediatric Environmental Health Specialty Unit (PEHSU): <u>Recommendations on Medical Management of Childhood Lead Exposure and Poisoning</u> (See Appendix C.)

Interpreting and Managing Low Blood Leads Levels

Healthcare providers should also review supplemental information on interpreting and managing low blood lead levels produced by the NW PEHSU: <u>Interpreting and Managing Low</u> <u>Blood Lead Levels: Supplemental Information for Clinicians</u>. See Appendix D.

Public Health Management of Children with Elevated Blood Lead Levels

Responding to growing evidence that there is no safe level of lead exposure in young children, CDC has revised its case management recommendations.⁴² Even the terminology has changed - "level of concern" has been replaced by a "reference value" that is used to identify children with a blood lead level that warrants case management. That value is set as the top 2.5% of 1 - 5 year-olds that have been tested in the National Health and Nutrition Examination Survey. Currently the blood lead reference value is 5.0 µg/dL. The new CDC guidance also emphasizes the importance of prevention as a primary approach to deal with the threat of lead exposure.

Public Health System Response

The clinical management of the child is the responsibility of the health care provider and parent/guardian of the child. The following steps describe the ideal process the public health system could undertake when a child receives a blood lead result of $\geq 5 \ \mu g/dL$. Local health jurisdictions with inadequate resources may not be able to perform all recommended follow up.

- Laboratory or health care provider report elevated blood lead level result directly to DOH within two business days (48 hours).
- 2. DOH staff contacts the laboratory or health care provider to collect complete case information.
- DOH enters the case into the Childhood Lead Registry and also enters case information into the Public Health Issue Management System (PHIMS). PHIMS is a web-based reporting system for notifiable conditions that facilitates communication between DOH and local health jurisdictions.
- 4. The local health jurisdiction responds to elevated blood lead cases based upon capacity. Ideally, the following steps should be taken. In all cases, the health care provider of record is notified. Health care providers unclear about the public health actions being taken for their patients are encouraged to consult with their local public health

department about specifics. Links to contact information for local health departments can be found on the <u>DOH website</u>.

- When children's blood lead test results are in the 5 7.5 μg/dL range, a letter (see Appendix E) and educational brochures are sent to the family.
- If blood lead test results are in the 7.5 10 µg/dL range, the family is contacted by phone, interviewed to identify sources of the lead exposure (see Appendix F) and educated to minimize exposure to lead and its health impacts. An action plan letter and educational brochures are sent to the family and health care provider.
- When blood lead results are above 10 μg/dL, depending on local health resources, the family may be contacted to schedule an in-home investigation. During the investigation analytical sampling with X-ray fluorescence (XRF) is used to identify the source of the lead exposure. The investigator works with the family to develop an action plan to eliminate the exposure. Interpreters may be provided if needed.

Education Materials and Forms

Lead education and outreach materials have been developed and fine-tuned over a number of years. Below is a listing of frequently used materials, some of which have been translated into additional languages, related to increasing awareness of lead and its health impacts; clinical reporting; investigations; and understanding the blood lead testing results from the Department of Health and the U.S. Environmental Protection Agency.

To increase parent awareness of the new targeted policy for lead screening, the Health Care Authority will partner with the Washington State Department of Early Learning (DEL) to develop communication and educational tools for parents of children enrolled in preschool programs under DEL's leadership, including Early Childhood Education and Assistance Program and Head Start.

This listing is not topically comprehensive (i.e., working lead safe, Ayurveda, environmental sampling) nor does it reflect local variations.

