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Lead, a naturally occurring heavy metal is not an essential element to human functioning and can be a health hazard. The fetus, infants and young children are most susceptible to harmful effects since the brain is in a period of rapid development. Children also can have more exposure from frequent hand-to-mouth behavior which can lead to higher lead doses by body weight than those of at-risk adults. Most U.S. adults and children have some amount of lead in their bodies because it is ubiquitous in the environment. The specific laws regarding lead exposure screening, testing, and reporting are established at the state level. However, a national blood lead reference value (BLRV) limit is recommended by the CDC: the elevated blood lead limit (BLL) was 5.0 ug/L blood up through 2022, when CDC lowered it to 3.5 ug/L. Army regulation directs installations to comply with state law. While most states require reporting BLL results above the CDC's 3.5 µg/dL, some states (Louisiana, New York, North Carolina) require reporting *all* lead levels, including below 3.5 µg/dL. The DCPH-A has supported the Army's child lead exposure program since 2019 by publicly providing quarterly pediatric blood lead surveillance reports. This document summarizes the surveillance findings of reported elevated blood lead levels (eBLLs) among Army dependents aged 0 to 6 years between 2019 and 2023. Over the 5 years (2019–2023), Army dependents with blood samples collected and tested had lower levels showed lower blood level levels than the (2015–2018) national data available at time of this TIP; though national levels may also be falling.

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TIP No. 031-0524

ARMY PEDIATRIC BLOOD LEAD REPORTING: SUMMARY OF MILITARY HEALTH SURVEILLANCE REPORTS, 2019–2023

This technical information paper summarizes the surveillance findings of reported elevated blood lead levels (eBLLs) among Army dependents aged 0 to 6 years between 2019 and 2023.

1. BACKGROUND

a. Lead hazard. Lead, a naturally occurring heavy metal in the environment that is not an essential element to human functioning, can be a health hazard to humans.

(1) *Health effects*. Lead is neurotoxic and can cause cognitive and behavioral dysfunction, as well as gastrointestinal and hematological problems in both adults and children (References 1–5). The Centers for Disease Control and Prevention (CDC)'s National Institute for Occupational Safety and Health (NIOSH) requires adults who may be exposed to lead in the workplace to be monitored and removed if exposures are too high, especially pregnant women (Reference 5). In addition to the fetus, infants and young children are most susceptible to harmful effects of lead since the brain is in a period of rapid development. Children also can have more exposure from frequent hand-to-mouth behavior which can lead to higher lead doses by body weight than those of at-risk adults.

(2) *Exposures*. Prior to the Clean Air Act's national ban on leaded gasoline implemented in 1996, the primary source of lead exposure in the U.S. population was from inhalation of lead in vehicle exhaust (References 1–4). Today inhalation or accidental ingestion of contaminated dust and soil from aging or chipping lead-based paint (LBP) is the most common exposure. Though LBP was banned in the U.S. in 1978, many homes built prior 1978 have LBP as either the primary paint surface or under newer lead-free paint. The LBP becomes a hazard when exposed from chipping, renovation, or when a child is teething on a surface (such as on a window ledge). Other sources of lead noted by the CDC are contaminated water from lead piping, certain jewelry, foreign-made toys, ceramics, make-up, and packaged foods. Certain baby foods are also a concern. Children living near airports may be exposed to lead in air and soil from aviation fuel. Also, adults may bring lead into the home from dust on jobs and hobbies involving lead-containing products such as ammunition, fishing tackle, or stained glass.

b. National guidance for monitoring children for lead exposure. Though lead is not a substance meant to be in the body, most U.S. adults and children have some amount of lead in their bodies because it is ubiquitous in the environment. The specific laws regarding lead exposure screening, testing, and reporting are established at the state level. However, the following guidelines summarize key national criteria.

(1) CDC criteria (Reference 4, 6). Until 2012, the CDC had identified levels greater than or equal to 10 micrograms per deciliter of blood (µg/dL) as a lead "level of concern." In 2012, the CDC instead established a "blood lead reference value" (BLRV) of 5 µg/dL that corresponded to the 97.5th percentile of the blood lead values among U.S. children aged 1 to 5 years in the 2007–2010 National Health and Nutrition Examination Survey (NHANES) data set. In 2021, the CDC lowered the BLRV from 5 µg/dL to 3.5 µg/dL to reflect the updated 97.5th percentile of child blood level in the NHANES 2015–2016 and 2017–2018 cycles. The CDC continues to stress that there is no safe level of lead and that the BLRV should not be interpreted as a "safe" level, as it is not health-based.

(2) Testing guidance (Reference 4). To identify children who exceed the CDC's BLRV, the American Academy of Pediatrics recommends that all children aged 6 months to 6 years, inclusive, be screened for increased risk of lead exposure with a parental questionnaire that is administered at routine well-child visits. According to the American Academy of Pediatrics recommendation, children who are identified from the questionnaire as having an increased exposure risk (i.e., they screen positive) should be tested for an elevated blood lead level (eBLL).

c. Military pediatric blood lead level (BLL) data collection (References 7–8). The Defense Centers for Public Health–Portsmouth (DCPH-P) provides BLL laboratory results from the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system and the Military Health System (MHS) GENESIS system for all military child dependents who receive care at Department of Defense medical treatment facilities (MTFs). Records are dated according to the blood sample collection date. Data for all BLL test results, above and below the eBLL cutoff, are documented either in the CHCS Armed Forces Health Longitudinal Technology Application or MHS GENESIS. MHS GENESIS laboratory data provided by the DCPH-P are included to provide visibility on the installations that have converted to that electronic medical record system. However, DCPH-P data specialists have expressed concerns about the quality and completeness of these data. Therefore, the reported data may not include BLL test results for all Army dependents. One reason for the limitation is a potential time delay for certified laboratory data to be reported. In addition, because blood samples collected and tested outside the MHS are not available to the military for analyses, such samples are not represented in military surveillance reports.

d. Army pediatric blood lead monitoring and reporting. Army regulation directs installations to comply with state law (References 9–10). While most states require reporting of BLL results above the CDC's BLRV of 3.5 µg/dL, some states (e.g., Louisiana, New York, North Carolina) require reporting of all lead levels, including those below 3.5 µg/dL, to state or local health departments. Additionally—

(1) According to a Defense Health Agency Decision Memorandum, dependents aged 0 to 6 years with eBLLs from a venous blood sample must be reported to the Disease Reporting System internet (DRSi) as a reportable medical event (RME) per Defense Health Agency Armed Forces Health Surveillance Division (AFHSD) guidelines (References 11–13).

(a) From October 2018 through October 2022, the eBLLs for RMEs were determined using the previous CDC reference value of 5 µg/dL.

(b) In November 2022, the AFHSD case definition for an eBLL RME was updated to 3.5 µg/dL to reflect the new CDC reference value (Reference 13).

(2) As part of each Army installation's 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.

(a) Since April 2019, specific questions regarding childhood lead exposure were included in the Public Health Nurses Program Status Report (PHN-PSR) to assess installations' Environmental Health Hazard Management Control Program.

(b) 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; and (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.

(3) The DCPH-A has supported the Army's child lead exposure program since 2019 by publicly providing quarterly pediatric blood lead surveillance reports.

(a) These reports include a summary of the number of Army dependents 0 to 6 years of age with a BLL test result, above or below the CDC BLRV, in the MHS laboratory data (provided by DCPH-P).

(b) Test results are excluded from the Army analysis when the unit of measure or the result cannot be determined, or the biological sample is not blood. Zinc photoporphyrin (ZPP), point of care (POC), and capillary blood tests are also not included as these tests are not considered in the AFHSD RME case definition (Reference 13).

(c) For the summaries of elevated results, the eBLL standard used in the reports was ≥ 5.0 µg/dL from 2019 to 2021; since then, results ≥3.5 µg/dL are considered elevated.

(d) Per the AFHSD guidance, a child is counted as an eBLL case only once per calendar year. If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during a calendar year, the highest BLL result is used for the report.

(e) From 2019–2021, Army reports present frequency of BLL test results by BLL range (<5 µg/dL, 5–9 µg/dL, 10–19 µg/dL, ≥20 µg/dL). From 2022 through 2023, Army reports present frequency of BLL test results by BLL range (<3.5 µg/dL, 3.5–9 µg/dL, 10–19 µg/dL, ≥20 µg/dL). In all reports, BLL test results are also summarized by Medical Readiness Command (MRC) and installation.

(f) The number of dependents with an eBLL reported to DRSi are summarized and compared to the laboratory test results. Because eBLLs are a required RME, the DCPH-A reports also describe DRSi Reporting Compliance.

2. ARMY PEDIATRIC BLOOD LEAD FINDINGS, 2019–2023

This document summarizes the BLL test results for Army dependents for test results collected from 1 January 2019 through 31 December 2023 (5 years).

a. From 2019 through 2023, over 41,000 blood lead tests were collected within the MHS among Army dependents aged 0 to 6 years (Tables 1a and 1b). However, the number of dependents with a blood lead test result within the available MHS laboratory data declined by 56% from 2019 to 2023. From 2019 through 2021, the average annual prevalence of eBLL was 0.4%. When the CDC BLRV was lowered from 5 to 3.5 µg/dL, the average annual prevalence increased slightly to 1.2%. Because of the lower reference value, an additional 68 children with an eBLL were identified from 2022 to 2023.

Table 1a. Total Count of Pediatric (0–6 years) Blood Lead Levels, CY2019–2021

BLL Ranges (µg/dL)	CY2019 n (%)	CY2020 n (%)	CY2021 n (%)
<5	11,984 (99.6%)	10,059 (99.5%)	8,639 (99.6%)
5–9	35 (0.3%)	44 (0.4%)	22 (0.2%)
10–19	7 (0.06%)	7 (0.07%)	7 (0.08%)
≥20	4 (0.03%)	1 (0.01%)	1 (0.01%)
Total	**12,030 (100%)**	**10,111 (100%)**	**8,669 (100%)**

Table 1b. Total Count of Pediatric (0–6 years) Blood Lead Levels, CY2022–2023

BLL Ranges (µg/dL)	CY2022 n (%)	CY2023 n (%)
<3.5	5,557 (98.5%)	5,234 (99.2%)
3.5–9	80 (1.4%)	36 (0.7%)
10–19	7 (0.1%)	6 (0.1%)
≥20	0	0
Total	**5,644 (100%)**	**5,276 (100%)**

b. Figure 1 shows the number of pediatric eBLLs in the last 5 years. As expected, the number of eBLLs increased from 2021 to 2022 when the BLRV was lowered.

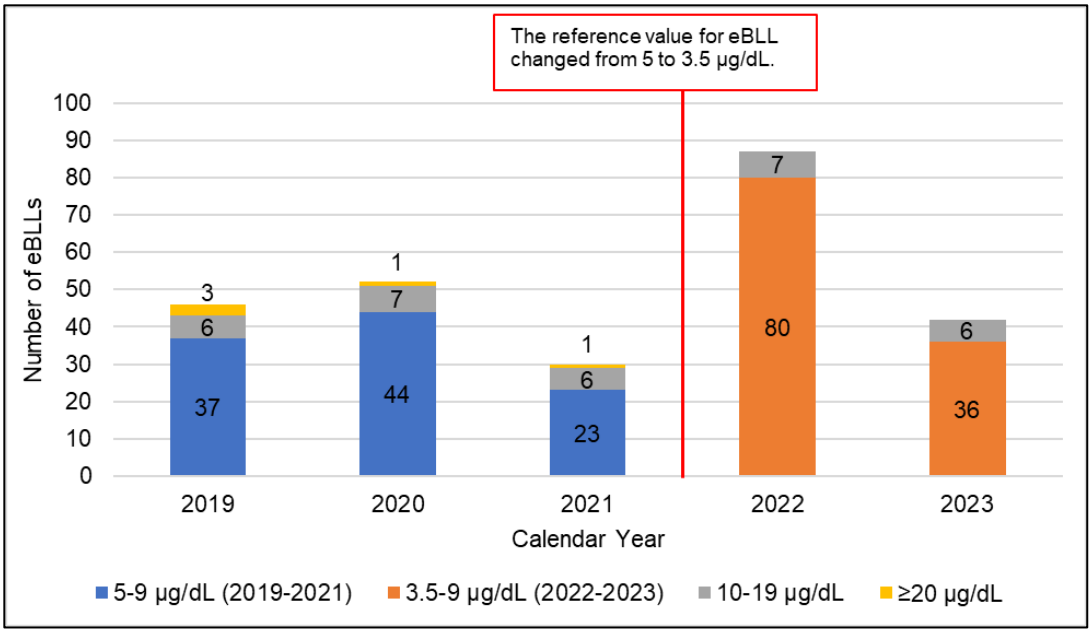

Figure 1. Number of Elevated Blood Lead Cases by Year, CY2019–2023
Data source: CHCS HL7 and MHS GENESIS

c. Using NHANES data, the CDC estimates that 2.5% of U.S. children aged 1 to 5 years have an eBLL (Reference 6). In comparison, a lower prevalence of eBLL was observed among Army dependents with blood samples collected and tested within the MHS. However, the NHANES study cycle (2015–2016 and 2017–2018) fell before the time period reported for the Army (2019–2023).

3. RECOMMENDATIONS AND FUTURE EFFORTS

a. Continued surveillance of eBLL among military dependents is critical to help inform military commanders and medical communities such as the Department of Public Health (Preventive Medicine Services). Local-level installations' organizations must address local and state-specific requirements, but pediatric BLL data should also be reviewed in terms of Service-wide impacts and comparisons to other community child BLL data such as national CDC trends.

b. As emphasized by the CDC, no level of lead in the blood is "safe." Military public health entities should routinely encourage military dependents to protect children from potential lead exposures. CDC suggests the following ways to protect children from lead exposure:

(1) **Get a blood test**. Parents can talk to their child's healthcare provider about getting a blood lead test. A blood test is the best way to determine if a child has been exposed to lead. Based on blood lead test results, healthcare providers can recommend follow-up actions and care.

(2) **Get the child's home checked**. Have the home checked by a licensed lead inspector if the child lives in a home or building built before 1978. Renters should ask their landlord to have their home checked. Visit the

Environmental Protection Agency's (EPA) web page to find a certified inspector or risk assessor.

(3) **Hire trained contractors**. When planning renovations, hire contractors who are trained in lead-safe practices. Visit EPA's web page to find a certified contractor.

(4) **Regularly wet-mop floors, windows, and windowsills**. Household dust can be a major source of lead in homes and buildings built before 1978.

(5) **Leave shoes by the door or outside**. This is especially important if someone works with or has a hobby that involves lead, such as construction or shooting firearms.

(6) **Shower and change clothes and shoes after working around lead-containing products**. This can keep lead dust from being tracked through the home and prevent families from being exposed.

(7) **Protect soil**. Cover bare soil with grass, mulch, or wood chips and prevent children from playing in bare soil that may be contaminated with lead. See the Lead in soil web page for more information. (https://www.cdc.gov/nceh/lead/prevention/sources/soil.htm)

(8) **Avoid certain children's products and toys**. Some toys, especially imported toys, antique toys, and toy jewelry, may contain lead. Visit the Consumer Product Safety Commission's (CPSC) web page (https://www.cpsc.gov/Recalls) for photos and descriptions of currently recalled toys.

(9) Also ensure your infant or child doesn't mouth items that may contain lead, such as jewelry or fishing sinkers.

c. For more information, visit https://www.epa.gov/lead/learn-about-lead

APPENDIX A

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APPENDIX B

CY2019 PEDIATRIC LEAD REPORTS

The CY2019 Annual and Quarterly Pediatric Lead Reports begin on the next page.

ANNUAL HIGHLIGHT

12,030 Army Dependents

received a blood lead test between 1 January and 31 December 2019; 0.4% of those tests indicated an elevated blood lead level. Among child dependents tested within the Military Health System, the rate of elevated blood lead levels in CY2019 is 3.8 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. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 October through 31 December 2019 (CY2019 Q4), as well as a summary of all CY2019 results. HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2019 4th Quarter (Q4), the highest BLL result was retained. Data from each quarter of CY2019 was combined to summarize the annual BLL test results. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] All CY2019 Q4 eBLL test results are reported; however, a distinction is made between new cases of eBLLs and cases previously reported in CY2019.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the Disease Reporting System internet (DRSi) for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. 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 2019 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2019 Q4 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2019 Q4 that were also reported via a medical event report in DRSi.

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

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six years of age or younger is confirmed to have an eBLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: 1) The 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.

The Fiscal Year 2020 (FY20) APHN-PSR no longer includes questions on the housing status of eBLL cases, environmental housing assessments, or mold exposure.

RESULTS

CHCS HL7 Chemistry Data System Results

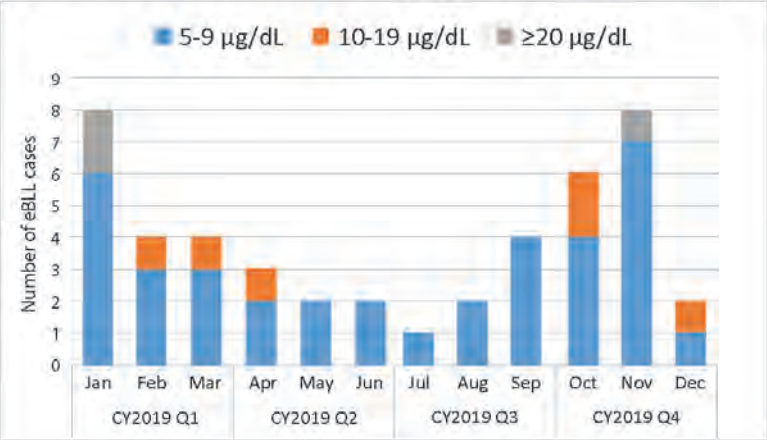
During CY2019, 12,030 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 46 of those results (0.4%) were elevated (BLL ≥5 µg/dL). In CY2019, four children had a BLL within the highest range (≥20 µg/dL, Table 1); however, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl). When repeat blood lead tests were examined, 18 out of the 46 children (39%) with elevated results within the calendar year had blood lead test results that fell below the CDC cut-off for elevated blood lead at the end of CY2019 (i.e., <5 µg/dl).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2019

BLL Ranges	Q4	CY2019
<5 µg/dL	2,552	11,984
5-9 µg/dL	13	35
10-19 µg/dL	4	7
≥20 µg/dL	1	4
Total	**2,570**	**12,030**

In CY2019 Q4, 2,570 Army dependents received a blood lead test within the MHS, and 18 of those results (0.7%) were elevated (BLL ≥5 µg/dL). Sixteen of the elevated results in CY2019 Q4 are new eBLL cases. Two of the 18 Army Dependents with an elevated result in CY2019 Q4 had an elevated result reported earlier in CY2019. Figure 1 summarizes the number of elevated test results from each quarter in CY2019.

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter, CY2019



With the highest test result from the calendar year retained for each dependent, Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Belvoir (1), Ft Bliss (4), Ft Bragg (5), Ft Campbell (5), Ft Carson (2), Ft Drum (2), Ft Gordon (2), Ft Hood (3), Ft Knox (1), Ft Leavenworth (1), Ft Polk (3), Ft Riley (4), Ft Rucker (1), Ft Sill (1), Schofield Barracks (4), Joint Base (JB) Elmendorf-Richardson (1), JB Langley-Eustis (1), Walter Reed National Military Medical Center (WRNMMC) (1), USAG Wiesbaden (1), Patrick Air Force Base (AFB) (1), and Scott AFB (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2019 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	161	0	0	0	161
Carlisle Barracks	1	0	0	0	1
Ft Belvoir	108	1	0	0	109
Ft Benning	527	0	0	0	527
Ft Bragg*	1,382	5	0	0	1,387
Ft Buchanan	1	0	0	0	1
Ft Campbell*	214	3	1	1	219
Ft Detrick	31	0	0	0	31
Ft Drum	445	2	0	0	447
Ft Gordon*	86	2	0	0	88
Ft Jackson	48	0	0	0	48
Ft Knox	278	0	1	0	279
Ft Lee	249	0	0	0	249
Ft Meade	113	0	0	0	113
Ft Rucker*	153	1	0	0	154
Ft Stewart	251	0	0	0	251
Redstone Arsenal	36	0	0	0	36
Rock Island Arsenal	4	0	0	0	4
West Point	101	0	0	0	101
Walter Reed NMMC*	28	0	0	1	29
CENTRAL					
Ft Bliss*	1,095	4	0	0	1,099

3

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019

Ft Carson	236	2	0	0	238
Ft Hood*	1,174	2	0	1	1,177
Ft Huachuca	10	0	0	0	10
Ft Irwin	77	0	0	0	77
Ft Leavenworth*	318	1	0	0	319
Ft Leonard Wood	311	0	0	0	311
Ft Polk*	241	2	1	0	244
Ft Riley*	677	0	3	1	681
Ft Sill*	276	1	0	0	277
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Camp Zama	14	0	0	0	14
Ft Greely	1	0	0	0	1
Ft Shafter	144	0	0	0	144
Ft Wainwright	304	0	0	0	304
Presidio of Monterey	1	0	0	0	1
Schofield Barracks*	908	4	0	0	912
USAG Daegu	1	0	0	0	1
USAG Humphreys	7	0	0	0	7
USAG Yongsan	15	0	0	0	15
EUROPE					
Grafenwoehr	18	0	0	0	18
Hohenfels/Amberg	7	0	0	0	7
Kaiserslautern	1	0	0	0	1
Katterbach	2	0	0	0	2
Landstuhl	20	0	0	0	20
Vilseck	3	0	0	0	3
USAG Benelux	1	0	0	0	1
USAG Vicenza	3	0	0	0	3
USAG Wiesbaden	85	1	0	0	86
JOINT BASES					
Joint Base Elmendorf-Richardson*	124	1	0	0	125
Joint Base San Antonio	557	0	0	0	557
Joint Base Langley-Eustis	233	1	0	0	234
Joint Base Little Creek-Fort Story	3	0	0	0	3
Joint Base McGuire-Dix-Lakehurst	36	0	0	0	36
Joint Base Meyer-Henderson Hall	38	0	0	0	38
Joint Base Anacostia-Bolling	36	0	0	0	36
Joint Base Pearl Harbor-Hickam	9	0	0	0	9
USAF MTF*±					
	610	2	1	0	613
NAVAL/MARINE CORPS MTF*±					
	168	0	0	0	168

* eBLL result in CY2019
± list of USAF, Naval, and Marine Corps locations in Appendix A

In DRSi, fourteen eBLL cases among Army Dependents have CY2019 Q4 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, two children had a BLL test in CY2019 Q3 and the remaining twelve children had BLL tests in CY2019 Q4. A total of 40 eBLL cases among Army Dependents were reported to DRSi in CY2019. The location of the cases are summarized in Table 3.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2019

	# cases*	
INSTALLATION	Q4	CY2019
Aberdeen Proving Ground	0	1
Ft Belvoir	0	1
Ft Bliss	2	4
Ft Bragg	3	5
Ft Campbell	2	5
Ft Carson	0	1
Ft Drum	0	2
Ft Gordon	2	2
Ft Hood	1	2
Ft Polk	0	2
Ft Riley	2	4
Ft Rucker	1	1
Ft Sill	1	1
Schofield Barracks	0	3
Joint Base Langley-Eustis	0	1
USAG Wiesbaden	0	1
Walter Reed NMMC	0	1
McConnell AFB	0	1
Patrick AFB	0	1
Scott AFB	0	1
TOTAL	14	40

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. The Army had 81.3% reporting compliance for CY2019 Q4. Thirteen of the 16 new eBLL cases identified in the CHCS HL7 laboratory data system were reported to DRSi. Twelve of the cases were reported during CY2019 Q4. One case was reported after the end of the fourth quarter (31 December 2019) but is being counted towards the reporting compliance measure because the test collection date fell within CY2019 Q4. Of the three cases that were not reported to DRSi, one child was tested at Ft Leavenworth, one tested at Joint Base Elmendorf-Richardson, and one tested at Schofield Barracks.

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

The results of the APHN-PSR indicated that a total of 1,287 BLL test results were reported to state and/or local authorities during CY2019 Q4 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). Twenty-four (1.9%) of those results were elevated.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2019 Q4*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Belvoir	25	0
Ft Bragg	3	3
Ft Campbell	1	1
Ft Gordon	35	2
Ft Jackson	11	0
Ft Knox	36	0

Table 4 (continued). Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2019 Q4*

Ft Rucker	29	1
JB Myer-Henderson Hall	9	0
Redstone Arsenal	10	0
CENTRAL		
Ft Bliss	476	2
Ft Carson	16	0
Ft Hood	235	1
Ft Huachuca	6	0
Ft Leavenworth	1	1
Ft Polk	52	1
Ft Riley	2	2
Ft Sill	66	1
Joint Base San Antonio	154	1
PACIFIC		
Ft Wainwright	57	0
Joint Base Lewis-McChord	55	2
Tripler AMC/Schofield Barracks	6	6
EUROPE		
USAG Ansbach	2	0

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.4% of the BLL tests performed in CY2019 (1 January – 31 December 2019) were elevated. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2019 was 3.8 per 1,000 child dependents, and is consistent with the CY2018 rate, 4.1 per 1,000. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 81% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. A new medical event report should be submitted for any cases reported in CY2019 with an elevated result on a repeat test in CY2020.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities, including Joint Base Lewis-McChord and Presidio of Monterey, continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood samples collected and tested outside the MHS are not represented in this report. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The number of questions relevant to lead and other household exposures have been changed on the most current APHN-PSR. However, this was in response to the introduction of a

Housing-related Illness Investigation Worksheet to be completed by Preventive Medicine Services/Department of Public Health. A copy of this worksheet can be found in Annex C of the Fragmentary Order (FRAGO) 2 to Operations Order (OPORD) 19-29.[8]

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8. Headquarters, U.S. Army Medical Command, USAMEDCOM Fragmentary Order 2 to Operations Order 19-29 (Environmental Health Management Control Plan (Lead Hazard Management Control Plan – Preventing Childhood Lead Exposure)), dated 25 November 2019.

