



Army Quarterly Pediatric Lead Report (Calendar Year (CY) 2022 Quarter (Q2))

SECOND QUARTER HIGHLIGHT

1,339 Army Child Dependents

received a blood lead test between 1 April and 30 June 2022; 1.2% of those tests indicated an elevated blood lead level (e BLL). This quarterly report uses laboratory data based on the updated Centers for Disease Control and Prevention reference value for an e BLL ($\geq 3.5 \mu\text{g/dL}$).

INTRODUCTION

Lead is a naturally occurring heavy metal but can present an environmental and health hazard if it contaminates water, air, soil, or dust. In the U.S., the most common ways that people are exposed to lead are the inhalation or accidental ingestion of contaminated dust and soil as a result of aging or chipping lead-based paint.^{1,2} Lead-based paint was banned from use in the U.S. in 1978, but many homes built prior to the ban still exist in communities across the country. Other potential sources of lead exposure are contaminated water, ammunition, soldering equipment, as well as some foreign-made toys, ceramics, make-up, and packaged foods.

Lead is neurotoxic and can cause cognitive and behavioral issues, as well as gastrointestinal and hematological problems.^{2,3} Children are at higher risk of lead exposure because of their more frequent hand-to-mouth behavior. They are also more susceptible to the harmful effects of lead since the brain is in a period of rapid development during childhood.

Because children are at higher risk of poor health outcomes if exposed to lead, the American Academy of Pediatrics recommends that all children aged 6 months to 6 years, inclusive, be screened for increased risk of lead exposure via a parental questionnaire administered at routine well-child visits.³ Children who screen positive for an increased exposure risk should be tested for an elevated blood lead level (e BLL). Laws regarding lead exposure screening, testing, and reporting are established at the State level, and Army regulation directs installations to comply with State law.³

In 2021, the Centers for Disease Control and Prevention (CDC) lowered the e BLL reference value from 5 micrograms per deciliter ($\mu\text{g/dL}$) to $3.5 \mu\text{g/dL}$.⁴ This updated reference value was derived from the 97.5th percentile of the blood lead values among U.S. children aged 1 to 5 years, resulting from the 2015–2016 and 2017–2018 National Health and Nutrition Examination Survey cycles. The CDC reference value should not be interpreted as a “safe” level, and the CDC continues to stress that there is no safe level of lead exposure.

In October 2018, e BLLs were established as a reportable medical event (RME) for Army dependents aged 0 to 6 years, according to the Army Lead Hazard Management Control Program.⁵ Army dependents with e BLLs must be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division guidelines. The Tri-Service Reportable Medical Event Working Group is in the process of updating the case definition of the elevated blood lead RME to reflect the change in the CDC reference value.

This quarterly report tracks all available BLL laboratory test results within the Army dependent population and monitors the occurrence of e BLLs. This iteration uses the new CDC reference value for e BLL ($3.5 \mu\text{g/dL}$).

METHODS

Laboratory Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army dependents from the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system and Military

Health System (MHS) GENESIS. Records are dated according to the BLL collection date, and this report covers test results collected from 1 April through 30 June 2022 (CY2022 Q2). The data include all BLL test results above and below the eBLL cutoff collected within the MHS. These include test results for Army dependents who receive care at Army medical treatment facilities (MTFs) and other Department of Defense facilities. Test results were excluded from the analysis when the unit of measure or the result could not be determined, or the biological sample was not blood.⁶ Zinc photoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=10) were also not included as these tests are not considered in the case definition in the *Armed Forces Reportable Medical Events – Guidelines and Case Definitions*⁷, hereafter referred to as the Armed Forces RME Guidelines.

Only BLL results for Army dependents aged 0 to 6 years were analyzed for this report. According to the Armed Forces RME Guidelines, a child can be counted as an eBLL case only once per calendar year.⁷ If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2022 Q2, the highest BLL result was retained. The frequency of BLL test results is displayed by BLL range (<3.5 µg/dL, 3.5–9 µg/dL, 10–19 µg/dL, ≥20 µg/dL), Regional Health Command (RHC), and installation. Results ≥3.5 µg/dL are considered elevated. All CY2022 Q2 eBLL test results are reported.

Disease Reporting System, Internet Data

The DRSi is a tri-service reportable medical event system. Since 18 October 2018, eBLLs have been reportable through the DRSi for children aged 0 to 6 years.⁵ The Armed Forces RME Guidelines case definition for an eBLL (≥5 µg/dL) has not been updated to reflect the current CDC cut-off value (3.5 µg/dL).⁷ Therefore, only eBLL cases that meet the current Armed Forces RME Guidelines case definition are included in the summary of DRSi data and in the reporting compliance calculation described below. Only Army dependent cases reported to DRSi are included in this report. Among Army dependents, DRSi cases with medical event report dates from 1 April through 30 June 2022 were counted.