Туре	Agency	Title/Languages	Doc ID	Photo
	DOH	LEAD WARNING! Lead Can Poison Your Child Chinese English Korean Russian Somali	DOH 334-141 DOWNLOAD	Final Provides And Provide
		Spanish Tagalog Vietnamese		
General	EPA	Protect Your Family For Lead In Your Home Arabic English Somali Spanish Vietnamese	EPA747-K-99-001 DOWNLOAD	Protect Your Family From Lead In Your Home EFPA Institute Without Without Without Without Without Without Without Without
	EPA	Fight Lead Poisoning With A Healthy Diet English Spanish	EPA-747-F-01-004 DOWNLOAD	SEPA Fight with a Healthy Det with a Healthy Det
Reporting	WA DOH	Blood Lead Level Reporting English	DOH 334-153 DOWNLOAD	
Investigation	WA DOH	Childhood Lead Investigation Form English	DOH-334-169 DOWNLOAD	

Туре	Agency	Title/Languages	Doc ID	Photo
Results	WA DOH	What Does Your Child's Lead Test Result Mean? English Arabic Burmese Farsi Nepali Russian Somali Spanish Swahili Tigrinya	DOH 334-339 DOWNLOAD	<section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header>

Appendix A: Clinical Algorithm for Recommended Blood Lead Testing of Children in Washington State

See next page



Appendix B: Lead Exposure Risk Index Methods

Methods

The Washington Tracking Network (WTN) is a public website where users can find data and information about environmental health hazards, population characteristics, and health outcomes. Relative lead exposure risk is provided on the WTN's Information by Location (IBL) feature. IBL allows users to view a map of multiple indicators, with rankings, at the community level. After reviewing a large number of possible geospatial risk factors for estimating geographic lead exposure risk only two were appropriate for use in Washington State: Lead risk from age of housing and poverty.

These two risk factors were identified by the Washington State Department of Health and were reviewed by a multi-stakeholder expert panel. Although there are other risk factors for lead exposure such as having a sibling or playmate with an elevated blood lead level or parents who work in an industry where lead is used, we did not have sufficiently high quality data to account for these variables in the tool.

Data and sources:

Age of housing – data on housing age comes from the U.S. Census's American Community Survey's 5-year rollup. This dataset provides the total number of houses and proportion of houses by year of construction. We used this data in conjunction with national estimates of the proportion of housing from each era with lead risks.⁴³ Here is an example of how lead risk from age of housing was calculated for a fictitious census tract:

	Construction	Number of	Percent with Lead	Estimate of homes with a
	Year	Houses	Hazards	lead risk
	After 1980	100	0	0
	1960-1979	100	8%	8
	1940-1959	100	43%	43
	Before 1940	100	68%	68
Total		400		119
	Proportion of lead risk:	homes with a	119/400	29.8%

Example calculation of lead risk from age of housing using a fictitious census tract:

Poverty – There is a significant association between poverty and elevated blood lead levels.⁴⁴ Children who live below the poverty line and live in pre-1950 housing are at the greatest risk for lead exposure because the home is more likely to have aging lead paint that is in poor condition.⁴⁵

Weighting:

IBL combines age of housing and poverty into a single geographic risk layer and classifies census tracts into deciles. A decile is a group that represents one tenth of the whole. IBL allows us to weight risk factors to best approximate the amount of risk attributable to the indicator. The weights were calculated using data from the National Health and Nutrition Examination Survey reported in CDC's 2013 MMWR "Blood Lead Levels in Children Aged 1-5 Years – United States 1990-2010".

Weighting Risk Factors in the Lead Risk Map:

Poverty	Mean BLL					
<1.3	4.4 μg/dL					
					Change in	Final
≥1.3	1.2 μg/dL				BLL	Weight
Difference	3.2			Poverty	3.2 μg/dL	42%
				Age of		E 9 %
				Housing	4.5 μg/dL	50/0
Age of						
Housing						
Pre-1950	5.3 μg/dL					
1950-1977	<u>1.3</u> μg/dL			_		
Difference	4.0 μg/dL		4.0	μg/dL		
			4.9	µg/dL		
		Mean	4.5	µg/dL		
Pre-1950	5.3 μg/dL					
1978 or later	0.4 μg/dL					
Difference	4.9 μg/dL					

Appendix C: Pediatric Environmental Specialty Units Recommendation on Medical Management of Childhood Lead Exposure and Poisoning



Recommendations on Medical Management of Childhood Lead Exposure and Poisoning

No level of lead in the blood is safe. In 2012, the CDC established a new "reference value" for blood lead levels (5 mcg/dL), thereby lowering the level at which evaluation and intervention are recommended (CDC).