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases		Naval/Marine Corps Stations
Altus AFB	MacDill AFB	Annapolis
Andersen JB	Malmstrom AFB	Camp Lejeune
Andrews JBA	Maxwell AFB	Camp Pendleton
Barksdale AFB	McConnell AFB	Charleston
Beale AFB	Minot AFB	Cherry Point
Cannon AFB	Misawa AB	Chesapeake
Davis-Monthan AFB	Mountain Home AFB	Groton
Dover AFB	Nellis AFB	Indian Head
Dyess AFB	Offutt AFB	Jacksonville
Edwards AFB	Osan AB	Kaneohe
Eielson AFB	Patrick AFB	Kingsville
Eglin AFB	Peterson AFB	Lemoore
Ellsworth AFB	RAF Alconbury	Marianas-Guam
FE Warren AFB	RAF Croughton	Meridian
Hanscom AFB	Ramstein AB	Milton
Hill AFB	Robins AFB	New England
Hurlburt Field	Schriever AFB	Norfolk
Goodfellow AFB	Scott AFB	North Chicago
Grand Forks AFB	Seymour Johnson AFB	Okinawa
Holloman AFB	Tinker AFB	Patuxent River
Kadena AB	Travis AFB	Pensacola
Keesler AFB	USAF Academy	Portsmouth
Kirtland AFB	Vance AFB	Quantico
Laughlin AFB	Vandenberg AFB	Rota
Los Angeles AFB	Whiteman AFB	San Diego
Little Rock AFB	Wright-Patterson AFB	Suffolk
Luke AFB	Yokota AB	Virginia Beach
		Yokosuka
		Yorktown

8

Quarterly Highlight

3,174 Army Dependents
received a blood lead test between 1 January and 31 March 2019;
0.5% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an elevated BLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, elevated BLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of elevated BLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this analysis covers test results collected from 1 January through 31 March 2019 (CY2019 Q1). HL7 data includes all BLL test results, above and below the elevated BLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, cases are counted once per calendar year.[7] Therefore, if an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2019 1st Quarter (Q1), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL) and by Regional Health Command (RHC) and installation. Results ≥5 µg/dL are considered elevated.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the Disease Reporting System, internet (DRSi) for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. Only Army Dependent cases reported to DRSi are included in this report. Among Army Dependents, DRSi cases with medical event report dates from 1 January through 31 March 2019 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration DRSi cases with test collection dates during CY2019 Q1 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2019 Q1 that were also reported via a medical event report in DRSi.

Army Public Health Nurses Program Status Report

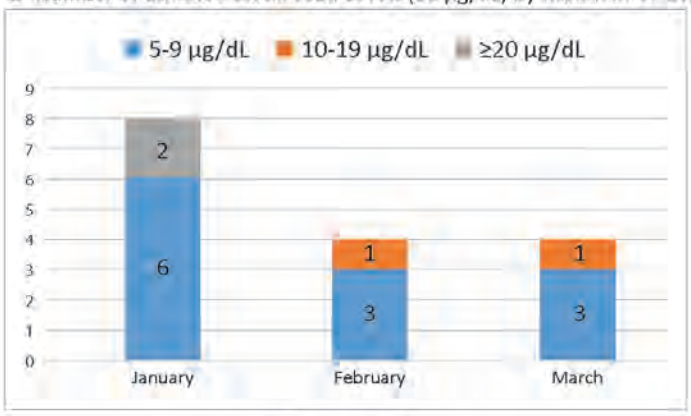
Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six years of age or younger is confirmed to have an elevated BLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: 1) Number of pediatric BLL tests conducted and/or confirmed elevated pediatric BLL tests reported to the State/local authorities per individual State/local reporting requirements; 2) Number of confirmed elevated pediatric BLL cases, by location of residence (on/off-post); and 3) Number of environmental investigations initiated, by location of residence (on/off-post). The APHN-PSR captures the following Mold Exposure metrics: 1) Number of International Classification of Disease (ICD)-10 codes related to mold exposure (Z77.120: Contact with and (suspected) exposure to mold) documented in American Forces Health Longitudinal Technology Application (AHLTA) and MHS Genesis® electronic health records; 2) Number of indoor residential environmental mold assessments referred by healthcare provider, by location of residence (on/off-post); 3) Number of initiated indoor residential environmental mold assessments, by location of residence (on/off-post).

RESULTS

CHCS HL7 Chemistry Data System Results

During CY2019 Q1, 3,174 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 16 of those results (0.5%) were elevated (BLL ≥5 µg/dL) (Figure 1).

Figure 1. Number of Elevated Blood Lead Levels (≥5 µg/dL) by Month in CY 2019 Q1



*Data source: HL7

Two children had a BLL within the highest range (≥20 µg/dL) (Table 1); however, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dL).

Table 1. Total Count of pediatric (ages 0-6) blood lead levels (BLL) in CY2019 Q1

BLL Ranges				
<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
3,158	12	2	2	**3,174**

2

Table 2 summarizes the BLLs by RHC and installation. Elevated BLL results came from 8 Army installations (Fort (Ft) Bliss (2), Ft Campbell (2), Ft Carson, Ft Drum, Ft Hood, Ft Knox, Ft Polk (2), Ft Riley, Walter Reed National Military Medical Center (NMMC), and U.S. Army Garrison (USAG) Wiesbaden) and 2 U.S. Air Force (USAF) Bases (Patrick AFB (2) and Scott AFB). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2019 Q1 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) blood lead levels (BLL), by Region and Installation, CY2019 Q1

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	48	0	0	0	48
Ft Belvoir	29	0	0	0	29
Ft Benning	127	0	0	0	127
Ft Bragg	427	0	0	0	427
Ft Campbell	42	1	0	1	44
Ft Detrick	4	0	0	0	4
Ft Drum	120	1	0	0	121
Ft Gordon	22	0	0	0	22
Ft Jackson	10	0	0	0	10
Ft Knox	107	0	1	0	108
Ft Lee	53	0	0	0	53
Ft Meade	34	0	0	0	34
Ft Rucker	47	0	0	0	47
Ft Stewart	71	0	0	0	71
Redstone Arsenal	7	0	0	0	7
Rock Island Arsenal	1	0	0	0	1
West Point	34	0	0	0	34
Walter Reed NMMC	4	1	0	0	5
CENTRAL					
Ft Bliss	243	2	0	0	245
Ft Carson	57	1	0	0	58
Ft Hood	309	0	0	1	310
Ft Huachuca	2	0	0	0	2
Ft Irwin	9	0	0	0	9
Ft Leavenworth	79	0	0	0	79
Ft Leonard Wood	79	0	0	0	79
Ft Polk	75	2	0	0	77
Ft Riley	161	0	1	0	162
Ft Sill	73	0	0	0	73
PACIFIC					
Ft Greely	1	0	0	0	1
Ft Shafter	32	0	0	0	32
Ft Wainwright	82	0	0	0	82
Presidio of Monterey	1	0	0	0	1
Schofield Barracks	214	0	0	0	214
Camp Zama	3	0	0	0	3
Pyongtaek	1	0	0	0	1
Seoul	9	0	0	0	9
Daegu	1	0	0	0	1
EUROPE					
Grafenwoehr	9	0	0	0	9
Hohenfels/Amberg	3	0	0	0	3
Landstuhl	12	0	0	0	12
Vilseck	2	0	0	0	2
Wiesbaden	26	1	0	0	27

Table 2 (continued). Pediatric (ages 0-6) blood lead levels (BLL), by Region and Installation, CY2019 Q1

	BLL Ranges				
	<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
JOINT BASES					
Joint Base Elmendorf-Richardson	32	0	0	0	32
Joint Base San Antonio	159	0	0	0	159
Joint Base Langley-Eustis	56	0	0	0	56
Joint Base McGuire-Dix-Lakehurst	11	0	0	0	11
Joint Base Meyer-Henderson Hall	11	0	0	0	11
Joint EB Little Creek-Ft Story	2	0	0	0	2
Joint Base Anacostia-Bolling	12	0	0	0	12
Joint Base Pearl Harbor-Hickam	4	0	0	0	4
USAF MTF*					
	163	3	0	0	166
NAVAL/MARINE CORPS MTF*					
	38	0	0	0	38

*list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, a total of 10 eBLL cases among Army Dependents have CY2019 Q1 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, 2 of these children had BLL tests in CY2018 Q4 and 8 had BLL tests in CY2019 Q1. The location of the cases are summarized in Table 3.

Table 3. Locations where elevated BLLs were reported through DRSi, CY2019 Q1

INSTALLATION	# cases*
Ft Belvoir	1
Ft Bliss	2
Ft Campbell	1
Ft Drum	1
Ft Hood	1
Ft Polk	2
USAG Wiesbaden	1
McConnell AFB	1

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Of the 16 eBLL tests found in the CHCS HL7 laboratory data system, 14 cases were reported to DRSi. Of those 14 cases, 8 were reported during CY2019 Q1. An additional two cases had been reported based on prior (2018 Q4) eBLLs and were not reported again in CY2019 Q1; 4 of the cases were reported after the end of the first quarter (31 March 2019) but are being counted towards the reporting compliance measure because their test collection dates fell within CY2019 Q1. Of the two cases that were not reported to DRSi, one child was tested at Patrick AFB and one tested at Ft Campbell. Taking this into consideration, the Army had a reporting compliance of 13/14 (92.9%).

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

The results of the APHN-PSR indicated that a total of 1,285 BLL test results were reported to state and/or local authorities during CY2019 Q1 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). Only twelve (0.9%) of those results were elevated.

According to the survey, 6 children with elevated BLLs lived in off-post housing and 2 environmental investigations were initiated for off-post housing. Nine children lived in on-post housing and 7 environmental investigations were initiated for on-post housing. The installations that reported confirmed elevated BLL cases living in on-post housing are indicated in Table 4.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2019 Q1*

REGION	Number of BLL tests reported to the State/local authorities	Number of elevated BLL tests reported to the State/local authorities
ATLANTIC		
Aberdeen Proving Ground	1	1
Ft Belvoir	65	0
Ft Campbell[a]	2	2
Ft Gordon	14	0
Ft Jackson	1	0
Ft Knox	1	0
Ft Meade[a]	0	2
Walter Reed NMMC	1	1
CENTRAL		
Ft Bliss[a]	322	2
Ft Hood[a]	374	1
Ft Huachuca	3	0
Ft Irwin	15	0
Ft Leonard Wood	86	0
Ft Polk[a]	86	2
Ft Riley	168	0
PACIFIC		
Ft Shafter	3	0
Ft Wainwright	94	0
Joint Base Lewis-McChord	42	0
Seoul[a]	1	0
Daegu	5	0
EUROPE		
Wiesbaden[a]	1	1

*Installations that are not listed did not report BLL tests or eBLL tests
[a]Installations reported confirmed eBLL case lived in on-post housing

A total of 59 cases of contact with and suspected exposure to mold were found in the electronic health record and reported to the APHN-PSR in CY2019 Q1. The locations of these cases are summarized in Table 5. A total of 21 on-post housing mold assessments were referred to installation Public Health by a healthcare provider, and a total of 60 mold assessments recommended by a healthcare provider were initiated in on-post housing. The survey also asked about off-post mold assessments, but none were reported.

Table 5. Mold Exposure Reported through the APHN-PSR, by Region and Installation, CY2019 Q1**

REGION	Number of mold exposures* documented in health records	Number of provider recommended mold assessments referred to Installation Public Health	Number of provider recommended mold assessments initiated by the responsible housing authority
ATLANTIC			
Ft Belvoir	22	0	0
Ft Jackson	1	0	0
Ft Lee	0	1	0
Ft Meade	24	5	5
Joint Base Langley-Eustis	1	0	0

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West Point	6	0	0
CENTRAL			
Ft Hood	3	2	0
Ft Leonard Wood	0	1	4
Ft Riley	0	0	48
EUROPE			
Landstuhl	2	0	0
Wiesbaden	0	10	0

*ICD-10 code Z77.120 (Contact with and (suspected) exposure to mold) documented in AHLTA or MHS Genesis
**Installations that are not listed did not report on any of the mold exposure questions

DISCUSSION

Approximately 0.5% of the BLL tests performed in the first quarter of 2019 (1 January – 31 March 2019) were elevated. This is consistent with historical HL7 data which show that between 2010 and 2018, an average of 0.9% (range: 0.4 – 1.4%) BLL tests were elevated among Army Dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to prevent childhood lead exposure and monitor children with an eBLL to ensure each case receives proper treatment and management.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled one month after the end of Q1 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood collected and tested outside the MHS are not represented in this report.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting elevated BLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The last quarterly APHN-PSR captured the lead and mold exposure metrics for the first time. Since this is a new reporting requirement, the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The survey provides more details about the location (residence on-/off-post) of cases and the status of environmental assessments at installations. However, because the survey only reports final case counts and does not track individuals, it remains unclear if the same individuals are represented across the questions. For example, the survey cannot indicate if the mold exposure cases referred for mold assessments are the same as the cases where mold assessments were initiated.

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1. United States Environmental Protection Agency (USEPA). Protect Your Family from Exposures to Lead. Last updated on March 26, 2019. Available at: https://www.epa.gov/lead/protect-your-family-exposures-lead#sl-home
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For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

Appendix A

Table A1. U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Andersen JB
Andrew JBA
Beale AFB
Cannon AFB
Davis-Monthan AFB
Edwards AFB
Eglin AFB
FE Warren AFB
Hanscom AFB
Hill AFB
Goodfellow AFB
Holloman AFB
Kadena AB
Keesler AFB
Kirtland AFB
Laughlin AFB
Los Angeles AFB
Luke AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Misawa AB
Nellis AFB
Osan AB
Patrick AFB
Peterson AFB
Scott AFB
Tinker AFB
Travis AFB
Vandenberg AFB
Whiteman AFB
Wright-Patterson AFB
Naval/Marine Corps Stations
Annapolis
Camp Lejeune
Chesapeake
Groton
Kaneohe
Lemoore
Milton
New England

7

Norfolk
Okinawa
Patuxent River
Pensacola
Portsmouth
Quantico
San Diego
Virginia Beach
Yorktown

Quarterly Highlight

3,117 Army Dependents
received a blood lead test between 1 April and 30 June 2019;
0.5% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 April through 30 June 2019 (CY2019 Q2). HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2019 2nd Quarter (Q2), the

highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Regional Health Command (RHC), and installation. Results ≥5 µg/dL are considered elevated. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] All CY2019 Q2 eBLL test results are reported; however, a distinction is made between new cases of eBLLs and cases previously reported in CY2019 Q1.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the Disease Reporting System internet (DRSi) for children 0 to 6 years of age.[8] DRSi is a Tri-Service reportable medical event system. 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 2019 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2019 Q2 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2019 Q2 that were also reported via a medical event report in DRSi.

Army Public Health Nurses Program Status Report

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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 and/or confirmed elevated pediatric BLL tests reported to the State/local authorities per individual State/local reporting requirements; 2) Number of confirmed elevated pediatric BLL cases, by location of residence (on/off-post); and 3) Number of environmental investigations initiated, by location of residence (on/off-post).

The APHN-PSR captures the following Mold Exposure metrics: 1) Number of International Classification of Disease (ICD)-10 codes related to mold exposure (Z77.120: Contact with and (suspected) exposure to mold) documented in American Forces Health Longitudinal Technology Application (AHLTA) and MHS Genesis® electronic health records; 2) Number of ICD-10 codes related to mold exposure (Z13.88: Encounter for screening for disorders due to exposure to contaminants); 3) Number of indoor residential environmental mold assessments referred by healthcare provider, by location of residence (on/off-post); 4) Number of initiated indoor residential environmental mold assessments, by responsible housing authority (Army-owned/leased housing and Privatized Partner housing). Unlike the Childhood Lead Exposure questions, these metrics capture data from Servicemembers and all Army Dependents (adult and child).

RESULTS

CHCS HL7 Chemistry Data System Results

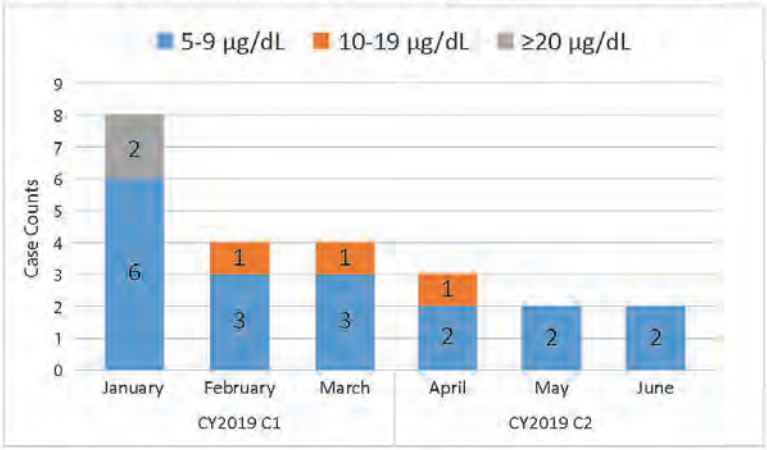
During CY2019 Q2, 3,117 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 15 of those results (0.5%) were elevated (BLL ≥5 µg/dL). In CY2019 Q2, no children had a BLL within the highest range (≥20 µg/dL) (Table 1).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2019 Q2

BLL Ranges				
<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
3,102	9	6	0	3,117

Seven of the elevated results in CY2019 Q2 are new eBLL cases. Eight of the 15 Army Dependents with an elevated result in CY2019 Q2 had a previous elevated result reported in CY2019 Q1. In the first two quarters of CY2019, there were a total of 23 Army Dependents with an eBLL (Figure 1).

Figure 1. Number of Elevated Blood Lead Levels (≥5 µg/dL) by Month and Quarter in CY2019



*Data source: HL7

Table 2 summarizes the BLLs by RHC and installation. Elevated BLL results came from Fort (Ft) Bragg (2), Ft Campbell (3), Ft Carson (1), Ft Hood (1), Ft Riley (3), Walter Reed National Military Medical Center (WRNMMC) (1), Joint Base Langley-Eustis (1), Patrick Air Force Base (AFB) (2), and Scott AFB (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2019 Q2 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019 Q2

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	41	0	0	0	41
Carlisle Barracks	1	0	0	0	1
Ft Belvoir	34	0	0	0	34
Ft Benning	131	0	0	0	131
Ft Bragg	399	2	0	0	401
Ft Buchanan	1	0	0	0	1
Ft Campbell	65	2	1	0	68
Ft Detrick	7	0	0	0	7
Ft Drum	111	0	0	0	111
Ft Gordon	23	0	0	0	23
Ft Jackson	11	0	0	0	11
Ft Knox	71	0	0	0	71
Ft Lee	63	0	0	0	63
Ft Meade	18	0	0	0	18
Ft Rucker	35	0	0	0	35
Ft Stewart	69	0	0	0	69
Redstone Arsenal	14	0	0	0	14
West Point	27	0	0	0	27
Walter Reed NMMC	10	0	1	0	11
CENTRAL					
Ft Bliss	273	0	0	0	273
Ft Carson	68	1	0	0	69
Ft Hood	327	1	0	0	328
Ft Irwin	21	0	0	0	21

3

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019 Q2

Ft Leavenworth	71	0	0	0	71
Ft Leonard Wood	86	0	0	0	86
Ft Polk	61	0	0	0	61
Ft Riley	179	0	3	0	182
Ft Sill	66	0	0	0	66
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Ft Shafter	37	0	0	0	37
Ft Wainwright	77	0	0	0	77
Schofield Barracks	227	0	0	0	227
Camp Zama	2	0	0	0	2
Camp Humphreys	1	0	0	0	1
USAG Yongsan	3	0	0	0	3
EUROPE					
Grafenwoehr	1	0	0	0	1
Hohenfels/Amberg	1	0	0	0	1
Kaiserslautern	1	0	0	0	1
Katterbach	1	0	0	0	1
Landstuhl	4	0	0	0	4
SHAPE	1	0	0	0	1
USAG Vicenza	2	0	0	0	2
USAG Wiesbaden	22	0	0	0	22
JOINT BASES					
Joint Base Elmendorf-Richardson	30	0	0	0	30
Joint Base San Antonio	129	0	0	0	129
Joint Base Langley-Eustis	69	1	0	0	70
Joint Base McGuire-Dix-Lakehurst	13	0	0	0	13
Joint Base Meyer-Henderson Hall	11	0	0	0	11
Joint EB Little Creek-Ft Story	1	0	0	0	1
Joint Base Anacostia-Bolling	12	0	0	0	12
Joint Base Pearl Harbor-Hickam	4	0	0	0	4
USAF MTF*					
	124	2	1	0	127
NAVAL/MARINE CORPS MTF*					
	45	0	0	0	45

*list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, a total of 8 eBLL cases among Army Dependents have CY2019 Q2 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, 1 child had a BLL test in CY2019 Q1 and the remaining 7 children had BLL tests in CY2019 Q2. The location of the cases are summarized in Table 3.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2019 Q2

INSTALLATION	# cases*
Aberdeen Proving Ground	1
Ft Bragg	2
Ft Campbell	1
Ft Riley	2
Patrick AFB	1
Scott AFB	1

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. Of the 7 new eBLL cases identified in the CHCS HL7 laboratory data system, 5 cases were reported to DRSi. Of those 5 cases, 4 were reported during CY2019 Q2. One (1) case was reported after the end of the second quarter (30 June 2019) but is being counted towards the reporting compliance measure because the test collection date fell within CY2019 Q2. Of the two cases that were not reported to DRSi, one child was tested at Joint Base Langley-Eustis and one tested at Ft Hood. Taking this into consideration, the Army had a reporting compliance of 5/7 (71.4%).

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

The results of the APHN-PSR indicated that a total of 1,716 BLL test results were reported to state and/or local authorities during CY2019 Q2 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). Only 10 (0.6%) of those results were elevated.

According to the status report, 7 children with eBLLs lived in off-post housing and 6 environmental investigations were initiated for off-post housing. Six children lived in on-post housing and 2 environmental investigations were initiated for on-post housing. The installations that reported confirmed eBLL cases living in on-post housing are indicated in Table 4.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2019 Q2*

REGION	Number of BLL tests reported to the State/local authorities	Number of elevated BLL tests reported to the State/local authorities
ATLANTIC		
Aberdeen Proving Ground	1	1
Ft Belvoir	72	0
Ft Bragg[a]	2	2
Ft Campbell[a]	2	2
Ft Drum	117	0
Ft Gordon	34	0
Ft Jackson	3	0
Ft Knox	65	0
Ft Lee	102	0
Ft Rucker	48	0
CENTRAL		
Ft Bliss	308	2
Ft Carson	73	0
Ft Hood	331	0
Ft Huachuca	2	0
Ft Irwin	10	0
Ft Polk	67	0
Ft Riley	2	2
Ft Sill	57	0
Joint Base San Antonio	310	0
PACIFIC		
Ft Wainwright	78	0
Joint Base Lewis-McChord	27	0
Presidio of Monterey	1	1
EUROPE		
Landstuhl	4	0

*Installations that are not listed did not report BLL tests or eBLL tests
[a]Installations reported confirmed eBLL case lived in on-post housing

A total of 107 cases of contact with and suspected exposure to mold were found in the electronic health record and reported to the APHN-PSR in CY2019 Q2. Nineteen records included an encounter for screening for disorders due to exposure to contaminants. The locations of these cases are summarized in Table 5. A total of 32 on-post housing mold assessments were referred to Installation Department of Public Health by a healthcare provider, and a total of 45 mold assessments recommended by a healthcare provider were initiated in on-post housing. Presidio of Monterey reported three additional mold assessments for off-post housing were referred to Installation Department of Public Health. No other installations reported for off-post housing.

Table 5. Mold Exposure Reported through the APHN-PSR, by Region and Installation, CY2019 Q2*

REGION	Number of mold exposures[a] documented in health records	Number of screenings for disorders due to exposure to contaminants[b]	Number of provider recommended mold assessments referred to Installation Public Health	Number of provider recommended mold assessments initiated by the responsible housing authority
ATLANTIC				
Ft Belvoir	8	1	0	0
Ft Drum	0	0	1	1
Ft Lee	4	0	0	4
Ft Meade	5	0	0	0
Joint Base Langley-Eustis	1	0	0	0
Walter Reed NMMC	2	12	0	0
West Point	19	1	2	17
CENTRAL				
Ft Carson	3	3	1	1
Ft Hood	5	0	0	0
Ft Huachuca	2	2	0	0
Ft Riley	2	0	2	0
Ft Sill	0	0	2	0
PACIFIC				
Joint Base Lewis-McChord	7	0	0	0
Camp Red Cloud	0	0	2	0
Presidio of Monterey	49	0	22	22

Note: counts include Servicemembers and all Army Dependents (adult and child)

[a]ICD-10 code Z77.120 (Contact with and (suspected) exposure to mold) documented in AHLTA or MHS Genesis

[b]ICD-10 code Z13.88 (Encounter for screening for disorders due to exposure to contaminants) documented in AHLTA or MHS Genesis

*Installations that are not listed did not report on any of the mold exposure questions

DISCUSSION

Approximately 0.5% of the BLL tests performed in the second quarter of 2019 (1 April – 30 June 2019) were elevated. This is consistent with historical HL7 data which show that between 2010 and 2018, an average of 0.9% (range: 0.4 – 1.4%) BLL tests were elevated among Army Dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to prevent childhood lead exposure and monitor children with an eBLL to ensure each case receives proper treatment and management.

The reporting compliance percent decreased this quarter (71.4%); however, the actual number of cases not reported to DRSi (2 cases) was the same as the previous quarter.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood collected and tested outside the MHS are not represented in this report.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The survey provides more details about the location (residence on-/off-post) of cases and the status of environmental assessments at installations. However, because the survey does not identify individuals, it remains unclear if the same individuals are represented across the questions. For example, the survey cannot indicate if the mold exposure cases referred for mold assessments are the same as the cases where mold assessments were initiated.

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7. Defense Health Agency. 2017. Armed Forces Reportable Medical Events – Guidelines and Case Definitions. Available at: https://health.mil/Reference-Center/Publications/2017/07/17/Armed-Forces-Reportable-Medical-Events-Guidelines

Appendix A

Table A1. U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Andrew JBA
Davis-Monthan AFB
Dover AFB
Dyess AFB
Eielson AFB
Eglin AFB
Ellsworth AFB
FE Warren AFB
Hanscom AFB
Hill AFB
Goodfellow AFB
Holloman AFB
Kadena AB
Keesler AFB
Kirtland AFB
Laughlin AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Nellis AFB
Osan AB
Patrick AFB
Peterson AFB
Ramstein AB
Robins AFB
Scott AFB
Tinker AFB
USAF Academy
Vandenberg AFB
Wright-Patterson AFB
Yokota AB

Naval/Marine Corps Stations
Camp Lejeune
Camp Pendleton
Charleston
Chesapeake
Jacksonville
Kaneohe
Lemoore
Norfolk
North Chicago
Okinawa
Portsmouth
Quantico
San Diego
Virginia Beach
Yokosuka
Yorktown

Quarterly Highlight

3,323 Army Dependents
received a blood lead test between 1 July and 30 September 2019;
0.4% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 July through 30 September 2019 (CY2019 Q3). HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2019 3rd Quarter (Q3), the

highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Regional Health Command (RHC), and installation. Results ≥5 µg/dL are considered elevated. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] All CY2019 Q3 eBLL test results are reported; however, a distinction is made between new cases of eBLLs and cases previously reported in CY2019.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the Disease Reporting System internet (DRSi) for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. Only Army Dependent cases reported to DRSi are included in this report. Among Army Dependents, DRSi cases with medical event report dates from 1 July through 30 September 2019 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2019 Q3 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2019 Q3 that were also reported via a medical event report in DRSi.

Army Public Health Nurses Program Status Report

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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 and/or confirmed elevated pediatric BLL tests reported to the State/local authorities per individual State/local reporting requirements; 2) Number of confirmed elevated pediatric BLL cases, by location of residence (on/off-post), and housing authority (Army-owned/leased or privatized partner housing); and 3) Number of environmental investigations initiated, by location of residence (on/off-post)), and housing authority (Army-owned/leased or privatized partner housing).

