

Blood Lead Levels in California Workers

Data Reported to the California Occupational Blood Lead Registry,
2012–2014



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Executive Summary

This report presents data from the Occupational Blood Lead Registry, a laboratory-based tracking system for adult blood lead tests managed by the Occupational Lead Poisoning Prevention Program (OLPPP) at the California Department of Public Health. We report data from 2012–2014 both as a three-year total and annually, describe the operation of the Registry, highlight OLPPP activities to follow up with individuals and employers, and discuss initiatives to improve worker protection. Key findings related to workplace lead exposure in 2012–2014 include:

- Over the three-year period, 38,440 workers had a blood lead level (BLL) test and 6,051 workers were identified with an elevated BLL, defined here as at or above 5 micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$).
- A total of 14,002 workers had two or more BLL tests, and 2,782 (20%) had an elevated BLL result on two or more tests. Chronic exposure at this level increases the risk for chronic health effects including hypertension, kidney disease, cognitive dysfunction, and adverse reproductive outcomes.
- The majority of workers with an elevated BLL were male, 20–59 years of age, and had a Hispanic surname.
- Sixty percent (60%) of workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ worked in the Manufacturing sector, primarily in industries that make batteries, aircraft, aircraft parts, plumbing fixtures, or metal valves; build or repair ships; or recover lead from scrap. Fourteen percent worked in the Construction sector.
- BLLs ≥ 40 $\mu\text{g}/\text{dL}$ were reported among workers in industries that handle lead-containing bullets and firearms, such as shooting ranges, ammunition manufacturing, gun repair, and firearm instruction. Workers in metal-related and construction industries also had BLLs ≥ 40 $\mu\text{g}/\text{dL}$.
- Since many employers in industries that use or disturb lead do not regularly offer BLL testing to their workers, data presented in this report do not fully describe the magnitude and distribution of elevated BLLs among California workers.

Based on the findings of this report, OLPPP initiated new prevention activities to protect workers and to increase BLL testing. With increased BLL testing, and therefore a more complete picture of workplace lead exposure in California, OLPPP can better target prevention efforts to industries and employers that most need them.

Part 1: Introduction

Background

Although the toxic effects of lead have been known for centuries, harmful lead exposures are still widespread. Lead affects multiple body systems and can cause permanent damage. Damage can occur without any overt signs or symptoms. Low levels of exposure to lead in adults have been associated with hypertension, adverse effects on renal function, cognitive dysfunction, and adverse reproductive outcomes (National Toxicology Program 2012; Kosnett 2007). No blood lead level threshold for adverse health effects has been identified.

In 2013, based on the available scientific evidence, the Occupational Lead Poisoning Prevention Program (OLPPP) at the California Department of Public Health (CDPH) determined that having chronic blood lead levels (BLLs) ≥ 5 –10 micrograms of lead per deciliter ($\mu\text{g}/\text{dL}$) poses a health risk to adults. In addition, pregnant women or women considering pregnancy should not have a BLL ≥ 5 $\mu\text{g}/\text{dL}$ (OLPPP 2013). The Council of State and Territorial Epidemiologists (CSTE) and the Centers for Disease Control and Prevention (CDC) have revised the definition of an elevated blood lead level for adults to ≥ 5 $\mu\text{g}/\text{dL}$ (CSTE 2015; CDC 2016). For comparison, the estimated average (geometric mean) BLL concentration among U.S. adults aged twenty and older was 1.09 $\mu\text{g}/\text{dL}$ in 2011–2012 (CDC 2014).

OLPPP is a statewide program aimed at preventing the occurrence of lead poisoning among California workers. The California Occupational Blood Lead Registry (Registry) is a laboratory-based tracking system for adult blood lead tests that has been in operation since 1987. OLPPP receives, compiles, edits, tabulates, and analyzes the BLL laboratory reports for persons aged 16 years and older. We use this information to identify cases of lead poisoning that need follow-up, to determine the magnitude and distribution of occupational lead poisoning in California, and to target employers and industries for OLPPP's prevention efforts. In addition, OLPPP contributes BLL data without personal identifiers to the national surveillance system, the Adult Blood Lead Epidemiology and Surveillance (ABLES) program, coordinated by the National Institute for Occupational Safety and Health (NIOSH), a part of CDC.

Workers who are exposed to lead on the job may have BLL tests taken either because their employer has implemented a medical monitoring program that includes periodic blood lead testing of employees, or because their personal healthcare provider has ordered a blood lead test. Workplace lead regulations for general industry and construction are enforced by the Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA). Under these regulations, employers are required to offer employees

blood lead testing when air monitoring shows that their exposure exceeds a specified level. Currently, air monitoring results that exceed an action level of 30 micrograms of lead per cubic meter of air ($\mu\text{g}/\text{m}^3$), calculated as a time-weighted average over an eight-hour work shift, trigger blood lead testing ([Title 8 CCR §1532.1](#); [Title 8 CCR §5198](#)).

This report presents data from the Registry for 2012 through 2014. It also describes the operation of the system, discusses its limitations, highlights some OLPPP activities, and discusses updates to improve worker protection and tracking of lead poisoning.

Data Collection

All laboratories that perform a blood lead analysis on blood drawn in California are required to report specified information to CDPH ([California Health and Safety Code §124130](#)). Reportable information includes the blood test result, demographic data about the person whose blood is being tested, the person's employer, the physician who ordered the test, and the lab where the test was performed. Labs report this data electronically to CDPH's Childhood Lead Poisoning Prevention Branch, and OLPPP receives all results for individuals aged 16 or older.