DRSi Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, cases with test collection dates during CY2022 Q2 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of eBLL laboratory results within CHCS and MHS GENESIS collected during CY2022 Q2 that were also reported via a medical event report in DRSi. Only eBLL cases that meet the current Armed Forces RME Guidelines case definition for eBLL (≥5 µg/dL) were counted in the compliance measure.⁷

Army Public Health Nurses Program Status Report (APHN-PSR)

Starting in April 2019, specific questions regarding childhood lead exposure were included in the APHN-PSR to assess the Environmental Health Hazard Management Control Program.⁸ As part of installation safety and housing office-led environmental investigations, the installation’s Department of Public Health (Preventive Medicine Services) conducts parent/guardian interviews after a child 6 years of age or younger is confirmed to have an eBLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: (1) number of pediatric BLL tests conducted in the past fiscal quarter reported to the State/local authorities; (2) number of confirmed elevated pediatric BLL test results in the past fiscal quarter reported to the State/local authorities per the State/local reporting requirements.

RESULTS

Laboratory Test Results

During CY2022 Q2, 1,339 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 16 of those results (1.2%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1. Because of the lower reference value for eBLL, eight additional children with an eBLL were identified. In CY2022 Q2, no child’s BLL exceeded the level at which chelation therapy is typically recommended (≥45 µg/dL) or fell within the highest range (≥20 µg/dL, Table 1).

Table 1. Total Count of Pediatric (ages 0–6) Blood Lead Levels in CY2022 Q2

BLL Ranges (µg/dL)	CY2022 Q2 n (%)
<3.5	1,323 (98.8%)
3.5–9	15 (1.1%)
10–19	1 (0.1%)
≥20	0 (0%)
Total	1,339 (100%)

Thirteen of the elevated results in CY2022 Q2 are new eBLL cases. Three Army dependents with an elevated result in CY2022 Q2 had an elevated result reported previously in CY2022. In the first half of CY2022, there were a total of 31 Army dependents with an eBLL (Figure 1).

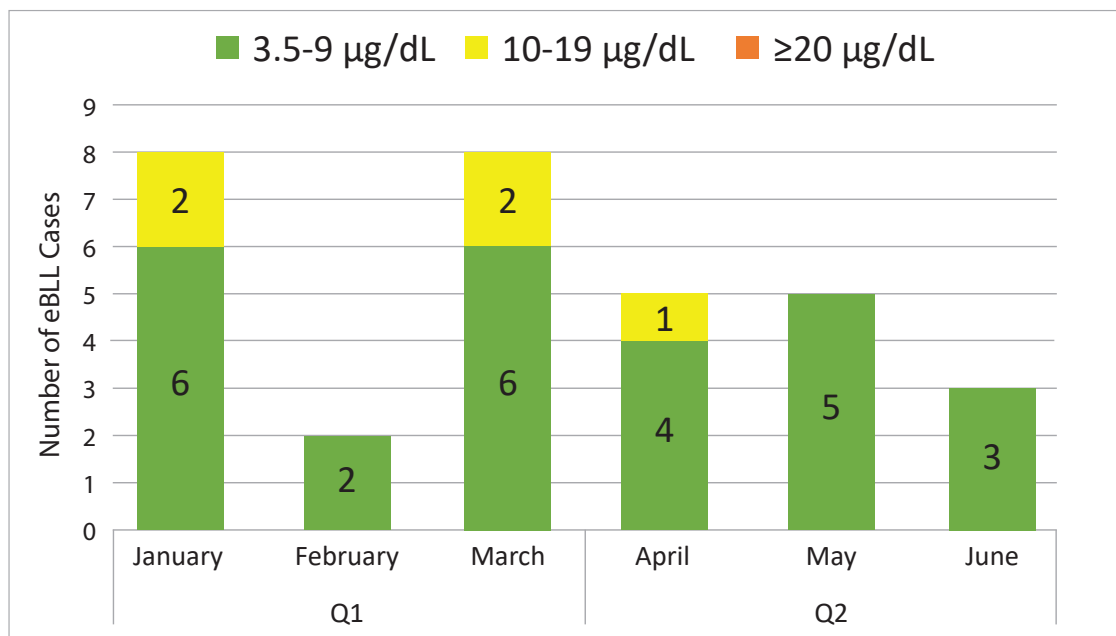


Figure 1. Number of Elevated Blood Lead Cases (≥ 3.5 µg/dL) by Month in CY2022
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2022 Q2 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Bragg (1), Ft. Lee (2), Ft. Leonard Wood (1), Ft. Sill (2), Ft. Stewart (3), Joint Base (JB) Langley-Eustis (1), JB McGuire-Dix-Lakehurst (1), JB San Antonio (3), West Point (1), and JB Charleston (1). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2022 Q2.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q2

