



DCPH-A

Army Annual Pediatric Lead Report Calendar Year (CY) 2023

ANNUAL HIGHLIGHT

5,276 Army Child Dependents

received a blood lead test between 1 January and 31 December 2023;

0.8% of those tests indicated an elevated blood lead level (eBLL ≥ 3.5 $\mu\text{g}/\text{dL}$). Among child dependents tested within the Military Health System, the rate of eBLL in CY2023 was 7.9 per 1,000 children.

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 (eBLL). 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 eBLL reference value from 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$) to 3.5 $\mu\text{g}/\text{dL}$.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, eBLLs 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 Based on the Defense Health Agency’s Armed Forces Health Surveillance Division guidelines, Army dependents with eBLLs must be reported to the Disease Reporting System internet (DRSi). In November 2022, the Tri-Service Reportable Medical Event Working Group updated the case definition of the elevated blood lead RME to reflect the change in the CDC reference value.

This annual report tracks all available BLL laboratory test results within the Army dependent population and monitors the occurrence of eBLLs.

METHODS

Laboratory Data

The Defense Centers for Public Health – Portsmouth (DCPH-P) 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 October through 31 December 2023 (CY2023 Q4), as well as a summary of all CY2023 results. 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 medical treatment facilities (MTFs) on Army installations 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 protoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=99) 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 CY2023 Q4, 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), Medical Readiness Command (MRC), and installation. Results ≥3.5 µg/dL are considered elevated. All CY2023 Q4 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 Only Army dependent cases reported to DRSi are included in this report. Among Army dependents, DRSi cases with medical event report dates from 1 October through 31 December 2023 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 CY2023 Q4 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 CY2023 Q4 that were also reported via a medical event report in DRSi.

Public Health Nurses Program Status Report (PHN-PSR)

Starting in April 2019, specific questions regarding childhood lead exposure were included in the PHN-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 PHN-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 CY2023, 5,276 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 42 of those results (0.8%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1. Because of the lower reference value for eBLL, 20 additional children with an eBLL were identified. In CY2023, 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). When repeat blood lead tests were examined 12 out of the 42 (28.6%) with elevated results within the calendar year had a follow-up blood lead test result below the CDC cut-off for elevated blood lead by the end of CY2023 (i.e., <3.5 µg/dL).

Table 1. Total Count of Pediatric (ages 0–6) Blood Lead Levels in CY2023

BLL Ranges (µg/dL)	CY2023 Q4 n (%)	CY2023 n (%)
<3.5	1,792 (99%)	5,234 (99.2%)
3.5–9	15 (0.8%)	36 (0.7%)
10–19	3 (0.2%)	6 (0.1%)
≥20	0	0
Total	1,810 (100%)	5,276 (100%)

In CY2023 Q4, 1,810 Army dependents received a blood lead test within the MHS, and 18 of those results (1%) were elevated ($\geq 3.5 \mu\text{g/dL}$) (Table 1). Seventeen of the elevated results in CY2023 Q4 are new eBLL cases. One Army dependent with an elevated result in CY2023 Q4 had an elevated result reported previously in CY2023. Figure 1 summarizes the number of elevated test results from each month in CY2023.