OLPPP staff use a customized data management system to perform many quality control steps that contribute to data accuracy and completeness. These quality control measures include verifying inconsistent dates, names, or other information; obtaining missing demographic, address, employer, and source information; and a thorough process of deduplication which generates the counts of workers and employers. Phone calls are required to obtain missing information about employers, in order to understand the industries where lead exposures occur, and to obtain addresses required for follow-up based on BLL. Registry staff contact laboratories and physicians to gather missing information on individual results $\geq 10 \mu\text{g}/\text{dL}$; this function is very labor-intensive and cannot currently be done for the large number of BLLs $< 10 \mu\text{g}/\text{dL}$ that we receive.

In order to analyze data by industry, a trained coder assigns an industry code to any employer with one BLL test result $\geq 10 \mu\text{g}/\text{dL}$, or at least five BLL tests in a rolling two-year period. OLPPP codes industries using the North American Industry Classification System (NAICS 2002).

Because we receive almost no information on the race or ethnicity of workers reported to the Registry, OLPPP uses Hispanic surname as a surrogate, or approximate measure, for Hispanic ethnicity (Bureau of the Census 1980).

Public Health Response

The Registry data guide OLPPP's follow-up activities for individuals exposed to lead. All individuals with a BLL ≥ 10 $\mu\text{g/dL}$ and a known address are mailed a personalized letter and educational materials. Employers of workers with a BLL ≥ 10 $\mu\text{g/dL}$ receive a similar mailing. Workers with a BLL ≥ 40 $\mu\text{g/dL}$ are referred to OLPPP's case investigation team. OLPPP staff interview employers and workers to further understand the situation that led to overexposure, follow up with physicians to ensure that affected workers receive appropriate medical care, and send additional health education materials. OLPPP's industrial hygiene staff also provide education and technical assistance to individual employers regarding the necessary components of a lead safety program and compliance with applicable Cal/OSHA regulations.

OLPPP provides monthly reports to local health departments listing workers in their jurisdictions who have a BLL ≥ 10 $\mu\text{g/dL}$. This supports local efforts to identify and prevent instances of lead dust being brought home from the workplace on clothes, shoes, or in vehicles, also known as "take-home" lead poisoning. Counties may use this information to encourage BLL testing of workers' family members.

Part 2: Results

This report provides information on workers with elevated BLLs, defined as ≥ 5 $\mu\text{g}/\text{dL}$. More detailed data are available for workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ due to the efforts made to obtain missing information. Limited data on BLL reports identified as non-occupational or where work-relatedness is unknown are also included. Results are presented only as counts of individuals in a particular category. When a person has multiple BLL tests in a calendar year, the highest level is used to categorize exposure. Rates of elevated BLL among California workers are not calculated because there is no reliable way to estimate how many individuals are working with lead in California.

Overall

Each year OLPPP receives over 55,000 reports for approximately 50,000 individuals. The number of BLL results received increased slightly during 2012–2014, from 55,065 results in 2012 to 58,926 in 2014. Likewise, the number of persons who had at least one blood lead test during the calendar year increased from 48,693 to 51,820 (Table 1).

As noted in the Introduction, our efforts to identify the source of exposure are limited to BLLs ≥ 10 $\mu\text{g}/\text{dL}$, which represent only 5–7% of total reports received annually. Therefore, for the majority of reports, we do not know whether the lead exposure was occupational or non-occupational. Among persons with unknown exposure source, more than 96% have a BLL less than 5 $\mu\text{g}/\text{dL}$, and less than 0.1% have a BLL ≥ 10 $\mu\text{g}/\text{dL}$. For those individuals for whom we know the exposure source, 17,831–18,449 (87%) are exposed at work each year, and 2,698–2,811 (13%) have a non-occupational exposure (Table 1).

Table 1: Number of BLL Results and Persons Tested, by Type of Lead Exposure

Type of Exposure	2012 Results n	2012 Persons n (%)	2013 Results n	2013 Persons n (%)	2014 Results n	2014 Persons n (%)
Non-occupational	3,193	2,793 (6)	3,217	2,811 (6)	3,119	2,698 (5)
Occupational	23,487	18,449 (38)	23,754	18,169 (37)	23,352	17,831 (34)
Unknown	28,385	27,451 (56)	29,098	28,040 (57)	32,454	31,291 (60)
Total	55,065	48,693 (100)	56,069	49,020 (100)	58,926	51,820 (100)

Occupational

In the remainder of this report, we present results where a workplace was identified as the source of exposure, and each worker is counted at his or her highest BLL in a calendar year.

Table 2 shows BLL distributions of workers tested annually and for the three-year period. The total column counts each worker only once during the three-year period at their highest measurement. An individual worker is also included in one, two, or three annual columns depending on whether they were tested in that year.

