



PERSONNEL AND
READINESS

UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

AUG 10 2021

The Honorable Jack Reed
Chairman
Committee on Armed Services
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The enclosed report is in response to section 703 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116-92), which requires the Secretary of Defense to submit a report on the number of children the Department of Defense (DoD) tested for blood lead level, the number found to have an elevated blood lead level, and the number screened for an elevated risk of lead exposure.

The Defense Health Agency has completed its analysis and found 12,044 children tested for blood lead level, 83 with an elevated blood lead level, and 30,412 children were screened for elevated lead exposure risk from December 20, 2019 through August 15, 2020.

DoD is disseminating clinical guidelines enumerating best practices, as the Centers for Disease Control and Prevention recommends, to improve pediatric lead poisoning preventive care.

Thank you for your continued strong support of our Service members, civilian workforce, and families. I am sending a similar letter to the House Armed Services Committee.

Sincerely,

A handwritten signature in black ink that reads "Virginia S. Penrod".

Virginia S. Penrod
Acting

Enclosure:
As stated

cc:
The Honorable James M. Inhofe
Ranking Members



PERSONNEL AND
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UNDER SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
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AUG 10 2021

The Honorable Adam Smith
Chairman
Committee on Armed Services
U.S. House of Representatives
Washington, DC 20515

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Virginia S. Penrod
Acting

Enclosure:
As stated

cc:
The Honorable Mike D. Rogers
Ranking Member

Report to Congressional Armed Services Committees



Lead Level Screening and Testing for Children

**Required by: Section 703 of the National Defense Authorization Act
for Fiscal Year 2020 (Public Law 116-92)**

August 2021

The estimated cost of this report or study for the Department of Defense is approximately \$42,000 in Fiscal Years 2020 - 2021. This includes \$31,000 in expenses and \$11,000 in DoD labor.

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1. PURPOSE

This report is in response to section 703 of the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2020 (Public Law 116-92), which requires the Secretary of Defense to submit a report to the Committees on Armed Services of the Senate and House of Representatives on Lead Level Screening and Testing for Children in the Department of Defense (DoD).

2. BACKGROUND

Childhood lead exposure can cause brain and nerve damage; growth and developmental delays; and learning, behavior, hearing, and speech problems. In addition, low blood lead levels can negatively affect intelligence quotient, ability to pay attention, and academic performance. Children's exposure to lead classically occurs from lead-based paint; however, lead exposures can also occur when parents inadvertently bring home contaminated materials from work in lead-related industries, after drinking contaminated drinking water, from taking contaminated folk remedies, and in other ways.

Fortunately, lead poisoning is preventable. One method of prevention relies on early detection of lead exposure to remediate and treat early in the course of disease to minimize harm. DoD providers play a large role in prevention by screening children for history of lead exposure and testing for blood lead levels, as indicated. Providers typically screen for elevated lead exposure risk with screening questions or a questionnaire. The results of the screening questions determine the need for blood lead level testing. In some settings (e.g., where health jurisdictions require universal testing or where parents do not know the answers to the screening questions), blood lead levels are obtained directly in lieu of screening questions.

The Centers for Disease Control and Prevention (CDC) recommend lead screening and testing according to state or local health department recommendations. CDC targets its lead surveillance on children under six years of age because of their rapid growth and development during this stage and their tendency to put things in their mouths.¹ Similarly, the American Academy of Pediatrics Bright Futures lead screening schedule calls for screening children through age six.² The DoD is disseminating clinical guidelines enumerating best practices, as the CDC recommends, to improve pediatric lead poisoning preventive care.

Section 703(d) of the NDAA for FY 2020 required the following:

(d) Report.—Not later than January 1, 2021, the Secretary of Defense shall submit to the Committees on Armed Services of the Senate and the House of Representatives a report detailing, with respect to the period beginning on the date of the enactment of this Act and ending on the date of the report, the following:

(1) The number of children who were tested by the Department of Defense for the level of lead

¹ Centers for Disease Control and Prevention. Childhood Lead Poisoning Prevention. Aug. 27, 2020. <https://www.cdc.gov/nceh/lead/default.htm>. Accessed Sept. 29, 2020.