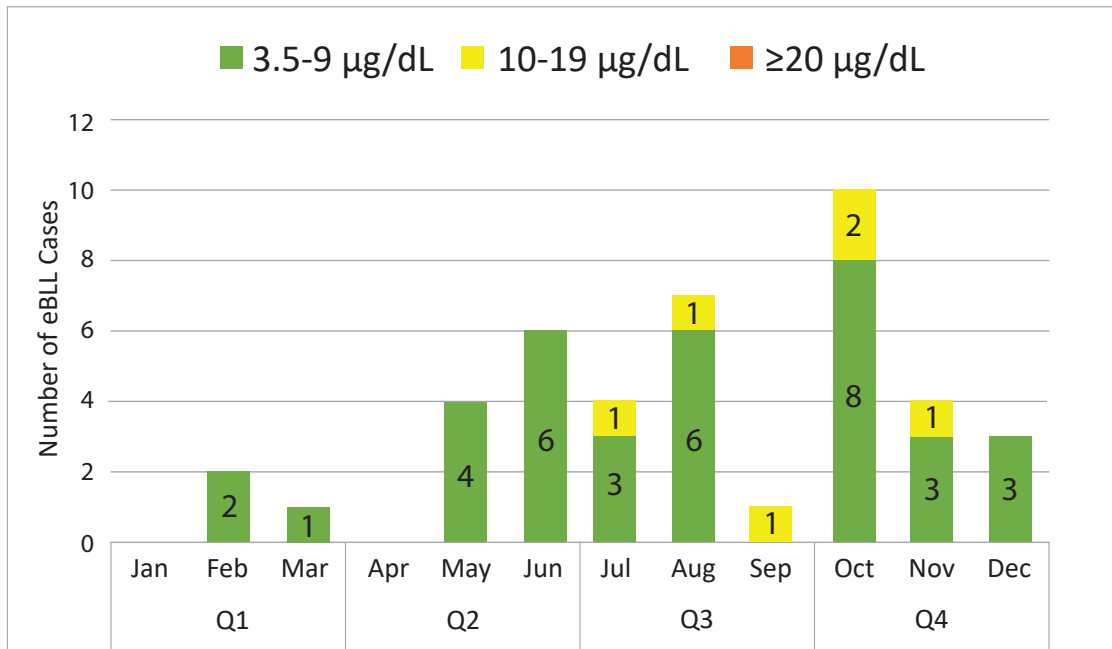


Figure 1. Number of Elevated Blood Lead Cases ($\geq 3.5 \mu\text{g/dL}$) by Month in CY2023
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2023 were retained for each child dependent; Table 2 summarizes these BLLs by MRC and installation. The elevated BLL results were from Fort (Ft.) Bliss (7), Ft. Campbell (1), Ft. Carson (1), Ft. Cavazos (3), Ft. Drum (4), Ft. Irwin (1), Ft. Johnson (1), Ft. Leavenworth (1), Ft. Leonard Wood (1), Ft. Liberty (4), Ft. Moore (3), Ft. Novosel (1), Ft. Riley (2), Ft. Shafter (1), Ft. Sill (1), Ft. Stewart (2), Ft. Wainwright (1), Joint Base (JB) San Antonio (1), Landstuhl (1), MacDill Air Force Base (AFB) (1), Maxwell AFB (1), Schofield Barracks (2), and Vicenza (1). Appendix A shows a list of U.S. Air Force (USAF), Space Force, Marine Corps, and Navy locations where Army dependents received BLL testing during CY2023.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023

MRC	BLL Ranges				Total
	<3.5 µg/dL	3.5–9 µg/dL	10–19 µg/dL	≥20 µg/dL	
EAST					
Aberdeen Proving Ground	52	0	0	0	52
Carlisle Barracks	4	0	0	0	4
Ft. Belvoir	142	0	0	0	142
Ft. Buchanan	1	0	0	0	1
Ft. Campbell*	152	1	0	0	153
Ft. Detrick	26	0	0	0	26
Ft. Drum*	231	4	0	0	235
Ft. Eisenhower	6	0	0	0	6
Ft. Gregg-Adams	39	0	0	0	39
Ft. Jackson	5	0	0	0	5
Ft. Knox	97	0	0	0	97
Ft. Liberty*	388	3	1	0	392
Ft. Meade	91	0	0	0	91
Ft. Moore*	165	2	1	0	168
Ft. Novosel*	77	1	0	0	78
Ft. Stewart*	193	2	0	0	195

