Blood Lead

Disease Plan

Quick Links:

Last updated: July 31, 2019, by Mark Jones.

Questions about this disease plan?

Contact the Utah Department of Health/Bureau of Epidemiology: 801-538-6191.

✓ CRITICAL CLINICIAN INFORMATION

Clinical Evidence
Signs/Symptoms 1. Children • Developmental delay • Learning difficulties • Persistent tiredness/fatigue • Decreased muscle and bone growth • Poor muscle coordination • Insomnia • Hyperactivity • Irritability • Loss of appetite/weight • Reduced attention span • Stomach aches • Frequent vomiting • Constipation • Headache • Anemic • Hearing loss 2. Newborns • Born prematurely • Lower birth weight • Slowed growth/developmental delay 3. Children exposed to lead who do not have visible signs or symptoms, may have learning and behavioral problems as the child becomes older.
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 her 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: ▪ Lead-contaminated dust ▪ Lead-based paint ▪ occupational work/environments ▪ Hobbies ▪ Home/folk remedies ▪ Food

- Water
- Soil
- 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 & 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 & venous)

Type of Specimens

- Whole Blood (capillary or venous)

Treatment Recommendations

Type of Treatment

- Identify the lead source and remove from the child's environment.
- Diet with foods high in iron, calcium and vitamin C.
- Chelation.
- See RESOURCES section – "Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention."

Time Period to Treat

- Monitoring of blood lead levels is based on the value, using CDC guidelines. See below (page 12) Utah Blood Lead Follow-up Guidelines.

Prophylaxis

- Removal of the lead source.
- At higher blood lead levels (≥45 µg/dL) Chelation may be used, but with caution.

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 living 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), the reference level at which CDC recommends public health action be initiated[1]. 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.
- 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)[2].

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[3, 4].
- It is important to prevent all lead exposures.

While the immediate health effect of concern in children is typically neurological, it is important to remember that childhood lead poisoning can lead to health effects later in life, including renal effects, hypertension, reproductive problems, and developmental problems with their offspring.

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. It is used 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 rarer 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, behavior 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, Environmental Epidemiology Program (UDOH/EEP).

Treatment

Protecting children 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. Effects of lead exposure cannot be corrected.

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 a child's environment must be identified and controlled or removed safely.

The medical treatment for children with high blood lead exposure levels is chelation therapy, which is considered when a child has a blood lead test result greater than or equal to 45 µg/dL.

Case Fatality

Death related to lead exposure in the United States is quite rare in children and is typically from an acute exposure. Blood lead levels ≥70 µg/dL are considered a medical emergency; in this case, the child 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 published in the following Morbidity and Mortality Weekly Report (In 2006, a child age four, had ingested a metallic charm and his blood lead level was determined to be 180 µg/dL[5]).

Reservoir

N/A.

Transmission

There is no person-to-person transmission, although a woman who is pregnant and is exposed to lead can transfer the lead exposure to the unborn child. Lead has been found to pass through the placental barrier and can be transferred to the newborn child through breast milk.

Susceptibility

All children under the age of six years are at the highest risk, because they are growing rapidly and because they tend to put their hands or other objects, which may be contaminated with lead dust, into their mouths.

Other risk factors include: children living at or below the poverty level who live in older housing and African-American non-Hispanic children[6], immigrants, and refugees; children living in older, poorly maintained rental properties or who have parents who are exposed to lead at work, or who have hobbies related to lead. These hobbies can bring leaded dust home, exposing family members. In addition, women who are pregnant and exposed to lead can transfer the lead exposure to their unborn child.

Incubation Period

NA.

Period of Communicability

NA.

Epidemiology

From 1996 to 2016, Utah's prevalence for children ages 0-5 years, with an elevated blood lead level (EBLL) (≥10 µg/dL), has decreased from 4.0 % to 0.4 %, with the geometric mean decreasing from 3.0 µg/dL to 1.3 µg/dL respectively[7]. Although the rates have been declining, there are areas within the state that 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; pre-1950 housing units throughout Utah and 76% of the units are located in these higher populated communities[8]. The main sources of lead exposure identified in children residing in Utah include lead-based paint, past mining activities, parent's occupation/hobbies, previous exposure (immigrants/refugees) and other non-traditional routes of exposure. The risk factors associated with children identified as having an EBLL 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[9].

