Utah Department of Health & Human Services

Blood lead

Disease plan

Quick links

Last updated: October 18, 2023 by Mark Jones

Questions about this disease plan?

Contact the Utah Department of Health and Human Services Office of Communicable Diseases: 801-538-6191.

Blood lead critical clinician information

Clinical evidence

Signs/symptoms

- Infants and children
    - Damage to the brain and nervous system
    - Decreased muscle and bone growth
    - Poor coordination
    - Hearing and speech problems
    - Decreased ability to pay attention, learning difficulties, lower IQ
    - Hyperactivity, reduced attention span, irritability
    - Headache
    - Insomnia, persistent tiredness/fatigue
    - Anemia
    - Gastrointestinal problems—abdominal pain, nausea, frequent vomiting, constipation, appetite/weight loss
- Adults (16 yrs and older) (taken from NIOSH)
    - Gastrointestinal problems—abdominal pain, nausea, vomiting, diarrhea or constipation, appetite loss
    - Headache, depression, irritability, weakness, exhaustion
    - Memory loss, distraction, forgetfulness
    - Anemia, kidney damage, brain damage, increased blood pressure
    - Bone or tooth loss
    - Increased infections in general
    - Fertility problems
- Pregnant individuals
    - Increased risk for miscarriage
    - Premature labor and birth
    - Lower birth weight in infants
    - Damage to baby's brain, kidneys, nervous system
    - Cause child to have learning or behavior problems

Lead exposure symptoms may be difficult to see. Especially in children, there may be no obvious immediate symptoms, but there is evidence that childhood exposure and/or chronic exposure to lead can cause long-term harm in several ways.

Period of communicability

- Not applicable

Incubation period

- Not applicable

Mode of transmission/lead exposure

- From lead-exposed mother to her unborn child via the bloodstream (crossing the placental barrier).
- From lead-exposed mother to child via mother's breast milk.
- See "Resources" section—"Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women."

- Breathing and/or ingesting lead from environmental exposures, such as lead-contaminated dust, lead-based paint, soil, water, food, high risk occupational or hobby environments, home/folk remedies, manufactured products.

Laboratory testing

Type of lab test/timing of specimen collection

- Atomic absorption spectrometry (AAS)
    - Flame atomic absorption spectrometry (FAAS) (capillary & venous)
    - Graphite furnace atomic absorption spectrometry (GFAAS) (capillary and venous)
- Anodic stripping voltammetry (ASV) (capillary & venous)
- Portable ASV (LeadCare®II—Currently, the only FDA approved POC analyzer) (capillary)
- Inductively coupled plasma mass spectrometry (ICP-MS) (capillary and venous)

Type of specimens

- Whole blood (capillary or venous)

Treatment recommendations

Type of treatment

- Identify source(s) of lead and remove from the environment.
- Diet with foods high in iron, calcium, and vitamin C.
- See Resources section—"Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention."
- See Resources section—"Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women."
- At higher blood lead levels (≥45 µg/dL) chelation therapy may be used.

Prophylaxis

- Monitor blood lead levels based on the value, using CDC guidelines. See below (page 15) Utah blood lead follow-up guidelines.
- Diet with foods high in iron, calcium, and vitamin C.
- Identify potential sources of lead exposure in one's environment and take actions to remove them https://www.cdc.gov/nceh/lead/prevention/sources.htm

Contact management

Isolation of case

- Not applicable

Quarantine of contacts

- Not applicable

Infection control procedures

- Not applicable

Why is blood lead important to public health?

Lead poisoning is the most significant and prevalent disease of environmental origin among children who live in the United States. Despite considerable knowledge, increased screening, and intervention efforts, lead exposure still occurs. In the United States, approximately half a million children have blood levels >5 micrograms per deciliter (>5 µg/dL), which, from 2010–2021, was the reference level at which CDC recommended public health action be initiated.[1] In 2021, the CDC lowered the reference level from 5 µg/dL to 3.5 µg/dL.[2] Health effects include decreased intelligence, behavioral and speech problems, anemia, decreased muscle and bone growth, poor muscle coordination, and hearing damage. High levels of lead can cause many health problems by damaging the brain, nervous system, and kidneys.

Disease and epidemiology

Clinical description

Lead exposure occurs primarily by inhaling or ingesting lead. The most common exposure is ingesting leaded dust. Lead serves no useful purpose in the human body, but its presence in the body can lead to toxic effects, regardless of exposure pathway.

- Lead toxicity can affect every organ system.
- The effects of lead exposure may be permanent.
- On a molecular level, proposed mechanisms for toxicity involve fundamental biochemical processes. These include lead's ability to inhibit or mimic the actions of calcium (which can affect calcium-dependent or related processes) and to interact with proteins (including those with sulfhydryl, amine, phosphate and carboxyl groups).[3]

It must be emphasized that **there may be no threshold** for developmental effects on children.

- The healthcare provider can distinguish overt clinical symptoms and health effects that come with high exposure levels on an individual basis. However, lack of overt symptoms does not mean “no lead poisoning.”
- Lower levels of exposure have been shown to have many subtle health effects.
- Some researchers have suggested that lead continues to contribute significantly to socio-behavioral problems such as juvenile delinquency and violent crime.[4] [5]
- While the immediate health effect of concern in children is typically neurological, it is important to remember that childhood lead poisoning can lead to physical health effects later in life, including renal effects, hypertension, reproductive problems, and developmental problems with their offspring.
- The most important step one can take is to prevent lead exposure before it occurs.