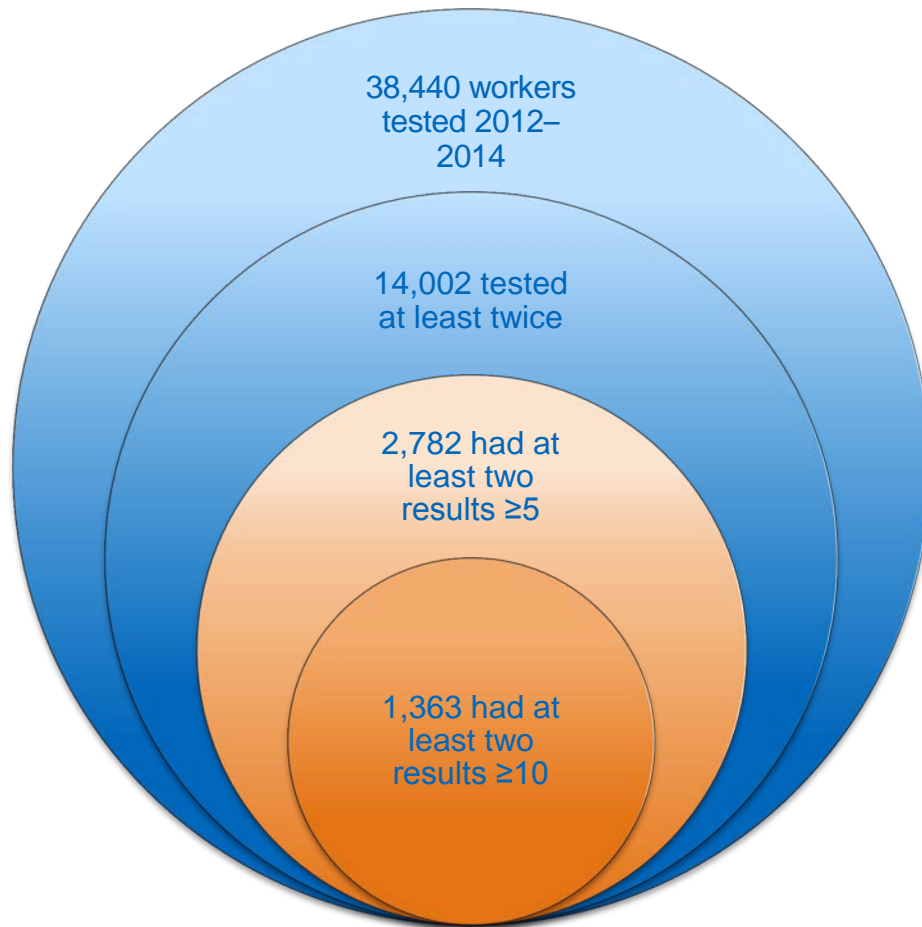
OLPPP received elevated BLL reports (defined here as ≥ 5 $\mu\text{g}/\text{dL}$) for approximately 3,000 (16%-17%) workers tested each year. The total number of workers tested between 2012–2014 was 38,440, and the total number who ever had an elevated BLL in this time period was 6,050 (15%).

Workers included in a Cal/OSHA-compliant medical monitoring program would receive BLL testing every six months. If all workers were tested at least annually, the three-year totals would be equal to the annual totals. However, the total of workers tested is significantly greater for the three-year period (38,440) than for the one-year totals (approximately 18,000). This demonstrates that many workers are not tested annually.

Table 2. BLL Distribution of Workers Tested

BLL ($\mu\text{g}/\text{dL}$)	2012 n (%)	2013 n (%)	2014 n (%)	2012–2014 n
Under 5	15,270 (83)	14,996 (83)	14,951 (84)	32,390
5–9	1,733 (9)	1,707 (9)	1,639 (9)	3,444
10–19	1,097 (6)	1,164 (6)	976 (5)	1,957
20–29	276 (1)	238 (1)	214 (1)	493
30 and greater	73 (<1)	64 (<1)	50 (<1)	156
≥ 5 (Total elevated)	3,179 (17)	3,173 (17)	2,879 (16)	6,050
Total tested	18,449 (100)	18,169 (100)	17,830 (100)	38,440

While having a single BLL ≥ 5 $\mu\text{g}/\text{dL}$ may not necessarily cause health damage, chronic exposure at this level puts adults at an increased risk for effects such as hypertension and reduced kidney and cognitive function. From 2012–2014, 14,002 workers had two or more BLL tests, and 2,782 (20%) had an elevated BLL result on two or more tests (Figure 1).

Figure 1. Workers with Multiple BLL Tests

Demographic Characteristics

The overwhelming majority of workers with elevated BLLs reported to the Registry were male (96–97%). Eighty-six percent of workers were between the ages of 20 and 59, a typical age range for a working population. Workers with a Hispanic surname were disproportionately represented among workers with elevated BLLs. California’s workforce was 42% Hispanic (American Community Survey 2009–2013 estimate), whereas the proportion of Hispanic surnames among individuals with elevated BLLs reported to the Registry was 63–64%. This suggests that Hispanic workers are more likely to be exposed to higher levels of lead on the job (Table 3). In contrast, the proportion of Hispanic surnames among individuals with BLLs below 5 $\mu\text{g}/\text{dL}$ was 44–46%, very close to the proportion of Hispanic persons in the California workforce as a whole.

Table 3. Workers with BLLs ≥ 5 $\mu\text{g}/\text{dL}$, by Demographic Characteristics

Worker Characteristic	2012 n	2012 (%)*	2013 n	2013 (%)	2014 n	2014 (%)
Total	3,179	(100)	3,173	(100)	2,879	(100)
Sex						
Male	3,038	(96)	3,044	(96)	2,788	(97)
Female	141	(4)	129	(4)	91	(2)
Age (years)						
16–19	32	(1)	44	(1)	53	(2)
20–29	573	(18)	643	(20)	580	(20)
30–39	705	(22)	683	(22)	596	(21)
40–49	852	(27)	754	(24)	672	(23)
50–59	696	(22)	712	(22)	651	(23)
60–69	279	(9)	294	(9)	280	(10)
70+	42	(1)	43	(1)	47	(2)
Hispanic surname[†]						
Yes	1,995	(63)	2,036	(64)	1,817	(63)
No	1,184	(37)	1,137	(36)	1,062	(37)

*Percentages may not add to 100% because of rounding.

[†]Based on Bureau of the Census. *Census of Population and Housing, 1980 Spanish Surname List.*

Geography

Information on where workers reside and work is presented for BLLs ≥ 10 $\mu\text{g}/\text{dL}$ because data for workers with BLLs between 5–10 $\mu\text{g}/\text{dL}$ is less complete.

A large proportion of workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ were employed in Los Angeles County (46–50%), which reflects the concentration of lead industries in this county. Riverside County (7–8%) had the next highest proportion of workers with BLLs ≥ 10 , followed by Orange (5–7%), and San Bernardino (5–6%) counties (Table 4; note that Table 4 and all remaining tables appear in the Tables section beginning on page 22).