The APHN-PSR captures the following Mold Exposure metrics: 1) Number of International Classification of Disease (ICD)-10 codes related to mold exposure (Z77.120: Contact with and (suspected) exposure to mold) documented in American Forces Health Longitudinal Technology Application (AHLTA) and MHS Genesis® electronic health records; 2) Number of ICD-10 codes related to mold exposure (Z13.88: Encounter for screening for disorders due to exposure to contaminants); 3) Number of indoor residential environmental mold assessments referred by healthcare provider, by location of residence (on/off-post); 4) Number of initiated indoor residential environmental mold assessments, by responsible housing authority (Army-owned/leased housing and Privatized Partner housing). Unlike the Childhood Lead Exposure questions, these metrics capture data from Servicemembers and all Army Dependents (adult and child).

RESULTS

CHCS HL7 Chemistry Data System Results

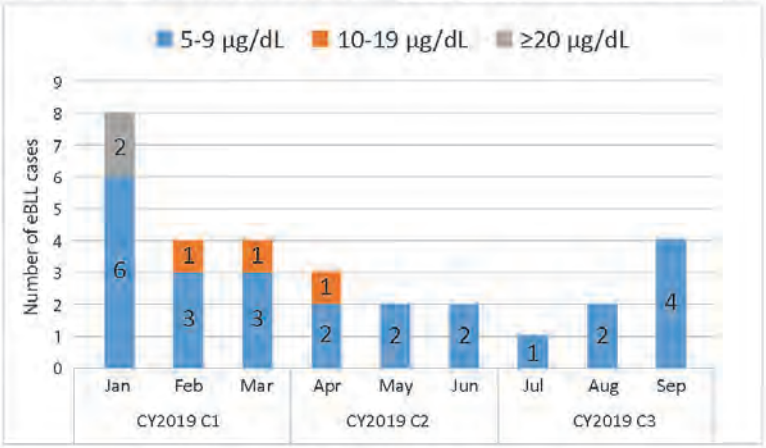
During CY2019 Q3, 3,323 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 14 of those results (0.4%) were elevated (BLL ≥5 µg/dL). In CY2019 Q3, one child had a BLL within the highest range (≥20 µg/dL, Table 1); however, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2019 Q3

BLL Ranges				
<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
3,309	9	4	1	3,323

Seven of the elevated results in CY2019 Q3 are new eBLL cases. Seven of the 14 Army Dependents with an elevated result in CY2019 Q3 had an elevated result reported earlier in CY2019. In the first three quarters of CY2019, there were a total of 30 Army Dependents with an eBLL (Figure 1).

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter in CY2019



*Data source: HL7

Table 2 summarizes the BLLs by RHC and installation. Elevated BLL results came from Fort (Ft) Belvoir (1), Ft Bragg (1), Ft Campbell (1), Ft Carson (1), Ft Drum (1), Ft Knox (1), Ft Riley (2), Schofield Barracks (3), Walter Reed National Military Medical Center (WRNMMC) (1), Joint Base Langley-Eustis (1), and Scott AFB (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2019 Q3 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019 Q3

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	61	0	0	0	61
Ft Belvoir	37	1	0	0	38
Ft Benning	150	0	0	0	150
Ft Bragg	292	1	0	0	293
Ft Campbell	59	0	1	0	60
Ft Detrick	13	0	0	0	13
Ft Drum	142	1	0	0	143
Ft Gordon	22	0	0	0	22
Ft Jackson	20	0	0	0	20
Ft Knox	63	0	1	0	64
Ft Lee	93	0	0	0	93
Ft Meade	42	0	0	0	42
Ft Rucker	47	0	0	0	47
Ft Stewart	58	0	0	0	58
Redstone Arsenal	10	0	0	0	10
Rock Island Arsenal	3	0	0	0	3
West Point	18	0	0	0	18
Walter Reed NMMC	6	0	0	1	7
Walter Reed NMMC	10	0	1	0	11
CENTRAL					
Ft Bliss	314	0	0	0	314
Ft Carson	69	1	0	0	70
Ft Hood	316	0	0	0	316
Ft Huachuca	2	0	0	0	2

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2019 Q3

Ft Irwin	32	0	0	0	32
Ft Leavenworth	120	0	0	0	120
Ft Leonard Wood	73	0	0	0	73
Ft Polk	64	0	0	0	64
Ft Riley	197	0	2	0	199
Ft Sill	80	0	0	0	80
PACIFIC					
Camp Zama	5	0	0	0	5
Ft Shafter	43	0	0	0	43
Ft Wainwright	90	0	0	0	90
Schofield Barracks	261	3	0	0	264
USAG Humphreys	2	0	0	0	2
USAG Yongsan	3	0	0	0	3
EUROPE					
Grafenwoehr	8	0	0	0	8
Hohenfels/Amberg	2	0	0	0	2
Landstuhl	3	0	0	0	3
Vilseck	1	0	0	0	1
USAG Vicenza	2	0	0	0	2
USAG Wiesbaden	20	0	0	0	20
JOINT BASES					
Joint Base Elmendorf-Richardson	27	0	0	0	27
Joint Base San Antonio	148	0	0	0	148
Joint Base Langley-Eustis	53	1	0	0	54
Joint Base McGuire-Dix-Lakehurst	7	0	0	0	7
Joint Base Meyer-Henderson Hall	9	0	0	0	9
Joint Base Anacostia-Bolling	6	0	0	0	6
Joint Base Pearl Harbor-Hickam	1	0	0	0	1
USAF MTF*					
	164	1	0	0	165
NAVAL/MARINE CORPS MTF*					
	51	0	0	0	51

*list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, a total of eight eBLL cases among Army Dependents have CY2019 Q3 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, two children had a BLL test in CY2019 Q2 and the remaining six children had BLL tests in CY2019 Q3. The location of the cases are summarized in Table 3.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2019 Q3

INSTALLATION	# cases*
Ft Belvoir	1
Ft Carson	1
Ft Campbell	1
Ft Drum	1
Schofield Barracks	3
Joint Base Langley-Eustis	1

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. The Army had 100% reporting compliance for CY2019 Q3. All seven of the new eBLL cases identified in the CHCS HL7 laboratory data system were reported to DRSi. Six of the cases were reported during CY2019 Q3. One case was reported after the end of the third quarter (30 June 2019) but is being counted towards the reporting compliance measure because the test collection date fell within CY2019 Q3.

Army Public Health Nurses Program Status Report (APHN-PSR

The results of the APHN-PSR indicated that a total of 958 BLL test results were reported to state and/or local authorities during CY2019 Q3 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). Only six (0.6%) of those results were elevated.

According to the status report, three children with eBLLs lived in off-post housing and one environmental investigation was initiated for off-post housing. Five children with eBLLs lived in on-post housing and three environmental investigations were initiated for on-post housing (1 in Army-owned/leased housing and 2 in privatized partner housing). The installations that reported confirmed eBLL cases living in on-post housing are indicated in Table 4.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2019 Q3*

REGION	Number of BLL tests reported to the State/local authorities	Number of elevated BLL tests reported to the State/local authorities
ATLANTIC		
Ft Belvoir[a]	53	1
Ft Campbell[a]	1	1
Ft Jackson	12	0
Ft Rucker	50	0
Redstone Arsenal	16	0
Walter Reed NMMC[a]	0	1
CENTRAL		
Ft Bliss	311	0
Ft Carson	70	1
Ft Huachuca	10	0
Ft Irwin	3	0
Ft Riley	1	1
Ft Sill	113	0
Joint Base San Antonio	164	0
PACIFIC		
Ft Wainwright	104	0
Joint Base Lewis-McChord	46	0
Camp Walker (Daegu)	3	0
EUROPE		
Grafenwoehr (USAG Bavaria)	1	1

*Installations that are not listed did not report BLL tests or eBLL tests
[a]Installations reported confirmed eBLL case lived in on-post housing

A total of 122 cases of contact with and suspected exposure to mold were found in the electronic health record and reported to the APHN-PSR in CY2019 Q3. Sixty-eight records included an encounter for screening for disorders due to exposure to contaminants. The locations of these cases are summarized in Table 5. A total of 14 on-post housing mold assessments were referred to Installation Department of Public Health by a healthcare provider, and a total of 15 mold assessments recommended by a healthcare provider were initiated in on-post housing (2 in Army-owned/leased housing and 13 in privatized partner housing). Provider recommended mold assessments referred for off-post housing were reported at Ft Hood (3 reports) and USAG Vicenza (1 report). No other installations reported for off-post housing.

Table 5. Mold Exposure Reported through the APHN-PSR, by Region and Installation, CY2019 Q3*

REGION	Number of mold exposures[a] documented in health records	Number of screenings for disorders due to exposure to contaminants[b]	Number of provider recommended mold assessments referred to Installation Public Health	Number of provider recommended mold assessments initiated by the responsible housing authority
ATLANTIC				
Aberdeen Proving Ground	21	0	0	0
Ft Belvoir	4	6	0	0
Ft Benning	0	1	0	0
Ft Meade	9	9	0	0
Ft Rucker	0	9	1	0
Joint Base Myer-Henderson Hall	0	2	0	0
Redstone Arsenal	1	0	0	0
Walter Reed NMMC	1	31	0	0
West Point	10	0	0	0
CENTRAL				
Ft Carson	7	6	2	2
Ft Hood	1	0	3	0
Ft Riley	4	4	0	0
PACIFIC				
Ft Wainwright	0	0	1	1
Joint Base Lewis-McChord	45	0	0	0
Presidio of Monterey	18	0	10	10
EUROPE				
Grafenwoehr (USAG Bavaria)	0	0	0	2
USAG Vicenza	1	0	1	0

Note: counts include Servicemembers and all Army Dependents (adult and child)

[a]ICD-10 code Z77.120 (Contact with and (suspected) exposure to mold) documented in AHLTA or MHS Genesis

[b]ICD-10 code Z13.88 (Encounter for screening for disorders due to exposure to contaminants) documented in AHLTA or MHS Genesis

*Installations that are not listed did not report on any of the mold exposure questions

DISCUSSION

Approximately 0.4% of the BLL tests performed in the third quarter of 2019 (1 July – 30 September 2019) were elevated. This is consistent with historical HL7 data which show that between 2010 and 2018, an average of 0.9% (range: 0.4 – 1.4%) BLL tests were elevated among Army Dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 100% reporting compliance this quarter.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled one month after the end of Q3 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood samples collected and tested outside the MHS are not represented in this report.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The survey provides more details about the location (residence on-/off-post) of cases and the status of environmental assessments at installations. However, because the survey does not identify individuals, it remains unclear if the same individuals are represented across the questions. For example, the survey cannot indicate if the mold exposure cases referred for mold assessments are the same as the cases where mold assessments were initiated.

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Appendix A

Table A1. U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Altus AFB
Andersen JB
Andrew JBA
Barksdale AFB
Davis-Monthan AFB
Dover AFB
Eielson AFB
Eglin AFB
Hanscom AFB
Hill AFB
Hurlburt Field
Goodfellow AFB
Grand Forks AFB
Holloman AFB
Kadena AB
Keesler AFB
Kirtland AFB
Little Rock AFB
Luke AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Minot AFB
Mountain Home AFB
Nellis AFB
Offutt AFB
Osan AB
Patrick AFB
Peterson AFB
Scott AFB
Seymour Johnson AFB
Tinker AFB
Travis AFB
USAF Academy
Vance AFB
Wright-Patterson AFB
Yokota AB

Naval/Marine Corps Stations
Camp Lejeune
Charleston
Cherry Point
Indian Head
Jacksonville
Kaneohe
Kingsville
Marianas-Guam
Meridian
Norfolk
North Chicago
Okinawa
Pensacola
Portsmouth
Quantico
San Diego
Virginia Beach

8

APPENDIX C

CY2020 PEDIATRIC LEAD REPORTS

The CY2020 Annual and Quarterly Pediatric Lead Reports begin on the next page.

ANNUAL HIGHLIGHT

10,111 Army Dependents

received a blood lead test between 1 January and 31 December 2020; 0.5% of those tests indicated an elevated blood lead level. Among child dependents tested within the Military Health System, the rate of elevated blood lead levels in CY2020 is 5.1 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. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with elevated blood lead levels should be reported to the Disease Reporting System internet (DRSi) according to Armed Force Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

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 MHS Genesis. This is the first report where laboratory results from MHS Genesis records are available. Records are dated according to the BLL collection date, and this report covers test results collected from 1 October through 31 December 2020 (CY2020 Q4), as well as a summary of all CY2020 results. The data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2020 4th Quarter (Q4), the highest BLL result was retained. Data from each quarter of CY2020 will be combined to summarize annual BLL test results. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated. All CY2020 Q4 eBLL test results are reported; however, a distinction is made between new cases of eBLLs and cases previously reported in CY2020.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[8] DRSi is a Tri-Service reportable medical event system. 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 2020 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2020 Q4 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within CHCS and MHS Genesis collected during CY2020 Q4 that were also reported via a medical event report in DRSi.

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. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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

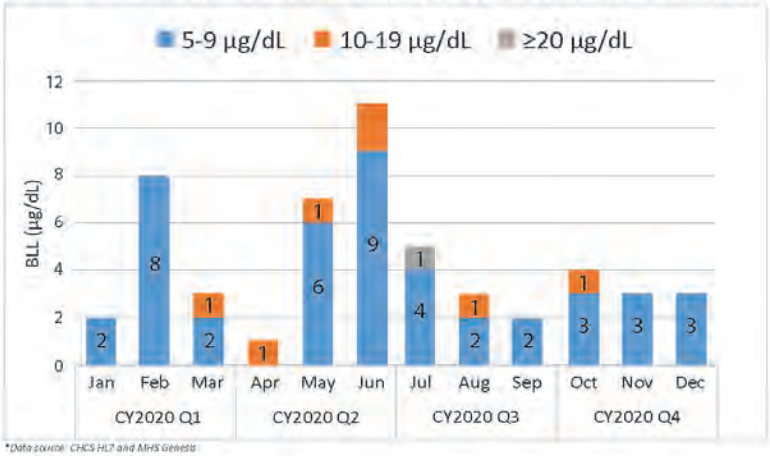
During CY2020, 10,111 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 52 of those results (0.5%) were elevated (BLL ≥5 µg/dL). In CY2020, one child had a BLL within the highest range (≥20 µg/dL, Table 1); however, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl). When repeat blood lead tests were examined, 20 out of the 52 children (38%) with elevated results within the calendar year had a follow-up blood lead test result that fell below the CDC cut-off for elevated blood lead by the end of CY2020 (i.e., <5 µg/dl). There was a 16% decrease in the total number of pediatric blood lead tests performed in CY2020 compared to CY2019 (n=12,030 BLL tests), possibly due to missed or delayed well-child visits during the COVID-19 pandemic.

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2020

BLL Ranges	Q4	CY2020
<5 µg/dL	2,293	10,059
5-9 µg/dL	11	44
10-19 µg/dL	1	7
≥20 µg/dL	0	1
Total	**2,305**	**10,111**

In CY2020 Q4, 2,305 Army dependents received a blood lead test within the MHS, and 12 of those results (0.5%) were elevated (BLL ≥5 µg/dL). Ten of the elevated results in CY2020 Q4 are new eBLL cases. Two of the 12 Army Dependents with an elevated result in CY2020 Q4 had an elevated result reported earlier in CY2020. Figure 1 summarizes the number of elevated test results from each quarter in CY2020.

Figure 1. . Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter, CY2020



*Data source: CHCS HL7 and MHS Genesis

With the highest test result from the calendar year retained for each dependent, Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Benning (3), Ft Bliss (1), Ft Bragg (4), Ft Campbell (3), Ft Carson (1), Ft Drum (5), Ft Hood (4), Ft Jackson (1), Ft Leavenworth (1), Ft Lee (1), Ft Leonard Wood (1), Ft Polk (3), Ft Riley (7), Ft Rucker (2), Ft Sill (3), Ft Shafter (2), Ft Wainwright (1), Schofield Barracks (4), Joint Base (JB) Lewis-McChord (1), JB San Antonio (1), Dover Air Force Base (AFB) (2), and Patrick AFB (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2020 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	79	0	0	0	79
Carlisle Barracks	8	0	0	0	8
Ft Belvoir	248	0	0	0	248
Ft Benning*	371	3	0	0	374
Ft Bragg*	1,182	3	1	0	1,186
Ft Campbell*	226	2	1	0	229
Ft Detrick	24	0	0	0	24
Ft Drum*	416	5	0	0	421
Ft Gordon	59	0	0	0	59
Ft Jackson*	72	1	0	0	73
Ft Knox	216	0	0	0	216
Ft Lee*	180	1	0	0	181
Ft Meade	47	0	0	0	47
Ft Rucker*	114	2	0	0	116
Ft Stewart	273	0	0	0	273
Redstone Arsenal	18	0	0	0	18
West Point	70	0	0	0	70
Walter Reed NMMC	28	0	0	0	28
CENTRAL					
Ft Bliss*	1,041	1	0	0	1,042
Ft Carson*	213	1	0	0	214
Ft Hood*	1,028	4	0	0	1,032
Ft Huachuca	13	0	0	0	13
Ft Irwin	49	0	0	0	49

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020

Ft Leavenworth*	190	1	0	0	191
Ft Leonard Wood*	272	1	0	0	273
Ft Polk*	165	3	0	0	168
Ft Riley*	500	5	2	0	507
Ft Sill*	356	1	2	0	359
PACIFIC					
Camp Zama	2	0	0	0	2
Ft Shafter*	157	2	0	0	159
Ft Wainwright*	183	1	0	0	184
Schofield Barracks*	724	4	0	0	728
USAG Humphreys	5	0	0	0	5
USAG Yongsan	6	0	0	0	6
EUROPE					
Grafenwoehr	2	0	0	0	2
Hohenfels/Amberg	3	0	0	0	3
Kaiserslautern	3	0	0	0	3
Katterbach	1	0	0	0	1
Landstuhl	27	0	0	0	27
Vicenza	5	0	0	0	5
Vilseck	18	0	0	0	18
Wiesbaden	85	0	0	0	85
JOINT BASES					
Joint Base Elmendorf-Richardson	128	0	0	0	128
Joint Base San Antonio*	476	0	1	0	477
Joint Base Langley-Eustis*	142	0	0	0	142
Joint Base Lewis-McChord*	47	0	0	1	48
Joint Base Little Creek-Fort Story	7	0	0	0	7
Joint Base McGuire-Dix-Lakehurst	17	0	0	0	17
Joint Base Meyer-Henderson Hall	15	0	0	0	15
Joint Base Anacostia-Bolling	19	0	0	0	19
Joint Base Pearl Harbor-Hickam	2	0	0	0	2
USAF MTF*±					
	419	3	0	0	422
NAVAL/MARINE CORPS MTF*±					
	108	0	0	0	108

* eBLL result in CY2020
± list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, eight eBLL cases among Army Dependents have CY2020 Q4 report dates. A total of 33 eBLL cases among Army Dependents were reported to DRSi in CY2020. The location of the cases are summarized in Table 3.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2020

	# cases*	
INSTALLATION	Q4	CY2020
Ft Benning	0	2
Ft Bliss	0	1
Ft Bragg	0	1
Ft Carson	0	1
Ft Drum	1	4
Ft Hood	0	4
Ft Jackson	0	1
Ft Leonard Wood	0	1
Ft Polk	1	2
Ft Riley	4	8
Ft Rucker	1	1
Ft Sill	1	1
Ft Shafter	0	4
Dover AFB	0	2
Total	8	33

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. The Army had 60% reporting compliance for CY2020 Q4. Six out of the ten new eBLL cases identified in the CHCS and MHS Genesis laboratory data system were reported to DRSi. Five of the cases were reported during CY2020 Q4. One case was reported after the end of the fourth quarter (31 December 2020) but is being counted towards the reporting compliance measure because the test collection date fell within CY2020 Q4. Each of the following installations had one unreported eBLL case from CY2020 Q4: Ft Bragg, Ft Campbell, Ft Lee, and Ft Shafter.

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

The results of the APHN-PSR indicated that a total of 1,206 BLL test results were reported to state and/or local authorities during CY2020 Q4 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). Ten (0.8%) of those results were elevated.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2020 Q4*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Campbell	21	0
Ft Drum	1	1
Ft Jackson	8	0
Ft Rucker	39	1
JB Langley-Eustis	45	0
CENTRAL		
Ft Bliss	252	0
Ft Carson	58	0
Ft Hood	442	0
Ft Polk	33	1
Ft Riley	174	4
Ft Sill	0	1

Table 4 (continued). Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2020 Q4*

Joint Base San Antonio	112	0
PACIFIC		
Ft Wainwright	19	0
Joint Base Lewis-McChord	1	1
EUROPE		
USAG Wiesbaden	1	1

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.5% of the BLL tests performed in CY2020 (1 January – 31 December 2020) were elevated. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2020 was 5.1 per 1,000 child dependents, and is slightly higher than the CY2019 rate, 3.8 per 1,000. The total number of pediatric blood lead test results within the MHS decreased by 16% compared to CY2019. The CDC reported an even larger decrease on the civilian side (34% between January – May 2020), most likely due to missed or delayed well-child visits during the COVID-19 pandemic.[5]

Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 60% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. We are now in a new reporting year, and a new medical event report should be submitted for any cases reported in CY2020 with an elevated result on a repeat test in CY2021.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results were pulled 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 time of the NMCPHC data pull. For the first time, the NMCPHC provided MHS Genesis laboratory data along with data from CHCS. The MHS Genesis data was included in this report to provide some visibility on the installations that have switched over to that system (e.g., JB Lewis-McChord and Presidio of Monterey); however, the quality and completeness of this data is still being examined by the NMCPHC. 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. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

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Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases		Naval/Marine Corps Stations
Altus AFB	Los Angeles AFB	Annapolis
Andersen JB	Luke AFB	Bahrain
Andrews JBA	MacDill AFB	Camp Lejeune
Barksdale AFB	Malmstrom AFB	Cherry Point
Beale AFB	Maxwell AFB	Chesapeake
Davis-Monthan AFB	McConnell AFB	Jacksonville
Dover AFB	Minot AFB	Kaneohe
Dyess AFB	Nellis AFB	Marianas-Guam
Edwards AFB	Offutt AFB	Milton
Eglin AFB	Osan AB	Norfolk
Eielson AFB	Patrick AFB	Okinawa
Ellsworth AFB	Peterson AFB	Patuxent River
Fairchild AFB	RAF Alconbury	Portsmouth
FE Warren AFB	Ramstein AB	Quantico
Goodfellow AFB	Robins AFB	San Diego
Hanscom AFB	Scott AFB	Sasebo
Hill AFB	Seymour Johnson AFB	Suffolk
Holloman AFB	Tinker AFB	Virginia Beach
Hurlburt Field	Travis AFB	
Kadena AB	USAF Academy	
Keesler AFB	Vandenberg AFB	
Little Rock AFB	Wright-Patterson AFB	

8

QUARTERLY HIGHLIGHT

2,430 Army Dependents
received a blood lead test between 1 January and 31 March 2020; 0.5% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with elevated blood lead levels should be reported to the Disease Reporting System internet (DRSi) once per calendar year. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 January through 31 March 2020 (CY2020 Q1). HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2020 1st Quarter (Q1), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. Only Army Dependent cases reported to DRSi are included in this report. Among Army Dependents, DRSi cases with medical event report dates from 1 January through 31 March 2020 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2020 Q1 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2020 Q1 that were also reported via a medical event report in DRSi.

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

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six years of age or younger is confirmed to have an eBLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: 1) The 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.

The Fiscal Year 2020 (FY20) APHN-PSR no longer includes questions on the housing status of eBLL cases, environmental housing assessments, or mold exposure.

RESULTS

CHCS HL7 Chemistry Data System Results

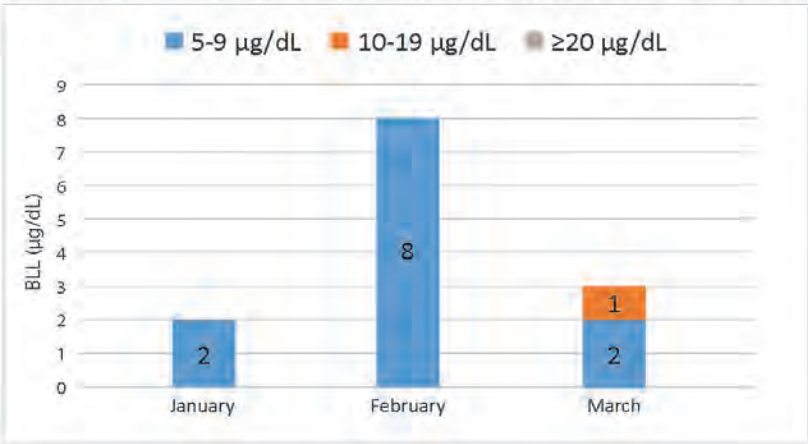
During CY2020 Q1, 2,430 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 13 of those results (0.5%) were elevated (BLL ≥5 µg/dL). In CY2020 Q1, no children had a BLL within the highest range (≥20 µg/dL, Table 1). There were a similar number of eBLLs in CY2020 Q1 compared to CY2019 Q1; however, there were 23% fewer blood lead test results among Army Dependents in CY2020 Q1 compared to the same time period last year. This could be due to the on-going COVID-19 pandemic.

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in Q1, CY2019-CY2020

BLL Ranges	CY2019 Q1	CY2020 Q1
<5 µg/dL	3,158	2,417
5-9 µg/dL	12	12
10-19 µg/dL	2	1
≥20 µg/dL	2	0
Total	**3,174**	**2,430**

Seven of the elevated results in CY2020 Q1 are new eBLL cases. Six of the 13 Army Dependents with an elevated result in CY2020 Q1 had an elevated result reported previously in CY2019; however, children with eBLL results are counted as cases once per calendar year. Figure 1 summarizes the number of elevated test results from CY2020 Q1.