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Provide educational materials about lead exposures, possible sources of exposure, the health effects, nutrition, and how to protect persons from lead exposures.
- Provide case management for children identified as having an elevated blood lead level, 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 the dwelling where the child may spend a large amount of time (e.g., grandparents or childcare). In housing, built before 1978, assume that 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 (https://deq.utah.gov/air-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 that pregnant women 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 and iron.
- Create barriers between living/play areas and lead sources. Until environmental clean-up is completed, parents should clean and isolate all sources of lead. They should close and lock doors to keep children away from chipping or peeling paint on walls. 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 should be implemented.
- Regularly wash children's hands and toys. Hands and toys can become contaminated from household dust or exterior soil. Both are known lead sources.
- Regularly wet-mop floors 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 a child's exposure from non-residential paint sources:
- Avoid foods, using traditional folk remedies, cosmetics and medicines containing lead (http://www.cdc.gov/nceh/lead/tips/folkmedicine.htm).
- 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 from children (http://www.cdc.gov/nceh/lead/tips/toys.htm) (http://www.cpsc.gov).
- Use only cold water from the tap for drinking, cooking, and making 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 (http://www.cdc.gov/nceh/lead/tips/water.htm).
- Shower and change clothes after finishing a task that involves working with lead-based products such as stained glass, making bullets, or 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. Cases of elevated blood lead levels include all persons with whole blood lead concentrations ≥5µg/dL. Confirmed cases shall be reported to the Utah Department of Health or to the local health department responsible for the geographic area where the injury occurred as per Utah Administrative Code R386-703: Injury Reporting Rule[10]. Testing is conducted based on clinical evaluation of risk and need, especially among children younger than 6 years, who are the most vulnerable, at-risk population.

NOTE: Clinical laboratories currently report *All* blood lead tests using electronic laboratory reporting (ELR) directly into the UT-NEDSS system (see pages 16 & 17). 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 UDOH/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 Minimum/Required Fields by Tab (see pages 16 & 17). An electronic spreadsheet is preferable, but a text or .pdf may be used. Please contact the UDOH/EEP at 801-538-6191 for a sample spreadsheet or questions.

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

- Laboratories should report ALL blood lead levels (BLLs) to public health authorities.
- Healthcare providers should report EBLLs 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 health department's routine schedule.
    - Laboratory reporting should be electronic.

NOTE: "adult" is defined as an individual age 16 years and older[11]

Criteria for **laboratory** reporting of BLL. Meeting the criteria listed under any single column of this table is sufficient to report a result.

Criterion	**Reporting BLL 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 EBLL. Meeting the criteria listed under any single column of this table is sufficient to report a case.

Criterion	**Reporting BLL 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.

Case Definition

A child aged <16 years old with a blood lead level ≥5 µg/dL is considered to have an elevated blood lead level and case management should proceed. (See below - Case Investigation Process).

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[12] and Association of Occupational and Environmental Clinics[13].

Criteria for defining a case of an EBLL. 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 number of EBLL in same year.	N	N	N			

Notes:

EBLL classification does not use any case classification categories other than “confirmed” and “unconfirmed.” The “unconfirmed” category identifies tested children with a potentially EBLL, 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 ≥16 years of age, then the local health department may contact the individual and notify of their elevated blood lead level, provide education, recommend a blood lead test be conducted, for any child and/or any pregnant woman or who may become pregnant, living in the home. In addition, the local health department may refer the individual to the Utah Labor Commission/Utah Occupational Safety and Health (UOSH) at: 801-530-6901, https://laborcommission.utah.gov/divisions/UOSH/index.html.

The following chart explains the procedures that should be performed for a child at 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 older, no follow-up is needed at any blood lead level. However, if the blood lead level is ≥5.0 µg/dL, may recommend that any child and/or any pregnant woman (or who may become pregnant), living 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	Contact parent/guardian, provide test results and conduct Risk Assessment (RA) questionnaire of child	Contact parent/guardian, provide test results and conduct RA of child	Contact parent/guardian, provide test results and conduct RA of child	Contact child's physician & coordinate for follow-up testing, and for emergency medical intervention

<table>
<tr><th>5.0 - 14.9 µg/dL</th><th colspan="2">15.0 - 19.9 µg/dL</th><th>20.0 - 44.9 µg/dL</th><th>45.0 - 69.9 µg/dL</th><th>≥70.0 µg/dL</th></tr>
<tr><td>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</td><td colspan="2">Contact child's physician for confirmatory test (venous-preferred or capillary) w/in one month of initial test, unless the initial test was a venous test</td><td>Contact child's physician for confirmatory test (venous-preferred or capillary) w/in one month of initial test, unless the initial test was a venous test</td><td>Contact child's physician for confirmatory test (venous-preferred or capillary) w/in one month of initial test, unless the initial test was a venous test</td><td>Contact parent/guardian and conduct RA of child</td></tr>
<tr><td>Provide educational materials to parent/guardian</td><td colspan="2">Provide educational materials to parent/guardian</td><td>Provide educational materials to parent/guardian</td><td>Provide educational materials to parent/guardian</td><td>Provide educational materials to parent/guardian</td></tr>
<tr><td></td><td>If child's blood lead drops <5 µg/dL

Continue to monitor and test annually</td><td>If child's blood lead level persists

Coordinate for an environmental investigation</td><td>Coordinate for an environmental investigation w/in 10 days</td><td>Coordinate for an environmental investigation w/in 5 days</td><td>Coordinate for an environmental investigation w/in 5 days</td></tr>
<tr><td>Send reminders to notify physician’s office to conduct follow-up testing, every 2-3 months until two consecutive tests are <5 µg/dL</td><td colspan="2">Send reminders to notify physician’s office to conduct follow-up testing, every 2-3 months until two consecutive tests are <5 µg/dL</td><td>Continue to monitor blood lead level, until two consecutive tests are <5 µg/dL</td><td>Continue to monitor blood lead level, until two consecutive tests are <5 µg/dL</td><td>Continue to monitor blood lead level, until two consecutive tests are <5 µg/dL</td></tr>
</table>

Resources

Utah Department of Health/Environmental Public Health Tracking Program (801-538-6191, https://epht.health.utah.gov/epht-view/topic/ChildhoodBloodLead.html).