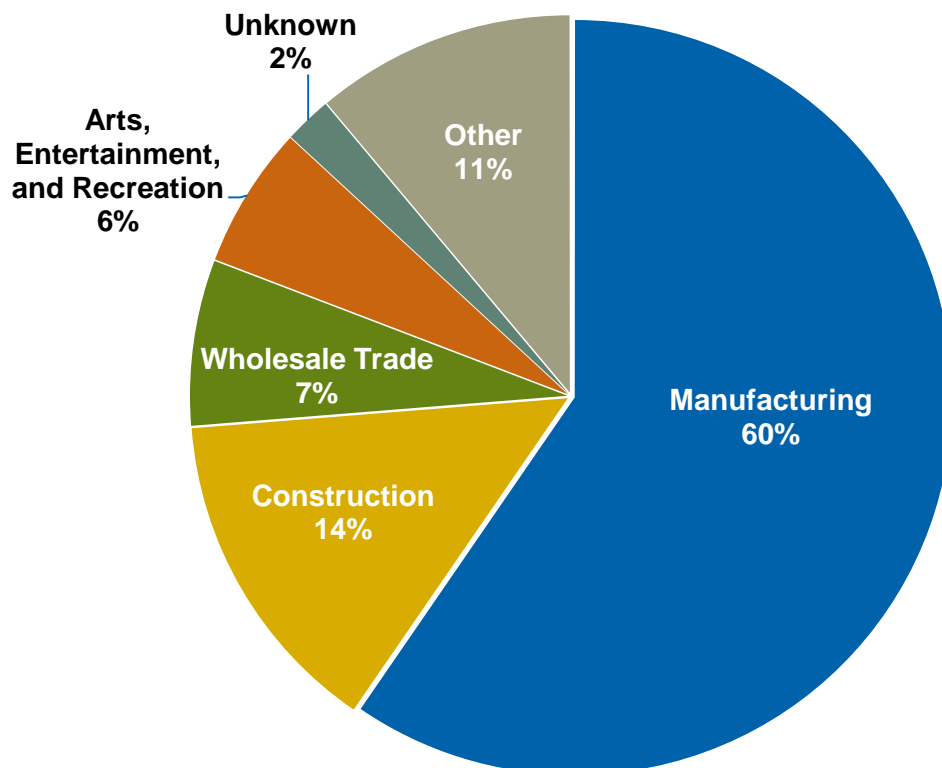
The largest numbers of workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ live in Los Angeles (40–42%), San Bernardino (11–14%), and Riverside (8–9%) counties (Table 5).

Industry

Numerous California industries use or disturb lead, including battery manufacturing; automotive radiator repair; residential, commercial, and industrial painting; shooting range operation and other firearm related industries; nonferrous foundries; stained glass art; and the recycling of and recovery of lead from scrap metal. Workers in 321 different NAICS-coded industries were reported to the Registry in 2012–2014. Tables 6–8 show annual BLL distributions, numbers of employees tested, and numbers of employers testing, by industry. This information informs OLPPP’s development of industry-specific interventions. Because the industry information is more complete for BLLs reports ≥ 10 $\mu\text{g}/\text{dL}$, we use these data to identify the types of work resulting in significant lead exposures.

Industries are grouped into sectors, where each sector is comprised of many specific industries. Sixty percent (60%) of workers reported to the Registry with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ worked in Manufacturing; 14% in Construction; 7% in Wholesale Trade; and 6% in Arts, Entertainment, and Recreation, which includes shooting ranges (Figure 2). “Other” industry sectors included Administrative and Support and Waste Management and Remediation Services, Other Services, Public Administration, and Educational Services.

Figure 2. Workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$, by Industry Sector



The 20 industries testing the most workers over the three-year period account for 85% of all workers tested. They are presented in Table 9 to show the extent of testing and how it varied over time. These industries include: remediation services; storage battery manufacture; painting contractors; government air, water, and waste programs; recyclable material; site preparation contractors; and secondary smelting, which is primarily battery recycling. Table 9 also includes the percent of workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ for each year, by industry. The industries with the highest percentage of workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ are “all other amusement,” which includes shooting ranges (66–82%); secondary smelting (55–68%); storage battery manufacture (42–46%); painting contractors (12–16%); recyclable material (11–14%); and commercial and institutional building construction (6–15%). Note that these 20 industries are highlighted in bold type in Tables 6–8, which present full BLL distributions for all industries.