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter, CY2020 Q1



*Data source: HL7

Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Campbell (2), Ft Hood (1), Ft Leavenworth (1), Ft Polk (2), Ft Riley (2), Ft Rucker (1), Ft Shafter (1), Schofield Barracks (2), and Patrick Air Force Base (AFB) (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2020 Q1 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q1

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	27	0	0	0	27
Ft Belvoir	35	0	0	0	35
Ft Benning	87	0	0	0	87
Ft Bragg	279	0	0	0	279
Ft Campbell*	33	1	1	0	35
Ft Detrick	6	0	0	0	6
Ft Drum	113	0	0	0	113
Ft Gordon	21	0	0	0	21
Ft Jackson	17	0	0	0	17
Ft Knox	57	0	0	0	57
Ft Lee	40	0	0	0	40
Ft Meade	16	0	0	0	16
Ft Rucker*	25	1	0	0	26
Ft Stewart	49	0	0	0	49
Redstone Arsenal	2	0	0	0	2
West Point	20	0	0	0	20
Walter Reed NMMC	3	0	0	0	3
CENTRAL					
Ft Bliss	241	0	0	0	241
Ft Carson	44	0	0	0	44
Ft Hood*	204	1	0	0	205
Ft Huachuca	5	0	0	0	5

*eBLL result in CY2020 Q1
**list of USAF, Naval, and Marine Corps locations in Appendix A

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q1

Ft Irwin	16	0	0	0	16
Ft Leavenworth*	53	1	0	0	54
Ft Leonard Wood	63	0	0	0	63
Ft Polk*	43	2	0	0	45
Ft Riley*	135	2	0	0	137
Ft Sill	92	0	0	0	92
PACIFIC					
Camp Zama	1	0	0	0	1
Ft Shafter*	44	1	0	0	45
Ft Wainwright	65	0	0	0	65
Schofield Barracks*	191	2	0	0	193
EUROPE					
Grafenwoehr	2	0	0	0	2
Landstuhl	4	0	0	0	4
Vilseck	2	0	0	0	2
USAG Wiesbaden	23	0	0	0	23
JOINT BASES					
Joint Base Elmendorf-Richardson	29	0	0	0	29
Joint Base San Antonio	125	0	0	0	125
Joint Base Langley-Eustis	47	0	0	0	47
Joint Base Little Creek-Fort Story	4	0	0	0	4
Joint Base McGuire-Dix-Lakehurst	7	0	0	0	7
Joint Base Meyer-Henderson Hall	6	0	0	0	6
Joint Base Anacostia-Bolling	9	0	0	0	9
USAF MTF*‡					
	110	1	0	0	111
NAVAL/MARINE CORPS MTF*‡					
	22	0	0	0	22

*eBLL result in CY2020 Q1
**list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, three eBLL cases among Army Dependents have CY2020 Q1 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, two children had a BLL test in CY2019 Q4 and one child had a BLL test in CY2020 Q1. One case was reported from each of the following installations: Ft Hood, Ft Shafter, and Schofield Barracks. These case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only three out of the 13 eBLL cases identified in the CHCS HL7 laboratory data system were reported to DRSi, resulting in a reporting compliance of 23% for CY2020 Q1. Six of the 13 cases had been previously reported in CY2019; however, per the RME case definition, elevated pediatric blood lead should be reported once per calendar year. A child with an eBLL in CY2019 with an elevated follow-up test result in CY2020 should be reported to DRSi again. Four of the cases have not been reported to DRSi, these cases were tested at Ft Campbell, Ft Leavenworth, Ft Polk, and Schofield Barracks.

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

The results of the APHN-PSR indicated that a total of 1,398 BLL test results were reported to state and/or local authorities during CY2020 Q1 (Table 3). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to state and local authorities (n=981), followed by PHC-Atlantic (n=264), and PHC-Pacific (n=153). Eight (0.5%) of those results were elevated.

Table 3 Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2020 Q1*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Belvoir	67	0
Ft Jackson	1	0
Ft Rucker	31	0
JB Langley-Eustis	163	1
Redstone Arsenal	2	0
CENTRAL		
Ft Bliss	286	0
Ft Hood	318	0
Ft Polk	122	3
Ft Sill	87	0
Joint Base San Antonio	168	2
PACIFIC		
Ft Wainwright	83	0
Joint Base Lewis-McChord	69	1
Tripler AMC/Schofield Barracks	1	1

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.5% of the BLL tests performed in CY2020 (1 January – 31 March 2020) were elevated. A similar prevalence of elevated results was seen in the first quarter of CY2019. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2019 was 3.8 per 1,000 child dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 23% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. A new medical event report should be submitted for any cases reported in CY2019 with an elevated result on a repeat test in CY2020.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled one month after the end of Q1 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities, including Joint Base Lewis-McChord and Presidio of Monterey, continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood samples collected and tested outside the MHS are not represented in this report. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The number of questions relevant to lead and other household exposures have been changed on the most current APHN-PSR. However, this was in response to the introduction of a Housing-related Illness Investigation Worksheet to be completed by Preventive Medicine Services/ Department of Public Health. A copy of this worksheet can be found in Annex C of the Fragmentary Order (FRAGO) 2 to Operations Order (OPORD) 19-29.[8]

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Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Andrews JBA
Barksdale AFB
Davis-Monthan AFB
Dover AFB
Eielson AFB
Eglin AFB
Ellsworth AFB
FE Warren AFB
Goodfellow AFB
Hanscom AFB
Hill AFB
Kadena AB
Keesler AFB
Los Angeles AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Minot AFB
Osan AB
Patrick AFB
Peterson AFB
Scott AFB
Tinker AFB
USAF Academy
Vandenberg AFB
Wright-Patterson AFB
Yokota AB

Naval/Marine Corps Stations
Camp Lejeune
Kaneohe
Milton
Okinawa
Patuxent River
Portsmouth
Quantico
Sasebo
Suffolk
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

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QUARTERLY HIGHLIGHT

2,384 Army Dependents
received a blood lead test between 1 April and 30 June 2020; 0.8% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure at all 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with elevated blood lead levels should be reported in accordance with Armed Forces Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 April through 30 June 2020 (CY2020 Q2). HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DoD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces Reportable Medical Events (RME) Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during Calendar Year (CY) 2020 2nd Quarter (Q2), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. 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 2020 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2020 Q2 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2020 Q2 that were also reported via a medical event report in DRSi.

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

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the Army Public Health Nursing Program Status Report (APHN-PSR) to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six years of age or younger is confirmed to have an eBLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: 1) The 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.

The Fiscal Year 2020 (FY20) APHN-PSR no longer includes questions on the housing status of eBLL cases, environmental housing assessments, or mold exposure.

RESULTS

CHCS HL7 Chemistry Data System Results

During CY2020 Q2, 2,384 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 20 of those results (0.8%) were elevated (BLL ≥5 µg/dL). In CY2020 Q2, no children had a BLL within the highest range (≥20 µg/dL, Table 1).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2020 Q2

BLL Ranges				
<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
2,364	16	4	0	2,384

Nineteen of the elevated results in CY2020 Q2 are new eBLL cases. One Army Dependent with an elevated result in CY2020 Q2 had an elevated result reported previously in CY2020. In the first two quarters of CY2020. there were a total of 32 Army Dependents with an eBLL (Figure 1).

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter, CY2020

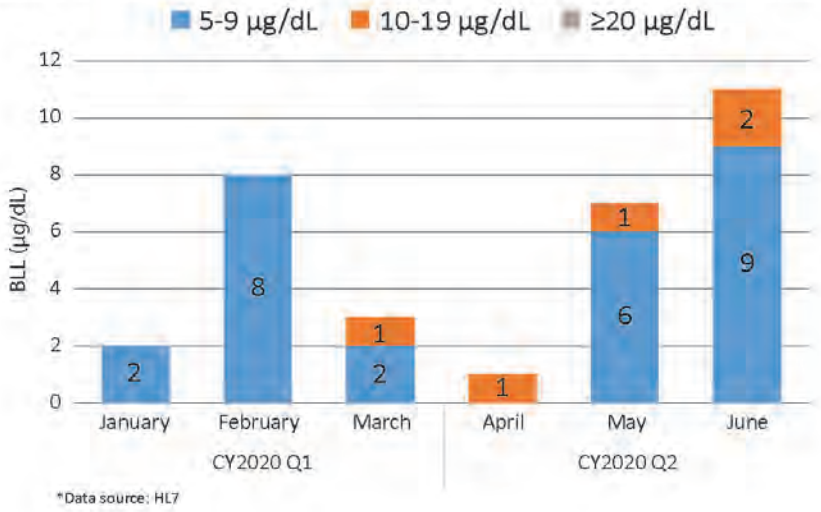

Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Benning (2), Ft Bliss (1), Ft Bragg (2), Ft Drum (1), Ft Hood (3), Ft Jackson (1), Ft Leonard Wood (1), Ft Riley (3), Ft Sill (1), Ft Wainwright (1), Joint Base San Antonio (1), Schofield Barracks (1), and Dover Air Force Base (AFB) (2). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2020 Q2 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q2

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	11	0	0	0	11
Ft Belvoir	75	0	0	0	75
Ft Benning*	132	2	0	0	134
Ft Bragg*	319	1	1	0	321
Ft Campbell	74	0	0	0	74
Ft Detrick	6	0	0	0	6
Ft Drum*	86	1	0	0	87
Ft Gordon	13	0	0	0	13
Ft Jackson*	23	1	0	0	24
Ft Knox	47	0	0	0	47
Ft Lee	26	0	0	0	26
Ft Meade	5	0	0	0	5
Ft Rucker	24	0	0	0	24
Ft Stewart	72	0	0	0	72
Redstone Arsenal	1	0	0	0	1
West Point	16	0	0	0	16
Walter Reed NMMC	6	0	0	0	6
CENTRAL					
Ft Bliss*	261	1	0	0	262
Ft Carson	46	0	0	0	46

*eBLL result in CY2020 Q2
**list of USAF, Naval, and Marine Corps locations in Appendix A

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Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q2

Ft Hood*	231	3	0	0	234
Ft Huachuca	4	0	0	0	4
Ft Irwin	12	0	0	0	12
Ft Leavenworth	29	0	0	0	29
Ft Leonard Wood*	46	1	0	0	47
Ft Polk	44	0	0	0	44
Ft Riley*	103	2	1	0	106
Ft Sill*	72	0	1	0	73
PACIFIC					
Camp Humphreys	1	0	0	0	1
Camp Zama	1	0	0	0	1
Ft Shafter	34	0	0	0	34
Ft Wainwright*	60	1	0	0	61
Schofield Barracks*	185	1	0	0	186
USAG Yongsan	1	0	0	0	1
EUROPE					
Hohenfels	1	0	0	0	1
Kaiserslautern	1	0	0	0	1
Katterbach	1	0	0	0	1
USAG Wiesbaden	32	0	0	0	32
JOINT BASES					
Joint Base Elmendorf-Richardson	37	0	0	0	37
Joint Base San Antonio*	110	0	1	0	111
Joint Base Langley-Eustis	9	0	0	0	9
Joint Base McGuire-Dix-Lakehurst	3	0	0	0	3
Joint Base Meyer-Henderson Hall	2	0	0	0	2
Joint Base Anacostia-Bolling	5	0	0	0	5
USAF MTF*±					
	77	2	0	0	79
NAVAL/MARINE CORPS MTF*±					
	20	0	0	0	20

*eBLL result in CY2020 Q2
**list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, nine eBLL cases among Army Dependents have CY2020 Q2 report dates. These case counts are based on DRSi reporting date and may not reflect the counts in Table 1. Due to differences in the report date compared to the test collection date in the DRSi system, three children had a BLL test in CY2020 Q1 and six children had a BLL test in CY2020 Q2.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2020 Q2

Installation	# cases*
Ft Benning	2
Ft Bliss	1
Ft Bragg	1
Ft Hood	1
Ft Jackson	1
Ft Leonard Wood	1
Ft Riley	1
Ft Shafter – Tripler	1

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. Of the 19 new eBLL cases identified in the CHCS HL7 laboratory data system, 13 cases were reported to DRSi, a reporting compliance of 68.4%. Of those 13 cases, seven were reported during CY2020 Q2. Six cases were reported after the end of the second quarter (30 June 2020), but are being counted towards the reporting compliance measure because the test collection date fell within CY2020 Q2. Six cases from CY2020 Q2 have not been reported to DRSi, these cases were tested at Ft Bragg, Ft Drum, Ft Jackson, Ft Sill, Ft Wainwright, and Joint Base San Antonio.

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

The results of the APHN-PSR indicated that a total of 725 BLL test results were reported to state and/or local authorities during CY2020 Q2 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to state and local authorities (n=661), followed by PHC-Atlantic (n=19), and PHC-Pacific (n=43). Sixteen (2.2%) of those results were elevated.

Table 4 Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2020 Q2*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Benning	2	2
Ft Bragg	1	1
Ft Jackson	2	2
JB Langley-Eustis	9	0
Redstone Arsenal	5	0
CENTRAL		
Ft Bliss	215	1
Ft Hood	262	3
Ft Leonard Wood	1	1
Ft Polk	48	0
Ft Riley	1	1
JB San Antonio	134	2
EUROPE		
Grafenwoehr	1	0
USAG Wiesbaden	1	1
PACIFIC		
Ft Wainwright	1	1
JB Lewis-McChord	41	0
Presidio of Monterey	1	1

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.8% of the BLL tests performed in CY2020 Q2 (1 April – 30 June 2020) were elevated. This is slightly higher than the annual rate of eBLL in CY2019 among Army dependents tested within the MHS (3.8 per 1,000 child dependents). Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 68% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. Installations with unreported eBLL cases should submit a medical event report for these cases.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities, including Joint Base Lewis-McChord and Presidio of Monterey, continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood samples collected and tested outside the MHS are not represented in this report. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The number of questions relevant to lead and other household exposures have been changed on the most current APHN-PSR. However, this was in response to the introduction of a Housing-related Illness Investigation Worksheet to be completed by Preventive Medicine Services/ Department of Public Health. A copy of this worksheet can be found in Annex C of the Fragmentary Order (FRAGO) 2 to Operations Order (OPORD) 19-29.[8]

REFERENCES

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4. Schnur, J. and R.M. John. 2014. Childhood lead poisoning and the new Centers for Disease Control and Prevention guidelines for lead exposure. J Am Assoc Nurse Pract. 26(5):238-247.
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6. Navy and Marine Corps Public Health Center EpiData Center Department. 2019. NMCPHC-EDC-TR-061-2019, DOD Quarterly Pediatric Lead Report, CY 2018 Q4.
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8. Headquarters, U.S. Army Medical Command, USAMEDCOM Fragmentary Order 2 to Operations Order 19-29 (Environmental Health Management Control Plan (Lead Hazard Management Control Plan – Preventing Childhood Lead Exposure)), dated 25 November 2019.

Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Altus AFB
Andrews JBA
Beale AFB
Davis-Monthan AFB
Dover AFB
Edwards AFB
Eglin AFB
Ellsworth AFB
Hanscom AFB
Hill AFB
Keesler AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Nellis AFB
Osan AB
Patrick AFB
Peterson AFB
RAF Alconbury
Ramstein AB
Scott AFB
Seymour Johnson AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Camp Lejeune
Jacksonville
JB Pearl Harbor-Hickam
Kaneohe
Okinawa
Portsmouth
Quantico
Suffolk

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

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Army Quarterly Pediatric Lead Report (Calender Year (CY) 2020 Quarter (Q3))

QUARTERLY HIGHLIGHT

3,060 Army Dependents
received a blood lead test between 1 July and 30 September 2020; 0.5% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure at all 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army Dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with elevated blood lead levels should be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

METHODS

Health Level 7 Chemistry Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army Dependents within the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system. HL7 records are dated according to the BLL collection date, and this report covers test results collected from 1 July to 30 September 2020 (CY2020 Q3). HL7 data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS) and captures test results for Army Dependents who receive care at Army medical treatment facilities (MTFs) and other Department of Defense (DOD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army Dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2020 3rd Quarter (Q3), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. Only Army dependent cases reported to DRSi are included in this report. Among Army Dependents, DRSi cases with medical event report dates from 1 July to 30 September 2020 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2020 Q3 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2020 Q3 that were also reported via a medical event report in DRSi.

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

Starting in April 2019, specific questions regarding Childhood Lead Exposure and Mold Exposure were included in the APHN-PSR to assess the Environmental Health Hazard Management Control Program. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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.

The Fiscal Year 2020 (FY20) APHN-PSR no longer includes questions on the housing status of eBLL cases, environmental housing assessments, or mold exposure.

RESULTS

CHCS HL7 Chemistry Data System Results

During CY2020 Q3, 3,060 Army Dependents between 0 and 6 years old received a blood lead test within the MHS, and 16 of those results (0.5%) were elevated (BLL ≥5 µg/dL). In CY2020 Q3, no children had a BLL within the highest range (≥20 µg/dL, Table 1).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2020 Q3

BLL Ranges				
<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
3,044	14	2	0	**3,060**

Nine of the elevated results in CY2020 Q3 are new eBLL cases. Seven Army Dependents with an elevated result in CY2020 Q3 had an elevated result reported previously in CY2020. In the first three quarters of CY2020, there were a total of 39 Army Dependents with an eBLL (Figure 1).

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter, CY2020

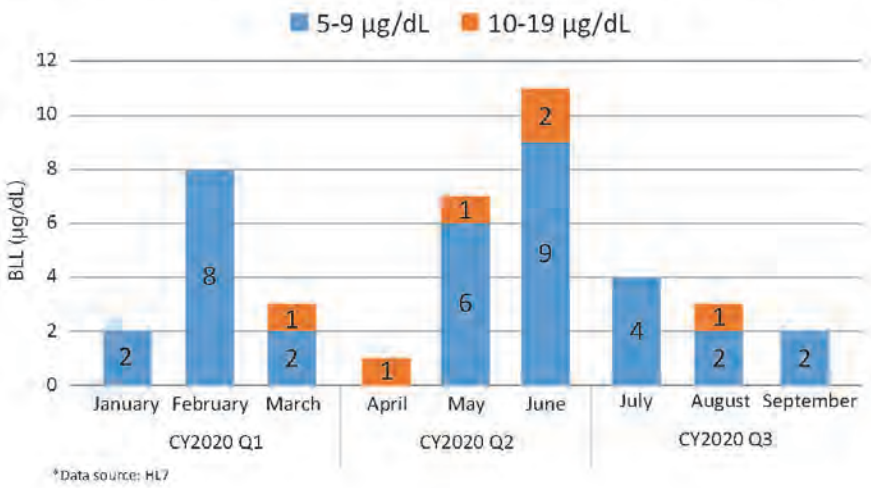

Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Benning (2), Ft Bliss (1), Ft Campbell (1), Ft Carson (1), Ft Drum (3), Ft Hood (1), Ft Riley (4), Ft Sill (1), Schofield Barracks (1), and Nellis Air Force Base (AFB) (1). A list of USAF, Marine Corps, and Navy locations where Army Dependents received BLL testing during CY2020 Q3 is shown in Appendix A.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q3

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	21	0	0	0	21
Ft Belvoir	79	0	0	0	79
Ft Benning*	128	2	0	0	130
Ft Bragg*	285	0	0	0	285
Ft Campbell*	73	0	1	0	74
Ft Detrick	2	0	0	0	2
Ft Drum*	143	3	0	0	146
Ft Gordon	16	0	0	0	16
Ft Jackson	21	0	0	0	21
Ft Knox	77	0	0	0	77
Ft Lee	63	0	0	0	63
Ft Meade	16	0	0	0	16
Ft Rucker	36	0	0	0	36
Ft Stewart	83	0	0	0	83
Redstone Arsenal	7	0	0	0	7
West Point	19	0	0	0	19
Walter Reed NMMC	13	0	0	0	13
CENTRAL					
Ft Bliss*	332	1	0	0	333
Ft Carson*	64	1	0	0	65

*eBLL result in CY2020 Q3
**list of USAF, Naval, and Marine Corps locations in Appendix A

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2020 Q3

Ft Hood*	322	1	0	0	323
Ft Irwin	10	0	0	0	10
Ft Leavenworth	72	0	0	0	72
Ft Leonard Wood	95	0	0	0	95
Ft Polk	59	0	0	0	59
Ft Riley*	170	4	0	0	174
Ft Sill*	111	0	1	0	112
PACIFIC					
Camp Humphreys	4	0	0	0	4
Ft Shafter	47	0	0	0	47
Ft Wainwright	42	0	0	0	42
Schofield Barracks*	205	1	0	0	206
USAG Yongsan	3	0	0	0	3
EUROPE					
Hohenfels	2	0	0	0	2
Landstuhl	5	0	0	0	5
Vicenza	3	0	0	0	3
Vilseck	5	0	0	0	5
Wiesbaden	17	0	0	0	17
JOINT BASES					
Joint Base Elmendorf-Richardson	46	0	0	0	46
Joint Base San Antonio	138	0	0	0	138
Joint Base Langley-Eustis	43	0	0	0	43
Joint Base McGuire-Dix-Lakehurst	3	0	0	0	3
Joint Base Meyer-Henderson Hall	5	0	0	0	5
Joint Base Anacostia-Bolling	5	0	0	0	5
USAF MTF*‡					
	119	1	0	0	120
NAVAL/MARINE CORPS MTF*‡					
	35	0	0	0	35

*eBLL result in CY2020 Q3
**list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, 13 eBLL cases among Army Dependents have CY2020 Q3 report dates. These case counts are based on DRSi reporting date and may not reflect the counts in Table 1. Due to differences in the report date compared to the test collection date in the DRSi system, six children had a BLL test in CY2020 Q2 and seven children had a BLL test in CY2020 Q3.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2020 Q3

Installation	# cases*
Ft Carson	1
Ft Drum	3
Ft Hood	2
Ft Riley	4
Ft Shafter – Tripler	1
Dover AFB	2

*case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Only new eBLL cases were considered in the calculation of reporting compliance. Of the nine new eBLL cases identified in the CHCS HL7 laboratory data system, seven cases were reported to DRSi, a reporting compliance of 77.8%. All seven cases were reported during CY2020 Q3. Two cases from CY2020 Q3 have not been reported to DRSi, these cases were tested at Ft Benning and Ft Sill.

APHN-PSR

The results of the APHN-PSR indicated that a total of 1,532 BLL test results were reported to state and/or local authorities during CY2020 Q3 (Table 4). This question is relevant for installations located in state and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to state and local authorities (n=922), followed by PHC-Atlantic (n=548), and PHC-Pacific (n=60). Fourteen (0.9%) of those results were elevated.

Table 4 Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2020 Q3*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Belvoir	513	0
Ft Drum	3	3
Ft Gordon	22	0
Redstone Arsenal	10	0
CENTRAL		
Ft Bliss	301	1
Ft Carson	82	1
Ft Hood	327	0
Ft Leonard Wood	1	1
Ft Polk	58	0
Ft Riley	7	5
JB San Antonio	146	0
EUROPE		
USAG Ansbach	1	1
USAG Wiesbaden	1	1
PACIFIC		
Ft Wainwright	58	0
Presidio of Monterey	1	1
Schofield Barracks	1	0

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.5% of the BLL tests performed in CY2020 Q3 (1 July - 30 September 2020) were elevated. A decrease from CY2020 Q2, but slightly higher than the annual rate of eBLL in CY2019 among Army dependents tested within the MHS (3.8 per 1,000 child dependents). Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and MTFs reached 78% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. Installations with unreported eBLL cases should submit a medical event report for these cases.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results from the HL7 data system were pulled one month after the end of Q3 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 time of the NMCPHC data pull. MHS Genesis does not currently feed laboratory data into the HL7 system, so MTFs that have transitioned to MHS Genesis are not represented in this report. However, these facilities, including Joint Base Lewis-McChord and Presidio of Monterey, continue to report to the APHN-PSR and DRSi, which highlights the importance of elevated blood lead as an RME. In addition, only BLLs collected within the MHS are available through the HL7 data system, meaning blood samples collected and tested outside the MHS are not represented in this report. As the MHS reforms, some MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established an RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the HL7 data shows that there were no eBLLs among the Army Dependents who received BLL tests at Navy/Marine Corps MTFs.

The APHN-PSR reports aggregate numbers and the counts in that survey may not directly correspond to the counts in the CHCS HL7 data system and DRSi medical event reporting. The number of questions relevant to lead and other household exposures have been changed on the most current APHN-PSR. However, this was in response to the introduction of a Housing-related Illness Investigation Worksheet to be completed by Preventive Medicine Services/ Department of Public Health. A copy of this worksheet can be found in Annex C of the Fragmentary Order (FRAGO) 2 to Operations Order (OPORD) 19-29.[8]

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Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test

USAF Bases
Altus AFB
Andrews JBA
Davis-Monthan AFB
Dover AFB
Dyess AFB
Eglin AFB
Eielson AFB
Ellsworth AFB
Goodfellow AFB
Hanscom AFB
Hill AFB
Holloman AFB
Keesler AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Nellis AFB
Osan AB
Patrick AFB
Peterson AFB
RAF Alconbury
Ramstein AB
Scott AFB
Seymour Johnson AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Annapolis
Bahrain
Camp Lejeune
Jacksonville
JB Guam - Andersen
JB Pearl Harbor-Hickam
Kaneohe
Okinawa
Portsmouth
Quantico
Suffolk

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

APPENDIX D

CY2021 PEDIATRIC LEAD REPORTS

The CY2021 Annual and Quarterly Pediatric Lead Reports begin on the next page.

ANNUAL HIGHLIGHT

8,669 Army child dependents
received a blood lead test between 1 January and 31 December 2021; 0.3% of those tests indicated an elevated blood lead level. Among child dependents tested within the Military Health System, the rate of elevated blood lead levels in CY2021 is 3.5 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. 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure 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.

In 2021, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 5 to 3.5 micrograms per deciliter (µg/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 old 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 it 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 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with eBLLs should be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division (AFHSD) guidelines. The Tri-Service Reportable Medical Event Working Group is in the process of updating the case definition of the elevated lead RME to reflect the change in the CDC reference value. This report tracks all available blood lead level (BLL) test results within the Army dependent population and monitors the occurrence of eBLLs. This iteration will use the previous CDC reference value for eBLL (5 µg/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 October through 31 December 2021 (CY2021 Q4), as well as a summary of all CY2021 results. The data include all BLL test results above and below the eBLL cutoff collected within the MHS. This includes test results for Army dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DOD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army dependents ages 0 to 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2021 4th Quarter (Q4), the highest BLL result was retained. Data from each quarter of CY2021 were combined to summarize annual BLL test results. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Regional Health Command (RHC), and installation. Results ≥5 µg/dL are considered elevated. All CY2021 Q4 eBLL test results are reported.

Disease Reporting System, Internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a tri-service reportable medical event system. 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 2021 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, cases with test collection dates during CY2021 Q4 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within CHCS and MHS GENESIS collected during CY2021 Q4 that were also reported via a medical event report in DRSi.

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. 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 six 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 CY2021, there were 8,669 Army dependents 0 to 6 years old that received a blood lead test within the MHS, and 30 of those results (0.3%) were elevated (BLL ≥5 µg/dL). In CY2021, one child had a BLL within the highest range (≥20 µg/dL, Table 1); however, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dL). When repeat blood lead tests were examined, 15 out of the 30 children (50%) with elevated results within the calendar year had a follow-up blood lead test result that fell below the CDC cut-off for elevated blood lead by the end of CY2021 (i.e., <5 µg/dL).

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in CY2021

BLL Ranges	CY2021 Q4	CY2021
<5 µg/dL	1,659	8,639
5-9 µg/dL	9	22
10-19 µg/dL	1	7
≥20 µg/dL	0	1
Total	**1,669**	**8,669**

In CY2021 Q4, 1,659 Army dependents received a blood lead test within the MHS, and ten of those results (0.6%) were elevated (BLL ≥5 µg/dL). Seven of the elevated results in CY2021 Q4 were new eBLL cases. Three Army dependents with an elevated result in CY2021 Q4 had an elevated result reported previously in CY2021. Figure 1 summarizes the number of elevated test results from each quarter in CY2021.