Causative agent

Lead is a soft, bluish-gray metal. Lead occurs naturally and is found in small amounts in the earth's crust, but much of its presence in the environment stems from its historic use in paint and gasoline, burning fossil fuels, manufacturing and from ongoing or historic mining and commercial operations. Lead has many different uses, including in the production of batteries, ammunition, metal products (solder and pipes), devices to shield X-rays, and various other products. Because of health concerns, lead from gasoline, paints, ceramic products, caulking, and pipe solder has been dramatically reduced.

The absorption and biologic fate of lead, once it enters the human body, depends on a variety of factors, including nutritional status, health, and age.

- Most inhaled lead in the lower respiratory tract is absorbed.
- Most lead that enters the body is excreted in urine or through biliary clearance (ultimately, in the feces).

For the chemical form of lead or lead compounds, entering the body is also a factor for the absorption and biologic fate of lead.

- Inorganic lead, the most common form of lead, is not metabolized in the liver.
- Nearly all organic lead that is ingested is absorbed.
- Organic lead compounds (far more rare today after EPA's ban on gasoline additives containing lead) are metabolized in the liver.

Absorbed lead that is not excreted is exchanged primarily among *three compartments:*

- Blood;
- Mineralizing tissues (bones and teeth), which typically contain the vast majority of the lead body burden; and
- Soft tissue (liver, kidneys, lungs, brain, spleen, muscles, and heart).

Differential diagnosis

The differential diagnosis for lead exposure includes growth failure, developmental delays, hyperactivity, behavioral disorders, hearing loss, and anemia.

Laboratory identification

The diagnosis of lead exposure is performed by laboratory analysis of a capillary or venous sample of whole blood. The blood lead result is presented in the units, “µg/dL” (micrograms per deciliter). All blood lead results are reportable to the Utah Department of Health and Human Services (DHHS) Environmental Epidemiology Program (EEP).

Treatment

Protecting children and adults from exposure to lead is important to lifelong good health. No safe blood lead level in children has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. Many effects on the body, brain and nervous system from lead exposure cannot be corrected and may be permanent.

The medical treatment for children or adults with high blood lead exposure levels is chelation therapy. Chelation is considered when a child or adult has a blood lead level greater than or equal to 45 µg/dL.[6,7,8]

The most important step parents, doctors, and others can take is to **prevent lead exposure**. There are many ways parents can reduce a child's exposure to lead. Lead hazards in any environment, but especially a child's, must be identified and controlled or removed safely. CDC has an extensive Childhood Lead Poisoning Prevention Program https://www.cdc.gov/nceh/lead/default.htm, with support to state and local prevention programs, including Utah https://www.cdc.gov/nceh/lead/programs/ut.htm.

Case fatality

Death related to lead exposure in the United States is quite rare, and if death does occur, it is typically from an acute exposure. Blood lead levels ≥70 µg/dL are considered a medical emergency; in this case, the child or adult should be hospitalized, diagnostic testing should be performed immediately as an emergency lab test, and immediate chelation therapy should be started. In the United States, the last known death of a child related to lead exposure was in 2006, when a four-year-old child ingested a metallic charm and had a blood lead value of 180 µg/dL.[9]

Reservoir

N/A

Transmission

In general, there is no person-to-person transmission of lead, but lead can pass from a pregnant parent to their unborn baby. If an adult has been exposed to lead over a long period of time or has had high levels of lead in their blood before becoming pregnant, the lead stored in their bones can be released into the blood during pregnancy. If a pregnant person is exposed to lead acutely, the developing baby can also be exposed. Lead has been found to pass through the placental barrier and can be transferred to the newborn child through breast milk.

Susceptibility

Children younger than age 6 are at the highest risk for lead exposure as they tend to put their hands or other objects, which may be contaminated with lead dust, into their mouths.

Children who are African-American non-Hispanic,[10] immigrants, and refugees are at higher risk for exposure to lead, as well as children who live at or below the poverty level in older housing; live in older, poorly-maintained rental properties; and children who live with parents or caregivers who are exposed to lead at work or have hobbies related to lead, as family members who work with or have hobbies related to lead can bring leaded dust into the home. In addition, people who are pregnant and exposed to lead can transfer the lead exposure to their unborn child.

Children are more susceptible than adults to the effects of lead because their bodies are still growing and rapidly developing and lead inhibits their development cognitively and physically.

Incubation period

N/A

Period of communicability

N/A

Epidemiology

From 1996 to 2019, Utah's prevalence for children ages 0–5 years with a blood lead level ≥10 µg/dL decreased from 4.0% to 0.2%, with the geometric mean decreasing from 3.0 µg/dL to 1.3 µg/dL, respectively.[11]

Before 2012,10 µg/dL of lead in the blood was known as the "level of concern" and children with 10µg/dL or more of lead in the blood were considered to have an "elevated blood lead level." In 2012, CDC introduced the blood lead reference value (BLRV) and determined it to be 5 µg/dL of lead in the blood. Children with blood lead levels at or above the BLRV are considered to have higher levels of lead in their blood than most children. According to CDC, the BLRV is based on the 97.5th percentile of the blood lead values among U.S. children ages 1-5 years from 2015-2016 and 2017-2018 National Health and Nutrition Examination Survey (NHANES) cycles. Children with blood lead levels at or above the BLRV represent those who are at the top 2.5% with the highest blood lead levels.[2] CDC no longer uses the term "level of concern" or "elevated blood lead level" and instead uses the blood lead reference value to identify children who have more lead in their blood than most children.