Workers with the Highest Exposures to Lead

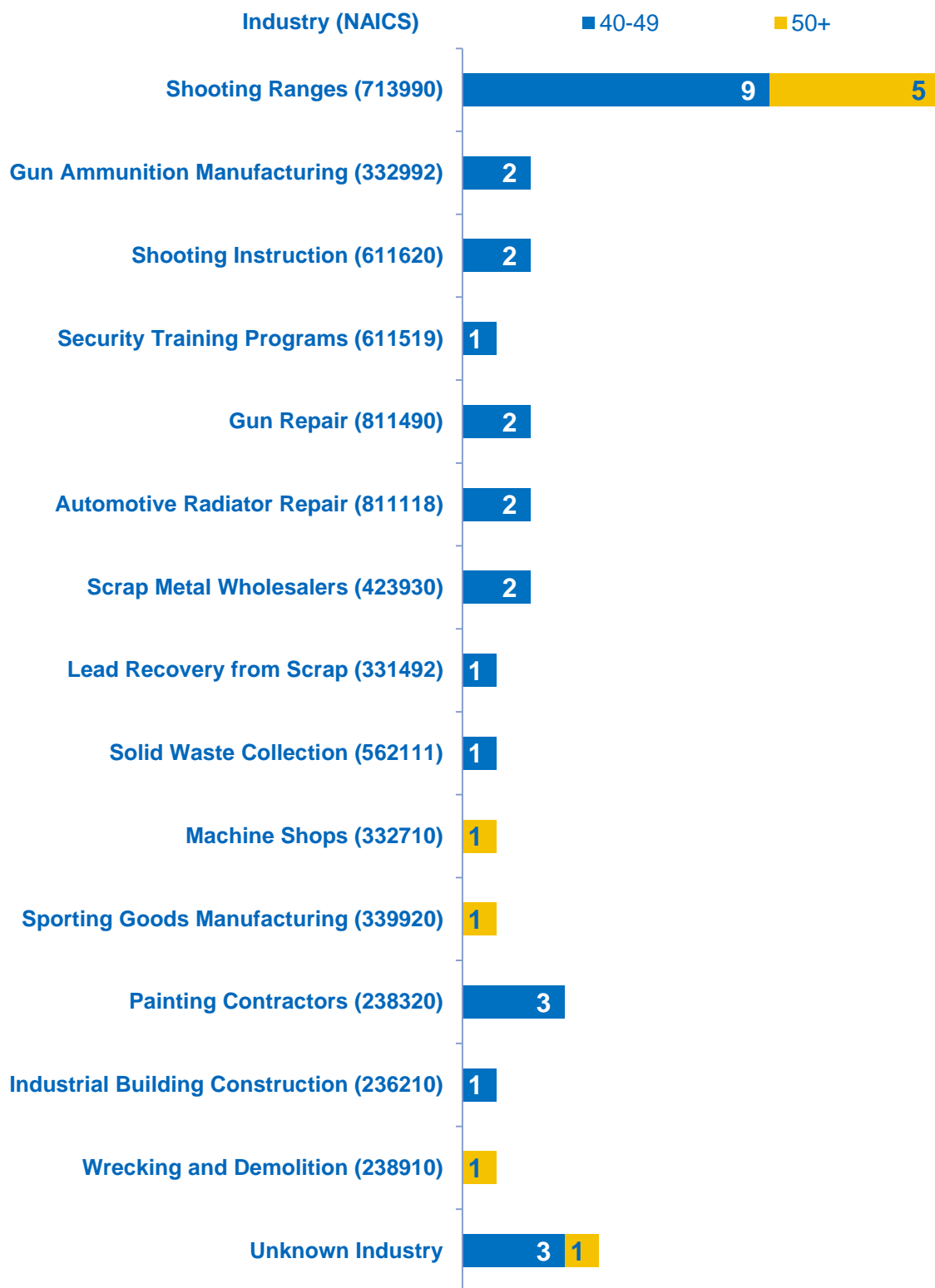
There are a limited number of industries where the workers tested had very high BLLs. In 2012–2014, 187 workers in 32 industries had a BLL ≥ 30 $\mu\text{g}/\text{dL}$, 38 workers in 14 industries had a BLL ≥ 40 $\mu\text{g}/\text{dL}$, and 9 workers in 4 industries had a BLL ≥ 50 $\mu\text{g}/\text{dL}$.

Fourteen (37%) of the workers with BLLs ≥ 40 $\mu\text{g}/\text{dL}$ were employed at shooting ranges (Figure 3). Gun ammunition manufacturing, shooting instruction, security training programs, and gun repair represented an additional 7 (18%) of the BLLs ≥ 40 $\mu\text{g}/\text{dL}$. These industries, which involve handling of lead-containing bullets and firearms, comprised 55% of the BLLs ≥ 40 $\mu\text{g}/\text{dL}$ and half of the BLLs ≥ 50 $\mu\text{g}/\text{dL}$.

Lead is still used in many products including solder and automotive batteries, so workers who repair or recycle these products may be exposed at high levels, depending on the specific process and use or absence of control measures. In 2012–2014, the automotive radiator repair, scrap metal wholesalers, secondary smelting (lead recovery from scrap), and solid waste collection industries had workers reported with very high BLLs.

Lead has been either banned or limited as an ingredient in products such as paint, gasoline, and solder used in drinking water systems. However, workers in many different construction industries perform tasks that disturb lead that is still present in older building materials including paint and solder, or in contaminated soil. Industries with high worker BLLs included painting contractors, wrecking and demolition, and industrial building construction.

Figure 3. Workers with BLLs ≥ 40 $\mu\text{g}/\text{dL}$, by Industry



Part 3: Discussion

Significant Findings

Overexposure to lead continues to be a serious occupational health problem in California in a wide range of industries. During 2012–2014, over 6,000 workers with elevated BLLs were reported to the Registry. Workers with sustained elevated BLLs are at risk for serious, long-term health effects.

The majority of workers with elevated BLLs were male, 20–59 years of age, and had a Hispanic surname. Sixty percent (60%) of workers reported to the Registry with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ worked in the Manufacturing sector, in industries that make and recycle batteries, aircraft and aircraft parts, ships, plumbing and pipefitting fixtures, and metal valves.

BLLs ≥ 40 $\mu\text{g}/\text{dL}$ were reported among workers in several industries, including those that handle lead-containing bullets and firearms, such as shooting ranges, ammunition manufacturing, gun repair, and firearm instruction. Identifying industries with very high BLLs, even if the number of workers is small, helps to point OLPPP toward exposure risks that may exist in more workplaces in that same industry.

Many employers in industries that use or disturb lead do not regularly offer BLL testing to their workers. Between 1996–2008 OLPPP assessed the percentage of employers providing BLL testing in five industries and found differing rates of testing. Eighty-seven percent (87%) of storage battery manufacturers, 56% of lead-using non-ferrous foundries, 14% of radiator repair shops, 8% of licensed San Francisco painting companies, and 1% of wrecking and demolition companies were conducting BLL testing (OLPPP 2002; OLPPP unpublished data 2008). BLL distributions in industries where a higher proportion of employers provide testing will be more accurately described by the data contained in this report, and comparing BLL distributions across industries is not advised.

Limitations

The data presented in this report do not fully describe the magnitude and distribution of elevated BLLs among California workers. As mentioned previously, the most significant limitation is that many employers fail to provide BLL testing to their lead-exposed workers. The result of this large testing deficiency is that we do not know the true numbers of California workers with elevated BLLs. In addition, because the proportion of employers offering blood lead tests varies widely by industry, we cannot accurately determine the relative risk of lead overexposure by industry. We believe that the numbers presented here

likely represent a significant underestimate of the number of California workers exposed to lead.

