

211 Elevated Blood Lead Levels

Definition/Cut-off Value

Blood lead level of ≥ 5 $\mu\text{g}/\text{deciliter}$ within the past 12 months. (1)*

**The cut-off value is the current reference value published in guidance from the Centers for Disease Control and Prevention.*

Participant Category and Priority Level

Category	Priority
Pregnant Women	I
Breastfeeding Women	I
Non-Breastfeeding Women	III, IV, V, or VI
Infants	I
Children	III

Justification

Lead poisoning is a persistent, but entirely preventable, public health problem in the United States. Elevated blood lead levels (BLLs) – levels at or above the reference value identified by the Centers for Disease Control and Prevention (CDC) – are a potent, pervasive neurotoxicant associated with harmful effects on health, nutritional status, learning and behavior. The CDC recognizes that there is no safe blood lead level for a mother or fetus yet there are no published guidelines for these groups. Therefore, CDC recommends that the same guidelines identified for children be used for prenatal and breastfeeding women as well as infants until specific guidelines are available. (1, 2)

Blood lead levels have been declining in the U.S. population as a whole. It is most common in children, but can occur in other groups as well. Children remain at heightened risk because they absorb lead more readily than adults and their developing nervous system is particularly vulnerable to the effects of lead. Elevated blood lead levels in children have been associated with decreased IQ, academic failure, and behavioral problems (1).

Avoidance of lead exposure remains the primary preventive strategy for reducing adverse health effects. (1). As a result of the wide variability in lead exposure in different communities, CDC recommends that state and/or local communities implement lead screening requirements based on their local data. If a state or local plan does not exist, it is recommended that the universal BLL testing according to 1991 CDC guidance be followed. (1)

Testing

Venous blood samples are the preferred method of blood lead testing. Elevated BLLs obtained using capillary (finger stick) samples should be confirmed using a venous blood test. (1)

Lead in Pregnant Women

Lead poisoning in a pregnant woman results in lead crossing the placenta and can have a detrimental impact on a developing fetus. One cause of lead poisoning in pregnant women is from practicing pica. Pica is defined as the eating of one or more nonnutritive substances on a persistent basis for a period of at least one month. Items commonly ingested include soil, clay, ice, starch, baking powder, chalk and paint. Cases of lead poisoning have been found when lead containing items, such as lead-contaminated soil and pottery, have been ingested. Pica is commonly practiced in areas of Africa, Asia, and Central America. In the United States it occurs more frequently in the South and in immigrant populations where it is culturally acceptable. In areas of the U.S. where pica is viewed negatively, women may not admit to engaging in these practices thus, it places the pregnant woman and her fetus at risk. (2, 3)

Lead in Breastfeeding Women

Lead can be passed to the infant through breast milk. Some mothers exposed to lead may be encouraged to continue breastfeeding if their BLLs are within an acceptable range. The benefits of breastfeeding outweigh the potential health consequences the infant would otherwise endure.

Key Recommendations for Initiation of Breastfeeding (2):

- Mothers with BLLs <40 µg/dL should breastfeed.
- Mothers with confirmed BLLs ≥40 µg/dL should begin breastfeeding when their blood lead levels drop below 40 µg/dL. Until then, they should pump and discard their breast milk.

Key Recommendations for Continuation of Breastfeeding (2):

- Breastfeeding should continue for all infants with BLLs below 5 µg/dL.
- Infants born to mothers with BLL ≥5 µg/dL and <40 µg/dL can continue to breastfeed unless there are indications that the breast milk is contributing to elevating BLLs.

Lead in Infants and Children

Similarly, children with pica may also have an elevated BLL. (For more information about pica please see the *Lead in Pregnant Women*, above and Risk #425 *Inappropriate Nutrition Practices for Children*.)

Lead poisoning is most common in children, especially those living in low income, migrant, or new refugee households. CDC recommends blood lead screening for all children at high risk for elevated BLLs with follow-up screening within 12 months.