In 2017, DHHS EEP adopted CDC's BLRV of 5 µg/dL. In accordance with CDC, DHHS now refers to a child with a blood lead level higher than most children as having a "blood lead level at or above the BLRV" rather than having an "elevated blood lead level." In October 2021, CDC lowered the BLRV from 5 µg/dL to 3.5 µg/dL.2 Utah is currently in the process of adopting the new BLRV.

From 2017 to 2019, Utah's prevalence rate for children ages 0–5 years with a blood lead level ≥5 µg/dL decreased from 1.9% to 0.8%. Although the rates have declined, there are areas within the state which have high-risk minority populations. Minority groups tend to occupy housing that is less expensive, older, and in closer proximity to industrial or hazardous waste sites. There are an estimated 127,266 housing units throughout Utah built before 1950, and 76% of the units are located in higher-populated communities.[12]

The main sources of lead exposure identified in children who live in Utah include lead-based paint, living near a site where mining activities occurred in the past, parent's occupation/hobbies, previous exposure (immigrants/refugees), and other non-traditional routes of exposure.

The risk factors associated with children identified as having a blood lead level ≥5 µg/dL include living in a home built prior to 1978; exposure to peeling and chipping paint or remodeling; hand-to-mouth activity; eating dirt; living or playing near tailings from mining or milling operations; chewing on furniture and toys; regularly visiting a home built before 1960 with peeling and chipping paint or broken plaster; exposure to folk remedies; having parent/guardians with activities of welding, battery or foundry work, radiator and auto repair, refinishing furniture, soldering, painting, or shooting/reloading activities.[13]

In October 2021, CDC lowered the BLRV from 5 µg/dL to 3.5 µg/dL.[2] Utah is currently in the process of adopting the new BLRV.

Public health control measures

Public health responsibility

- Provide educational materials about the physical and neurological health effects of lead exposure~~s~~, possible sources of exposure, the health effects, how to prevent and protect persons from lead exposures.
- Provide case management for children identified as having a blood lead level >5 µg/dL and coordinate an environmental investigation, if needed, for those with higher blood lead levels (see chart under Case investigation process below).

Prevention

It is important to determine the construction year of the house or dwelling where the child or person spends a large amount of time (e.g., grandparents, childcare or workplace). In housing built before 1978, assume the paint has lead unless tests show otherwise. The following guidelines will help reduce lead exposure:

- Talk to the state or local health department about testing paint and dust from the home for lead (Utah Department of Environmental Quality-Lead-Based Paint Program).
- Make sure the child does not have access to peeling paint or chewable surfaces painted with lead-based paint.
- Ensure pregnant people and children are not present in housing built before 1978 that is undergoing renovation. They should not participate in activities that disturb old paint or in cleaning up paint debris after work is completed.
- Maintain a healthy diet, especially high in calcium, iron, and vitamin C.[14]
- Create barriers between living/play areas and lead sources. Until environmental cleanup is completed, parents should clean and isolate all sources of lead. Close and lock doors to keep children away from chipping or peeling paint on walls. Implement temporary barriers such as contact paper or duct tape to cover holes in walls or to block children's access to other sources of lead.
- Regularly wash children's hands and toys. Hands and toys can become contaminated from household dust or exterior soil. Both are known lead sources.
- Wet-mop floors regularly and wet-wipe window components. Because household dust is a major source of lead, parents should wet-mop floors and wet-wipe horizontal surfaces every 2–3 weeks. Window sills and wells can contain high levels of leaded dust. They should be kept clean. If possible, windows should be shut to prevent abrasion of painted surfaces or opened from the top sash.
- Prevent children from playing in bare soil; if possible, provide them with sandboxes. Parents should plant grass on areas of bare soil or cover the soil with grass seed, mulch, or wood chips, if possible. Until the bare soil is covered, parents should move play areas away from the bare soil and away from the house.

To further reduce exposure from non-residential paint sources:

- Avoid foods, using traditional folk remedies, cosmetics, and medicines containing lead.[15]
- Avoid using containers, cookware, or tableware to store or cook foods or liquids that are not shown to be lead free.
- Remove recalled toys and other consumer products immediately.[16] Check for recalled products on the United States Consumer Product Safety Commission website: https://www.cpsc.gov/Recalls

- Use only cold water from the tap to drink, cook, and make baby formula (hot water is more likely to contain higher levels of lead. Most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.[17]
- Shower and change clothes after you finish a task that involves work with lead-based products such as stained glass, reloading/casting bullets, using a firing range, or working in a lead-related occupation.
- Avoid playing on or near tailings from mining or milling operations.

Chemoprophylaxis

N/A

Vaccine

N/A

Isolation and quarantine requirements

Isolation: N/A
Hospital: N/A
Quarantine: N/A

Case investigation

Reporting

All blood lead test results are reportable to DHHS. Testing is conducted based on clinical evaluation of risk and need, especially among children younger than age 6, who are the most vulnerable, at-risk population.

Because the *Utah Administrative Code R386-703: Injury Reporting Rule* has not yet been updated with CDC's new recommended BLRV of 3.5 µg/dL, local health departments are expected to investigate cases with whole blood lead concentrations ≥5 µg/dL.[18] Cases with ≥5 µg/dL will be routed to the appropriate jurisdiction in UT-NEDSS/EpiTrax for investigation. However, local health departments may choose to follow CDC's recommendation and investigate cases with whole blood lead concentrations of ≥3.5 µg/dL. Local health departments who wish to investigate cases with whole blood lead concentrations from 3.5–4.9 µg/dL must search for these manually in UT-NEDSS/EpiTrax.