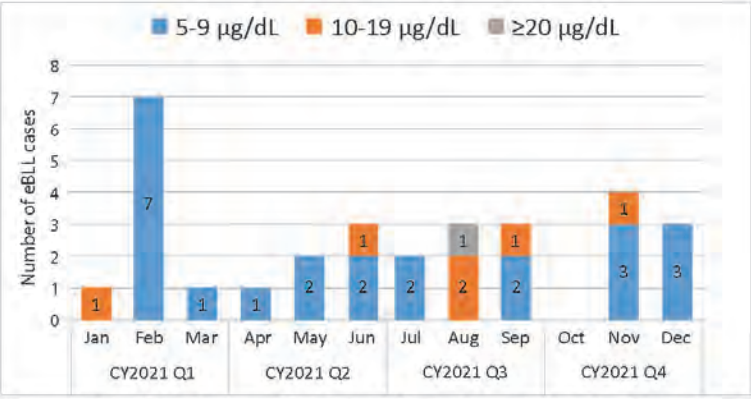

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month in CY2021
Data source: CHCS HL7 and MHS GENESIS

With the highest test result from the calendar year retained for each dependent, Table 2 summarizes the BLLs by RHC and installation. Elevated BLL results came from Fort (Ft) Bliss (3), Ft Bragg (5), Ft Campbell (1), Ft Drum (3), Ft Hood (2), Ft Lee (1), Ft Leonard Wood (1), Ft Riley (1), Ft Rucker (1), Ft Sill (5), Ft Stewart (3), Joint Base San Antonio (2), Walter Reed National Military Medical Center (NMMC) (1), and Dover Air Force Base (1). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2021.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2021

	BLL Ranges				
REGION	<5 µg/dL	5-9 µg/dL	10-19 µg/dL	≥20 µg/dL	Total
ATLANTIC					
Aberdeen Proving Ground	100	0	0	0	100
Carlisle Barracks	16	0	0	0	16
Ft Belvoir	244	0	0	0	244
Ft Benning	239	0	0	0	239
Ft Bragg*	1,130	4	1	0	1,135
Ft Campbell*	214	1	0	0	215
Ft Detrick	27	0	0	0	27
Ft Drum*	335	2	1	0	338
Ft Gordon	12	0	0	0	12
Ft Jackson	36	0	0	0	36
Ft Knox	166	0	0	0	166
Ft Lee*	139	0	1	0	140
Ft Meade	144	0	0	0	144
Ft Rucker*	110	0	0	1	111
Ft Stewart*	254	3	0	0	257
Redstone Arsenal	23	0	0	0	23
Walter Reed NMMC*	66	0	1	0	67
West Point	85	0	0	0	85
CENTRAL					
Ft Bliss*	1,032	2	1	0	1,035
Ft Carson	136	0	0	0	136
Ft Hood*	1,109	1	1	0	1,111
Ft Huachuca	4	0	0	0	4
Ft Irwin	25	0	0	0	25
Ft Leavenworth	77	0	0	0	77
Ft Leonard Wood*	135	1	0	0	136
Ft Polk	180	0	0	0	180

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2021

Ft Riley*	214	1	0	0	215
Ft Sill*	212	5	0	0	217
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Camp Humphreys	8	0	0	0	8
Camp Zama	2	0	0	0	2
Ft Shafter	139	0	0	0	139
Ft Wainwright	33	0	0	0	33
Schofield Barracks	527	0	0	0	527
EUROPE					
Grafenwoehr	16	0	0	0	16
Hohenfels/Amberg	10	0	0	0	10
Kaiserslautern	3	0	0	0	3
Landstuhl	83	0	0	0	83
Vicenza	3	0	0	0	3
Vilseck	54	0	0	0	54
Wiesbaden	44	0	0	0	44
JOINT BASES					
Joint Base Elmendorf-Richardson	34	0	0	0	34
Joint Base Langley-Eustis	217	0	0	0	217
Joint Base Lewis-McChord	18	0	0	0	18
Joint Base Little Creek-Ft Story	5	0	0	0	5
Joint Base McGuire-Dix-Lakehurst	24	0	0	0	24
Joint Base Meyer-Henderson Hall	24	0	0	0	24
Joint Base San Antonio*	443	1	1	0	445
USAF MTF**					
	370	1	0	0	371
NAVAL/MARINE CORPS MTF**					
	117	0	0	0	117

* elevated blood lead level (eBLL ≥5 µg/dL) result in CY2021
** list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

Seven eBLL cases among Army dependents were reported during CY2021 Q4 in DRSi. A total of 24 eBLL cases among Army dependents were reported to DRSi in CY2021. Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels (eBLL) Were Reported through DRSi, CY2021

	Number of eBLL* reports	
INSTALLATION	**CY2021 Q4**	**CY2021**
Ft Bliss	0	4
Ft Bragg	2	5
Ft Campbell	1	1
Ft Carson	1	1
Ft Drum	1	1
Ft Hood	0	2
Ft Leonard Wood	0	1
Ft Rucker	0	1
Ft Sill	1	5
Joint Base Lewis-McChord	0	1
Joint Base San Antonio	1	2
Total	**7**	**24**

*eBLL ≥5 µg/dl
Note: Case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Two out of the seven new eBLL cases identified in the CHCS and MHS GENESIS laboratory data system were reported to DRSi; a 29% reporting compliance for CY2021 Q4. Both cases were reported during CY2021 Q4. Ft Drum and Ft Stewart each had two unreported eBLL cases from CY2021 Q4, and Ft Lee had one unreported eBLL case from the same time period.

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

The results of the APHN-PSR indicated that a total of 790 BLL test results were reported to State and/or local authorities during CY2021 Q4 (Table 4). The APHN-PSR question related to pediatric lead is relevant for installations located in State and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). RHC-Central reported the most BLL test results to State and local authorities (n=334) followed by RHC-Atlantic (n=283). Three (0.4%) of those results were elevated.

Table 4. Blood Lead Levels (BLL) Reported through the APHN-PSR, by Region and Installation, CY2021 Q4

REGION	Number of BLL tests reported to the state/local authorities	Number of eBLL tests reported to the state/local authorities
ATLANTIC		
Ft Belvoir	120	0
Ft Benning	95	0
Ft Bragg	1	1
Ft Gordon	1	0
Ft Lee	1	0
Joint Base Langley-Eustis	55	0
Redstone Arsenal	10	0
CENTRAL		
Ft Bliss	216	0
Ft Hood	1	1
Ft Huachuca	4	0
Ft Irwin	18	0
Ft Polk	28	0
Ft Sill	1	0
Joint Base San Antonio	66	1
PACIFIC		
Tripler/Schofield Barracks	170	0
EUROPE		
Baumholder	3	0

Note: Installations that are not listed did not report BLL tests or elevated BLL (≥5 µg/dl) tests.

DISCUSSION

Approximately 0.3% of the BLL tests performed in CY2021 (1 January – 31 December 2021) were elevated. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2021 was 3.5 per 1,000 child dependents, and is similar to the annual rate of eBLL in CY2019 (3.8 per 1,000 child dependents), but slightly lower than the CY2020 rate of 5.1 per 1,000. The number of Army dependents tested during CY2021 compared to CY2020 (n=10,059 BLL tests) decreased by 14%. It is unclear whether the decrease in dependents tested for blood lead is due to the continued impact on preventive care during the pandemic or if more dependents are seeking care outside the MHS.[8]

Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 29% reporting compliance this quarter. This is the lowest quarterly reporting compliance in CY2021 (Q1 – Q3 range: 67-88%). While RME reporting has become more challenging during the COVID-19 pandemic, improvement of eBLL case reporting is critical to reliably identify installations where children may be at increased risk of lead exposure. Children with an eBLL are reportable to DRSi once per calendar year. The CY2021 reporting year has ended, and a new

medical event report should be submitted for any cases reported in CY2021 with an elevated result on a repeat test in CY2022. Contact the Disease Epidemiology Branch (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil) for any questions regarding DRSi reporting of eBLLs.

LIMITATIONS

This report may not include all Army dependent BLL test results. The NMCPHC extracted the BLL results from CHCS 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 this time. The inclusion of MHS GENESIS laboratory data in this report is still new. The MHS GENESIS data provided by the NMCPHC was 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 Carson, Ft Irwin, Ft Leavenworth, Ft Leonard Wood, Ft Riley, Ft Shafter, Ft Wainwright, JB Lewis-McChord, JB Elmendorf-Richardson, Presidio of Monterey, and Schofield Barracks); however, the quality and completeness of this data is still being examined by the NMCPHC. 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 Air Force similarly reports eBLLs through DRSi. However, the Navy relies solely on laboratory data and is not reporting eBLLs through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the data from CHCS/MHS GENESIS show that there were no eBLLs among the Army dependents who received BLL tests at Navy/Marine Corps MTFs.

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For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

Appendix A

Table A-1. U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test, CY2021

USAF Bases		Naval/Marine Corps Stations
Altus AFB	Maxwell AFB	Annapolis
Aviano AB	McConnell AFB	Camp Lejeune
Barksdale AFB	Mountain Home AFB	Cherry Point
Davis-Monthan AFB	Nellis AFB	Chesapeake
Dover AFB	Offutt AFB	Indian Head
Dyess AFB	Osan AB	Jacksonville
Eglin AFB	Patrick AFB	JB Charleston
Eielson AFB	Peterson AFB	JB Marianas Guam-Andersen
Ellsworth AFB	RAF Alconbury	JB Pearl Harbor-Hickam
Goodfellow AFB	Ramstein AB	Lemoore
Hanscom AFB	Robins AFB	Milton
Hurlburt Field	Scott AFB	Norfolk
JB Anacostia-Bolling	Seymour Johnson AFB	North Chicago
JB Andrews	Sheppard AFB	Okinawa
Kadena AB	Spangdalhem AB	Portsmouth
Keesler AFB	Tinker AFB	Quantico
Little Rock AFB	Travis AFB	Rota
Los Angeles AFB	USAF Academy	Suffolk
Luke AFB	Vance AFB	Virginia Beach
MacDill AFB	Wright-Patterson AFB	
Malmstrom AFB	Yokota AB	

8

QUARTERLY HIGHLIGHT

2,430 Army Dependents
received a blood lead test between 1 January and 31 March 2021; 0.4% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure at all 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with eBLLs should be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

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 MHS Genesis. Records are dated according to the BLL collection date, and this report covers test results collected from 1 January through 31 March 2021 (CY2021 Q1). The data includes all BLL test results, above and below the eBLL cut-off, collected within the Military Health System (MHS), and captures test results for Army dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DOD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2021 1st Quarter (Q1), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated. All CY2021 Q1 eBLL test results are reported.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. Only Army dependent cases reported to DRSi are included in this report. Among Army dependents, DRSi cases with medical event report dates from 1 January through 31 March 2021 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, DRSi cases with test collection dates during CY2021 Q1 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within the CHCS HL7 data system collected during CY2021 Q1 that were also reported via a medical event report in DRSi.

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. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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

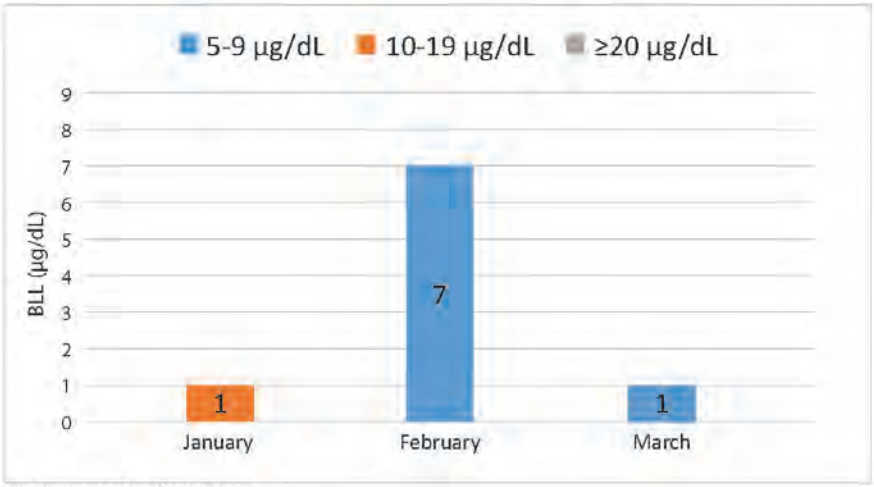
Laboratory Test Results

During CY2021 Q1, 2,430 Army dependents between 0 and 6 years old received a blood lead test within the MHS, and 9 of those results (0.4%) were elevated (BLL ≥5 µg/dL). In CY2021 Q1, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl). A similar number of BLL tests were completed in CY2021 Q1 compared to the same time period last year.

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in Q1, CY2020-CY2021

BLL Ranges	CY2020 Q1	CY2021 Q1
<5 µg/dL	2,437	2,421
5-9 µg/dL	12	8
10-19 µg/dL	1	1
≥20 µg/dL	0	0
Total	**2,450**	**2,430**

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month in CY2021 Q1



Data source: CHCS HL7 and MHS Genesis

With the highest test result from the first quarter of CY2021 retained for each dependent, Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Bliss (1), Ft Bragg (1), Ft Leonard Wood (1), Ft Riley (1), Ft Sill (3), and Joint Base (JB) San Antonio (2). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2021 Q1.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2021 Q1

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	23	0	0	0	23
Carlisle Barracks	4	0	0	0	4
Ft Belvoir	58	0	0	0	58
Ft Benning	20	0	0	0	20
Ft Bragg*	307	1	0	0	308
Ft Campbell	78	0	0	0	78
Ft Detrick	2	0	0	0	2
Ft Drum	72	0	0	0	72
Ft Gordon	5	0	0	0	5
Ft Jackson	16	0	0	0	16
Ft Knox	36	0	0	0	36
Ft Lee	35	0	0	0	35
Ft Meade	29	0	0	0	29
Ft Rucker	22	0	0	0	22
Ft Stewart	54	0	0	0	54
Redstone Arsenal	3	0	0	0	3
West Point	17	0	0	0	17
Walter Reed NMMC	4	0	0	0	4
CENTRAL					
Ft Bliss*	235	1	0	0	236
Ft Carson	71	0	0	0	71
Ft Hood	303	0	0	0	303
Ft Huachuca	3	0	0	0	3

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Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2021 Q1

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
Ft Irwin	9	0	0	0	9
Ft Leavenworth	41	0	0	0	41
Ft Leonard Wood*	81	1	0	0	82
Ft Polk	42	0	0	0	42
Ft Riley*	104	1	0	0	105
Ft Sill*	62	3	0	0	65
PACIFIC					
Ft Shafter	43	0	0	0	43
Ft Wainwright	16	0	0	0	16
Schofield Barracks	196	0	0	0	196
EUROPE					
Grafenwoehr	3	0	0	0	3
Hohenfels/Amberg	4	0	0	0	4
Kaiserslautern	3	0	0	0	3
Landstuhl	13	0	0	0	13
Vilseck	16	0	0	0	16
Wiesbaden	24	0	0	0	24
JOINT BASES					
Joint Base Elmendorf-Richardson	13	0	0	0	13
Joint Base San Antonio*	126	1	1	0	128
Joint Base Langley-Eustis	53	0	0	0	53
Joint Base Lewis-McChord	6	0	0	0	6
Joint Base Little Creek-Fort Story	1	0	0	0	1
Joint Base McGuire-Dix-Lakehurst	7	0	0	0	7
Joint Base Meyer-Henderson Hall	5	0	0	0	5
Joint Base Anacostia-Bolling	1	0	0	0	1
USAF MTF*±					
	131	0	0	0	131
NAVAL/MARINE CORPS MTF*±					
	0	0	0	0	24

*e BLL result in CY2021 Q1
*± list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, five eBLL cases among Army dependents have CY2021 Q1 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, one child had a BLL test in CY2020 Q4 and four children had BLL tests in CY2021 Q1. Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2021 Q1

Installation	Number of eBLL reports
Ft Bragg	1
Ft Bliss	1
Ft Sill	1
JB Lewis-McChord	1
JB San Antonio	1
Total	**5**

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

Reporting Compliance

Six out of the nine new eBLL cases identified in the CHCS and MHS Genesis laboratory data system were reported to DRSi. The Army had 67% reporting compliance for CY2021 Q1. Five of the cases were reported during CY2021 Q1. One case was reported after the end of the first quarter (31 March 2021) but is being counted towards the reporting compliance measure because the test collection date fell within CY2021 Q1. Each of the following installations had one unreported eBLL case from CY2021 Q1: Ft Leonard Wood, Ft Riley, and JB San Antonio. A child with an eBLL in CY2020 with an elevated follow-up test result in CY2021 should be reported to DRSi again.

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

The results of the APHN-PSR indicated that a total of 1,013 BLL test results were reported to State and/or local authorities during CY2021 Q1 (Table 4). This question is relevant for installations located in State and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to State and local authorities (n=938) followed by PHC-Atlantic (n=75). Five (0.5%) of those results were elevated.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2021 Q1*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Rucker	23	0
JB Langley-Eustis	47	0
Redstone Arsenal	5	0
CENTRAL		
Ft Bliss	285	1
Ft Carson	67	0
Ft Hood	352	0
Ft Huachuca	5	0
Ft Riley	2	0
Ft Sill	69	3
Joint Base San Antonio	158	1

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.4% of the BLL tests performed in CY2021 Q1 (1 January – 31 March 2021) were elevated. A similar prevalence of elevated results was seen in the first quarter of CY2020. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2020 was 5.1 per 1,000 child dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 67% reporting compliance this quarter. Children with an elevated blood lead are reportable to DRSi once per calendar year. We are now in a new reporting year, and a new medical event report should be submitted for any cases reported in CY2020 with an elevated result on a repeat test in CY2021.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results were pulled one month after the end of Q1 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 time of the NMCPHC data pull. The inclusion of MHS Genesis laboratory data in this report is still new. The MHS Genesis data provided by the NMCPHC was included in this report to provide some visibility on the installations that have switched over to that system (e.g., JB Lewis-McChord, Presidio of Monterey, Ft Wainwright, Ft Irwin); however, the quality and completeness of this data is still being examined by the NMCPHC. 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. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established a RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the data shows that there were no eBLLs among the Army dependents who received BLL tests at Navy/Marine Corps MTFs.

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Appendix A

U.S. Air Force, Navy, and Marine Corps locations where Army dependents Received a Blood Lead Test

USAF Bases
Barksdale AFB
Davis-Monthan AFB
Dover AFB
Eglin AFB
Eielson AFB
Ellsworth AFB
Goodfellow AFB
Hanscom AFB
Hill AFB
Hurlburt Field
JB Andersen
JB Andrews
Kadena AB
Keesler AFB
Little Rock AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Mountain Home AFB
Nellis AFB
Offutt AFB
Osan AB
Patrick AFB
Peterson AFB
Ramstein AB
Scott AFB
Tinker AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Camp Lejeune
Chesapeake
Indian Head
JB Charleston
Jacksonville
Kaneohe
Marianas-Guam
Milton
Okinawa
Patuxent River
Portsmouth
Quantico
Rota
Suffolk
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

7

QUARTERLY HIGHLIGHT

2,301 Army Dependents
received a blood lead test between 1 April and 30 June 2021; 0.3% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure at all 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with eBLLs should be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

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 2021 (CY2021 Q2). The data includes all BLL test results, above and below the eBLL cut-off, collected within the MHS, and captures test results for Army dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DOD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2021 2nd Quarter (Q2), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated. All CY2021 Q2 eBLL test results are reported.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. 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 2021 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, cases with test collection dates during CY2021 Q2 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within CHCS and MHS Genesis collected during CY2021 Q2 that were also reported via a medical event report in DRSi.

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. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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.

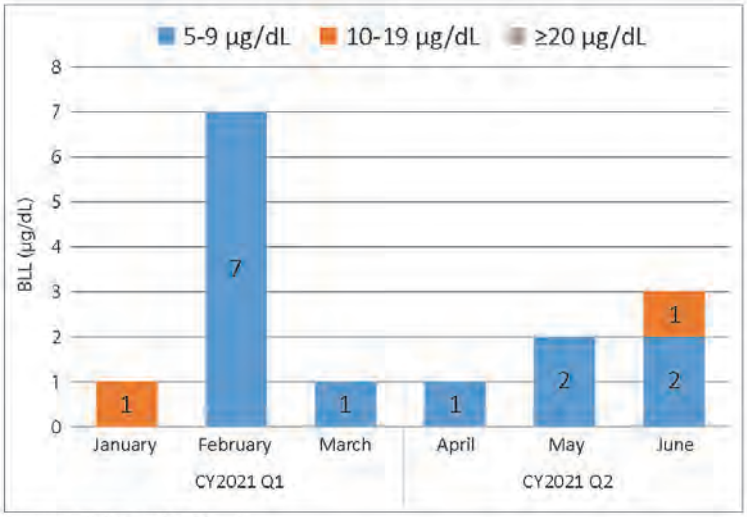
RESULTS

Laboratory Test Results

During CY2021 Q2, there were 2,301 Army dependents between 0 and 6 years old that received a blood lead test within the MHS, and seven of those results (0.3%) were elevated (BLL ≥5 µg/dL). In CY2021 Q2, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl). A similar number of Army dependents were tested during CY2021 Q2 compared to the same time last year; however, there were fewer elevated results in CY2021 Q2.

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in Q2, CY2020-CY2021

BLL Ranges	CY2020 Q2	CY2021 Q2
<5 µg/dL	2,364	2,294
5-9 µg/dL	16	5
10-19 µg/dL	4	2
≥20 µg/dL	0	0
Total	**2,384**	**2,301**



Data source: CHCS HL7 and MHS Genesis

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter in CY2021 Q2

With the highest test result from the second quarter of CY2021 retained for each dependent, Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Bliss (2), Ft Bragg (2), Ft Sill (1), Walter Reed National Military Medical Center (NMMC) (1), and Dover Air Force Base (AFB) (1). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2021 Q2.

Table 2. Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2021 Q2

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	25	0	0	0	25
Carlisle Barracks	5	0	0	0	5
Ft Belvoir	58	0	0	0	58
Ft Benning	24	0	0	0	24
Ft Bragg*	318	2	0	0	320
Ft Campbell	62	0	0	0	62
Ft Detrick	9	0	0	0	9
Ft Drum	76	0	0	0	76
Ft Gordon	3	0	0	0	3
Ft Jackson	14	0	0	0	14
Ft Knox	52	0	0	0	52
Ft Lee	42	0	0	0	42
Ft Meade	32	0	0	0	32
Ft Rucker	20	0	0	0	20
Ft Stewart	55	0	0	0	55
Redstone Arsenal	6	0	0	0	6
Walter Reed NMMC*	6	0	1	0	7
West Point	23	0	0	0	23
CENTRAL					
Ft Bliss*	274	1	1	0	276
Ft Carson	35	0	0	0	35

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2021 Q2

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
Ft Hood	347	0	0	0	347
Ft Irwin	9	0	0	0	9
Ft Leavenworth	9	0	0	0	9
Ft Leonard Wood	34	0	0	0	34
Ft Polk	41	0	0	0	41
Ft Riley	58	0	0	0	58
Ft Sill*	50	1	0	0	51
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Camp Humphreys	2	0	0	0	2
Ft Shafter	37	0	0	0	37
Ft Wainwright	6	0	0	0	6
Schofield Barracks	172	0	0	0	172
EUROPE					
Grafenwoehr	6	0	0	0	6
Hohenfels/Amberg	2	0	0	0	2
Landstuhl	18	0	0	0	18
Vicenza	1	0	0	0	1
Vilseck	14	0	0	0	14
Wiesbaden	16	0	0	0	16
JOINT BASES					
Joint Base Elmendorf-Richardson	9	0	0	0	9
Joint Base Langley-Eustis	79	0	0	0	79
Joint Base Lewis-McChord	7	0	0	0	7
Joint Base Little Creek-Fort Story	2	0	0	0	2
Joint Base McGuire-Dix-Lakehurst	4	0	0	0	4
Joint Base Meyer-Henderson Hall	10	0	0	0	10
Joint Base San Antonio	110	0	0	0	110
USAF MTF*±					
	82	1	0	0	83
NAVAL/MARINE CORPS MTF*±					
	29	0	0	0	29

*e BLL result in CY2021 Q2
*± list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, five eBLL cases among Army dependents have CY2021 Q2 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, three children had a BLL test in CY2021 Q1 and two children had BLL tests in CY2021 Q2. Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels Were Reported through DRSi, CY2021 Q2

Installation	Number of eBLL reports
Ft Bragg	1
Ft Bliss	1
Ft Sill	3
Total	**5**

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

Reporting Compliance

Four out of the six new eBLL cases identified in the CHCS and MHS Genesis laboratory data system were reported to DRSi; a 67% reporting compliance for CY2021 Q2. Two of the cases were reported during CY2021 Q2. Two cases were reported after the end of the first quarter (30 June 2021) but are being counted towards the reporting compliance measure because the test collection dates fell within CY2021 Q2. Walter Reed and Dover AFB each had one unreported eBLL case from CY2021 Q2. A child with an eBLL in CY2020 with an elevated follow-up test result in CY2021 should be reported to DRSi again.

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

The results of the APHN-PSR indicated that a total of 731 BLL test results were reported to State and/or local authorities during CY2021 Q2 (Table 4). This question is relevant for installations located in State and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to State and local authorities (n=590) followed by PHC-Atlantic (n=138). Seven (1.0%) of those results were elevated.

Table 4. Blood Lead Levels Reported through the APHN-PSR, by Region and Installation, CY2021 Q2*

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
JB Langley-Eustis	131	0
Redstone Arsenal	7	0
CENTRAL		
Ft Bliss	277	3
Ft Hood	112	0
Ft Huachuca	9	0
Ft Riley	53	0
Ft Sill	56	1
Joint Base San Antonio	83	0
EUROPE		
Baumholder	3	3

*Installations that are not listed did not report BLL tests or eBLL tests

DISCUSSION

Approximately 0.3% of the BLL tests performed in CY2021 Q2 (1 April – 30 June 2021) were elevated. A similar prevalence of elevated results was seen in the first quarter of CY2021. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2020 was 5.1 per 1,000 child dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 67% reporting compliance this quarter. Children with an eBLL are reportable to DRSi once per calendar year. We are now in a new reporting year, and a new medical event report should be submitted for any cases reported in CY2020 with an elevated result on a repeat test in CY2021.

