Efforts to Address Americans’ Exposure to Lead

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APHL 2019 Annual Meeting // June 5, 2019
Lead is Local: Distribution of Risk Varies by Location

Estimated Distribution of Children’s Blood Lead Levels ≥5.0 µg/dL (2010)
About 60% of Children Identified Nationally

Estimated Percent of Children with Blood Lead Levels ≥10 µg/dL Missed by State, 1999–2010

Percent of children missed:
- more than 80%
- 61-80%
- 41-60%
- 40% or less
- not reported

A Hidden Problem: Lead-Poisoned Children in the United States, April 2017
Lead Activities Across NCEH/ATSDR

- **NCEH:**
  - Lead Poisoning Prevention Program & Childhood Blood Lead Surveillance System
  - Lead measures on the Environmental Public Health Tracking Network
  - Biomonitoring & Blood Lead Proficiency Program
  - Lead Exposure and Prevention Advisory Committee

- **ATSDR:**
  - Health Assessments & Studies of Community States
  - Lead Toxicological Profile
CDC’s Childhood Lead Poisoning Prevention Program

- **Mission:** Reducing blood lead levels in children and eliminating differences in average risk based on race/ethnicity and social class.

- **Core Strategies:**
  - Strengthen blood lead testing and reporting
  - Strengthen surveillance
  - Strengthen linkages of lead-exposed children to recommended services
  - Strengthen targeted, population-based interventions
Expanded Lead Activities

- **Enhance Lead poisoning prevention and surveillance**
  - 14 new state and local health department partners

- **Flint Lead Exposure Registry and associated community engagement activities**
  - Consortium led by Michigan State University

- **Federal Advisory Committee**
  - Lead Exposure and Prevention Advisory Committee (LEPAC)
Childhood Lead Poisoning Prevention Program Success

Healthy People 2020 Objectives

Reduce by 10% blood lead levels in the 97.5th percentile of children ages 1–5 years

- Baseline: 5.8 µg/dL
- 2020 Target: (5.2 µg/dL)
- 2014 Actual: (3.5 µg/dL)

This objective has exceeded the target.

Reduce by 10% geometric mean blood lead levels in children ages 1–5 years

- Baseline: 1.8 µg/dL
- 2020 Target: (1.6 µg/dL)
- 2014 Actual: (0.8 µg/dL)

This objective has exceeded the target.
BLOOD LEAD TESTING & REPORTING
Changes to Definitions for Interpreting Children’s Blood Lead Levels Over Time

- **Blood Lead Level (µg/dL):**
  - **1960:** 60
  - **1970:** 40
  - **1975:** 30
  - **1978:** 30
  - **1985:** 25
  - **1991:** 10
  - **2012:** 5
  - **2017:** 3.5

- **Definitions:**
  - **1960:** undue or increased lead absorption
  - **1970-1985:** elevated blood lead level
  - **1991:** level of concern
  - **2012-2017:** reference value

*Being Considered*
Ensuring Accurate Lead Testing

- Ensuring accurate and interpretable test results at lower lead values is important

- CDC provides resources to help laboratories ensure accurate and interpretable lead test results
CDC’s Lead and Multi-Element Proficiency Program (LAMP)
How to Test Children for Lead with Maximum Accuracy
Special Supplement on Lead Poisoning Prevention

LAMP: A CDC Program to Ensure the Quality of Blood-Lead Laboratory Measurements
Kathleen L. Caldwell, PhD; Po-Yung Chang, PhD; Kathy A. Vance, BS; Amir Mahmodov, PhD; Jeffrey M. Jarrett, MS; Samuel P. Caudill, PhD; De-Fei Ho; Robert L. Jones, PhD

ABSTRACT

Objective: To investigate the ability of US laboratories, participating in the Centers for Disease Control and Prevention (CDC) LAMP program to accurately measure blood-lead levels (BLL) 0.3 to 475 μg/dL using evaluation criteria of 0.2 μg/dL ± 10%, whichever is greater.

Methods: The CDC distributes blood specimens to participating laboratories 4 times per year. We evaluated participating performance over 5 challenges on samples with BLL between 0.75 and 475 μg/dL. The CDC sent 15 pooled samples to 6 laboratories. The LAMP laboratories used 2 primary technologies to analyze lead in blood: inductively coupled plasma mass spectrometry, graphite furnace atomic absorption spectrometry, and LeadCare technology based on atomic stripping voltammetry. Laboratories reported their BLL analytical results to the CDC. The LAMP uses these results to provide performance feedback to the laboratories.

Setting: The CDC sent blood samples to approximately 60 US laboratories for lead analysis.

Participants: Of the approximately 200 laboratories enrolled in LAMP in 2017, 44 US laboratories provided data used in this report (January 2017 to March 2019).

Results: Laboratory precision ranged from 0.20 μg/dL for inductively coupled plasma mass spectrometry to 1.95 μg/dL for LeadCare instruments. All participating US LAMP laboratories reported accurate BLLs for 89% of challenge samples, using the ±0.2 μg/dL or ±10% evaluation criteria.

Conclusions: Laboratories participating in the CDC’s LAMP program can accurately measure blood lead using the current Clinical Laboratory Improvement Amendments of 1988 guidelines of ±0.2 μg/dL or ±10%, with a success rate of 66%. However, when we apply limits of ±0.2 μg/dL or ±10%, the success rate drops to 58%. When challenged with samples that have target values between 3 and 6 μg/dL, nearly 100% of reported results fell within ±0.4 μg/dL, while 96% of the results fell outside of the acceptability criteria used by the CDC’s LAMP Program. As public health focuses on lower blood lead levels, laboratories must ensure their ability to successfully meet these analytical challenges surrounding accurately measuring blood lead. In addition proposed CLIA guidelines ±0.2 μg/dL or ±10% would be achievable performance by a majority of US laboratories participating in the LAMP program.

KEY WORDS: blood lead, external quality assurance, laboratory, performance

Screening for Elevated Blood Lead Levels: False-Positive Rates of Tests on Capillary Samples, Minnesota, 2011-2017
Amy Wang, MPH; Zeynab Razinia, MPH; Kathryn M. B. Haugen, BA; Luke Baertlein, MPH; Stephanie J. Yendell, DVM, MPH

ABSTRACT

Objective: To evaluate the prevalence and risk of false-positive results in elevated lead levels based on various potential predictors.

Design, Setting, Participants: We analyzed data from 2011 to 2017 in Minnesota. A false positive was defined as a test result on a capillary sample of at least 5 μg/dL, followed by a test result on a venous sample less than 5 μg/dL, within 90 days. Multivariate regression was used to estimate the probability of false-positive results on the total test result and the time between initial and confirmatory tests.

Results: Results from 139,086 children were included in analyses. Of these, 2,305 (0.23%) had confirmatory results below 5 μg/dL, and were classified as false positives. The proportion of false positives varied with time between tests, dependent on the initial result. Excluding the result to 90 days between tests, without time for any change in the child’s true BLL, we predicted 60% false positives in this group. 16% confidence interval: 62%-67%.

Conclusion: Cautions warranted when interpreting elevated tests on capillary samples without confirmatory tests on venous samples. Providers should be encouraged to follow-up all elevated capillary screens with confirmatory tests on venous samples.

KEY WORDS: lead poisoning, predictive value of tests, public health surveillance
Thank you