Note: Clinical laboratories currently report ***all*** blood lead tests using electronic laboratory reporting (ELR) directly into the UT-NEDSS/EpiTrax system (see pages 20 and 21). Entities using portable ASV or point of care analyzers (e.g., LeadCare®II) and are not reporting blood lead results

via ELR, should send the results to the DHHS EEP using either the secured email at: EPICDEPFAX@utah.gov or FAX # at: 801-539-9923. Include the fields as shown in the UT-NEDSS/EpiTrax minimum/required fields by tab (see pages 16 and 17). An electronic spreadsheet is preferable, but a .txt or .pdf may be used. Please contact the DHHS EEP at 801-538-6191 for a sample spreadsheet or questions.

Reporting (CSTE position statement, 2015)[19]

Please note: This section is copied directly from the most recently-published CSTE position statement on public health reporting and national notification for elevated blood lead levels (2015). It uses the term "elevated blood lead level" while the terminology used by CDC and DHHS is "blood lead level at or above the BLRV."

A description of suggested criteria for case ascertainment of a specific condition.

- Laboratories should report ***all*** blood lead levels to public health authorities.
- Healthcare providers should report blood lead levels meeting either of the following criteria:
    - A person <16 years of age with a lead concentration in a capillary blood specimen ≥5 µg/dL (0.24 µmol/L).
    - A person of any age with a venous blood lead concentration, as determined by a CLIA-certified facility, ≥5 µg/dL (0.24 µmol/L).
- Other recommended reporting procedures
    - Reporting should be ongoing and routine.
    - Frequency of reporting should follow the state's routine schedule.
    - Laboratory reporting should be electronic.

Criteria for **laboratory** reporting of blood lead levels. Meeting the criteria listed under any single column of this table is sufficient to report a result. "Adult" is defined as an individual age 16 years and older.[20]

Criterion	**Reporting blood lead level condition subtypes**			
	Child capillary	Child venous	Adult capillary	Adult venous
Person <16 years of age	N	N		
Person ≥16 years of age			N	N
Laboratory findings				
Any blood lead test result in a capillary blood specimen	N		N	
Any blood lead test in a venous blood specimen		N		N

Notes: N = Necessary; this criterion in conjunction with all other "N" in the same column is required to report a result.

Criteria for **clinician** reporting of a case of an elevated blood lead level. Meeting the criteria listed under any single column of this table is sufficient to report a case.

Criterion	Reporting blood lead level condition subtypes		
	Child capillary	Child venous	Adult venous
Person <16 years of age	N	N	
Person ≥16 years of age			N
Laboratory findings			
Lead concentration ≥5 µg/dL (0.24 µmol/L) in a capillary blood specimen	N		
Lead concentration ≥5 µg/dL (0.24 µmol/L) in a venous blood specimen		N	N

Notes:

N = Necessary; this criterion in conjunction with all other "N" in the same column is required to report a case.

CSTE case definition (CSTE position statement, 2015)[19]

Please note: This section is copied directly from the most recently-published CSTE position statement on public health reporting and national notification for elevated blood lead levels (2015). It uses the term "elevated blood lead level'' while the terminology used by CDC and DHHS is "blood lead level above the BLRV."

Note: If specimen type is unknown, it should be considered capillary for persons <16 years of age and venous for persons ≥16 years of age, for the purpose of case classification.

Elevated blood lead levels among children

Laboratory criteria

Blood lead concentration, as determined by a CLIA-certified or CLIA-waived facility, ≥5 µg/dL (0.24 µmol/L) in a child (person <16 years of age).

Case classification

Unconfirmed: A single capillary or unknown blood specimen with elevated lead concentration or two capillary blood specimens, drawn >12 weeks apart, both with elevated lead concentration.

Confirmed: One venous blood specimen with elevated lead concentration, or two capillary blood specimens, drawn within 12 weeks of each other, both with elevated lead concentration.

Elevated blood lead levels among adults

Laboratory criteria

Blood lead concentration, as determined by a CLIA-certified facility, of ≥5 µg/dL (0.24 µmol/L) in an adult (person ≥16 years of age).

Case classification

Confirmed: one venous blood specimen with elevated lead concentration.

Comment: Elevated blood lead levels, as defined above, should be used as standard criteria for case classification for the purposes of surveillance, but may not correspond to action levels determined by individual public health programs or by providers with respect to patient care.
Note: For medical management guidelines for lead-exposed adults, see guidelines from Council of State and Territorial Epidemiologists[21] and the Association of Occupational and Environmental Clinics.[22]

Criteria for defining a case of an elevated blood lead level. Meeting the criteria listed under any single column of this table is sufficient to classify a case, as indicated by the column's heading.

Criteria	**Case definition**					
	Confirmed			Unconfirmed		
Clinical evidence						
Person <16 years of age	N	N			N	N
Person ≥16 years of age			N			
Laboratory evidence						
Lead concentration ≥5 µg/dL (0.24 µmol/L) in a single capillary blood specimen					N	
Lead concentration ≥5 µg/dL (0.5 µmol/L) in a capillary blood specimen drawn within 12 weeks of another capillary blood specimen with a lead concentration ≥5 µg/dL (0.24 µmol/L)		N				
Lead concentration ≥5 µg/dL (0.5 µmol/L) in a capillary blood specimen drawn >12 weeks after another capillary blood specimen with a lead concentration ≥5 µg/dL (0.24 µmol/L)						N

Lead concentration ≥5 µg/dL (0.24 µmol/L) in a venous blood specimen	N		N			
Criteria to distinguish a new case						
Counted once per year, regardless of the number of elevated blood lead levels in the same year.	N	N	N			

Notes:
Elevated blood lead level classification does not use any case classification categories other than "confirmed" and "unconfirmed." The "unconfirmed" category identifies tested children with a potentially elevated blood lead level but where testing was inadequate to make that determination.
N=Necessary; this criterion in conjunction with all other "Ns" in the same column is required to classify a case.