Utah Poison Control Center (phone #: 801-587-0600, web link: http://poisoncontrol.utah.edu/).

Utah Lead Coalition (https://utahleadcoalition.org)

Utah Department of Environmental Quality/Lead-Based Paint Program (https://deq.utah.gov/air-quality/lead-based-paint-program)

Centers for Disease Control and Prevention (CDC) (https://www.cdc.gov/nceh/lead/ACCLPP/blood_lead_levels.htm).

Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention (https://www.cdc.gov/nceh/lead/casemanagement/casemanage_main.htm).

Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women. (https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf).

Guidelines for Measuring Lead in Blood Using Point of Care iInstruments. Advisory Committee on Childhood Lead Poisoning Prevention of the CDC. 10/14/2013. https://www.cdc.gov/nceh/lead/ACCLPP/20131024_POCguidelines_final.pdf.

Agency for Toxic Substances & Disease Registry (https://www.atsdr.cdc.gov/).

U.S. Environmental Protection Agency, Lead Awareness Program (https://www.epa.gov/lead).

Housing and Urban Development, Healthy Homes for Healthy Families (https://www.hud.gov/program_offices/healthy_homes/healthyhomes)

Rocky Mountain Center for Occupational and Environmental Health (phone #: 801-581-4800, (https://medicine.utah.edu/rmcoeh/).

Outbreaks

N/A.

Identifying Case Contacts

N/A.

Case Contact Management

N/A.

✓ REFERENCES

1. CDC. https://www.cdc.gov/nceh/lead/default.htm. Accessed May 30, 2018.

2. Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological profile for lead. ATSDR. Found at: https://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=96&tid=22. Accessed April 16, 2018.

3. Needleman H.L. 2002. Bone lead levels in adjudicated delinquents: A case control study. Neurotoxicology and Teratology 24: 711-717.

4. Nevin R. 2000. How lead exposure relates to temporal changes in IQ, violent crime, and unwed pregnancy.

5. CDC (Centers for Disease Control and Prevention). 2006. Death of a Child after Ingestion of a Metallic Charm — Minnesota, 2006. MMWR Dispatch Vol. 55 / March 23, 2006. Found at: http://www.cdc.gov/mmwr/PDF/wk/mm55d323.pdf. Accessed April 16, 2018.

6. Dixon, S.L., J.M. Gaitens, D.E. Jacobs, W. Strauss, J. Nagaraja, T. Pivetz, J.W. Wilson, and P. Ashley. 2009. U.S. Children's exposure to residential dust lead, 1999-2004: II. The contribution of lead-contaminated dust to children's blood lead levels. Environmental Health Perspectives 117 (3):468-74. Accessed July 31, 2019.

7. EPHTN (Environmental Public Health Tracking Network). 2017. Blood Lead Topic Page. Found at: http://epht.health.utah.gov/epht-view/. Accessed April 12, 2018.

8. United States Census. 2000. Census of Housing. Accessed 2002.

9. EEP (Environmental Epidemiology Program). 2003. Utah Blood Lead Registry.

10. Utah Administrative Code R386-703. Injury Reporting Rule (https://rules.utah.gov/publicat/code/r386/r386-703.htm)

11. Alarcon W et al. Adult Blood Lead Epidemiology and Surveillance --- United States, 2008—2009 MMWR. July 1, 2011 / 60(25);841-845. Available at https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6025a2.htm. Accessed 9/6/2018.

12. Council of State and Territorial Epidemiologists. —Management Guidelines for Blood Lead Levels in Adults‖ June 12, 2013. Available at https://c.ymcdn.com/sites/www.cste.org/resource/resmgr/OccupationalHealth/ManagementGuidelinesforAdult.pdf. Accessed 9/6/2018.

13. Association of Occupational and Environmental Clinics. Medical Management Guidelines for Lead-Exposed Adults Revised 04/24/2007 CSTE Medical Management Guidelines Added October 2013. Available at http://www.aoec.org/documents/positions/mmg_revision_with_cste_2013.pdf. Accessed 9/6/2018.

✓ VERSION CONTROL

V. 01.11.15 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 mcg/dL to 9.9 mcg/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.

✓ UT-NEDSS Minimum/Required Fields by Tab

Demographic
- First Name
- Last Name
- Date of Birth or Age
- Gender
- 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. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

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

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.