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023

MRC	BLL Ranges				Total
	<3.5 µg/dL	3.5–9 µg/dL	10–19 µg/dL	≥20 µg/dL	
Redstone Arsenal	9	0	0	0	9
Walter Reed NMMC	20	0	0	0	20
West Point	37	0	0	0	37
WEST					
Ft. Bliss*	535	5	2	0	542
Ft. Carson*	162	1	0	0	163
Ft. Cavazos*	508	3	0	0	511
Ft. Huachuca	19	0	0	0	19
Ft. Irwin*	3	1	0	0	4
Ft. Johnson*	143	1	0	0	144
Ft. Leavenworth*	66	1	0	0	67
Ft. Leonard Wood*	127	0	1	0	128
Ft. Riley*	281	2	0	0	283
Ft. Sill*	136	0	1	0	137
PACIFIC					
Camp Zama	3	0	0	0	3
Ft. Shafter*	152	1	0	0	153
Ft. Wainwright*	64	1	0	0	65
Schofield Barracks*	252	2	0	0	254
USAG Humphreys	3	0	0	0	3
EUROPE					
Baumholder	1	0	0	0	1
Grafenwoehr	50	0	0	0	50
Hohenfels	7	0	0	0	7
Kaiserslautern	4	0	0	0	4
Landstuhl*	97	1	0	0	98
Vicenza*	38	1	0	0	39
Vilseck	63	0	0	0	63
Wiesbaden	1	0	0	0	1
JOINT BASES					
JB Elmendorf-Richardson	49	0	0	0	49
JB Langley-Eustis	66	0	0	0	66
JB Lewis-McChord	52	0	0	0	52
JEB Little Creek-Ft Story	3	0	0	0	3
JB McGuire-Dix-Lakehurst	10	0	0	0	10
JB Meyer-Henderson Hall	3	0	0	0	3
JB San Antonio*	241	1	0	0	242
USAF MTF**					
	272	2	0	0	274
NAVAL/MARINE CORPS MTF**					
	88	0	0	0	88

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2023

** See Appendix A for the list of USAF, Space Force, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2023.

DRSi Reporting Results

Among Army dependents, 15 eBLL cases were reported in DRSi during CY2023 Q4. Due to the differences in the report date compared to the test collection date in the DRSi system, two children had BLL test results from CY2023 Q1 reported, two children had BLL test results from CY2023 Q3 reported, and the remaining 11 had test results from CY2023 Q4 reported.

A total of 63 e BLL cases among Army dependents were reported in DRSi during CY2023. Of note, 18 of the results were late reports from e BLL results in CY2022 (Ft. Bliss (3), Ft. Liberty (14), JB San Antonio (1)). Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels (e BLL) Were Reported through DRSi, CY2023

Installation	Number of e BLL* reports	
	CY2023 Q4	CY2023
Ft. Bliss	2	9
Ft. Campbell	1	1
Ft. Cavazos	3	7
Ft. Drum	2	7
Ft. Johnson	0	3
Ft. Knox	0	1
Ft. Leonard Wood	0	1
Ft. Liberty	3	20
Ft. Moore	0	2
Ft. Novosel	0	1
Ft. Riley	1	2
Ft. Stewart	0	1
JB San Antonio	0	2
Landstuhl	0	1
Tripler Army Medical Center	1	2
JB Elmendorf-Richardson	1	1
Vicenza	0	1
Wright-Patterson AFB	1	1
Total	15	63

*e BLL ≥ 3.5 $\mu\text{g}/\text{dL}$

Note: Case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

DRSi Reporting Compliance

Fifteen of the 17 new e BLL cases identified in the laboratory data in CY2023 Q4 were reported to DRSi, an 88% reporting compliance. Ft. Irwin and MacDill AFB each had one unreported e BLL during CY2023 Q4.

Public Health Nurses Program Status Report (PHN-PSR)

The results of the PHN-PSR indicated that a total of 1,303 BLL test results were reported to State and/or local authorities during CY2023 Q4 (Table 3). The PHN-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 $\mu\text{g}/\text{dL}$ (e.g., Louisiana, New York, North Carolina). MRC-West reported the most BLL test results to State and local authorities (n=723), followed by MRC-East (n=309) and MRC-Pacific (n=271). Twelve (0.9%) of those results (n=1,303) indicated elevated BLLs.