Case investigation process

- The local health departments follow the case definition above to conduct case investigations.
- If the individual is an adult, considered ≥16 years of age, the local health department should contact the individual and notify them that their blood lead level is at or above the BLRV, and provide education on risk reduction. A blood lead test should be recommended or conducted for any child, pregnant individual or individual of child-bearing age who may become pregnant, that lives in the home. In addition, the local health department may refer the individual to the Utah Labor Commission/Utah Occupational Safety and Health (UOSH) https://laborcommission.utah.gov/divisions/uosh/ and/or the National Institute for Occupational Safety and Health (NIOSH) https://www.cdc.gov/niosh/topics/lead/workerinfo.html
- If the individual is an infant or child less than 16 years of age, the local health department should refer to the following chart for recommendations of procedures that should be performed based on a child's various blood lead levels.

Utah blood lead follow-up guidelines

- Lab reports of blood lead tests performed on children, ages 0-15 years old, follow guidelines below at the various blood lead level ranges.
- If aged ≥16 years and the blood lead level is ≥5.0 µg/dL, notify the individual of their blood lead level, provide educational materials, and recommend any child and/or any pregnant woman (or who may become pregnant), who lives in the home, receive a blood lead test.

If the blood lead level is:

5.0 - 14.9 µg/dL	15.0 - 19.9 µg/dL	20.0 - 44.9 µg/dL	45.0 - 69.9 µg/dL	≥70.0 µg/dL
Notify or contact parent/guardian, provide test results, and conduct Child Lead Risk Survey (CLRS)*	Contact parent/guardian, provide test results, and conduct CLRS* of child	Contact parent/guardian, provide test results, and conduct CLRS* of child	Contact parent/guardian, provide test results, and conduct CLRS* of child	Contact child's physician and coordinate for follow-up testing, and for emergency medical intervention
5.0 - 14.9 µg/dL	**15.0 - 19.9 µg/dL**	**20.0 - 44.9 µg/dL**	**45.0 - 69.9 µg/dL**	**≥70.0 µg/dL**
Contact child's physician for confirmatory test (venous-preferred or capillary) within one month of initial test, unless the initial test was a venous test	Contact child's physician for confirmatory test (venous-preferred or capillary) within 1 month of initial test, unless the initial test was a venous test	Contact child's physician for confirmatory test (venous-preferred or capillary) within 2 weeks of initial test, unless the initial test was a venous test	Contact child's physician for confirmatory test (venous-preferred or capillary) within 48 hours of initial test, unless the initial test was a venous test	Contact parent/guardian and conduct CLRS* of child
Provide educational materials to parent/guardian	Provide educational materials to parent/guardian	Provide educational materials to parent/guardian	Provide educational materials to parent/guardian	Provide educational materials to parent/guardian

	If child's blood lead drops <5 µg/dL Continue to monitor and test annually	If child's blood lead level persists Coordinate for a home and environment assessment*	Coordinate for a home and environment assessment* within 10 days	Coordinate for a home and environment assessment* within 5 days	Coordinate for a home and environment assessment* within 5 days
Send reminders to notify physician's office to conduct follow-up testing, every 2–3 months until 2 consecutive tests are <5 µg/dL	Send reminders to notify physician's office to conduct follow-up testing, every 2–3 months until 2 consecutive tests are <5 µg/dL		Continue to monitor blood lead level, until 2 consecutive tests are <5 µg/dL	Continue to monitor blood lead level, until 2 consecutive tests are <5 µg/dL	Continue to monitor blood lead level, until 2 consecutive tests are <5 µg/dL

*The child lead risk survey (CLRS) and the home and environment assessment are tools to help guide local health districts to determine the risk factors in the child's environment that might be exposing them to lead. These surveys can be found in EpiTrax under the "investigation" tab in a child's record and can also be found in the Case investigation forms section of this document. Investigators should enter the survey results into EpiTrax based on the parent/guardians responses.

Outbreaks

N/A

Identifying case contacts

N/A

Case contact management

N/A

Resources

Utah-specific resources

- Utah Department of Health/Environmental Public Health Tracking Program
    - Phone: (801)-538-6191
- Utah Poison Control Center
    - Phone: (801)-587-0600
- Utah Lead Coalition
- Utah Department of Environmental Quality/Lead-Based Paint Program
- Rocky Mountain Center for Occupational and Environmental Health
    - Phone: (801) -581-4800

Other resources

- Agency for Toxic Substances and Disease Registry
- Centers for Disease Control and Prevention (CDC)
- Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women
- Guidelines for Measuring Lead in Blood Using Point of Care iInstruments. Advisory Committee on Childhood Lead Poisoning Prevention of the CDC (10/14/2013)
- Housing and Urban Development, Healthy Homes for Healthy Families
- Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention
- U.S. Environmental Protection Agency, Lead Awareness Program

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Version control

January 2015—Created new disease plan based on current protocols.

Updated April 2018—changes include: updates to the Case Definition; Case Investigation Process section, updating the link to the Injury Reporting Rule, those aged ≥16 years old having an elevated blood lead level and recommendations to those children ages 0-5 years old, that have a blood lead level from 5 µg/dL to 9.9 µg/dL; updated 2016 prevalence rate; added references; adding the UEPHTP web link to the Resources section and grammatical corrections.