² American Academy of Pediatrics. Recommendations for Preventive Pediatric Health: Bright Futures/American Academy of Pediatrics. March 2020. https://downloads.aap.org/AAP/PDF/periodicity_schedule.pdf. Accessed Sept. 29, 2020.

in the blood of the child and, of such number, the number who were found to have an elevated blood lead level.

- (2) The number of children who were screened by the Department of Defense for an elevated risk of lead exposure.³

Furthermore, Section 703(f) states:

(f) Definitions.—In this section, the terms “abnormal blood lead level” and “elevated blood lead level” have the meanings given those terms by the Centers for Disease Control and Prevention.

CDC defines elevated blood lead level (BLL) as a single blood lead test (capillary or venous) at or above the CDC blood lead reference value of 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$) established in 2012.⁴

3. LEAD TESTING

Methods

DoD analysts aimed to find the number of children tested for BLL and, of these children, the number found to have an elevated BLL of at least five micrograms per deciliter, CDC’s current reference level for blood lead. The analysts generally tried to be consistent with methods used in previous lead testing reports⁵, although adaptations were necessary to meet NDAA requirements. Laboratory records with a test collection date from December 20, 2019 through August 15, 2020 were recorded through the Health Level 7 (HL7) chemistry data system and obtained from the Composite Health Care System (CHCS). Records were excluded if the sample was not blood or whole blood (e.g., serum), if the unit of measure or the test result could not be determined, if test results were true duplicates, or if the results indicated a test was not performed. Zinc protoporphyrin (ZPP) tests were not included. The highest BLL test result for each pediatric beneficiary was retained for the reporting period.

BLL tests for beneficiary children aged less than 18 years at the time of sample collection were retained for analysis. The query included all Military Health System (MHS) direct care beneficiaries whose tests were ordered at military medical treatment facilities within CHCS.

Results

The analysts found the following:

- DoD tested 12,044 children for blood lead level.
- DoD found 83 to have an elevated blood lead level. Analysts did not find evidence of

³ National Defense Authorization Act for Fiscal Year 2020 (Public Law 116–92) section 703(d).

⁴ Centers for Disease Control and Prevention. Standard Surveillance Definitions and Classifications. July 30, 2019. <https://www.cdc.gov/nceh/lead/data/case-definitions-classifications.htm>. Accessed Oct. 27, 2020.

⁵ Navy and Marine Corps Public Health Center. DOD Quarterly Pediatric Lead Report, CY 2019 Q4. NMCPHC-EDC-TR-053-2020. February 2020.

geographical clustering.

Limitations

These data do not include records from shipboard facilities, battalion aid stations, private sector care providers, or in-theater facilities. Data from MHS GENESIS, a new electronic health record which launched in February 2017 at select MHS facilities, were unavailable.

The chemistry database consists of non-culture laboratory test results (e.g., polymerase chain reaction and antigen testing). Providers may order a group of tests, called panels, when patients present with non-specific symptoms. If the test name or test results within a panel are not disease-specific, these results may not be captured in search terms used to query the chemistry data. Classifying chemistry tests involves extensive searching of free-text test result fields. It is possible that some test results were misclassified, though validation steps were included to reduce error.

Finally, the ascertainment period overlapped substantially with decreased health services use because of the COVID-19 pandemic^{6,7}. Counts are likely lower than what would be observed in the absence of the pandemic.

4. LEAD EXPOSURE RISK SCREENING

Methods

As described in the Background above, screening for elevated risk of lead exposure involves either provider questionnaire followed by BLL testing, if indicated, or BLL testing at the outset; therefore, two outcomes qualified as evidence of lead exposure risk screening events:

- 1) Documentation of lead risk assessment date in electronic medical records; and
- 2) Blood lead test results in laboratory records.

From electronic health records' progress notes, DoD analysts identified lead risk assessment dates by the following methods:

- 1) Identifying all outpatient encounters for children under the age of 7 years at the time of the visit;
- 2) Parsing risk assessment dates indicated in Tri-service Workflow (TSWF) records; Preventive Medicine Services text notes include the pre-populated text strings "PREVENTIVE SERVICES Date last updated:" and "SCREENING". Custom code extracted the risk assessment date from the entered text after the subsequent pre-populated string, ">> Lead (Per Local Guidelines) –".