Lead level	Recommendation					
< 5 mcg/dL	1. Review lab results with family. For reference, the geometric mean blood lead level for					
	children 1-5 years old is less than 2 mcg/dL .					
	2. Repeat the blood lead level in 6-12 months if the child is at high risk or risk changes during the					
	timeframe. Ensure levels are done at 1 and 2 years of age.					
	3. For children screened at age < 12 months, consider retesting in 3-6 months as lead exposure					
	may increase as mobility increases.					
	4. Perform routine health maintenance including assessment of nutrition, physical and mental					
	development, as well as iron deficiency risk factors.					
	5. Provide anticipatory guidance on common sources of environmental lead exposure: paint in					
	homes built prior to 1978, soil near roadways or other sources of lead, take-home exposures					
	related to adult occupations, imported spices, cosmetics, folk remedies, and cookware.					
5-14 mcg/dL	 Perform steps as described above for levels < 5 mcg/dL. 					
	Re-test venous blood lead level within 1-3 months to ensure the lead level is not rising. If it is					
	stable or decreasing, retest the blood lead level in 3 months. Refer patient to local health					
	authorities if such resources are available. Most states require elevated blood lead levels be					
	reported to the state health department. Contact the CDC at 800-CDC-INFO (800-232-4636)					
	or the National Lead Information Center at 800-424-LEAD (5323) for resources regarding lead					
	poisoning prevention and local childhood lead poisoning prevention programs.					
	Take a careful environmental history to identify potential sources of exposures (see #5 above					
	and provide preliminary advice about reducing/eliminating exposures. Take care to consider					
	other children who may be exposed.					
	Provide nutritional counseling related to calcium and iron. In addition, recommend having a					
	fruit at every meal as iron absorption quadruples when taken with Vitamin C-containing					
	toods. Encourage the consumption of iron-enriched toods (e.g., cereals, meats). Some					
	children may be eligible for Special Supplemental Nutrition Program for Women, Infants and					
	Child (WIC) or other nutritional counseling.					
	5. Ensure iron sufficiency with adequate laboratory testing (CBC, Ferritin, CRP) and treatment					
	per AAP guidelines. Consider starting a multivitamin with iron.					
	 Perform structured developmental screening evaluations at child health maintenance visits, 					
15.44	as lead s effect on development may manifest over years.					
15-44 mcg/dl	Confirm the blood lead level with repeat veneus cample within 1 to 4 weaks					
mcg/uL	 Commit the blood lead level with repeat vehous sample within 1 to 4 weeks. Additional specific evaluation of the shild, such as abdominal x-ray should be considered. 					
	based on the environmental investigation and history (e.g., nica for paint chins, mouthing					
	behaviors). Gut decontamination may be considered if leaded foreign bodies are visualized or					
	x-ray. Any treatment for blood lead levels in this range should be done in consultation with					
	an expert. Contact local PEHSU or PCC for guidance: see resources on back for contact					
	information					
>44 mcg/dl	1. Follow guidance for BLL 15-44 mcg/dL as listed above					
s tring, ac	 Confirm the blood lead level with repeat venous lead level within 48 hours 					
	 Consider hospitalization and/or chelation therapy (managed with the assistance of a 					
	experienced provider). Safety of the home with respect to lead hazards, isolation of the lead					
	source, family social situation, and chronicity of the exposure are factors that may influence					
	management. Contact your regional PEHSU or PCC for assistance: see resources on back for					
	contact information.					