Nutrition and Lead Absorption

Adequate consumption of calcium, iron, selenium, and zinc along with vitamins C, D and E decreases the absorption of lead in adults and lowers the susceptibility to the toxic effects in children (2). Nutritional status affects the absorption, deposition, and excretion of lead and thus may affect lead toxicity. Infants and children with a BLL ≥5 µg/dL should be assessed for the adequacy of their diet with a focus on increasing iron, calcium, and vitamin C, as follows:

- Iron deficiency anemia (IDA) can be an indicator of lead poisoning as they often coexist. Iron status should be evaluated and nutritional supplementation may be recommended by the participant's health care provider to correct and prevent IDA. Testing for IDA should occur (4):
 - Once between ages 9-12 months,
 - Again 6 months later, and
 - Annually from ages 2 to 5 years.

- Inadequate dietary calcium intake generally affects lead absorption. Results from some studies indicate that dietary calcium (when consumed at Adequate Intake levels) competitively inhibits lead absorption.
- The antioxidant, vitamin C, has been shown to have natural chelating properties, enhancing the urinary elimination of lead from the body. (2,4)

Referrals

WIC agencies must assess the history of lead testing for every infant and child. The WIC staff should make a referral to a children's health care provider if the:

- Child has never received a lead test
- Child had an elevated BLL 12 months prior and has had no interim follow-up screening
- Child is suspected by a parent or a health care provider to be at risk for lead exposure
- Child has a sibling or frequent playmate with an elevated BLL
- Participant is a recent immigrant, refugee, or foreign adoptee
- Breastfeeding or lactating woman, parent, or child's principal caregiver works professionally or recreationally with lead
- Family has a household member who uses traditional, folk, or ethnic remedies; cosmetics; or who routinely eats unregulated/uninspected food imported from abroad
- Family has been identified at increased risk for lead exposure by the health department because the family has local risk factors for lead exposure

Implications for WIC Nutrition Services

WIC nutrition services may benefit participants with lead exposure or elevated BLL in the following ways by:

- Reinforcing primary prevention strategies to avoid lead exposure and reduce adverse health effects such as offering to explain risk factors and common sources of lead, and providing a referral to lead treatment programs in health departments. Other CDC prevention tips can be found at: <http://www.cdc.gov/nceh/lead/tips.htm>.
- Encouraging consumption of foods (with an emphasis on the foods in the WIC food package) with nutrients that help minimize absorption of ingested lead and assist in preventing adverse consequences.
 - Calcium: Low-fat dairy, bone-in canned fish, and fortified fruit and vegetable juices
<http://ods.od.nih.gov/factsheets/Calcium-HealthProfessional/>
 - Iron: Lentils and beans, fortified cereals, red meats, fish, and poultry
<http://ods.od.nih.gov/factsheets/Iron-HealthProfessional/>
 - Vitamin C: Citrus fruits, tomatoes, and other fruits and vegetables
<http://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/>
- Helping to determine source(s) of lead exposure and counsel participants on avoiding further exposure, including identification and assessment of pica behavior. (For more information, see Risk #427 *Inappropriate Nutrition Practices for Women* and Risk #425 *Inappropriate Nutrition Practices for Children*.)
- Working with local lead treatment programs to determine source(s) of lead exposure and to support their recommendations for reducing further exposure.
- Providing breastfeeding support to mothers with elevated BLLs who need to temporarily pump and discard their breast milk.
- Working with healthcare providers to support breastfeeding according to the CDC guidelines if lead exposure occurs in a breastfeeding dyad.

References

1. Advisory Committee on Childhood Lead Poisoning Prevention. Low level lead exposure harms children: a renewed call for primary prevention. Atlanta, GA: US Department of Health and Human Services, CDC, Advisory Committee on Childhood Lead Poisoning Prevention; 2012.
2. National Center for Environmental Health. Guidelines for the identification and management of lead exposure in pregnant and lactating women. Atlanta, Ga.: Centers for Disease Control and Prevention, National Center for Environmental Health, U.S. Dept. of Health and Human Services, 2010.
3. Cleveland LM, Minter ML, Cobb KA, Scott AA, German VF. Lead Hazards for Pregnant Women and Children: Part 1. American Journal of Nursing. 2008;108(10):40-49.
4. Centers for Disease Control and Prevention. Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta, GA: US Department of Health and Human Services, CDC, Advisory Committee on Childhood Lead Poisoning Prevention; 2002. P. 59-76