Updated September 2018—added the following sections: Critical Clinician Information and Electronic Laboratory Reporting Processing Rules. In addition, added the CSTE case definition and reporting tables.

Updated July 2019—revisions based on the Epidemiology Affiliate Group comments.

Updated October 2021—revisions included updating the prevalence rates and geometric mean.

Updated October 2023—revisions included updating the DHHS logo and DHHS referenced in the document from UDOH; including the prevalence rates from 2017 to 2019 at the current case definition of ≥ 5µg/dL: stating a change in CDC's terminology of EBLL to BLRV and CDC's BLRV of 3.5 µg/dL, adding the report forms and case investigation forms to the end of the plan, grammatical corrections, and a change to the order of some paragraphs for flow.

UT-NEDSS/EpiTrax minimum/required fields by tab

Demographic

- First name
- Last name
- Date of birth or age
- Sex
- Race
- Ethnicity
- Parent/guardian name
- Phone number
- Address
- City
- ZIP code
- County
- State

Clinical

- Healthcare provider's name
- Hospital/clinic
- Phone number
- Address
- City
- ZIP code

Laboratory

- Lab name
- Blood lead test result
- Test type (venous, capillary)
- Sample/collection date
- Test/analysis date

Epidemiological

- N/A

Investigation

- N/A

Contacts

- N/A

Reporting

- Date first reported to public health

Administrative

- N/A

Electronic laboratory reporting rules

Lead poisoning rules for entering laboratory test results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS/EpiTrax. These rules have been developed for the automated processing of electronic laboratory reports, although they also apply to manual data entry.

Test-specific rules

Test-specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS/EpiTrax, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS/EpiTrax.

Test type	Test result	Create a new event	Update an existing event
Absolute value	Positive	Yes	Yes
	Negative	Yes	Yes
	Equivocal	Yes	Yes

Whitelist rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Lead poisoning morbidity whitelist rule: Never a new case.

Lead poisoning contact whitelist rule: Not applicable.

Graylist rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Lead poisoning graylist rule: Not applicable.

Other electronic laboratory processing rules

- If an existing event has a state case status of "not a case," ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.

Case report forms

Blood lead report form: Single test

Utah Department of Health & Human Services

Blood lead report form
Utah Department of Health and Human Services
Environmental Epidemiology Program
(801) 538-6191

Patient information:

Last name: _____ **First name:** _____ **MI:** _____

Street address: _____ **City:** _____ **State:** _____ **ZIP:** _____

County: _____ **Phone:** (_____)_____-_____ **Birthdate:** _____/_____/_____

Sex
(circle one)

(1) Male

(2) Female

Patient's race
(circle as many as appropriate)

(1) American Indian/Alaska Native

(2) Asian

(3) Black

(4) White

(5) Native Hawaiian or Other Pacific Islander

(9) Unknown

Patient's ethnicity
(circle one)

(1) Hispanic

(2) Non-Hispanic

(9) Unknown

Guardian name (if child patient)

_____ _____
(Last name) (First name)

Adult patient's employer

_____

Test information:

Date drawn: _____/_____/_____

Date analyzed: _____/_____/_____

Blood lead result: _____ _____ . _____µg/dL

Test type:
☐ Capillary
☐ Venous

Analysis lab information:

Lab name: _____

Address: _____

City: _____ State: _____

ZIP: _____ Phone: (_____) _____ - _____

Healthcare provider information:

Physician name: _____

Clinic name: _____

Address: _____

City: _____ State: _____

ZIP: _____ Phone: (_____) _____ - _____

Mail completed form to: Utah Department of Health and Human Services, Environmental Epidemiology Program
Blood Lead Surveillance
288 North 1460 West
P.O. Box 142104
Salt Lake City, UT 84114-2104

Or: Email: EPICDEPFAX@utah.gov, Fax: (801)538-9923

Blood lead report form for point of care analyzers

Utah blood lead reporting

Utah Department of Health & Human Services

Reports can be sent securely by email to: EPICDEPFAX@utah.gov or faxed to: 801-538-9923, Attn: Mark Jones, Utah Department of Health and Human Services (DHHS) Environmental Epidemiology Program (EEP)
Please note: this form is for sending blood lead results from point of care analyzers i.e., LeadCare II. If the capillary blood lead result is ≥ 5 mcg/dL, conduct a venous blood lead sample for confirmation for analysis at a clinical laboratory.
(A spreadsheet is preferred, but a text or .pdf format may be used to send reports)
(Clinical laboratory results are automatically sent to DHHS EEP)

Last name	First name	Sex	Race	Ethnicity	Date of birth	Age (if no DOB)	Blood lead value (µg/dL, at least one decimal)	Type of sample: C or V (capillary or venous)	Test date (Date blood sample analyzed)	Sample date (Date blood sample taken)	Laboratory (i.e., LEADCARE II - analysis facility)	Ordered by (physician/ nurse name)	Clinic/ Hospital name (where blood sample is drawn)	Patient address	Patient city	Patient ZIP code	Parent/ guardian name	Parent/ guardian phone number

Case investigation forms

Child lead risk survey

Child lead risk survey

Childhood Lead Poisoning Prevention Program
Utah Department of Health and Human Services
Environmental Epidemiology Program

Child's Name:		
Blood Lead Level: µg/dL	Test Date:	Test Lab:
Child's ID #:	Local Health Department:	
Child's Parent or Guardian:		
Child's Home Phone:	Child's Street Address:	
Date of Survey:	Survey Completed by:	

Child's demographic information:

1. Date of Birth (mm/dd/yy): ___/___/___

2. Gender: Male Female

3. Race: 1. Native American/Alaskan Native 5. Asian or Pacific Islander
2. Black 6. White
3. Multiracial 7. Other
4. Unknown

4. Ethnicity: 1. Hispanic
2. Non-Hispanic White
3. Non-Hispanic/Asian or Pacific Islander

a. Asian Indian	b. Chinese	c. Filipino
d. Hawaiian	e. Korean	f. Vietnamese
g. Japanese	h. Samoan	i. Guamanian
j. Hmong	k. Other	l. Unknown

Child's behavior:

Has your child ever done any of the following?

a.Eaten dirt, or any other non-food item	YES	NO	Unknown
b. Chewed on toys, crayons, or jewelry	YES	NO	Unknown
c. Used any crayons/chalk manufactured outside the U.S.	YES	NO	Unknown
d. Picked at or play near chipping or flaking paint	YES	NO	Unknown
e. Picked at or play near areas of broken plaster	YES	NO	Unknown
f. Put paint chips or broken plaster in mouth	YES	NO	Unknown
g. Placed fingers in mouth/suck their thumb	YES	NO	Unknown
h. Chewed on furniture, crib, or window sills	YES	NO	Unknown
i. Frequently played in bare soil	YES	NO	Unknown
j. Rode a bike or all-terrain vehicle (ATV) on or around mine tailings	YES	NO	Unknown

Child's home environment:
(See also: Home and environment assessment form below)

1. Are you the owner of the home the child lives in? YES NO Unknown

If NO: a. Name of the person who owns dwelling: _____
b. Phone number of the person who owns dwelling: _____
c. Address of dwelling: _____
_____
_____

2. How would you classify your home?

1. Single Family	4. Government Owned
2. Multi-family	5. Complex (Apartment)
3. Mobile Home	6. Federally Assisted Housing - Rental-Voucher

3. Which best describes where the child's neighborhood is located?

1. City
2. Suburbs
3. Country
4. Other
5. Don't know

4. How long has the child lived in this home? _____

5. What year was the home built? _____

6. Is there any peeling or chipping paint in the child's home? YES NO Unknown

7. Is there broken plaster in the child's home? YES NO Unknown

8. Has the dwelling been remodeled or repainted in the last three months?

1. Yes - Inside
2. Yes – Outside
3. Yes - Both inside and outside
4. No
5. Unknown

9. Has the dwelling been sanded or stripped in the last three months?

1. Yes - Inside
2. Yes – Outside
3. Yes - Both inside and outside
4. No
5. Unknown

10. a. Does the child regularly visit an older house or facility built before 1960? (i.e., day care center, preschool, babysitter's home, friend's home or relative's home) YES NO Unknown

b. Does the house or facility have peeling or chipping paint? YES NO Unknown

11. Is the child's home located near a lead smelter, battery recycling plant, or other industry likely to release lead? YES NO Unknown

Demographic information of parents/guardians:

Names of Adults:

_____

_____

Parents/guardians and other family members:

1. Has any adult listed above ever had a blood lead test?	YES	NO	Unknown

If YES:

What was the test result? _____ ug/dL Date: _____
What was the test result? _____ ug/dL Date: _____

2. Have imported or homemade pottery or ceramics been used to prepare or serve food in your home?	YES	NO	Unknown
3. Has your child eaten vegetables grown in your home garden or someone else's home garden?	YES	NO	Unknown
4. Has the child eaten foods that have been stored in opened cans?	YES	NO	Unknown

5. In the past 6 months, has any member of the child's household done work in any of the following areas?

a. Battery work	YES	NO	Unknown
b. Radiator repair	YES	NO	Unknown
c. Auto repair	YES	NO	Unknown
d. Auto body work	YES	NO	Unknown
e. Metal working	YES	NO	Unknown
f. Welding	YES	NO	Unknown
g. Soldering	YES	NO	Unknown
h. Smelting	YES	NO	Unknown
i. Foundry working	YES	NO	Unknown
j. Mining	YES	NO	Unknown
k. Demolition	YES	NO	Unknown
l. Sandblasting	YES	NO	Unknown
m. Plumbing	YES	NO	Unknown
n. Painting	YES	NO	Unknown
o. Firearms handling (Law enforcement, Military, etc.)	YES	NO	Unknown
p. Other lead handling duties	YES	NO	Unknown

6. Does any member of the household do any of the following activities at home?

a. Leaded glass work/repair	YES	NO	Unknown
b. Make jewelry	YES	NO	Unknown
c. Make pottery or ceramics	YES	NO	Unknown
d. Ceramic painting	YES	NO	Unknown
e. Used artist's paints	YES	NO	Unknown
f. Auto body repair	YES	NO	Unknown
g. Radiator repair	YES	NO	Unknown
h. Recycled lead batteries	YES	NO	Unknown
I. Auto body painting	YES	NO	Unknown
j. Painting bicycles or furniture	YES	NO	Unknown
k. Refinish furniture	YES	NO	Unknown
l. Solder pipes	YES	NO	Unknown
m. Use lead fishing weights or line	YES	NO	Unknown
n. Black powder shooting or shot making	YES	NO	Unknown
o. Indoor/Outdoor Shooting Range	YES	NO	Unknown
p. Reload/Cast bullets	YES	NO	Unknown
q. Eat hunted game meat shot with leaded bullets	YES	NO	Unknown
r. Used lead recently for any other reason	YES	NO	Unknown