LIMITATIONS

This report may not include all Army Dependent BLL test results. BLL results were pulled 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 time of the NMCPHC data pull. The inclusion of MHS Genesis laboratory data in this report is still new. The MHS Genesis data provided by the NMCPHC was included in this report to provide some visibility on the installations that have switched over to that system (e.g., Ft Carson, Ft Irwin, Ft Leavenworth, Ft Leonard Wood, Ft Riley, Ft Wainwright, JB Lewis-McChord, JB Elmendorf-Richardson, and Presidio of Monterey); however, the quality and completeness of this data is still being examined by the NMCPHC. 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. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established a RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the data shows that there were no eBLLs among the Army dependents who received BLL tests at Navy/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

USAF Bases
Davis-Monthan AFB
Dover AFB
Dyess AFB
Eglin AFB
Eielson AFB
Goodfellow AFB
Hanscom AFB
Hurlburt Field
JB Anacostia-Bolling
JB Andrews
Kadena AB
Keesler AFB
Little Rock AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Osan AB
Patrick AFB
Peterson AFB
Ramstein AB
Scott AFB
Sheppard AFB
Tinker AFB
Travis AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Camp Lejeune
Cherry Point
Indian Head
JB Charleston
JB Marianas Guam-Andersen
Jacksonville
Norfolk
Okinawa
Portsmouth
Quantico
Suffolk
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

7

QUARTERLY HIGHLIGHT

2,343 Army Dependents
received a blood lead test between 1 July and 30 September 2021; 0.4% of those tests indicated an elevated blood lead level.

INTRODUCTION

Lead is a naturally occurring heavy metal, but can present an environmental and health hazard if it contaminates water, air, soil, or dust. 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 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 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 if exposed to lead, the American Academy of Pediatrics (AAP) recommends that all children ages 6 months to 6 years old, inclusive, be screened via a parental questionnaire for increased risk of lead exposure at all 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.

In 2012, the Centers for Disease Control and Prevention (CDC) lowered the reference value for an eBLL from 10 to 5 micrograms per deciliter (µg/dL); however, the CDC continues to stress that there is no safe level of lead exposure.[4] In October 2018, eBLLs became a reportable medical event (RME) for Army dependents 0 to 6 years old according to the Army Lead Hazard Management Control Program.[5] Army dependents with eBLLs should be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division (AFHSD) guidelines. This report tracks all available blood lead level (BLL) test results within the Army-Dependent population and monitors the occurrence of eBLLs.

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 July through 30 September 2021 (CY2021 Q3). The data includes all BLL test results, above and below the eBLL cutoff, collected within the MHS, and captures test results for Army dependents who receive care at Army military medical treatment facilities (MTFs) and other Department of Defense (DOD) 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 were also not included as these tests are not considered in the case definition in the Armed Forces RME Guidelines and Case Definitions.[7]

Only BLL results for Army dependents ages 0 through 6 years old were analyzed for this report. According to the Armed Forces RME Guidelines and Case Definitions, a child can only be counted as an eBLL case once per calendar year.[7] If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2021 3rd Quarter (Q3), the highest BLL result was retained. The frequency of BLL test results are displayed by BLL range (<5 µg/dL, 5-9 µg/dL, 10-19 µg/dL, ≥20 µg/dL), Public Health Command (PHC), and installation. Results ≥5 µg/dL are considered elevated. All CY2021 Q3 eBLL test results are reported.

Disease Reporting System, internet Data

Since 18 October 2018, eBLLs (≥5 µg/dL) have been reportable through the DRSi for children 0 to 6 years of age.[5] DRSi is a Tri-Service reportable medical event system. 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 2021 were counted.

Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, cases with test collection dates during CY2021 Q3 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of all eBLL laboratory results within CHCS and MHS Genesis collected during CY2021 Q3 that were also reported via a medical event report in DRSi.

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. As part of installation safety and housing office-led environmental investigations, Installation Department of Public Health (Preventive Medicine Services) conduct parent/guardian interviews in conjunction with installation services after a child six 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 CY2021 Q3, there were 2,343 Army dependents between 0 and 6 years old that received a blood lead test within the MHS, and ten of those results (0.4%) were elevated (BLL ≥5 µg/dL). In CY2021 Q3, no children exceeded the BLL at which chelation therapy is typically recommended (≥45 µg/dl). The number of Army dependents tested during CY2021 Q3 compared to the same time last year decreased by 23%.

Table 1. Total Count of Pediatric (ages 0-6) Blood Lead Levels in Q3, CY2020-CY2021

BLL Ranges	CY2020 Q3	CY2021 Q3
<5 µg/dL	3,044	2,333
5-9 µg/dL	14	6
10-19 µg/dL	2	3
≥20 µg/dL	0	1
Total	**3,060**	**2,343**

Eight of the elevated results in CY2021 Q3 are new eBLL cases. Two Army dependents with an elevated result in CY2021 Q3 had an elevated result reported previously in CY2021. In the first three quarters of CY2021, there were a total of 23 Army dependents with an eBLL (Figure 1).

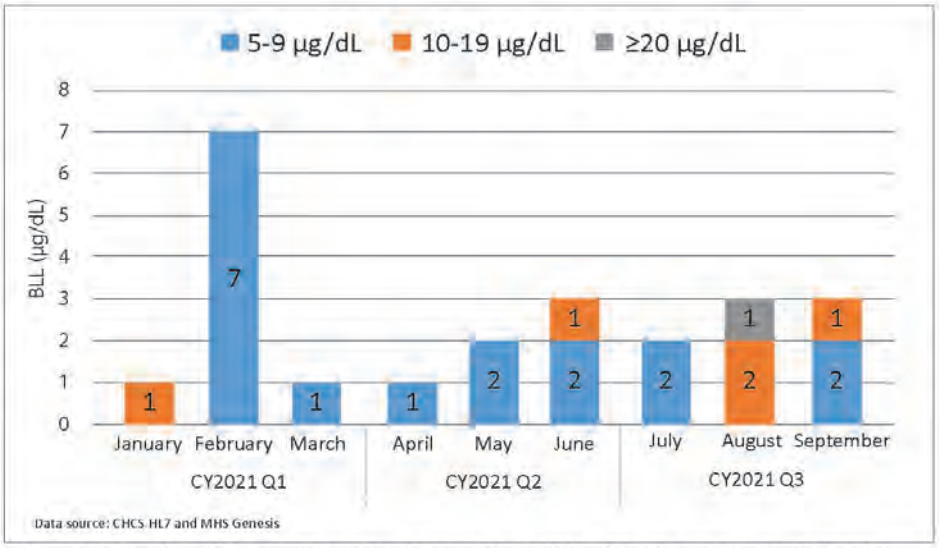

Figure 1. Number of Elevated Blood Lead Cases (≥5 µg/dL) by Month and Quarter in CY2021

With the highest test result from the third quarter of CY2021 retained for each dependent, Table 2 summarizes the BLLs by PHC and installation. Elevated BLL results came from Fort (Ft) Bliss (3), Ft Bragg (2), Ft Campbell (1), Ft Drum (1), Ft Hood (1), Ft Rucker (1), and Ft Stewart (1). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2021 Q3.

Table 2. Pediatric (ages 0-6) Blood Lead Levels (BLL), by Region and Installation, CY2021 Q3

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	26	0	0	0	26
Carlisle Barracks	7	0	0	0	7
Ft Belvoir	78	0	0	0	78
Ft Benning	106	0	0	0	106
Ft Bragg*	335	1	1	0	337
Ft Campbell*	45	1	0	0	46
Ft Detrick	9	0	0	0	9
Ft Drum*	117	0	1	0	118
Ft Gordon	3	0	0	0	3
Ft Jackson	1	0	0	0	1
Ft Knox	48	0	0	0	48
Ft Lee	39	0	0	0	39
Ft Meade	58	0	0	0	58
Ft Rucker*	42	0	0	1	43
Ft Stewart*	89	1	0	0	90
Redstone Arsenal	5	0	0	0	5
Walter Reed NMMC	18	0	0	0	18
West Point	26	0	0	0	26
CENTRAL					
Ft Bliss*	294	3	0	0	297
Ft Carson	16	0	0	0	16
Ft Hood*	258	0	1	0	259

3

Table 2 (continued). Pediatric (ages 0-6) Blood Lead Levels, by Region and Installation, CY2021 Q3

	BLL Ranges				
REGION	**<5 µg/dL**	**5-9 µg/dL**	**10-19 µg/dL**	**≥20 µg/dL**	**Total**
Ft Huachuca	1	0	0	0	1
Ft Irwin	3	0	0	0	3
Ft Leavenworth	9	0	0	0	9
Ft Leonard Wood	5	0	0	0	5
Ft Polk	64	0	0	0	64
Ft Riley	33	0	0	0	33
Ft Sill	39	0	0	0	39
PACIFIC					
Camp Humphreys	3	0	0	0	3
Camp Zama	1	0	0	0	1
Ft Shafter	53	0	0	0	53
Ft Wainwright	6	0	0	0	6
Schofield Barracks	123	0	0	0	123
EUROPE					
Grafenwoehr	4	0	0	0	4
Hohenfels/Amberg	4	0	0	0	4
Landstuhl	23	0	0	0	23
Vicenza	1	0	0	0	1
Vilseck	6	0	0	0	6
Wiesbaden	3	0	0	0	3
JOINT BASES					
Joint Base Elmendorf-Richardson	3	0	0	0	3
Joint Base Langley-Eustis	45	0	0	0	45
Joint Base Lewis-McChord	3	0	0	0	3
Joint Base McGuire-Dix-Lakehurst	7	0	0	0	7
Joint Base Meyer-Henderson Hall	6	0	0	0	6
Joint Base San Antonio	124	0	0	0	124
USAF MTF*±					
	83	0	0	0	83
NAVAL/MARINE CORPS MTF*±					
	37	0	0	0	37

*elevated blood lead level (eBLL ≥5 µg/dL) result in CY2021 Q3
** list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

In DRSi, seven eBLL cases among Army dependents have CY2021 Q3 report dates. Due to differences in the report date compared to the test collection date in the DRSi system, two children had a BLL test in CY2021 Q2 and five children had BLL tests in CY2021 Q3. Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels (eBLL) Were Reported through DRSi, CY2021 Q3

Installation	Number of eBLL* reports
Ft Bliss	1
Ft Bragg	2
Ft Drum	1
Ft Hood	1
Ft Leonard Wood	1
Ft Rucker	1
Total	7

*eBLL ≥5 µg/dL
Note: Case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

Reporting Compliance

Seven out of the eight new eBLL cases identified in the CHCS and MHS Genesis laboratory data system were reported to DRSi; an 88% reporting compliance for CY2021 Q3. Four of the cases were reported during CY2021 Q3. Three cases were reported after the end of the third quarter (30 September 2021) but are being counted towards the reporting compliance measure because the test collection dates fell within CY2021 Q3. Ft Stewart had one unreported eBLL case from CY2021 Q3.

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

The results of the APHN-PSR indicated that a total of 1,066 BLL test results were reported to State and/or local authorities during CY2021 Q3 (Table 4). This question from the APHN-PSR is relevant for installations located in State and local jurisdictions that require reporting of all BLL tests, including test results below 5 µg/dL (e.g., Louisiana, New York, North Carolina). PHC-Central reported the most BLL test results to State and local authorities (n=807) followed by PHC-Atlantic (n=259). Seven (0.7%) of those results were elevated.

Table 4. Blood Lead Levels (BLL) Reported through the APHN-PSR, by Region and Installation, CY2021 Q3

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft Belvoir	154	0
Ft Bragg	3	3
Ft Gordon	5	0
JB Langley-Eustis	89	0
Redstone Arsenal	8	0
CENTRAL		
Ft Bliss	293	2
Ft Carson	0	1
Ft Hood	298	1
Ft Huachuca	3	0
Ft Riley	104	0
Joint Base San Antonio	109	0

Note: Installations that are not listed did not report BLL tests or elevated BLL (≥5 µg/dL) tests

DISCUSSION

Approximately 0.4% of the BLL tests performed in CY2021 Q3 (1 July – 30 September 2021) were elevated. A similar proportion of elevated results was seen in the second quarter of CY2021. Among Army dependents tested within the MHS, the annual rate of eBLL in CY2020 was 5.1 per 1,000 child dependents. Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, and military MTFs reached 88% reporting compliance this quarter. Children with an eBLL are reportable to DRSi once per calendar year. We are in a new reporting year, and a new medical event report should be submitted for any cases reported in CY2020 with an elevated result on a repeat test in CY2021.

LIMITATIONS

This report may not include all Army Dependent BLL test results. NMPHC extracted the BLL results from CHCS one month after the end of Q3 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 time of the data pull. The inclusion of MHS Genesis laboratory data in this report is still new. The MHS Genesis data provided by the NMCPHC was included in this report to provide some visibility on the installations that have switched over to that system (e.g., Ft Carson, Ft Irwin, Ft Leavenworth, Ft Leonard Wood, Ft Riley, Ft Shafter, Ft Wainwright, JB Lewis-McChord, JB Elmendorf-Richardson, Presidio of Monterey, and Schofield Barracks); however, the quality and completeness of this data is still being examined by the NMCPHC. 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. As the MHS reforms, some military MTFs may transition to providing care for Active Duty personnel only, which could further limit the availability of laboratory data for child dependents.

To improve BLL surveillance, the Army established a RME for eBLLs in children 0-6 years old. At this point in time, only the Army and the Air Force are reporting eBLLs through DRSi. The Navy is not reporting elevated lead exposure through DRSi, so it is possible that these cases will not be immediately visible to APHC. However, the data shows that there were no eBLLs among the Army dependents who received BLL tests at Navy/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, CY2021 Q3

USAF Bases
Aviano AB
Barksdale AFB
Dover AFB
Eglin AFB
Goodfellow AFB
Hanscom AFB
JB Anacostia-Bolling
JB Andrews
Kadena AB
Keesler AFB
Little Rock AFB
Los Angeles AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Patrick AFB
Peterson AFB
RAF Alconbury
Ramstein AB
Robins AFB
Scott AFB
Seymour Johnson AFB
Sheppard AFB
Spangdalhem AB
Travis AFB
Wright-Patterson AFB

Naval/Marine Corps Stations
Annapolis
Camp Lejeune
Cherry Point
Chesapeake
Indian Head
JB Charleston
JB Marianas Guam-Andersen
JB Pearl Harbor-Hickam
Milton
Norfolk
North Chicago
Okinawa
Portsmouth
Quantico
Suffolk
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

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APPENDIX E

CY2022 PEDIATRIC LEAD REPORTS

The CY2022 Annual and Quarterly Pediatric Lead Reports begin on the next page.

ANNUAL HIGHLIGHT

5,644 Army Dependents

received a blood lead test between 1 January and 31 December 2022; 1.5% of those tests indicated an elevated blood lead level. Among child dependents tested within the Military Health System, the rate of eBLL in CY2022 is 15.4 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 (µg/dL) to 3.5 µg/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] Army dependents with eBLLs must be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division guidelines. 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 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 October through 31 December 2022 (CY2022 Q4), as well as a summary of all CY2022 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 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=98) 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 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), Regional Health Command (RHC), and installation. Results ≥3.5 µg/dL are considered elevated. All CY2022 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 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 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 CY2022 Q4 that were also reported via a medical event report in DRSi.

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, 5,644 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 87 of those results (1.5%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1. Because of the lower reference value for eBLL, 48 additional children with an eBLL were identified. In CY2022, 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 tests were examined 15 out of the 87 children (17%) 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 CY2022 (i.e., <3.5 µg/dL).

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

BLL Ranges (µg/dL)	CY2022 Q4 n (%)	CY2022 n (%)
<3.5	958 (96.6%)	5,557 (98.5%)
3.5–9	33 (3.3.%)	80 (1.4%)
10–19	1 (0.1%)	7 (0.1%)
≥20	0	0
Total	**992 (100%)**	**5,644 (100%)**

In CY2022 Q4, 992 Army dependents received a blood lead test within the MHS, and 34 of those results (3.4%) were elevated (≥3.5 µg/dL) (Table 1). Thirty of the elevated results in CY2022 Q4 are new eBLL cases. Four Army dependents with an elevated result in CY2022 Q4 had an elevated result reported previously in CY2022. Figure 1 summarizes the number of elevated test results from each month in CY2022.

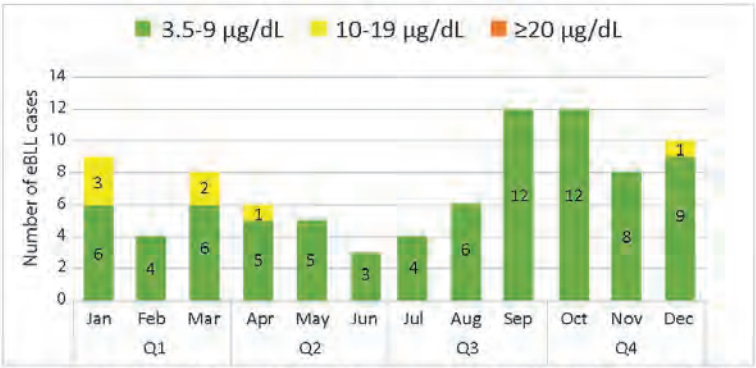

Figure 1. . Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2022
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2022 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Belvoir (3), Ft. Bliss (1), Ft. Bragg (11), Ft. Drum (2), Ft. Hood (4), Ft. Leavenworth (3), Ft. Lee (2), Ft. Leonard Wood (2), Ft. Meade (1), Ft. Polk (11), Ft. Riley (1), Ft. Sill (5), Ft. Stewart (3), Ft. Wainwright (3), Joint Base (JB) Charleston (1), JB Langley-Eustis (1), JB Lewis-McChord (6), JB McGuire-Dix-Lakehurst (1), JB San Antonio (20), Schofield Barracks (2), Scott Air Force Base (AFB) (1), Walter Reed National Military Medical Center (NMMC) (1), and West Point (2). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2022.

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

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	87	0	0	0	87
Carlisle Barracks	5	0	0	0	5
Ft. Belvoir*	241	3	0	0	244
Ft. Benning	223	0	0	0	223
Ft. Bragg*	321	10	1	0	332
Ft. Campbell	175	0	0	0	175
Ft. Detrick	28	0	0	0	28
Ft. Drum*	341	2	0	0	343
Ft Gordon	2	0	0	0	2
Ft. Jackson	12	0	0	0	12
Ft. Knox	112	0	0	0	112
Ft. Lee*	64	1	1	0	66
Ft. Meade*	132	1	0	0	133
Ft. Rucker	97	0	0	0	97
Ft. Stewart*	173	2	1	0	176
Redstone Arsenal	12	0	0	0	12
Walter Reed NMMC*	99	1	0	0	100
West Point*	66	2	0	0	68
CENTRAL					
Ft. Bliss*	549	1	0	0	550
Ft. Carson	166	0	0	0	166
Ft. Hood*	451	2	2	0	455
Ft. Huachuca	12	0	0	0	12
Ft. Irwin	9	0	0	0	9
Ft. Leavenworth*	92	3	0	0	95
Ft. Leonard Wood*	105	2	0	0	107
Ft. Polk*	81	11	0	0	92

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

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Riley*	153	1	0	0	154
Ft. Sill*	163	5	0	0	168
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Camp Zama	4	0	0	0	4
Ft. Shafter	59	0	0	0	59
Ft. Wainwright*	76	2	1	0	79
Schofield Barracks*	134	2	0	0	136
USAG Humphreys	11	0	0	0	11
EUROPE					
Grafenwoehr	58	0	0	0	58
Hohenfels/Amberg	1	0	0	0	1
Kaiserslautern	2	0	0	0	2
Landstuhl	105	0	0	0	105
Vicenza	54	0	0	0	54
Vilseck	51	0	0	0	51
JOINT BASES					
JB Elmendorf-Richardson	57	0	0	0	57
JB Langley-Eustis*	142	1	0	0	143
JB Lewis-McChord*	27	6	0	0	33
JB Little Creek-Ft. Story	6	0	0	0	6
JB McGuire-Dix-Lakehurst*	15	1	0	0	16
JB Meyer-Henderson Hall	12	0	0	0	12
JB San Antonio*	397	19	1	0	417
USAF MTF**					
	287	2	0	0	289
NAVAL/MARINE CORPS MTF**					
	87	0	0	0	87

* elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2022.
** See Appendix A for the list of USAF, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2022.

DRSi Reporting Results

Among Army dependents, 48 eBLL cases were reported in DRSi during CY2022 Q4. Due to the differences in the report date compared to the test collection date in the DRSi system, one child had a BLL test result from CY2022 Q2 reported, five children had BLL test results from CY2022 Q3 reported, and the remaining 42 had test results from CY2022 Q4 reported. A total of 68 eBLL cases among Army dependents were reported in DRSi during CY2022. Table 3 summarizes the locations of the cases.

Table 3. Locations Where Elevated Blood Lead Levels (eBLL) Were Reported through DRSi, CY2022

	Number of eBLL* reports	
INSTALLATION	**CY2022 Q4**	**CY2022**
Ft. Bliss	1	3
Ft. Bragg	16	18
Ft. Drum	0	1
Ft. Hood	1	2
Ft. Leonard Wood	1	1
Ft. Polk	17	17
Ft. Riley	0	1
Ft. Shafter	0	1
Ft. Sill	0	1
JB Langley-Eustis	0	1
JB San Antonio	7	15
Total	**48**	**68**

*eBLL ≥3.5 µg/dL
Note: Case counts are based on DRSi reporting date and may not reflect the counts in Table 1.

DRSi Reporting Compliance

Twenty-four out of the thirty new eBLL cases identified in the CHCS and MHS GENESIS laboratory data system were reported in DRSi; an 80% reporting compliance for CY2022 Q4. Ft. Leavenworth, Ft. Sill, Ft. Wainwright, JB Lewis-McChord, Scott AFB, and West Point each had one unreported eBLL case from CY2022 Q4.

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

The results of the APHN-PSR indicated that a total of 913 BLL test results were reported to State and/or local authorities during CY2022 Q4 (Table 4). 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=735), followed by RHC-Atlantic (n=178). Sixty-seven (7.3%) of those results (n=913) indicated elevated BLLs.

Table 4. Blood Lead Levels (BLL) Reported through the APHN-PSR by Region and Installation, CY2022 Q4

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft. Belvoir	93	0
Ft.Bragg	29	29
Ft. Detrick	2	6
Ft. Rucker	21	0
JB Langley-Eustis	33	0
CENTRAL		
Ft. Bliss	275	1
Ft. Carson	96	0
Ft. Hood	170	1
Ft. Huachuca	8	8
Ft. Leonard Wood	1	1
Ft. Polk	0	7
Ft. Riley	111	0
JB San Antonio	74	10
PACIFIC		
JB Lewis-McChord	0	4

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

DISCUSSION

Approximately 1.5% of the results of BLL tests performed in CY2022 (1 January – 31 December 2022) indicated eBLLs. Because of the lower reference value for eBLL, 48 additional children with an eBLL were identified. The number of Army dependents tested during CY2022 (n=5,644 BLL tests) compared to CY2021 (n=8,669 BLL tests) decreased by 35%. The decrease in blood lead test results may be because more dependents are seeking care outside the MHS or a lag or decrement in the laboratory data received from installations that have transitioned to the MHS GENESIS electronic health record. For example, five eBLL cases from both Ft. Polk and JB San Antonio, and ten cases from Ft. Bragg were reported to DRSi, but were not included in the MHS GENESIS laboratory data sent by NMCPHC, indicating a potential gap in the data.

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 Army MTFs reaching 80% reporting compliance (Q1–Q3 reporting compliance range: 10–100%). 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@health.mil) for any questions regarding DRSi reporting of eBLLs.

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 Q4 to minimize the chance of missing any results collected during that quarter. However, the NMCPHC sent 458 results from Q1 – Q3 along with the laboratory results for CY2022 Q4 not previously accounted for in those quarters, indicating a longer lag in the 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.

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. However, the NMCPHC has communicated concerns about the quality and completeness of these data. At the time of this publication, installations that transitioned to MHS GENESIS include Ft. Benning, Ft. Bliss, Ft. Bragg, Ft. Carson, Ft. Drum, Ft. Gordon, Ft. Hood, Ft. Huachuca, Ft. Irwin, Ft. Jackson, Ft. Leavenworth, Ft. Leonard Wood, Ft. Polk, Ft. Riley, Ft. Rucker, Ft. Shafter, Ft. Sill, Ft. Stewart, Ft. Wainwright, JB Elmendorf-Richardson, JB Langley-Eustis, JB Lewis-McChord, JB San Antonio, Presidio of Monterey, Redstone Arsenal, Schofield Barracks, and West Point.

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 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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For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/lh/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

Appendix A

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

USAF Bases	
Aviano AB	Maxwell AFB
Barksdale AFB	McConnell AFB
Beale AFB	Mountain Home AFB
Buckley AFB	Nellis AFB
Davis-Monthan AFB	Offutt AFB
Dover AFB	Osan AB
Dyess AFB	Patrick AFB
Eglin AFB	Peterson AFB
FE Warren AFB	RAF Alconbury
Fairchild AFB	Ramstein AB
Goodfellow AFB	Robins AFB
Grand Forks AFB	Scott AFB
Hanscom AFB	Seymour Johnson AFB
Hill AFB	Sheppard AFB
JB Anacostia-Bolling	Spangdalhem AB
JB Andrews	Tinker AFB
JB Charleston	Travis AFB
Kadena AB	USAF Academy
Keesler AFB	Vance AFB
Little Rock AFB	Wright-Patterson AFB
Los Angeles AFB	Yokota AB

Naval/Marine Corps Stations
Camp Lejeune
Chesapeake
Indian Head
JB Marianas Guam-Andersen
JB Pearl Harbor-Hickam
Lemoore
Norfolk
Okinawa
Patuxent River
Portsmouth VA
Quantico
Sigonella
Suffolk
Virginia Beach

8

Army Quarterly Pediatric Lead Report (Calendar Year (CY) 2022 Quarter (Q1))

QUARTERLY HIGHLIGHT

1,533 Army Dependents

received a blood lead test between 1 January and 31 March 2022; 1.2% of those tests indicated an elevated blood lead level (eBLL). This quarterly report uses laboratory data based on the updated Centers for Disease Control and Prevention reference value for an eBLL (≥3.5 µg/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 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 (µg/dL) to 3.5 µg/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] Army dependents with eBLLs 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 eBLLs. This iteration will use the new CDC reference value for eBLL (3.5 µg/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 January through 31 March 2022 (CY2022 Q1). 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=13) 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 Q1, 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 Q1 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 January through 31 March 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 Q1 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 Q1 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 Q1, 1,533 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 18 of those results (1.2%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1 and Figure 1. In CY2022 Q1, 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 Q1

BLL Ranges (µg/dL)	CY2022 Q1 n (%)
<3.5	1,515 (98.8%)
3.5–9	14 (0.9%)
10–19	4 (0.3%)
≥20	0 (0%)
Total	**1,533 (100%)**

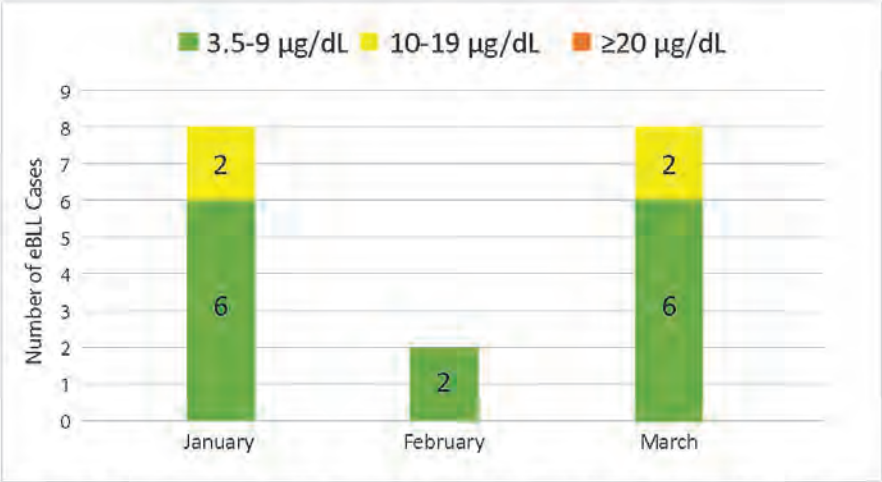

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2022 Q1
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2022 Q1 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Belvoir (2), Ft. Bragg (1), Ft. Drum (1), Ft. Hood (3), Ft. Leavenworth (1), Ft. Lee (1), Ft. Meade (1), Ft. Sill (1), Ft. Stewart (1), Ft. Wainwright (1), Joint Base (JB) Lewis-McChord (1), JB McGuire-Dix-Lakehurst (1), JB San Antonio (2), and Walter Reed National Military Medical Center (NMMC) (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 Q1.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q1.