The majority of BLL reports do not identify an individual's employer, which is only required to be reported if the laboratory has this information. This makes it difficult to determine if the exposure source is occupational and, if so, which industry the individual works in. OLPPP contacts the laboratory or the healthcare provider who ordered the test to obtain complete information on all BLLs ≥ 10 $\mu\text{g}/\text{dL}$. However, we are unable to contact providers on the tens of thousands of BLL results below 10 $\mu\text{g}/\text{dL}$ that lack employer information.

Despite these limitations, the data we collect provide valuable information on industries in California where BLL testing is more consistent and can indicate those industries where more testing is needed. Additionally, among industries where testing is more robust, BLL distributions highlight where employers are more successful in controlling worker exposure.

Education and Outreach Efforts

Based on the findings of this report, OLPPP initiated new prevention activities to protect workers and to increase BLL testing.

OLPPP began a project aimed at preventing lead poisoning among shooting range workers in response to the predominance of BLLs ≥ 40 $\mu\text{g}/\text{dL}$ in this industry. Initially, we conducted several worksite visits and a series of key informant interviews with range employers and employees, police officers who use ranges, and stakeholders. During these visits, we asked questions about the type of educational materials and messages that these workers and employers would find compelling. We are still in the process of understanding this diverse industry, including the differences between private and public sector shooting ranges. Additional work might include creating and disseminating health education materials, interventions to reduce exposure to lead dust at shooting ranges, and technical assistance to employers.

In 2013, Cal/OSHA updated their regulations on how employers warn their employees about lead hazards. OLPPP sent a newsletter to 24,417 employers about the new lead hazard communication requirements and how to comply, with an offer for free labels and hazard warning posters. The newsletter also reminded employers that they are required to provide BLL testing to any employee who uses or disturbs lead or lead-containing materials.

OLPPP is committed to increasing employer-sponsored BLL testing in lead industries. For example, we send personalized letters with educational materials about the importance of

BLL testing as a way to evaluate the effectiveness of a lead safety program. We target employers in lead industries with few employees reported to the Registry, employers who have stopped blood lead testing, and companies who are sub-contracted to perform lead work.

As part of our commitment to helping vulnerable workers, we provided free blood lead testing to workers whose employers do not offer them BLL testing and who do not have access to testing through health insurance. This small pilot project attempted to reach workers through referrals from local health departments, day labor centers, and other community partners. Free blood lead tests were offered to 250 workers, and 160 workers obtained the test.

OLPPP has updated our free online Continuing Medical Education (CME) course to emphasize the health risks linked to chronic exposure at BLLs ≥ 5 $\mu\text{g}/\text{dL}$ and the need to maintain BLLs as low as possible. This course identifies the industries where lead poisoning commonly occurs, describes the health effects associated with lead exposure, summarizes the medical requirements of the Cal/OSHA lead standards, and identifies criteria for removing workers from exposure. A second, more detailed, course for physicians who oversee employer medical monitoring programs will be available in early 2017.

OLPPP responds to data requests from state and local health departments, healthcare providers, researchers, and others who want more detailed information about lead poisoning in California. Our data also contribute to nationwide efforts to better understand and prevent lead poisoning. Each year OLPPP data are submitted to the NIOSH ABLES program that coordinates national surveillance efforts for lead poisoning. National data on adult BLLs are reported in the yearly Summary of Notifiable Noninfectious Conditions and Disease Outbreaks published in Morbidity and Mortality Weekly Report (Alarcon 2016). With data sharing agreements, California BLL results have been used by researchers to investigate correlations between lead exposure and renal disease morbidity and mortality and all-cause mortality (Chowdhury 2014a, Chowdhury 2014b, Chowdhury 2015).

The increased recognition of health effects at lower BLLs has prompted us to reassess our education and outreach efforts to workers with BLLs between 5 $\mu\text{g}/\text{dL}$ and 40 $\mu\text{g}/\text{dL}$. We are considering ways to quantify the number of workers with ongoing, cumulative low-level exposure, and to target these individuals and employers with interventions to reduce BLLs and related chronic disease risks.

Updating the Occupational Lead Standards

Existing Cal/OSHA lead standards are based on medical and scientific information that is over 35 years old, and there is now convincing evidence that chronic, low-level lead exposure causes harmful health effects. Recognizing this, OLPPP has been at the forefront of an effort to revise these standards to provide greater health protection to lead-exposed workers. Specifically, OLPPP recommended that Cal/OSHA lower the BLL at which workers must be removed from lead exposure; increase the required frequency of BLL testing; require BLL testing for all workplaces where lead is used or disturbed, regardless of air lead levels; and lower the permissible exposure limit (PEL) (OLPPP 2014). Since 2011, Cal/OSHA has taken steps toward revising its two lead standards, and OLPPP continues to actively participate in this process.

If revised standards are implemented, we expect that fewer workers would experience adverse health effects from lead exposure. Additionally, more workers would be included in a medical monitoring program, providing them with information about their health, and providing their employers with information about the effectiveness of their lead safety programs. With increased BLL testing, and therefore a more complete picture of workplace lead exposure in California, OLPPP can better target prevention efforts to industries and employers that most need them.