⁶ Santoli JM, Lindley MC, DeSilva MB, et al. Effects of the COVID-19 Pandemic on Routine Pediatric Vaccine Ordering and Administration — United States, 2020. MMWR Morb Mortal Wkly Rep 2020;69:591–593. DOI: <http://dx.doi.org/10.15585/mmwr.mm6919e2>.

⁷ Czeisler MÉ, Marynak K, Clarke KE, et al. Delay or Avoidance of Medical Care Because of COVID-19–Related Concerns — United States, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1250–1257. DOI: <http://dx.doi.org/10.15585/mmwr.mm6936a4>

- 3) Retaining encounters with risk assessment dates from December 20, 2019 through August 15, 2020.

Unique patients meeting criteria one through three contributed to the final result.

DoD analysts identified test results in the CHCS or MHS Management and Reporting Tool laboratory Comprehensive Ancillary Data Record Extract (M2 CADRE lab) where the following criteria were met:

- 1) The name contained the character string “lead”;
- 2) The specimen source field (where available) contained the character string “blood”, “vein”, “cap”, “plasma”, or “serum”;
- 3) The order date ranged from December 20, 2019 through August 15, 2020;
- 4) The child’s age was less than seven years on the order date.

ZPP tests were excluded. The criteria for qualifying BLL tests in Section 3, Lead Testing were stricter than the criteria for qualifying laboratory results in Section 4, Lead Exposure Risk Screening because Section 4 describes evidence merely that a provider performed some sort of assessment of lead risk. In contrast, Section 3 directly addresses the NDAA requirement to quantify the total number of children tested for blood lead.

Finally, the analysts identified unique patients who met criteria for either a qualifying risk assessment date or blood lead test result and who therefore met criteria as having undergone screening for elevated risk of lead exposure.

Note the age criterion for ascertaining BLL tests in Section 3 was broader than the criterion in Section 4 which pertains to screening—where experts recommend focusing on children to age 6; therefore, to identify screening for elevated risk of lead exposure, the age criterion was less than 7 years. Such evidence in older children is more likely an indicator of *diagnostic* evaluation, not screening. In contrast, Section 3 addresses the NDAA requirement to quantify the number of children tested for BLL, regardless of screening intent.

Results

- A total of 39,117 lead exposure risk assessment dates from December 20, 2019 through August 15, 2020 were identified in children younger than seven years of age—corresponding to 18,694 individual children.
- Lead test results for 14,815 children met selection criteria. The number is higher than the number of children tested for BLL estimated in Section 3, Lead Testing because of the broader inclusion criteria.

- Accounting for the overlap (3,097 children) between the ascertainment of the two qualifying outcomes, 30,412 children were determined to be screened for lead.

Limitations

The M2 CADRE lab database includes some but not all MHS GENESIS laboratory data due to lags in data availability at the time of report preparation. Some of the completed screenings may have been missed in the above account due to the incompleteness, incomprehensibility, or complexity of some text records, and some records ascertained as a screening event might not be true screening events. An estimate of less than 5 percent of actual lead tests may have been missed. TSWF data is a legacy medical records system, and some data are not available from MHS GENESIS sites. MHS GENESIS captures data differently from the legacy medical records system. Finally, as with BLL testing results above, the ascertainment period overlapped substantially with a period of lower health services use. Counts are likely lower than what would be observed in the absence of the pandemic.

5. SUMMARY

For the time period from December 20, 2019 through August 15, 2020:

- DoD tested 12,044 children for blood lead level;
- DoD found 83 to have an elevated blood lead level; and
- DoD screened 30,412 children for elevated lead exposure risk.

6. ACRONYMS

BLL	Blood lead level
CDC	Centers for Disease Control and Prevention
CHCS	Composite Health Care System
DoD	Department of Defense
FY	Fiscal year
HL7	Health Level 7
MHS	Military Health System
M2 CADRE	Military Health System Management Analysis and Reporting Tool laboratory
	Comprehensive Ancillary Data Record Extract
NDAA	National Defense Authorization Act
TSWF	Tri-service Workflow
ZPP	Zinc protoporphyrin