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	20	0	0	0	20
Ft. Belvoir	57	2	0	0	59
Ft. Benning	89	0	0	0	89
Ft. Bragg*	153	1	0	0	154
Ft. Campbell*	28	0	0	0	28
Ft. Detrick	3	0	0	0	3
Ft. Drum*	84	1	0	0	85
Ft. Gordon	2	0	0	0	2
Ft. Jackson	4	0	0	0	4
Ft. Knox	44	0	0	0	44
Ft. Lee*	10	0	1	0	11
Ft. Meade	24	1	0	0	25
Ft. Rucker	25	0	0	0	25
Ft. Stewart*	36	1	0	0	37
Redstone Arsenal	1	0	0	0	1
Walter Reed NMMC*	69	1	0	0	70
West Point	14	0	0	0	14
CENTRAL					
Ft. Bliss	205	0	0	0	205
Ft. Carson	11	0	0	0	11

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q1.

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Hood*	173	1	2	0	176
Ft. Huachuca	3	0	0	0	3
Ft. Irwin	3	0	0	0	3
Ft. Leavenworth*	17	1	0	0	18
Ft. Leonard Wood	15	0	0	0	15
Ft. Polk	33	0	0	0	33
Ft. Riley	21	0	0	0	21
Ft. Sill*	39	1	0	0	40
PACIFIC					
Camp Humphreys	1	0	0	0	1
Ft. Shafter	2	0	0	0	2
Ft. Wainwright	9	0	1	0	10
Schofield Barracks	9	0	0	0	9
EUROPE					
Grafenwoehr	18	0	0	0	18
Hohenfels/Amberg	1	0	0	0	1
Landstuhl	25	0	0	0	25
Vicenza	7	0	0	0	7
Vilseck	16	0	0	0	16
JOINT BASES					
Joint Base Elmendorf-Richardson	6	0	0	0	6
Joint Base Langley-Eustis	35	0	0	0	35
Joint Base Lewis-McChord	9	1	0	0	10
Joint Base Little Creek-Ft. Story	1	0	0	0	1
Joint Base McGuire-Dix-Lakehurst	9	1	0	0	10
Joint Base Meyer-Henderson Hall	4	0	0	0	4
Joint Base San Antonio*	98	2	0	0	100
USAF MTF*‡					
	62	0	0	0	62
NAVAL/MARINE CORPS MTF*‡					
	20	0	0	0	20

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2022 Q1
*‡ list of USAF, Naval, and Marine Corps locations in Appendix A

DRSi Reporting Results

Two eBLL cases among Army dependents were reported in DRSi during CY2022 Q1. Ft. Hood and Ft. Shafter–Tripler each reported one case.

DRSi Reporting Compliance

Ten out of the 18 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 10% reporting compliance for CY2022 Q1. Three cases reported in CY2021 had new eBLL results recorded in CY2022 and should have been reported to DRSi again. Ft. Belvoir, Ft. Bragg, Ft. Hood, Ft. Leavenworth, Ft. Lee, Ft. Stewart, Ft. Wainwright, Joint Base Lewis-McChord, and Walter Reed NMMC each had one unreported eBLL case from CY2022 Q1.

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

The results of the APHN-PSR indicated that a total of 536 BLL test results were reported to State and/or local authorities during CY2022 Q1 (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=411), followed by RHC-Atlantic (n=120). Eight (1.5%) of those results (n=536) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the APHN-PSR by Region and Installation, CY2022 Q1

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft. Belvoir	88	0
Ft. Bragg	1	1
Ft. Lee	1	0
Joint Base Langley-Eustis	29	0
Redstone Arsenal	1	0
CENTRAL		
Ft. Bliss	208	0
Ft. Carson	42	0
Ft. Hood	127	1
Ft. Huachuca	5	5
Ft. Leavenworth	0	1
Ft. Polk	29	0
PACIFIC		
Tripler/Schofield Barracks	5	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 January – 31 March 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 Q1 compared to CY2021 Q1 (n=2,430 BLL tests) decreased by 37%. It is unclear whether the decrease in dependents tested for blood lead is due to the continued impact on preventive care during the pandemic or if more dependents are seeking care outside the MHS.[9]

Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to 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, military MTFs reached 10% reporting compliance, a rate 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, 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. The CY2021 reporting year has ended, and a new medical event report should be submitted for any eBLL cases reported in CY2021 that indicated an eBLL on a repeat test in CY2022. Contact the Disease Epidemiology Branch (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil) for any questions regarding DRSi reporting of eBLLs.

LIMITATIONS

This report may not include all Army dependent BLL test results. The NMCPHC extracted the blood lead laboratory results from CHCS and MHS GENESIS one month after the end of Q1 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 did 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. Carson, Ft. Irwin, Ft. Leavenworth, Ft. Leonard Wood, Ft. Riley, Ft. Shafter, Ft. Wainwright, JB Lewis-McChord, JB Elmendorf-Richardson, Presidio of Monterey, and Schofield Barracks. However, the NMCPHC is still examining 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 Air Force 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 BLL between 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
Aviano AB
Barksdale AFB
Davis-Monthan AFB
Dover AFB
Eglin AFB
Goodfellow AFB
Grand Forks AFB
Hanscom AFB
JB Anacostia-Bolling
JB Andrews
Kadena AB
Keesler AFB
Little Rock AFB
Los Angeles AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Nellis AFB
Offutt AFB
Patrick AFB
Peterson AFB
RAF Alconbury
Ramstein AB
Seymour Johnson AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Camp Lejeune
JB Charleston
JB Marianas Guam-Andersen
Portsmouth
Quantico
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

7

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 (eBLL). This quarterly report uses laboratory data based on the updated Centers for Disease Control and Prevention reference value for an eBLL (≥3.5 µg/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 (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 (µg/dL) to 3.5 µg/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] Army dependents with eBLLs 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 eBLLs. This iteration uses the new CDC reference value for eBLL (3.5 µg/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).

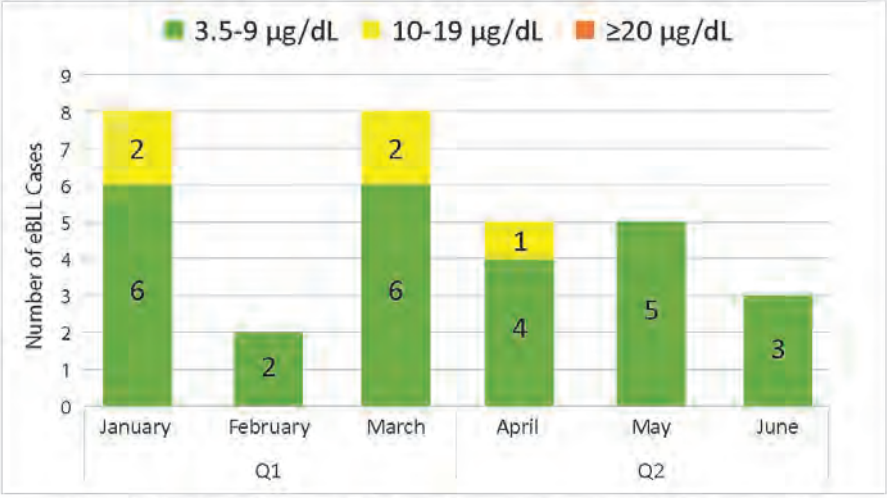

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2022
Data source: CHCS HL7 and MHS GENESIS

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

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
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

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
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
Davis-Monthan AFB
Dover AFB
Eglin AFB
Hill AFB
JB Anacostia-Bolling
JB Andrews
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

Naval/Marine Corps Stations
Indian Head
JB Marianas Guam-Andersen
Portsmouth
Quantico
Suffolk
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)

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Army Quarterly Pediatric Lead Report (Calendar Year (CY) 2022 Quarter (Q3))

THIRD QUARTER HIGHLIGHT

1,376 Army Child Dependents received a blood lead test between 1 July and 30 September 2022; 1.6% of those tests indicated an elevated blood lead level (eBLL). This quarterly report uses laboratory data based on the updated Centers for Disease Control and Prevention reference value for an eBLL (≥3.5 µg/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 (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 (µg/dL) to 3.5 µg/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] Army dependents with eBLLs must be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division guidelines. 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 quarterly report tracks all available BLL laboratory test results within the Army dependent population and monitors the occurrence of eBLLs. This iteration uses the updated CDC reference value for eBLL (3.5 µg/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 July through 30 September 2022 (CY2022 Q3). 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=122) 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 Q3, 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 Q3 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 July through 30 September 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 Q3 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 Q3 that were also reported via a medical event report in DRSi. Because the Armed Forces RME Guidelines case definition for an eBLL was updated after the dates covered in this report (1 July through 30 September 2022), only eBLL cases that meet the previous 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 Q3, 1,376 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 22 of those results (1.6%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1. Because of the lower reference value for eBLL, fifteen additional children with an eBLL were identified. In CY2022 Q3, 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 Q3

BLL Ranges (µg/dL)	CY2022 Q3 n (%)
<3.5	1,354 (98.4%)
3.5–9	21 (1.5%)
10–19	1 (0.1%)
≥20	0
Total	**1,376 (100%)**

Twenty of the elevated results in CY2022 Q3 are new eBLL cases. Two Army dependents with an elevated result in CY2022 Q3 had an elevated result reported previously in CY2022. In the first three quarters of CY2022, there were a total of 51 Army dependents with an eBLL (Figure 1).

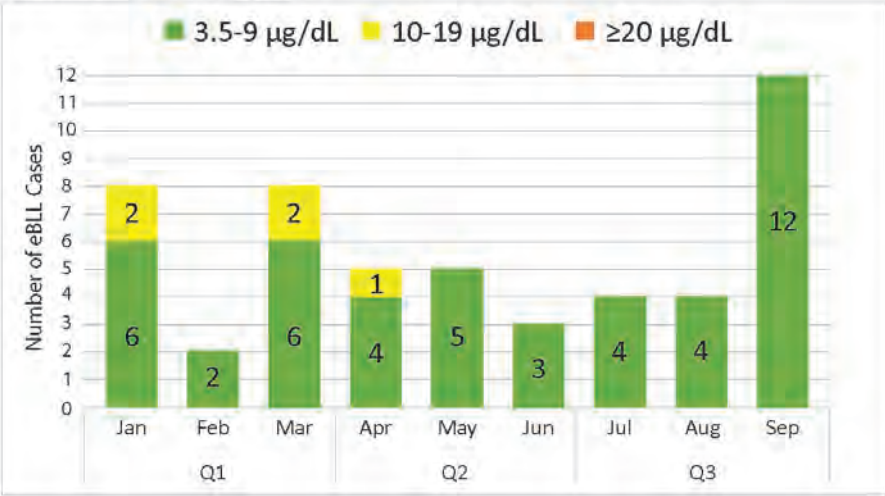

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2022
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2022 Q3 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Belvoir (1), Ft. Bliss (1), Ft. Drum (1), Ft. Hood (1), Ft. Leavenworth (1), Ft. Polk (2), Ft. Riley (1), Ft. Sill (1), Ft. Stewart (1), Ft. Wainwright (1), Joint Base (JB) Lewis-McChord (2), JB San Antonio (8), and West Point (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 Q3.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q3

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	26	0	0	0	26
Carlisle Barracks	3	0	0	0	3
Ft. Belvoir*	67	1	0	0	68
Ft. Benning	31	0	0	0	31
Ft. Bragg	56	0	0	0	56
Ft. Campbell	58	0	0	0	58
Ft. Detrick	11	0	0	0	11
Ft. Drum*	115	1	0	0	116
Ft. Jackson	6	0	0	0	6
Ft. Knox	23	0	0	0	23
Ft. Lee	22	0	0	0	22
Ft. Meade	52	0	0	0	52
Ft. Rucker	29	0	0	0	29
Ft. Stewart*	42	0	1	0	43
Redstone Arsenal	3	0	0	0	3
Walter Reed NMMC	11	0	0	0	11
West Point*	18	1	0	0	19
CENTRAL					
Ft. Bliss*	80	1	0	0	81

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q3

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Carson	57	0	0	0	57
Ft. Hood*	110	1	0	0	111
Ft. Huachuca	4	0	0	0	4
Ft. Irwin	2	0	0	0	2
Ft. Leavenworth*	13	1	0	0	14
Ft. Leonard Wood	33	0	0	0	33
Ft. Polk*	15	2	0	0	17
Ft. Riley*	42	1	0	0	43
Ft. Sill*	51	1	0	0	52
White Sands Missile Range	1	0	0	0	1
PACIFIC					
Camp Zama	2	0	0	0	2
Ft. Shafter	14	0	0	0	14
Ft. Wainwright*	17	1	0	0	18
Schofield Barracks	28	0	0	0	28
EUROPE					
Grafenwoehr	14	0	0	0	14
Landstuhl	32	0	0	0	32
Vicenza	22	0	0	0	22
Vilseck	11	0	0	0	11
JOINT BASES					
JB Elmendorf-Richardson	17	0	0	0	17
JB Langley-Eustis	42	0	0	0	42
JB Lewis-McChord*	4	2	0	0	6
JB Little Creek-Ft. Story	2	0	0	0	2
JB Meyer-Henderson Hall	3	0	0	0	3
JB San Antonio*	60	8	0	0	68
USAF MTF*†					
	82	0	0	0	82
NAVAL/MARINE CORPS MTF*†					
	23	0	0	0	23

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2022 Q3

*† See Appendix A for the list of USAF, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2022 Q3.

DRSi Reporting Results

Thirteen eBLL cases among Army dependents were reported in DRSi during CY2022 Q3. JB San Antonio reported eight eBLL cases. Ft Bliss and JB Lewis-McChord each reported two eBLL cases, and Ft. Bragg reported one eBLL 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 CY2022 Q1 reported, and the remaining twelve had test results from CY2022 Q3 reported.

DRSi Reporting Compliance

Based on the Armed Forces RME Guidelines case definition for eBLL (≥5 µg/dL) during the dates of this report (1 July through 30 September 2022), five out of the 20 new eBLL cases identified in the CHCS and MHS GENESIS laboratory data were considered in the measure of reporting compliance. All five of these cases were reported to DRSi; a 100% reporting compliance for CY2022 Q3.

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

The results of the APHN-PSR indicated that a total of 741 BLL test results were reported to State and/or local authorities during CY2022 Q3 (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=392), followed by RHC-Atlantic (n=349). Twelve (1.6%) of those results (n=741) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the APHN-PSR by Region and Installation, CY2022 Q3

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft. Belvoir	274	0
Ft.Bragg	2	2
Ft Rucker	46	0
JB Langley-Eustis	27	2
CENTRAL		
Ft. Bliss	2	2
Ft. Carson	100	0
Ft. Hood	240	2
Ft. Huachuca	5	1
Ft. Polk	40	3
Redstone Arsenal	5	0
PACIFIC		
JB Lewis-McChord	0	2

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

DISCUSSION

Approximately 1.6% of the results of BLL tests performed in CY2022 Q3 (1 July – 30 September 2022) indicated eBLLs. Because of the lower reference value for eBLL, fifteen additional children with an eBLL were identified. The number of Army dependents tested during CY2022 Q3 (n=1,376 BLL tests) compared to CY2021 Q3 (n=2,343 BLL tests) decreased by 41%. The decrease in blood lead test results may be because more dependents are seeking care outside the MHS or a decrement in the laboratory data received from installations that have transitioned to the MHS GENESIS electronic health record. For example, three eBLL cases from JB San Antonio and one case from Ft Bragg were reported to DRSi, but were not included in the MHS GENESIS laboratory data sent by NMCPHC, indicating a potential gap in the data.

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 Army MTFs reaching 100% reporting compliance. This rate is significantly improved from the first half of 2022 (Q1–Q2 reporting compliance range: 10–17%). 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@health.mil) for any questions regarding DRSi reporting of eBLLs.

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 Q3 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. 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.

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. However, the NMCPHC has communicated concerns about the quality and completeness of these data. At the time of this publication, installations that transitioned to MHS GENESIS include Ft. Benning, Ft. Bliss, Ft. Bragg, Ft. Carson, Ft. Gordon, Ft. Hood, Ft. Huachuca, Ft. Irwin, Ft. Jackson, Ft. Leavenworth, Ft. Leonard Wood, Ft. Polk, Ft. Riley, Ft. Rucker, Ft. Shafter, Ft. Sill, Ft. Stewart, Ft. Wainwright, JB Elmendorf-Richardson, JB Lewis-McChord, JB San Antonio, Presidio of Monterey, Redstone Arsenal, and Schofield Barracks.

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 was updated to reflect the current CDC reference value after the dates of this report, 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
Buckley AFB
Davis-Monthan AFB
Eglin AFB
FE Warren AFB
Fairchild AFB
Hill AFB
JB Anacostia-Bolling
JB Andrews
JB Charleston
Kadena AB
Keesler AFB
Los Angeles AFB
Luke AFB
MacDill AFB
Maxwell AFB
McConnell AFB
Misawa AB
Nellis AFB
Osan AB
Patrick AFB
Peterson AFB
Ramstein AB
Robbins AFB
Tinker AFB
Travis AFB
USAF Academy
Wright-Patterson AFB

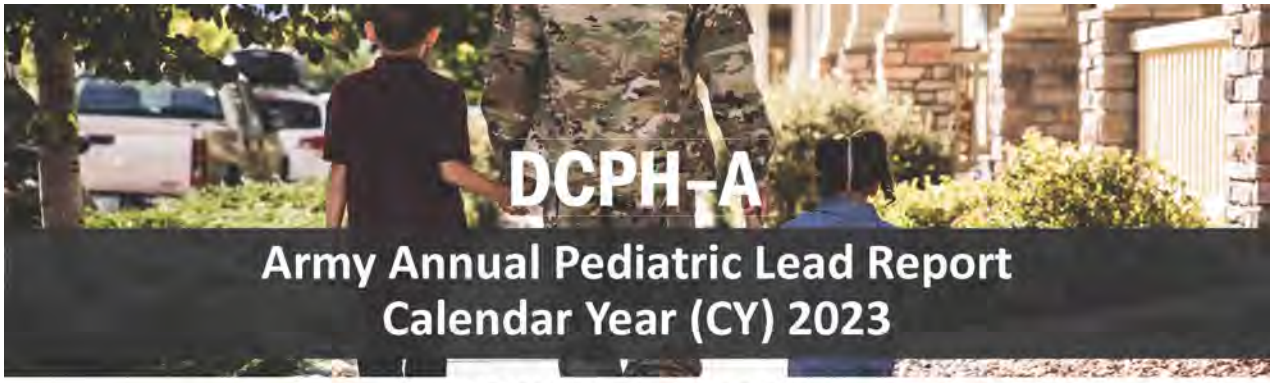
Naval/Marine Corps Stations
Chesapeake
Indian Head
JB Marianas Guam-Andersen
Norfolk
Patuxent River
Portsmouth
Quantico
Sigonella
Virginia Beach

For more information: APHC Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: APHC Disease Epidemiology Program (usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@health.mil)

APPENDIX F

CY2023 PEDIATRIC LEAD REPORTS

The CY2023 Annual and Quarterly Pediatric Lead Reports begin on the next page.



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 µg/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 (µg/dL) to 3.5 µg/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 annaul 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 photoporphyrin (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 (≥3.5 µg/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.

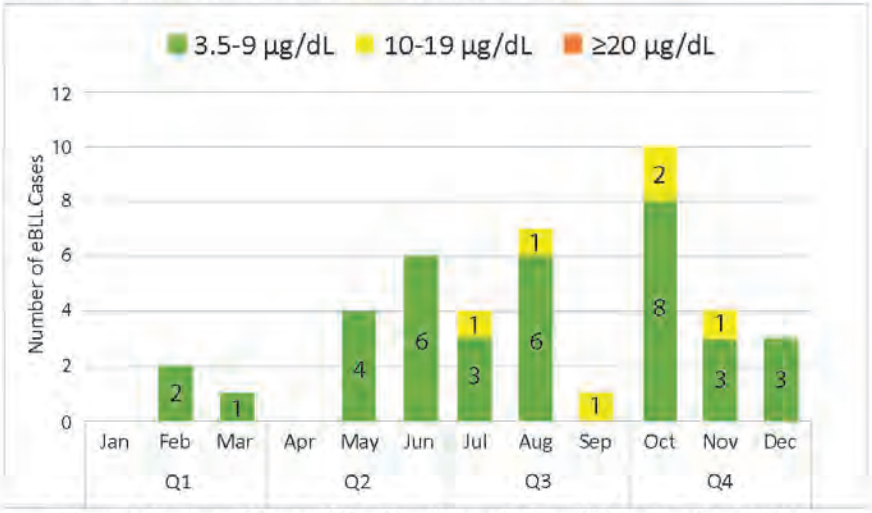


Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2023
Data source: CHCS HL7 and MHS GENESIS

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

	BLL Ranges				
MRC	<3.5 µg/dL	3.5–9 µg/dL	10–19 µg/dL	≥20 µg/dL	Total
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

	BLL Ranges				
MRC	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
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 eBLL cases among Army dependents were reported in DRSi during CY2023. Of note, 18 of the results were late reports from eBLL 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 (eBLL) Were Reported through DRSi, CY2023

Installation	Number of eBLL* 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

*eBLL ≥3.5 µg/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 eBLL 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 eBLL 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 µg/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 eBLL 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 µg/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.

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8. Headquarters, U.S. Army Medical Command, January 7, 2021; USAMEDCOM Operations Order 21-17. *Environmental Health Hazard Management Control Plan*. Falls Church, VA.

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
Altus AFB
Aviano AB
Barksdale AFB
Beale AFB
Buckley SFB
Cannon AFB
Davis-Monthan AFB
Dover AFB
Edwards AFB
Eglin AFB
Eielson AFB
Ellsworth AFB
F.E. Warren AFB
Fairchild AFB
Geilenkirchen AB
Goodfellow AFB
Grand Forks AFB
Hanscom AFB
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

Naval/Marine Corps Stations
Annapolis
Camp Lejeune
Cherry Point
Chesapeake
Indian Head
Joint Region Marianas
JB Pearl Harbor-Hickam
Kaneohe
Lemoore
Norfolk
North Chicago
Okinawa
Patuxent River
Portsmouth VA
Quantico
San Diego
Suffolk
Virginia Beach

For more information: DCPH-A Lead Information for Healthcare Providers (https://ph.health.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: DCPH-A Disease Epidemiology Program (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil)

FIRST QUARTER HIGHLIGHT

1,539 Army Child Dependents
received a blood lead test between 1 January and 31 March 2023;
0.2% of those tests indicated an elevated blood lead level (eBLL ≥3.5 µg/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 (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 (µg/dL) to 3.5 µg/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 quarterly 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 January through 31 March 2023 (CY2023 Q1). 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 photoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=113) 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 Q1, 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 CY2023 Q1 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 January through 31 March 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 Q1 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 Q1 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 Q1, 1,539 Army dependents aged 0 to 6 years received a blood lead test within the MHS; three of those results (0.2%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1 and Figure 1. Because of the lower reference value for eBLL, one additional child with an eBLL was identified. In CY2023 Q1, 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 CY2023 Q1

BLL Ranges (µg/dL)	CY2023 Q1 n (%)
<3.5	1,536 (99.7%)
3.5–9	3 (0.2%)
10–19	0
≥20	0
Total	**1,539 (100%)**

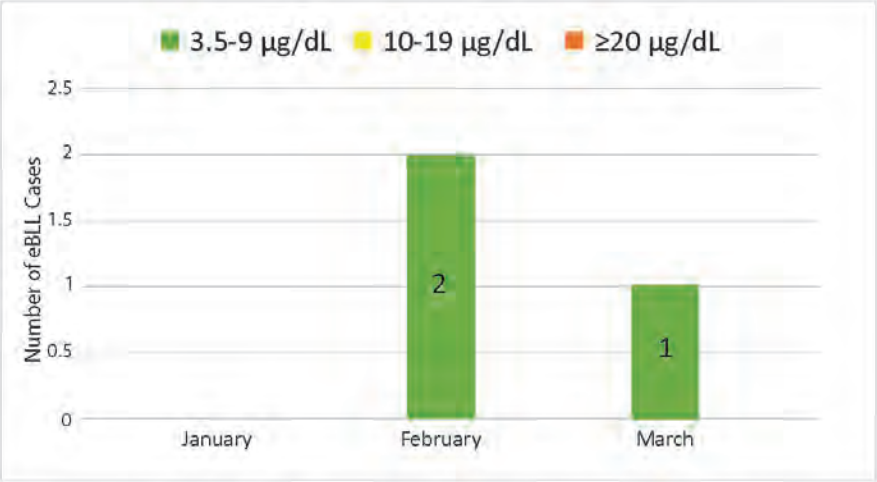

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2023
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2023 Q1 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Bliss (1), Ft. Wainwright (1), and Schofield Barracks (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 Q1.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2023 Q1

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
ATLANTIC					
Aberdeen Proving Ground	14	0	0	0	14
Ft. Belvoir	48	0	0	0	48
Ft. Campbell	36	0	0	0	36
Ft. Detrick	4	0	0	0	4
Ft. Drum	61	0	0	0	61
Ft. Gordon	1	0	0	0	1
Ft. Gregg-Adams (formerly Ft. Lee)	12	0	0	0	12
Ft. Jackson	1	0	0	0	1
Ft. Knox	22	0	0	0	22
Ft. Liberty (formerly Ft. Bragg)	102	0	0	0	102
Ft. Meade	20	0	0	0	20
Ft. Moore (formerly Ft. Benning)	49	0	0	0	49
Ft. Novosel (formerly Ft. Rucker)	30	0	0	0	30
Ft. Stewart	62	0	0	0	62
Redstone Arsenal	4	0	0	0	4
Walter Reed NMMC	10	0	0	0	10
West Point	14	0	0	0	14
CENTRAL					
Ft. Bliss*	135	1	0	0	136
Ft. Carson	66	0	0	0	66
Ft. Cavazos (formerly Ft. Hood)	180	0	0	0	180
Ft. Huachuca	15	0	0	0	15
Ft. Johnson (formerly Ft. Polk)	38	0	0	0	38

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Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2023 Q1

	BLL Ranges				
REGION	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Leavenworth	22	0	0	0	22
Ft. Leonard Wood	37	0	0	0	37
Ft. Riley	92	0	0	0	92
Ft. Sill	57	0	0	0	57
PACIFIC					
Camp Zama	3	0	0	0	3
Ft. Shafter	29	0	0	0	29
Ft. Wainwright*	26	1	0	0	27
Schofield Barracks*	82	1	0	0	83
USAG Humphreys	2	0	0	0	2
EUROPE					
Grafenwoehr	4	0	0	0	4
Hohenfels	1	0	0	0	1
Kaiserslautern	1	0	0	0	1
Landstuhl	28	0	0	0	28
Vicenza	12	0	0	0	12
Vilseck	13	0	0	0	13
JOINT BASES					
JB Elmendorf-Richardson	10	0	0	0	10
JB Langley-Eustis	17	0	0	0	17
JB Lewis-McChord	3	0	0	0	0
JB Little Creek-Ft. Story	2	0	0	0	2
JB McGuire-Dix-Lakehurst	3	0	0	0	3
JB San Antonio	66	0	0	0	66
USAF MTF*†					
	89	0	0	0	89
NAVAL/MARINE CORPS MTF*†					
	13	0	0	0	13

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2023 Q1

*† See Appendix A for the list of USAF, Space Force, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2023 Q1.