Recommendations on Medical Management of Childhood Lead Exposure and Poisoning



Principles of Lead Exposure in Children

- A child's blood lead concentration depends on their environment, habits, and nutritional status. Each of these
 can influence lead absorption. Children with differing habits or nutritional status but who live in the same
 environment can vary on blood lead concentration. Further, as children age or change residences, habits or
 environments change creating or reducing lead exposure potential.
- While clinically evident effects such as anemia, abdominal pain, nephropathy, and encephalopathy are seen at levels >40 µg/dL, even levels below 10 µg/dL are associated with subclinical effects such inattention and hyperactivity, and decreased cognitive function. Levels above 100 µg/dL may result in fatal cerebral edema.
- Lead exposure can be viewed as a lifelong exposure, even after blood lead levels decline. Bone acts as a
 reservoir for lead over an individual's lifetime. Childhood lead exposure has potential consequences for adult
 health and is linked to hypertension, renal insufficiency, and increased cardiovascular-related mortality.
- Since lead shares common absorptive mechanisms with iron, calcium, and zinc, nutritional deficiencies in these minerals promotes lead absorption. Acting synergistically with lead, deficiencies in these minerals can also worsen lead-related neurotoxicity.

Principles of Lead Screening

Lead screening is typically performed with a capillary specimen obtained by a finger prick with blood blotted
onto a testing paper. Testing in this manner requires that the skin surface be clean; false positives are
common. Therefore, elevated capillary blood lead levels should be followed by venipuncture testing to
confirm the blood lead level. In cases where the capillary specimen demonstrates an elevated lead level but
the follow-up venipuncture does not, it is important to recognize that the child may live in a leadcontaminated environment that resulted in contamination of the finger tip. Efforts should be made to identify
and eliminate the source of lead in these cases. Where feasible, lead screening should be performed by
venipuncture.

Principles of Iron Deficiency Screening

- The iron deficiency state enhances absorption of ingested lead.
- Hemoglobin is a lagging indicator of iron deficiency and only 40% of children with anemia are iron deficient.
- Lead exposed children (≥ 5 mcg/dL) are at risk for iron deficiency and should be screened using CBC, Ferritin, and CRP. Alternatively, reticulocyte hemoglobin can be used, if available.
- Children with iron deficiency, with or without anemia, should be treated with iron supplementation.

Re	Resources						
•	Pediatric Environmental Health Specialty Unit (PEHSU)Network	•	<u>www.pehsu.net</u> or 888-347-2632				
•	Poison Control Center (PCC)	•	www.aapcc.org/ or 800-222-1222				
•	Centers for Disease Control and Prevention	٠	www.cdc.gov/nceh/lead/ or 800-232-4636				
•	U.S. Environmental Protection Agency	•	www.epa.gov/lead/ or 800-424-5323				

Suggested Reading and References:

Pediatric Environmental Health, 3rd edition. American Academy of Pediatrics, 2012.

Woolf A, Goldman R, Bellinger D. Pediatric Clinics of North America 2007;54(2):271-294.

Levin R, et al. Environmental Health Perspectives 2008; 116(10):1285-1293.

Baker RD, Greer FR. Pediatrics 2010;126(5):1040-50.

Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women. CDC, 2010.

CDC Response to Advisory Committee on Childhood Lead Poisoning Prevention Recommendations in "Low Level Lead Exposure Harms Children: A Renewed Call of Primary Prevention" June 7, 2012

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(April 2013 version)

Appendix D: Interpreting and Managing Low Blood Lead Levels

INTERPRETING AND MANAGING LOW BLOOD LEAD LEVELS: Supplemental Information for Clinicians



Note that federal, state, and local strategies for preventing and screening pediatric lead poisoning vary. Primary prevention of lead exposure is essential, but secondary prevention (screening and early detection) also has an important role. This guidance is intended to help clinicians respond to lower BLL results once a blood sample has been collected.

The National PEHSU has released a factsheet for clinicians addressing "Recommendations on Medical Management of Childhood Lead Exposure and Poisoning" (April 2013, located at <u>http://www.aoec.org/pehsu/documents/medicalmgmnt-childhood-lead-exposure-June-2013.pdf</u>). This intent of this local NW PEHSU factsheet is to supplement the national factsheet, providing additional detail and discussion.

Blood lead level (BLL) and children's health

In order to identify children with excessive lead exposure, the CDC recommends using a national reference value based on the 97.5th percentile of BLL distribution in children 1-5 years old. As of 2012, this equates to a BLL of 5 μ g/dL. Children with BLLs of 5 μ g/dL and above are in the top 2.5% of lead exposure. This reference value will be recalculated by the CDC every 4 years.