REGION	BLL Ranges				Total
	<3.5 µg/dL	3.5–9 µg/dL	10–19 µg/dL	≥ 20 µg/dL	
ATLANTIC					
Aberdeen Proving Ground	28	0	0	0	28
Carlisle Barracks	2	0	0	0	2
Ft. Belvoir	78	0	0	0	78
Ft. Benning	70	0	0	0	70
Ft. Bragg*	64	1	0	0	65
Ft. Campbell	44	0	0	0	44
Ft. Detrick	9	0	0	0	9
Ft. Drum	70	0	0	0	70
Ft. Jackson	2	0	0	0	2
Ft. Knox	34	0	0	0	34
Ft. Lee*	19	2	0	0	21
Ft. Meade	35	0	0	0	35
Ft. Rucker	27	0	0	0	27
Ft. Stewart*	33	2	1	0	36
Redstone Arsenal	3	0	0	0	3
Walter Reed NMMC	14	0	0	0	14
West Point*	18	1	0	0	19

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q2

REGION	BLL Ranges				Total
	<3.5 µg/dL	3.5–9 µg/dL	10–19 µg/dL	≥20 µg/dL	
CENTRAL					
Ft. Bliss	191	0	0	0	191
Ft. Carson	19	0	0	0	19
Ft. Hood	90	0	0	0	90
Ft. Huachuca	2	0	0	0	2
Ft. Irwin	1	0	0	0	1
Ft. Leavenworth	17	0	0	0	17
Ft. Leonard Wood*	23	1	0	0	24
Ft. Polk	13	0	0	0	13
Ft. Riley	31	0	0	0	31
Ft. Sill*	36	2	0	0	38
PACIFIC					
Camp Humphreys	5	0	0	0	5
Camp Zama	2	0	0	0	2
Ft. Shafter	11	0	0	0	11
Ft. Wainwright	13	0	0	0	13
Schofield Barracks	20	0	0	0	20
EUROPE					
Grafenwoehr	15	0	0	0	15
Kaiserslautern	1	0	0	0	1
Landstuhl	28	0	0	0	28
Vicenza	10	0	0	0	10
Vilseck	17	0	0	0	17
JOINT BASES					
JB Elmendorf-Richardson	5	0	0	0	5
JB Langley-Eustis*	42	1	0	0	43
JB Lewis-McChord	9	0	0	0	9
JB Little Creek-Ft. Story	2	0	0	0	2
JB McGuire-Dix-Lakehurst*	4	1	0	0	5
JB Meyer-Henderson Hall	4	0	0	0	4
JB San Antonio*	58	3	0	0	61
USAF MTF**					
	80	1	0	0	81
NAVAL/MARINE CORPS MTF**					
	24	0	0	0	24

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2022 Q2

** See Appendix A for the list of USAF, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2022 Q2.

DRSi Reporting Results

Four eBLL cases among Army dependents were reported in DRSi during CY2022 Q2. Ft. Drum, Ft. Riley, Ft. Sill, and JB Langley-Eustis each reported one case. Due to differences in the report date compared to the test collection date in the DRSi system, one child had a BLL test result from CY2021 Q4 reported, one child had a result from CY2022 Q1 reported, and two had results from CY2022 Q2 reported.

DRSi Reporting Compliance

Six out of the 13 new eBLL cases identified in the CHCS and MHS GENESIS laboratory data met the Armed Forces RME Guidelines case definition for eBLL. One of these cases was reported to DRSi; a 17% reporting compliance for CY2022 Q2. Ft. Sill, Ft. Stewart, JB Charleston, JB San Antonio, and West Point, each had one unreported eBLL case from CY2022 Q2.