Table 4. Blood Lead Levels (BLL) Reported through the PHN-PSR by Medical Readiness Command and Installation, CY2023 Q4

MRC	Number of BLL tests reported to the State/local authorities	Number of e BLL tests reported to the State/local authorities
EAST		
Ft. Belvoir	122	0
Ft. Campbell	0	1
Ft. Drum	102	2
Ft. Liberty	1	1
Ft. Novosel	38	0
JB Langley-Eustis	46	0
WEST		
Ft. Bliss	235	2

Table 4 (continued). Blood Lead Levels (BLL) Reported through the PHN-PSR by Medical Readiness Command and Installation, CY2023 Q4

MRC	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
Ft. Carson	16	0
Ft. Cavazos	160	2
Ft. Johnson	74	0
Ft. Leavenworth	25	0
Ft. Leonard Wood	60	0
Ft. Riley	1	1
Ft. Sill	45	1
JB San Antonio	107	0
PACIFIC		
Ft. Wainwright	24	0
JB Lewis-McChord	37	1
Tripler AMC/Schofield Barracks	210	1

Installations that are not listed did not report BLL tests or eBLL (≥ 3.5 $\mu\text{g}/\text{dL}$) tests.

DISCUSSION

Less than 1% of the results of BLL tests performed in CY2023 (1 January – 31 December 2023) indicated eBLLs. Because of the lower reference value for eBLL, 20 additional children with an eBLL were identified. The number of Army dependents tested during CY2023 (n=5,276 BLL tests) was similar to the number tested in CY2022 (n=5,644 BLL tests).

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 high, with MTFs reaching 88% reporting compliance (Q1 – Q3 reporting compliance range: 0 – 92%). 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 (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil) for any questions regarding DRSi reporting of eBLLs.

LIMITATIONS

Across the MHS, the transition to the MHS GENESIS electronic medical record system is almost complete. The MHS GENESIS data provided by the DCPH-P were included in this report to provide visibility on the installations that have converted to that electronic medical record system. However, the DCPH-P has communicated concerns about the quality and completeness of these data.

This report may not include all Army dependent BLL test results. The DCPH-P extracted the blood lead laboratory results from CHCS and MHS GENESIS one month after the end of Q4 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 DCPH-P performed the data extraction. 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.

REFERENCES

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Appendix A

Table A-1. U.S. Air Force, Space Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test, CY2023

USAF/Space Force Bases	Naval/Marine Corps Stations
Altus AFB	Annapolis
Aviano AB	Camp Lejeune
Barksdale AFB	Cherry Point
Beale AFB	Chesapeake
Buckley SFB	Indian Head
Cannon AFB	Joint Region Marianas
Davis-Monthan AFB	JB Pearl Harbor-Hickam
Dover AFB	Kaneohe
Edwards AFB	Lemoore
Eglin AFB	Norfolk
Eielson AFB	North Chicago
Ellsworth AFB	Okinawa
F.E. Warren AFB	Patuxent River
Fairchild AFB	Portsmouth VA
Geilenkirchen AB	Quantico
Goodfellow AFB	San Diego
Grand Forks AFB	Suffolk
Hanscom AFB	Virginia Beach
Hill AFB	
Holloman AFB	
Hurlburt Field	
JB Anacostia-Bolling	
JB Andrews	
JB Charleston	
Kadena AB	
Keesler AFB	
Laughlin AFB	
Little Rock AFB	
MacDill AFB	
Malmstrom AFB	
Maxwell AFB	
McConnell AFB	
Moody AFB	
Mountain Home AFB	
Nellis AFB	
Offutt AFB	
Osan AB	
Patrick SFB	
RAF Lakenheath	
Ramstein AB	
Scott AFB	
Seymour Johnson AFB	
Tinker AFB	
Travis AFB	
USAF Academy	
Wright-Patterson AFB	