Unfortunately, there is <u>no</u> safe level of lead exposure for children, and even lower ranges of BLLs (below 5-10 μ g/dL) are known to be a risk factor for impaired cognitive and behavioral outcomes in childrenⁱ. Current and consistent evidence suggests that the reduction in children's IQ scores (per unit increase in BLL) is greater in the range of BLLs that are 0 to 10 μ g/dL than it is for BLLs > 10 μ g/dLⁱⁱ. New findings also suggest that the adverse health effects of low BLLs extend beyond cognitive function to include cardiovascular, immunological, and endocrine effects.

However, a single blood lead level in this range for any individual child is not predictive of effects for that child. It is one of multiple risk factors. Cognitive effects related to lead may be mitigated by a healthy home psychosocial environment and genetic inheritanceⁱⁱⁱ.

Blood lead interpretation considerations

- Initial BLLs can be measured from venous or capillary blood samples. Providers should have children wash
 hands with soap and water prior to obtaining a capillary sample to minimize fingerstick contamination
 issues.
- It is generally recommended that an initial capillary BLL > 4 μg/dL be confirmed with a venous sample within 1-4 weeks, because laboratory and sample collection methods can influence the results. Formal reporting and confirmation requirements may vary by state^{iν}.
- Limits of lead detection vary by analytical method and laboratory. Most laboratories performing BLL testing can achieve an error range within +/- 2 μg/dL. However, the current allowable error range for a lab to be in compliance with proficiency testing is +/- 4 mcg/dL or +/- 10%, whichever is greater^v. There is ongoing discussion that this error range should be reduced to better reflect modern lead reference ranges and lab capabilities.
 - When the most sophisticated machines (inductively coupled plasma method ICP MS) are used the limit of detection is typically 1 µg/dL or less (e.g. 0.1 µg/dL)^{vi}.
 - Many sites do not have these and instead use graphite furnace atomic absorption spectrophotometry (GFAAS) or flame atomic absorption spectrometry (FAAS), which have limits of detection of < 1-2 µg/dL or ~10 µg/dL, respectively^{vii}.
 - The error range for the handheld LeadCheck II instruments (a CLIA-waived instrument using a capillary sample) is +/- 3 mcg/dL.

 Ingested lead distributes first into the red blood cells, and then re-distributes into soft tissues (25%) and bone (70%). For children with baseline lower levels of lead exposure, after an acute exposure, the blood level will fall rapidly (weeks). A large decrease from the first to second lead level may reflect an acute exposure followed by body equilibration, or may result from laboratory or fingerstick contamination issues.

Identifying sources of lead exposure

The first priority is to identify sources and prevent ongoing exposure. Lead paint and contaminated dust/soil are sources responsible for the majority of BLLs above the reference value in U.S. children, but there is increasing evidence of exposure through other sources. It is important to question families about the child's home environment as well as other potential exposure sources. Talk to parents about exposure pathways (floor to hand to mouth) and important sites of exposure (windowsills). Some pertinent questions include:

- Does the child live in a home or regularly visit 1) a building (e.g. school, daycare) built before 1950, or 2) a building built before 1978 with recent or ongoing painting, repair, and/or remodeling?
- Could the soil where the child lives or plays be contaminated with lead (e.g. neighborhood with older housing, current or historical mining, smelting, or agriculture)?
 - Could the child's drinking water be contaminated (e.g. from indoor plumbing)?
 - Consider testing water sources, such as kitchen tap water, for lead contamination. Most NSF certified faucet mounted water filters remove lead - see PEHSU factsheet on lead removal from drinking water.
- Does the family have older or antique furniture with lead-based paint? Older children's toys? Newer imported toys?
- Does the child spend time with anyone who has a job or hobby where they may work with lead in the home
 or bring lead dust home on shoes and clothing (e.g. painting, remodeling, auto radiators, ship repair,
 soldering, making sinkers or bullets, going to shooting ranges, welding, mining, stained glass, pottery,
 jewelry, antiques, or imported toys)?
- Does the family use pottery or ceramics made in other countries (especially Mexico and China), lead crystal
 or pewter, or vintage dishes for cooking, storing, or serving food or drink?
 - Restrictions on lead in dishes were implemented in late 1980s and strengthened in early 1990s—since then US made dishes are without lead.
- Are imported spices used or home spices brought from other countries?
- Has the child ever used imported cosmetics or taken any traditional home remedies (e.g. Azarcon, Alarcon, Greta, Rueda, Pay-loo-ah, Kohl)?
- Has the child been adopted from, lived in, or visited another country?
- For children < 12 months, consider mother as the source for transmission prenatally and through human milk. Are there maternal risks for lead exposure (see CDC Guidelines for Pregnant and Lactating Mothers)?