Army Public Health Nurses Program Status Report (APHN-PSR)

The results of the APHN-PSR indicated that a total of 782 BLL test results were reported to State and/or local authorities during CY2022 Q2 (Table 3). The APHN-PSR question related to pediatric lead is relevant for installations located in State and local jurisdictions that require reporting of all BLL test results, including those below 3.5 µg/dL (e.g., Louisiana, New York, North Carolina). RHC-Central reported the most BLL test results to State and local authorities (n=507), followed by RHC-Atlantic (n=269) and RHC-Europe (n=6). Four (0.5%) of those results (n=782) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the APHN-PSR by Region and Installation, CY2022 Q2

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft. Belvoir	258	0
Ft. Gordon	1	0
JB Langley-Eustis	6	1
Redstone Arsenal	4	0
CENTRAL		
Ft. Bliss	210	0
Ft. Carson	50	0
Ft. Hood	161	0
Ft. Huachuca	6	0
Ft. Leavenworth	1	1
Ft. Polk	27	0
Ft. Riley	9	1
JB San Antonio	43	1
EUROPE		
Baumholder	6	0

Note: Installations that are not listed did not report BLL tests or eBLL (≥3.5 µg/dL) tests.

DISCUSSION

Approximately 1.2% of the results of BLL tests performed in CY2022 (1 April – 30 June 2022) indicated eBLLs. Because of the lower reference value for eBLL, eight additional children with an eBLL were identified. The number of Army dependents tested during CY2022 Q2 (n=1,339 BLL tests) compared to CY2021 Q2 (n=2,301 BLL tests) decreased by 42%. It is unclear whether the decrease in blood lead test results is due the transition of more installations to MHS GENESIS, more dependents seeking care outside the MHS, or the continued impact of the COVID-19 pandemic on preventive care.⁹

Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to both prevent childhood lead exposure and monitor children with an eBLL to ensure each case receives proper treatment and management. Reporting eBLLs to DRSi is an important aspect of that control and prevention program. This quarter, reporting compliance was low, with military MTFs reaching 17% reporting compliance. This rate is lower than any at point in CY2021 (Q1–Q4 reporting compliance range: 29–88%). While RME reporting has become more challenging during the COVID-19 pandemic and the transition to MHS GENESIS, improvement of eBLL case reporting is critical to reliably identifying installations where children may be at increased risk of lead exposure. Children with an eBLL are reportable to DRSi once per calendar year. Contact the Disease Epidemiology Branch (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil) for any questions regarding DRSi reporting of eBLLs.

LIMITATIONS

LIMITATIONS

This report may not include all Army dependent BLL test results. The NMCPHC extracted the blood lead laboratory results from CHCS one month after the end of Q2 to minimize the chance of missing any results collected during that quarter. However, it is still possible that some of the results were not certified by the laboratory and entered into CHCS or MHS GENESIS at the time the Navy performed the data extraction.

The inclusion of MHS GENESIS laboratory data in this report is new. The MHS GENESIS data provided by the NMCPHC were included in this report to provide some visibility on the installations that have converted to that electronic medical record system. At the time of this publication, these include Ft. Benning, Ft. Bliss, Ft. Bragg, Ft. Carson, Ft. Gordon, Ft. Irwin, Ft. Leavenworth, Ft. Leonard Wood, Ft. Riley, Ft. Shafter, Ft. Stewart, Ft. Wainwright, JB Elmendorf-Richardson, JB Lewis-McChord, JB San Antonio, Presidio of Monterey, and Schofield Barracks. However, the NMCPHC has communicated concerns about the quality and completeness of these data. In addition, only BLLs collected within the MHS are available through either CHCS or MHS GENESIS, meaning blood samples collected and tested outside the MHS are not represented in this report.

To improve BLL surveillance, the Army established a RME for eBLLs in children 0 to 6 years old. The USAF similarly reports eBLLs through DRSi. The Armed Forces RME Guidelines elevated blood lead case definition has not been updated to reflect the current CDC reference value, so children with a BLL of 3.5 – 5 µg/dL may not have been reported to DRSi. The Navy relies solely on laboratory data and does not report eBLLs through DRSi, so it is possible that those cases will not be immediately visible to the APHC. However, the data from CHCS/MHS GENESIS show that there were no eBLLs among the Army dependents who received BLL tests at Navy or Marine Corps MTFs.

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Appendix A

Table A-1. U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test, CY2022

USAF Bases	Naval/Marine Corps Stations
Davis-Monthan AFB	Indian Head
Dover AFB	JB Marianas Guam-Andersen
Eglin AFB	Portsmouth
Hill AFB	Quantico
JB Anacostia-Bolling	Suffolk
JB Andrews	Virginia Beach
JB Charleston	
Kadena AB	
Luke AFB	
MacDill AFB	
Maxwell AFB	
McConnell AFB	
Misawa AB	
Osan AB	
Patrick AFB	
Peterson AFB	
Sheppard AFB	
Spangdahlem AB	
Tinker AFB	
Travis AFB	
USAF Academy	
Wright-Patterson AFB	