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Tables

Table 4. Workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$, by County of Employment

County	2012 n	2012 (%)	2013 n	2013 (%)	2014 n	2014 (%)
Alameda	52	(4)	39	(3)	55	(4)
Amador	0	(0)	3	(<1)	1	(<1)
Butte	4	(<1)	16	(1)	8	(1)
Contra Costa	12	(1)	6	(<1)	7	(1)
El Dorado	1	(<1)	1	(<1)	2	(<1)
Fresno	29	(2)	22	(2)	14	(1)
Glenn	0	(0)	0	(0)	1	(<1)
Humboldt	1	(<1)	2	(<1)	0	(0)
Imperial	0	(0)	1	(<1)	1	(<1)
Kern	24	(2)	28	(2)	9	(1)
Los Angeles	675	(46)	740	(50)	585	(47)
Madera	1	(<1)	3	(<1)	1	(<1)
Marin	12	(1)	3	(<1)	4	(<1)
Mendocino	1	(<1)	0	(0)	1	(<1)
Merced	0	(0)	1	(<1)	1	(<1)
Monterey	1	(<1)	2	(<1)	1	(<1)
Napa	1	(<1)	4	(<1)	0	(0)
Nevada	2	(<1)	2	(<1)	2	(<1)
Orange	98	(7)	79	(5)	65	(5)
Placer	2	(<1)	3	(<1)	2	(<1)
Riverside	109	(8)	98	(7)	100	(8)
Sacramento	25	(2)	19	(1)	32	(3)
San Benito	0	(0)	0	(0)	1	(<1)
San Bernardino	74	(5)	85	(6)	72	(6)
San Diego	40	(3)	49	(3)	43	(4)
San Francisco	36	(2)	13	(1)	15	(1)
San Joaquin	25	(2)	57	(4)	49	(4)
San Luis Obispo	1	(<1)	4	(<1)	9	(1)
San Mateo	6	(<1)	16	(1)	20	(2)
Santa Barbara	15	(1)	15	(1)	13	(1)
Santa Clara	30	(2)	29	(2)	28	(2)
Santa Cruz	1	(<1)	1	(<1)	1	(<1)
Shasta	3	(<1)	0	(<1)	1	(<1)
Solano	12	(1)	8	(1)	15	(1)
Sonoma	6	(<1)	7	(<1)	9	(1)

County	2012 n	2012 (%)	2013 n	2013 (%)	2014 n	2014 (%)
Stanislaus	9	(1)	3	(<1)	3	(<1)
Sutter	2	(<1)	12	(1)	1	(<1)
Tehama	1	(<1)	0	(0)	0	(0)
Tuolumne	0	(0)	0	(0)	1	(<1)
Ventura	18	(1)	4	(<1)	2	(<1)
Yolo	2	(<1)	3	(<1)	1	(<1)
Yuba	3	(<1)	4	(0)	3	(<1)
Out of State	57	(4)	23	(2)	40	(3)
Unknown	55	(4)	61	(4)	24	(2)
Total	1446	(100)	1466	(100)	1240	(100)

*The following 15 counties had zero (0) workers with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ reported 2012–2014: Alpine, Calaveras, Colusa, Del Norte, Inyo, Kings, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity.

Table 5. Workers with BLLs ≥ 10 $\mu\text{g/dL}$, by County of Residence

County	2012	2012	2013	2013	2014	2014
	n	(%)	n	(%)	n	(%)
Alameda	50	(3)	30	(2)	40	(3)
Berkeley ⁺	0	(0)	1	(<1)	0	(0)
Amador	0	(0)	1	(<1)	2	(<1)
Butte	0	(0)	16	(1)	8	(1)
Calaveras	1	(<1)	1	(<1)	3	(<1)
Contra Costa	30	(2)	16	(1)	24	(2)
El Dorado	5	(<1)	1	(<1)	3	(<1)
Fresno	29	(2)	24	(2)	14	(1)
Glenn	0	(0)	0	(0)	1	(<1)
Humboldt	2	(<1)	4	(<1)	1	(<1)
Imperial	1	(<1)	1	(<1)	2	(<1)
Inyo	0	(0)	0	(0)	1	(<1)
Kern	27	(2)	40	(3)	14	(1)
Kings	1	(<1)	1	(<1)	0	(0)
Lake	1	(<1)	0	(0)	3	(<1)
Los Angeles	619	(41)	644	(42)	514	(40)
Long Beach	14	(1)	19	(1)	11	(1)
Pasadena	6	(<1)	3	(<1)	2	(<1)
Madera	2	(<1)	3	(<1)	1	(<1)
Marin	8	(<1)	3	(<1)	2	(<1)
Mariposa	1	(<1)	1	(<1)	0	(0)
Mendocino	1	(<1)	1	(<1)	2	(<1)
Merced	2	(<1)	3	(<1)	1	(<1)
Monterey	2	(<1)	2	(<1)	1	(<1)
Napa	1	(<1)	1	(<1)	0	(0)
Nevada	2	(<1)	1	(<1)	1	(<1)
Orange	72	(5)	59	(4)	54	(4)
Placer	17	(1)	10	(1)	9	(1)
Riverside	135	(9)	123	(8)	113	(9)
Sacramento	32	(2)	31	(2)	29	(2)
San Benito	1	(<1)	0	(0)	1	(<1)
San Bernardino	166	(11)	201	(14)	154	(12)
San Diego	45	(3)	39	(3)	42	(3)
San Francisco	28	(2)	20	(1)	19	(2)
San Joaquin	34	(2)	58	(4)	52	(4)
San Luis Obispo	0	(0)	5	(<1)	6	(<1)
San Mateo	7	(<1)	9	(1)	16	(1)
Santa Barbara	15	(1)	13	(1)	12	(1)

County	2012 n	2012 (%)	2013 n	2013 (%)	2014 n	2014 (%)
Santa Clara	26	(2)	29	(2)	21	(2)
Santa Cruz	3	(<1)	1	(<1)	3	(<1)
Shasta	3	(<1)	1	(<1)	1	(<1)
Siskiyou	1	(<1)	0	(0)	0	(0)
Solano	21	(1)	7	(<1)	18	(1)
Sonoma	8	(1)	7	(<1)	15	(1)
Stanislaus	12	(1)	7	(<1)	3	(<1)
Sutter	2	(<1)	1	(<1)	0	(0)
Tehama	1	(<1)	1	(<1)	2	(<1)
Tulare	0	(0)	0	(0)	1	(<1)
Tuolumne	0	(0)	0	(0)	1	(<1)
Ventura	11	(1)	19	(1)	6	(<1)
Yolo	2	(<1)	4	(<1)	3	(<1)
Yuba	2	(<1)	3	(<1)	4	(<1)
Out of State	5	(<1)	10	(1)	3	(<1)
Unknown	9	(1)	14	(1)	12	(1)
Total	1446	(100)	1466	(100)	1240	(100)

* The following 11 counties had zero (0) workers residing with BLLs ≥ 10 $\mu\text{g/dL}$ reported 2012–2014: Alpine, Colusa, Del Norte, Inyo, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Trinity.