Although a specific source may not be identified, the medical provider can still provide information and counseling to the family on common sources of exposure and how to avoid them (*e.g. use a doormat and take off shoes when entering the home, wash children's and adults' hands often, do not allow children to chew on painted wooden toys or furniture or windowsills*).

If a lead paint hazard is identified (e.g. paint prior to 1978), some practical lower cost approaches include simply keeping it in good condition, cleaning up dust often (wet wiping and using vacuums with HEPA filters), painting over suspect paint, or placing a barrier over the area to keep it out of reach from children.

A home inspection and risk assessment may be the best approach to identify and characterize lead hazards in the home. Such inspections typically cost \$400 - \$1000 and individual dust wipe samples cost about \$35 each. Trained lead professionals can use EPA approved test kits (<u>http://epa.gov/lead/pubs/testkit.htm</u>); these test kits are not generally recommended for consumer use. Proper and safe remediation is important to avoid actually increasing the risk for a child's exposure. Information on proper remediation and repair is available from the EPA at <u>http://epa.gov/lead/pubs/leadinfo.htm#remodeling</u>.

Also, note that federal law requires that home sellers and landlords must disclose a lead hazard at the time of sale or before a rental lease takes effect^{vii}.

Additional considerations

- For infants with initial BLLs > 4 mcg/dL, recheck earlier than the standard 1-3 months and include iron status testing. Their increasing mobility increases their risk of exposure.
- · Consider testing other members of the household/family, as this may aid identification of lead sources.
- Chelation therapy is not recommended for BLL's < 45 µg/dL except in special circumstances. Consult the PEHSU for chelation questions. The FDA recently released a statement warning of the dangers of off-label use of chelation therapies: <u>http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm229358.htm</u>

Resources for advice on identifying and reducing potential exposure sources

Call the local health department for assistance in evaluating the home environment for lead and check with your state or local housing agencies for resources to remediate lead-based pain hazards.

Region X State-specific lead programs

- Alaska Lead Surveillance Program: http://www.epi.hss.state.ak.us/eh/lead/default.htm
- Idaho Department of Health and Welfare lead education:<u>http://healthandwelfare.idaho.gov/Health/</u> <u>EnvironmentalHealth/IndoorEnvironment/Lead/tabi</u> <u>d/941/Default.aspx</u>
- Oregon lead poisoning prevention: http://www.oregon.gov/DHS/ph/lead/index.shtml
- Washington State Childhood Lead Poisoning Prevention program: http://www.doh.wa.gov/ehp/lead/default.htm

- National programs
 - CDC factsheet on new reference level: http://www.cdc.gov/nceh/lead/ACCLPP/ Lead Levels in Children Fact Sheet.p df
 - CDC tips for reducing lead exposure: http://www.cdc.gov/nceh/lead/tips.htm
 - EPA information on childhood lead exposure and lead in general: <u>http://www.epa.gov/lead/index.html</u> and <u>http://www.epa.gov/iag/lead.html</u>
 - National Center for Healthy Housing (NCHH) consumer factsheet: <u>http://www.nchh.org/Portals/0/Contents/</u> <u>Consumer BLL Fact Sheet 8-7-12.pdf</u>

For additional questions or guidance, contact the NW PEHSU. The University of Washington based Pediatric Environmental Health Specialty Unit (PEHSU) serves medical and public health professionals in Alaska, Washington, Idaho, and Oregon. For more information contact us at 206-221-8671 or pehsu@uw.edu or visit our website http://www.depts.washington.edu/pehsu.