DRSi Reporting Results

Twelve eBLL cases among Army dependents were reported in DRSi during CY2023 Q1. Ft. Bliss reported three eBLL cases, Ft. Liberty reported eight, and JB San Antonio reported one eBLL case. Due to differences in the report date compared to the test collection date in the DRSi system, all twelve children had test results from CY2022 Q4 reported.

DRSi Reporting Compliance

None of the eBLL cases identified in the laboratory data in CY2023 Q1 were reported to DRSi, a zero percent reporting compliance. Ft. Bliss, Ft. Wainwright, and Schofield Barracks each had one unreported eBLL during CY2023 Q1.

Public Health Nurses Program Status Report (PHN-PSR)

The results of the PHN-PSR indicated that a total of 1,028 BLL test results were reported to State and/or local authorities during CY2023 Q1 (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 µg/dL (e.g., Louisiana, New York, North Carolina). RHC-Central reported the most BLL test results to State and local authorities (n=610), followed by RHC-Pacific (n=241) and RHC-Atlantic (n=177). Seven (0.6%) of those results (n=1,028) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the PHN-PSR by Region and Installation, CY2023 Q1

REGION	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
ATLANTIC		
Ft. Belvoir	112	1
Ft. Novosel	35	0
JB Langley-Eustis	27	0
Redstone Arsenal	3	0
CENTRAL		
Ft. Cavazos	287	0
Ft. Huachuca	27	0
Ft. Johnson	65	0
Ft. Riley	126	0
Ft. Sill	1	1
JB San Antonio	104	3
PACIFIC		
JB Lewis-McChord	11	1
Tripler AMC/Schofield Barracks	230	1

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

DISCUSSION

Approximately 0.2% of the results of BLL tests performed in CY2023 Q1 (1 January – 31 March 2023) indicated eBLLs. Because of the lower reference value for eBLL, one additional child with an eBLL was identified. The number of Army dependents tested during CY2023 Q1 (n=1,539 BLL tests) was very similar to CY2022 Q1 (n=1,533 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 low, with Army MTFs reaching 0% reporting compliance. This rate is much lower compared to the reporting compliance in CY2022 Q4 (80%). 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. The CY2022 reporting year has ended, and a new medical event report should be submitted to DRSi for any eBLL cases reported in CY2022 with a repeat elevated test result in CY2023. Contact the Disease Epidemiology Branch (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil) for any questions regarding DRSi reporting of eBLLs.

LIMITATIONS

This report may not include all Army dependent BLL test results. The DCPH-P extracted the blood lead laboratory results from CHCS one month after the end of Q1 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.

The MHS GENESIS data provided by the DCPH-P were included in this report to provide some 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. At the time of this publication, installations that transitioned to MHS GENESIS include: Ft. Belvoir, Ft. Bliss, Ft. Carson, Ft. Cavazos, Ft. Detrick, Ft. Drum, Ft. Gordon, Ft. Huachuca, Ft. Irwin, Ft. Jackson, Ft. Johnson, Ft. Leavenworth, Ft. Leonard Wood, Ft. Liberty, Ft. Meade, Ft. Moore, Ft. Novosel, Ft. Riley, Ft. Shafter, Ft. Sill, Ft. Stewart, Ft. Wainwright, JB Elmendorf-Richardson, JB Langley-Eustis, JB Lewis-McChord, JB San Antonio, Presidio of Monterey, Redstone Arsenal, Schofield Barracks, Walter Reed NMMC, and West Point.

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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 Q1

USAF/Space Force Bases
Altus AFB
Aviano AB
Buckley SFB
Davis-Monthan AFB
Edwards AFB
Eglin AFB
Eielson AFB
FE Warren AFB
Fairchild AFB
Goodfellow AFB
Hill AFB
JB Anacostia-Bolling
JB Andrews
JB Charleston
Kadena AB
Keesler AFB
Laughlin AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Nellis AFB
Offutt AFB
Osan AB
Patrick SFB
Scott AFB
Seymour Johnson AFB
Tinker AFB
Travis AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Camp Lejeune
Cherry Point
Chesapeake
JB Marianas Guam-Andersen
JB Pearl Harbor-Hickam
Kaneohe
Okinawa
Portsmouth VA
Quantico

For more information: DCPH-A Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: DCPH-A Disease Epidemiology Program (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil)

SECOND QUARTER HIGHLIGHT

819 Army Child Dependents
received a blood lead test between 1 April and 30 June 2023;
1.2% of those tests indicated an elevated blood lead level (eBLL ≥3.5 µg/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 (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 (µg/dL) to 3.5 µg/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 quarterly 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 April through 30 June 2023 (CY2023 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 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 photoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=31) 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 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), Medical Readiness Command (MRC), and installation. Results ≥3.5 µg/dL are considered elevated. All CY2023 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] 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 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 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 CY2023 Q2 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 Q2, 819 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 10 of those results (1.2%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1 and Figure 1. Because of the lower reference value for eBLL, six additional children with an eBLL were identified. In CY2023 Q2, no child's BLL exceeded the level at which chelation therapy is typically recommended (≥45 µg/dL) or fell within the higher ranges (10 – 19 µg/dL, ≥20 µg/dL, Table 1).

Table 1. Total Count of Pediatric (ages 0–6) Blood Lead Levels in CY2023 Q2

BLL Ranges (µg/dL)	CY2023 Q2 n (%)
<3.5	809 (98.8%)
3.5–9	10 (1.2%)
10–19	0
≥20	0
Total	**819 (100%)**

All ten of the elevated results in CY2023 Q2 are new eBLL cases. In the first half of CY2023, there were a total of 13 Army dependents with an eBLL (Figure 1).

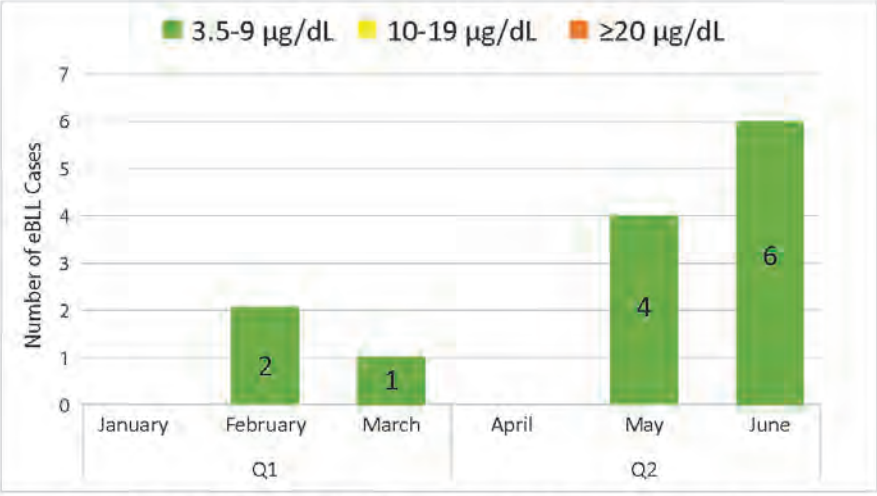

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2023
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2023 Q2 were retained for each child dependent; Table 2 summarizes these BLLs by MRC and installation. The elevated BLL results were from Fort (Ft.) Stewart (2), Ft. Carson (1), Ft. Cavazos (1), Ft. Liberty (1), Ft. Moore (1), JB San Antonio (1), Landstuhl (1), Vicenza (1) and Maxwell AFB (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 Q2.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023 Q2

	BLL Ranges				
MRC	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
EAST					
Aberdeen Proving Ground	2	0	0	0	2
Carlisle Barracks	2	0	0	0	2
Ft. Belvoir	25	0	0	0	25
Ft. Buchanan	1	0	0	0	1
Ft. Campbell	37	0	0	0	37
Ft. Detrick	3	0	0	0	3
Ft. Drum	48	0	0	0	48
Ft. Gordon	1	0	0	0	1
Ft. Gregg-Adams	6	0	0	0	6
Ft. Jackson	1	0	0	0	1
Ft. Knox	37	0	0	0	37
Ft. Liberty*	71	1	0	0	72
Ft. Meade	18	0	0	0	18
Ft. Moore*	32	1	0	0	33
Ft. Novosel	9	0	0	0	9
Ft. Stewart*	37	2	0	0	39
Redstone Arsenal	2	0	0	0	2
Walter Reed NMMC	2	0	0	0	2
West Point	8	0	0	0	8
WEST					
Ft. Bliss	72	0	0	0	72
Ft. Carson*	11	1	0	0	12

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023 Q2

	BLL Ranges				
MRC	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Cavazos*	51	1	0	0	52
Ft. Huachuca	3	0	0	0	3
Ft. Irwin	3	0	0	0	3
Ft. Johnson	14	0	0	0	14
Ft. Leavenworth	6	0	0	0	6
Ft. Leonard Wood	10	0	0	0	10
Ft. Riley	45	0	0	0	45
Ft. Sill	18	0	0	0	18
PACIFIC					
Ft. Shafter	15	0	0	0	15
Ft. Wainwright	6	0	0	0	6
Schofield Barracks	19	0	0	0	19
USAG Humphreys	1	0	0	0	1
EUROPE					
Grafenwoehr	12	0	0	0	12
Hohenfels	1	0	0	0	1
Kaiserslautern	3	0	0	0	3
Landstuhl*	23	1	0	0	24
Vicenza*	13	1	0	0	14
Vilseck	14	0	0	0	14
Wiesbaden	1	0	0	0	1
JOINT BASES					
JB Elmendorf-Richardson	7	0	0	0	7
JB Langley-Eustis	13	0	0	0	13
JB Lewis-McChord	8	0	0	0	8
JB Little Creek-Ft. Story	1	0	0	0	1
JB McGuire-Dix-Lakehurst	2	0	0	0	2
JB San Antonio*	38	1	0	0	39
USAF MTF*†					
	43	1	0	0	44
NAVAL/MARINE CORPS MTF*†					
	14	0	0	0	14

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2023 Q2

*† See Appendix A for the list of USAF, Space Force, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2023 Q2.

DRSi Reporting Results

Fourteen eBLL cases among Army dependents were reported in DRSi during CY2023 Q2. Ft. Drum reported four eBLL cases, Ft. Cavazos reported three eBLL cases, Ft. Liberty reported two, and Ft. Knox, Ft. Johnson, Ft. Moore, Ft. Stewart, and JB San Antonio each reported one eBLL case. Due to differences in the report date compared to the test collection date in the DRSi system, one child had a test result from CY2023 Q1 reported, and the remaining thirteen children had test results from CY2023 Q2 reported.

DRSi Reporting Compliance

Six of the ten eBLL cases identified in the laboratory data in CY2023 Q2 were reported to DRSi, a 60% reporting compliance. Ft. Stewart had two unreported eBLLs during CY2023 Q2, and Ft. Carson and Maxwell AFB each had one unreported eBLL.

Public Health Nurses Program Status Report (PHN-PSR)

The results of the PHN-PSR indicated that a total of 1,132 BLL test results were reported to State and/or local authorities during CY2023 Q2 (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 µg/dL (e.g., Louisiana, New York,

North Carolina). MRC-West reported the most BLL test results to State and local authorities (n=573), followed by MRC-Pacific (n=322) and MRC-East (n=237). Twenty (1.8%) of those results (n=1,132) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the PHN-PSR by Region and Installation, CY2023 Q2

MRC	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
EAST		
Carlisle Barracks	5	0
Ft. Belvoir	109	0
Ft. Drum	4	4
Ft. Knox	1	1
Ft. Liberty	2	2
Ft. Moore	1	1
Ft. Novosel	46	0
Ft. Stewart	1	1
JB Langley-Eustis	65	0
Redstone Arsenal	3	3
WEST		
Ft. Bliss	94	1
Ft. Carson	2	2
Ft. Cavazos	175	3
Ft. Huachuca	15	0
Ft. Johnson	39	1
Ft. Leonard Wood	60	0
Ft. Riley	102	0
JB San Antonio	86	0
PACIFIC		
JB Lewis-McChord	21	0
Tripler AMC/Schofield Barracks	301	1

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 CY2023 Q2 (1 April – 30 June 2023) indicated eBLLs. Because of the lower reference value for eBLL, six additional children with an eBLL were identified. The number of Army dependents tested during CY2023 Q2 (n=819 BLL tests) decreased 47% compared to the previous quarter (CY2023 Q1, n=1,539 BLL tests), indicating some gaps in the laboratory data. DCPH-P noted a decrease in the number of laboratory test results in the data system from installations that transitioned to MHS GENESIS.

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 Army MTFs reaching 60% reporting compliance. This rate improved compared to the reporting compliance in CY2023 Q1 (0%). 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

This report may not include all Army dependent BLL test results. The DCPH-P 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 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.

The MHS GENESIS data provided by the DCPH-P were included in this report to provide some 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. At the time of this publication, installations that transitioned to MHS GENESIS include: Ft. Belvoir, Ft. Bliss, Ft. Campbell, Ft. Carson, Ft. Cavazos, Ft. Detrick, Ft. Drum, Ft. Gordon, Ft. Gregg-Adams, Ft. Huachuca, Ft. Irwin, Ft. Jackson, Ft. Johnson, Ft. Knox, Ft. Leavenworth, Ft. Leonard Wood, Ft. Liberty, Ft. Meade, Ft. Moore, Ft. Novosel, Ft. Riley, Ft. Shafter, Ft. Sill, Ft. Stewart, Ft. Wainwright, JB Elmendorf-Richardson, JB Langley-Eustis, JB Lewis-McChord, JB San Antonio, Presidio of Monterey, Redstone Arsenal, Schofield Barracks, Walter Reed NMMC, and West Point.

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Appendix A

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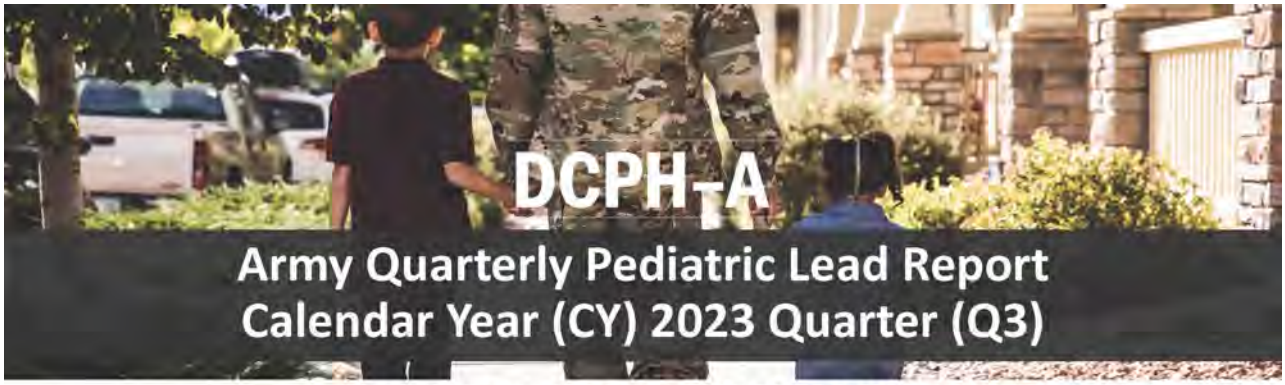
USAF/Space Force Bases
Buckley SFB
Dover AFB
Eglin AFB
Ellsworth AFB
Grand Forks AFB
JB Anacostia-Bolling
JB Andrews
Kadena AB
Keesler AFB
Laughlin AFB
MacDill AFB
Malmstrom AFB
Maxwell AFB
McConnell AFB
Mountain Home AFB
Nellis AFB
Osan AB
Patrick SFB
Ramstein AB
Scott AFB
Seymour Johnson AFB
Travis AFB
USAF Academy
Wright-Patterson AFB

Naval/Marine Corps Stations
Chesapeake
JB Marianas Guam-Andersen
JB Pearl Harbor-Hickam
Norfolk
Okinawa
Quantico
Virginia Beach

For more information: DCPH-A Lead Information for Healthcare Providers (https://phc.amedd.army.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: DCPH-A Disease Epidemiology Program (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil)



THIRD QUARTER HIGHLIGHT

1,169 Army Child Dependents
received a blood lead test between 1 July and 30 September 2023;
1.3% of those tests indicated an elevated blood lead level (eBLL ≥3.5 µg/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.

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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 quarterly 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 July through 30 September 2023 (CY2023 Q3). 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 photoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=44) 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 Q3, 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 Q3 eBLL test results are reported.

Disease Reporting System Internet Data

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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 Q3 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 Q3 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 Q3, 1,169 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 15 of those results (1.3%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1. Because of the lower reference value for eBLL, six additional children with an eBLL were identified. In CY2023 Q3, 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 CY2023 Q3

BLL Ranges (µg/dL)	CY2023 Q3 n (%)
<3.5	1,154 (98.7%)
3.5–9	12 (1.0%)
10–19	3 (0.3%)
≥20	0
Total	**1,169 (100%)**

Twelve of the elevated results in CY2023 Q3 are new eBLL cases. Three Army dependents with an elevated result in CY2023 Q3 had an elevated result reported previously in CY2023. In the first three quarters of CY2023, there were a total of 25 Army dependents with an eBLL (Figure 1).

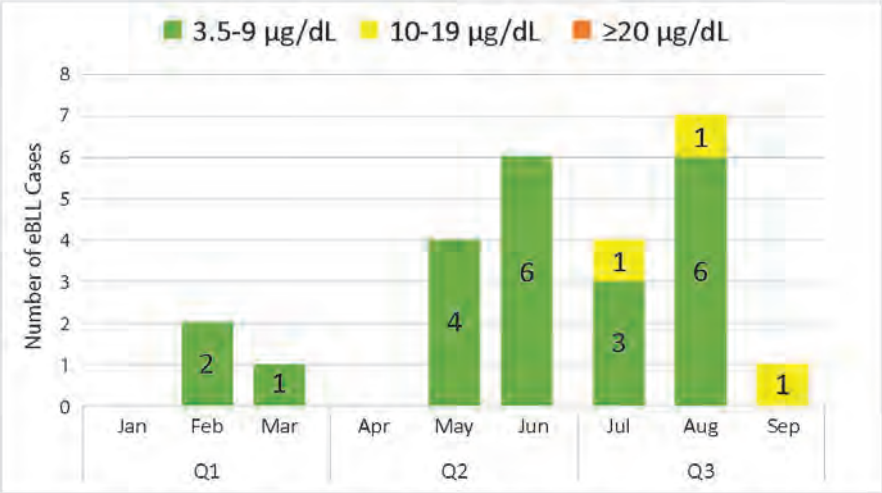

Figure 1. Number of Elevated Blood Lead Cases (≥3.5 µg/dL) by Month in CY2023
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2023 Q3 were retained for each child dependent; Table 2 summarizes these BLLs by MRC and installation. The elevated BLL results were from Fort (Ft.) Bliss (3), Ft. Liberty (3), Ft. Drum (1), Ft. Johnson (1), Ft. Leavenworth (1), Ft. Leonard Wood (1), Ft. Moore (1), Ft. Novosel (1), Ft. Riley (1), JB San Antonio (1), and Landstuhl (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 Q3.

Table 2. Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023 Q3

	BLL Ranges				
MRC	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
EAST					
Aberdeen Proving Ground	16	0	0	0	16
Ft. Belvoir	34	0	0	0	34
Ft. Campbell	36	0	0	0	36
Ft. Detrick	12	0	0	0	12
Ft. Drum*	39	1	0	0	40
Ft. Gregg-Adams	6	0	0	0	6
Ft. Jackson	1	0	0	0	1
Ft. Knox	16	0	0	0	16
Ft. Liberty*	82	2	1	0	85
Ft. Meade	39	0	0	0	39
Ft. Moore*	44	0	1	0	45
Ft. Novosel*	12	1	0	0	13
Ft. Stewart	44	0	0	0	44
Redstone Arsenal	1	0	0	0	1
Walter Reed NMMC	5	0	0	0	5
West Point	2	0	0	0	2
WEST					
Ft. Bliss*	120	3	0	0	123
Ft. Carson	41	0	0	0	41
Ft. Cavazos	118	0	0	0	118
Ft. Huachuca	1	0	0	0	1
Ft. Johnson*	28	1	0	0	29

Table 2 (continued). Pediatric (ages 0–6) Blood Lead Levels (BLL), by Medical Readiness Command and Installation, CY2023 Q3

	BLL Ranges				
MRC	**<3.5 µg/dL**	**3.5–9 µg/dL**	**10–19 µg/dL**	**≥20 µg/dL**	**Total**
Ft. Leavenworth*	19	1	0	0	20
Ft. Leonard Wood*	30	0	1	0	31
Ft. Riley*	50	1	0	0	51
Ft. Sill	27	0	0	0	27
PACIFIC					
Ft. Shafter	83	0	0	0	83
Ft. Wainwright	15	0	0	0	15
Schofield Barracks	9	0	0	0	9
EUROPE					
Grafenwoehr	23	0	0	0	23
Landstuhl*	25	1	0	0	26
Vicenza	6	0	0	0	6
Vilseck	21	0	0	0	21
JOINT BASES					
JB Elmendorf-Richardson	12	0	0	0	12
JB Langley-Eustis	13	0	0	0	13
JB Lewis-McChord	4	0	0	0	4
JB McGuire-Dix-Lakehurst	2	0	0	0	2
JB San Antonio*	39	1	0	0	40
USAF MTF*+					
	51	0	0	0	51
NAVAL/MARINE CORPS MTF*+					
	28	0	0	0	28

*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2023 Q3

** See Appendix A for the list of USAF, Space Force, Navy, and Marine Corps locations where Army dependents received BLL tests in CY2023 Q3.

DRSi Reporting Results

Thirteen eBLL cases among Army dependents were reported in DRSi during CY2023 Q3. Ft. Johnson reported two eBLL cases, and Ft. Bliss, Ft. Cavazos, Ft. Drum, Ft. Leonard Wood, Ft. Liberty, Ft. Moore, Ft. Novosel, Ft. Riley, Landstuhl, Tripler, and Vicenza each reported one eBLL case. Due to differences in the report date compared to the test collection date in the DRSi system, three children had a test result from CY2023 Q2 reported, and the remaining ten children had test results from CY2023 Q3 reported.

DRSi Reporting Compliance

Eleven of the twelve new eBLL cases identified in the laboratory data in CY2023 Q3 were reported to DRSi, a 92% reporting compliance. Ft. Leavenworth had one unreported eBLL during CY2023 Q3.

Public Health Nurses Program Status Report (PHN-PSR)

The results of the PHN-PSR indicated that a total of 979 BLL test results were reported to State and/or local authorities during CY2023 Q3 (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 µg/dL (e.g., Louisiana, New York, North Carolina). MRC-West reported the most BLL test results to State and local authorities (n=753), followed by MRC-East (n=208). Eighteen (1.8%) of those results (n=979) indicated elevated BLLs.

Table 3. Blood Lead Levels (BLL) Reported through the PHN-PSR by Medical Readiness Command and Installation, CY2023 Q3

MRC	Number of BLL tests reported to the State/local authorities	Number of eBLL tests reported to the State/local authorities
EAST		
Carlisle Barracks	9	0
Ft. Belvoir	119	0
Ft. Drum	1	1
Ft. Knox	0	1
Ft. Liberty	2	2
Ft. Novosel	23	1
JB Langley-Eustis	49	0
Redstone Arsenal	5	0
WEST		
Ft. Bliss	256	4
Ft. Cavazos	189	1
Ft. Johnson	91	4
Ft. Leonard Wood	70	1
Ft. Riley	107	1
JB San Antonio	40	0
PACIFIC		
JB Lewis-McChord	16	0
Tripler AMC/Schofield Barracks	1	1
EUROPE		
Landstuhl	1	1

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

DISCUSSION

Approximately 1.3% of the results of BLL tests performed in CY2023 Q3 (1 July – 30 September 2023) indicated eBLLs. Because of the lower reference value for eBLL, six additional children with an eBLL were identified. The number of Army dependents tested during CY2023 Q3 (n=1,169 BLL tests) increased 43% compared to the previous quarter (CY2023 Q2, n=819 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 Army MTFs reaching 92% reporting compliance. This rate improved compared to the reporting compliance in CY2023 Q1 (0%) and Q2 (60%). 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 Q3 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.

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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 Q3

USAF/Space Force Bases
Aviano AB
Barksdale AFB
Beale AFB
Buckley SFB
Davis-Monthan AFB
Dover AFB
Eglin AFB
F.E. Warren AFB
Geilenkirchen AB
Goodfellow AFB
Hanscom AFB
Hill AFB
JB Anacostia-Bolling
JB Andrews
Kadena AB
MacDill AFB
Nellis AFB
Offutt AFB
Osan AB
Scott AFB
Seymour Johnson AFB
USAF Academy

Naval/Marine Corps Stations
Annapolis
Chesapeake
Indian Head
JB Marianas Guam-Andersen
JB Pearl Harbor-Hickam
Lemoore
North Chicago
Okinawa
Patuxent River
Quantico
San Diego
Virginia Beach

For more information: DCPH-A Lead Information for Healthcare Providers (https://ph.health.mil/topics/workplacehealth/ih/Pages/leadproviders.aspx)
Contact us: DCPH-A Disease Epidemiology Program (dha.apg.pub-health-a.mbx.disease-epidemiologyprogram13@health.mil)