7. Has your family ever used any of the following folk medicines or herbal remedies for any reason?

a. Greta/Azarcon (Alarcon, Coral, Luiga, Maria Luisa or Rueda)	YES	NO	Unknown
b. Paylooah	YES	NO	Unknown
c. Ghasard	YES	NO	Unknown
d. Bala Goli	YES	NO	Unknown
e. Kandu	YES	NO	Unknown
f. Kohl	YES	NO	Unknown
g. Ba-baw-san	YES	NO	Unknown
h. Daw Tway	YES	NO	Unknown
i. Litargirio	YES	NO	Unknown
j. Saoott	YES	NO	Unknown
k. Cebagin	YES	NO	Unknown
l. Bint al Dahab	YES	NO	Unknown

8. Does the child receive or have access to imported foods, candies or spices (Turmeric)?	YES	NO	Unknown
9. Does the child use or have access to imported cosmetics (Tiro/Tozali/Kwalli,Kajal)?	YES	NO	Unknown

10. Is food prepared or stored in imported pottery or metal containers?	YES	NO	Unknown
11. Does anyone in your home smoke or use tobacco?	YES	NO	Unknown
12. Does the home contain vinyl mini blinds made overseas and purchased before 1997?	YES	NO	Unknown
13. Are painted or unusual materials burned in household fireplaces?	YES	NO	Unknown
14. Are imported candles with metal wicks burned in the home?	YES	NO	Unknown

Child's medical history:

1. Would you say this child's health is generally:

1. Excellent
2. Very Good
3. Good
4. Fair
5. Poor

2. Does your child receive a regular vitamin/mineral supplement?	YES	NO	Unknown

3. Has your child experienced any of the following symptoms more than three times in the last three months?

a. Vomiting	YES	NO	Unknown
b. Nausea	YES	NO	Unknown
c. Weight loss	YES	NO	Unknown
d. Loss of appetite	YES	NO	Unknown
e. Stomach aches	YES	NO	Unknown
f. Constipation	YES	NO	Unknown
g. Difficulty in urinating	YES	NO	Unknown
h. Extreme weakness or fatigue	YES	NO	Unknown
i. Joint pain	YES	NO	Unknown
j. Paleness	YES	NO	Unknown
k. Headaches	YES	NO	Unknown
l. Dizziness	YES	NO	Unknown
m. Irritability	YES	NO	Unknown
n. Seizures or convulsions	YES	NO	Unknown
o. Trouble sleeping	YES	NO	Unknown

4. Has the child ever been treated with folk remedies or herbal remedies ("non-Western" medicine)? YES NO Unknown

5. Has your child's doctor ever told you the child was low in iron, calcium or zinc? YES NO Unknown

6. Has the child ever received treatment for lead poisoning? YES NO Unknown

If YES:
Did the child receive chelation treatment? YES NO Unknown

If YES:
What kind of chelation treatment did the child receive?
1. Inpatient
2. Outpatient
3. Both
4. Unknown

Was the child hospitalized? YES NO Unknown

Who paid for the medical treatment?

1. Medicaid
2. Private insurance
3. Self-Pay
4. Other
5. Unknown

7. Has the child ever had a blood lead test? YES NO Unknown

If YES:
What was the result? _____ ug/dL Date: _____

Sample Type: Capillary Venous

If YES:
What was the source of funding for the test?
1. Medicaid
2. Private insurance
3. Self-Pay
4. Other
5. Unknown

Other children in home:

1. How many other children live in your home?_____

Blood Lead Test (if done)

Names of Other Children	Birth Date	Lead Level	Test Date

Home and environment assessment

Home and environment assessment

Assessment completed by: _____ Date: _____

1. Year the dwelling was constructed: _____.

2. Ownership:
a. Private, owner-occupied
b. Rental, privately owned
c. Rental, commercially owned
d. Rental, publicly owned
e. Rental, Section 8
f. Unknown

3. Dwelling Type:
a. Attached, single family
b. Day Care Center
c. Detached, single family
d. Multi-unit
e. School
f. Other
g. Unknown

Site surveillance:

4. Has the residence been renovated?
a. YES - Once
b. YES - More than once
c. NO
d. Unknown

Date first renovation began (mm/dd/yy): _____

Date latest renovation began (mm/dd/yy): _____

5. Does the dwelling have peeling, chipping or flaking paint:
a. YES - interior
b. YES - exterior
c. YES - both interior/exterior
d. NO
e. Not Inspected

6. Does the dwelling have broken plaster:
a. YES - interior
b. YES - Exterior
c. YES - both interior/exterior
d. NO
e. Not Inspected

7. Age of plumbing: _____

8. Type of plumbing: _____

9. What type of yard does this dwelling have:
a. Lawn - good growth
b. Lawn - poor growth
c. No lawn

10. Is there a garden area? YES NO Not Inspected

11. Are there other areas of uncovered soil? YES NO Not Inspected

12. List all other lead hazards observed at dwelling:
_____
_____
_____
_____

13. Is there an industrial hazard near dwelling? YES NO Unknown
Specify all: _____
_____
_____

14. Is there a freeway near dwelling? YES NO Unknown

Environmental surveillance:

Highest XRF result in mg/cm^2: _____

Highest floor dust sample result: _____
Unit of measure: $\mu g/ft^2$ ppm

Highest windowsill dust sample result: _____
Unit of measure: $\mu g/ft^2$ ppm

Highest window trough dust sample result: _____
Unit of measure: $\mu g/ft^2$ ppm

Highest paint chip sample result: _____
Unit of measure: $\mu g/ft^2$ ppm mg/cm^2

Highest soil sample result (ppm): _____

Highest water sample result (ppb): _____