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¹ ACCLPP. Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention. Report of the Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention. January 4, 2012 ⁱⁱ ACCLPP 2012; Lanphear BP, Dietrich K, Auinger P, Cox C. Cognitive deficits associated with blood lead concentrations <10 mg/dL in US children and adolescents. *Public Health Report*. 2000; 115:521–529; Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. *Environmental Health Perspectives*. 2005; 113(7):894–899.

^{III} Moodie S, Ialongo N, Lopez P, et al. The conjoint influence of home enriched environment and lead exposure on children's cognition and behaviour in a Mexican lead smelter community. *Neurotoxicology*. 2012. Advance of print. <u>http://dx.doi.org/10.1016/j.neuro.2012.10.004</u>; Guilarte TR, Toscano CD, McGlothan JL, Weaver SA. Environmental enrichment reverses cognitive and molecular deficits induced by developmental lead exposure. *Annals of Neurology*. 2003; 53(1): 50-56 [™] In Washington state, WAC 246-101 requires laboratories to report all blood lead test results to the Washington State Department of Health. All "elevated" blood lead levels, currently defined by the state as ≥10µg/dL in youths <15 years old and as ≥25µg/dL in people ≥15 years old, must be reported within 2 days. All other test results must be reported within 1 month.

(http://www.doh.wa.gov/PublicHealthandHealthcareProviders/HealthcareProfessionsandFacilities/ProfessionalResources /BloodLeadTestingandReporting/BloodLeadTestReporting, 9/19/12)

^v Per current regulation, *Clinical Laboratory Improvement Amendments (CLIA) of 1988*. A useful discussion of lab limits can be found in: Advisory Committee on Childhood Lead Poisoning Prevention. Meeting Minutes, November 16-18, 2010. Atlanta, Georgia. Pages 19-25.

^{vi} WHO. Brief guide to analytical methods for measuring lead in blood. 2011. Page 3.

(http://www.who.int/ipcs/assessment/public_health/lead_blood.pdf, 9/19/12)

^{vii} EPA. Residential Lead-Based Paint Disclosure Program, Section 1018 of Title X (<u>http://epa.gov/lead/pubs/leadbase.htm</u>, 9/19/12)

Appendix E. Letter to Parents of Child with Elevated Blood Lead Level

[Date]

Parents of [Child's Name] [Address] [Address]

RE: Blood Lead Level Consultation

Dear Parents:

On [Date] [Child's Name] received a blood lead test showing a blood lead level of [Test Result] μ g/dL. Blood lead levels at or above 5 μ g/dl are considered elevated per the Centers for Disease Control and Prevention.

Public Health would like to provide you with some information that can help you identify potential sources of lead in your home that may be contributing to your child's lead level. There is also information on methods that can decrease your child's lead exposure and minimize the effects on your child's health.

We provide this information because lead damages the brain and nervous systems of children at a critical time in their development. Children who are exposed to lead often have behavioral and developmental problems, and difficulty in school.

If you have any questions about lead please contact me at (xxx) xxx-xxxx.

Sincerely,

[Name & Contact Information]

Enclosures CC

Appendix F. Lead Exposure Investigation Form

Mail or fax completed form to: Webigton State Department of Healthh Childhood Lead Poisoning Prevention Program PO Box 7846 Olympia, WA 95604-7846 Fax (360)236-3059 Child Blood Lead County REPORT SOURCE	LHJ Use Report Classific: Cor Pro	ID ted to DOH Date ation nfirmed bable		Outbreak-related LHJ Cluster# LHJ Cluster Name: DOH Outbreak #
LHJ notification date// Investigation start date: // Lab Hospital HCP Public health agency Other	OK to talk Reporter Reporter Primary H Primary H	a to case?	No 🗌 Don'i	t know
Address	lame:	Homeless	Birth date Gender Ethnicity English sy Native lan Race (che Amer Native Native	Age F M Other Unk Hispanic or Latino Not Hispanic or Latino beaking? Y N Unk aguage eck all that apply) Ind/AK Native Asian et H/other PI Black/Afr Amer Other
CLINICAL INFORMATION Clinical Findings Y N DK NA Abdominal pain Lethargy/decreased activity Nausea, vomiting, constipation or diarrhea Loss of appetite Hyperactivity Irritability or behavior chrother: E Ever referred for neurological, developmenta educational assessment Specify: Reason for lead test Routine screen Special screening pro Symptoms of lead poisoning Known exposure to lead Anemia/iron deficiency Parental request Risk factors for lead exposure Other reason: Y N DK NA History of blood lead tests, either before or af elevated lead level was found Collect date: _/_/	evel ange al or oject ead	Y N DK NA	w-up or cor ory of a henr us ect date: _ _// □ 	nfirmatory lead tests scheduled latocrit or hemoglobin test for iron

Case defining variables are in bold. Answers are: Yes, No, Unknown to case, Not asked /Not answered DOH 334-169 (8/08)

Washington State Department of Health

Washington State Department of Health	Case Name:
EXPOSURE (over child's lifetime)	
Current home type Single family Multiple unit Mobile home Home ownership Owned Rented Public housing If not owned by family, give owner's name and phone number:	Y N DK NA Put metal or painted jewelry in mouth Household member in occupation involving lead (e.g., radiator repair shops, battery manufacturer or dismantler, lead or brass foundry or smelter) Specify
Years lived in home If less than a year list previous address:	Child or household member with hobbies involving lead (e.g., soldering, stained glass, ceramics, lead shot, casting bullets, fishing sinkers, shooting at a
Addresses of other places the child regularly spends time, such as day care or homes of friends or relatives:	rifle range or gun club) Specify: Received alternative medications
Year home constructed Exact year, if known 1980+ 1960-79 1950-59 1940-49 1920-39 Before 1920	Azarcon Rueda Maria Luisa Greta Liga Coral Alarcon Pay-loo-ah Bali Goli Ghasard Kandu Estomaquil Alkohl (kohl) Other, specify
Source of water for home Public water supply Small water system Private well Other	
Y N DK NA C Recent repairs/renovations done in the home Describe: Peeling or flaking paint inside or outside home Describe:	country Specify country: Covered by Medicaid Covered by Medicaid Receives WIC Nutrition benefits Attends Head Start or Early Head Start
Spends time in areas with flaking or peeling paint Exposed to soil outside home with peeling exterior paint Seen putting paint chips in mouth Seen chewing on painted surfaces in home	How was this person likely exposed to lead: Paint Drinking Water Other country Job Hobby Candy, toy Alternative medication Soil Other specify Unknown
Lives or plays in former orchard site (orchards on property before 1950) Exposed to soil contaminated by Tacoma smelter	Where the exposure probably occur? U.S. but not WA (State:) In WA (County:) Not in U.S. (Country/Region:) Unknown
I I I I I I I I I I I I I I I I I	Exposure details (e.g., exposure date, specific site, purchase or use- by date, product name/description):
Chili or tamarind candy imported from Mexico Played with toys recalled due to lead content	No risk factors or exposures could be identified Patient could not be interviewed
Y N DK NA Chelated Date complete: Chelated Date compl	r each household members and attach to case investigation form) Age <u>Tested?</u> <u>Collection date</u> <u>Result (µq/dL)</u>
PUBLIC HEALTH ISSUES	PUBLIC HEALTH ACTIONS
Y N DK NA Need for environmental risk assessment If yes, OK to release patient's name and information to contractor	Counseling on measures to avoid exposure Follow up/confirmatory blood lead tests recommended Referral to CTED's Lead Hazard Control Program
Environmental samples were collected Other environmental risks in home Asthma trigger Fall hazards Mold Other, specify:	Referral to developmental/educational assessment Referral to master home environmentalist Other, specify:
NOTES	
Investigator Phone/email:	Investigation complete date/_/
Local health jurisdiction	Record complete date/ _/

Acknowledgements

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