†City Health Department numbers are included in their respective county totals.

Table 6. Blood Lead Distributions of Workers Tested in 2012, by Industry
Industries where at least one worker had an elevated (≥ 5 $\mu\text{g/dL}$) BLL, ordered by NAICS code

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL ($\mu\text{g/dL}$)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Agriculture, Forestry, Fishing, and Hunting								
All Other Miscellaneous Crop Farming	111998	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Mining								
Gold Ore Mining	212221	4 (50)	0 (0)	4 (50)	0 (0)	0 (0)	8	4
Utilities								
Fossil Fuel Electric Power Generation*	221112	195 (95)	6 (3)	4 (2)	0 (0)	0 (0)	205	4
Electric Power Distribution	221122	22 (88)	2 (8)	1 (4)	0 (0)	0 (0)	25	1
Construction								
New Single-family Housing Construction	236115	6 (75)	0 (0)	2 (25)	0 (0)	0 (0)	8	6
New Multifamily Housing Construction	236116	17 (89)	0 (0)	1 (5)	1 (5)	0 (0)	19	1
Residential Remodelers	236118	10 (71)	0 (0)	3 (21)	1 (7)	0 (0)	14	7
Industrial Building Construction	236210	12 (18)	13 (20)	25 (38)	15 (23)	1 (2)	66	2
Commercial and Institutional Building Construction	236220	147 (81)	23 (13)	9 (5)	2 (1)	1 (1)	182	23
Water and Sewer Line and Related Structures Construction	237110	78 (93)	4 (5)	2 (2)	0 (0)	0 (0)	84	12
Highway Street and Bridge Construction	237310	190 (81)	25 (11)	17 (7)	2 (1)	1 (<1)	235	13
Other Heavy and Civil Engineering Construction (<i>heavy construction contractors incl bridge seismic retrofit</i>)	237990	23 (92)	1 (4)	0 (0)	1 (4)	0 (0)	25	6
Poured Concrete Foundation and Structure Contractors	238110	3 (75)	0 (0)	1 (25)	0 (0)	0 (0)	4	2
Structural Steel and Precast Concrete Contractors (<i>structural steel erection, seismic retrofit</i>)	238120	37 (69)	5 (9)	7 (13)	3 (6)	2 (4)	54	9
Roofing Contractors	238160	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Other Foundation, Structure, and Building Exterior Contractors	238190	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Electrical Contractors	238210	84 (99)	1 (1)	0 (0)	0 (0)	0 (0)	85	4
Plumbing, Heating, Air-Conditioning Contractors (<i>industrial ventilation installation and maintenance</i>)	238220	25 (60)	10 (24)	7 (17)	0 (0)	0 (0)	42	8
Other Building Equipment Contractors	238290	58 (85)	8 (12)	2 (3)	0 (0)	0 (0)	68	5

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Drywall and Insulation Contractors	238310	1 (33)	1 (33)	1 (33)	0 (0)	0 (0)	3	3
Paint and Wall Covering Contractors (<i>painting contractors</i>)	238320	374 (68)	89 (16)	58 (11)	21 (4)	6 (1)	548	63
Other Building Finishing Contractors (<i>waterproofing</i>)	238390	47 (90)	4 (8)	0 (0)	1 (2)	0 (0)	52	4
Site Preparation Contractors (<i>wrecking and demolition</i>)	238910	387 (91)	26 (6)	11 (3)	2 (<1)	1 (<1)	427	50
All Other Specialty Trade Contractors (<i>sandblasting, scaffolding, tank lining contractors</i>)	238990	85 (92)	5 (5)	1 (1)	0 (0)	1 (1)	92	17
Construction (<i>specific industry unknown</i>)	239999	7 (47)	3 (20)	3 (20)	2 (13)	0 (0)	15	11
Manufacturing								
Wood Window and Door Manufacturing	321911	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Wood Container and Pallet Manufacturing	321920	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	1
Petrochemical Manufacturing	325110	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Adhesive Manufacturing (<i>manufacture of lead-containing adhesive</i>)	325520	106 (99)	0 (0)	1 (1)	0 (0)	0 (0)	107	2
Glass Product Manufacturing Made of Purchased Glass	327215	4 (17)	2 (8)	15 (63)	2 (8)	1 (4)	24	22
All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	327999	3 (50)	2 (33)	1 (17)	0 (0)	0 (0)	6	1
Iron and Steel Mills	331111	22 (96)	0 (0)	1 (4)	0 (0)	0 (0)	23	2
Secondary Smelting, Refining, and Alloying of Copper	331423	1 (10)	2 (20)	5 (50)	2 (20)	0 (0)	10	1
Nonferrous Metal (ex. Copper and Aluminum) Rolling, Drawing, Extruding, and Alloying	331491	0 (0)	0 (0)	10 (77)	3 (23)	0 (0)	13	2
Secondary Smelting, Refining, and Alloying of Nonferrous Metal (<i>lead recovery from scrap</i>)	331492	43 (10)	96 (22)	223 (52)	53 (12)	13 (3)	428	11
Copper Foundries (except Die-Casting)	331525	3 (33)	4 (44)	2 (22)	0 (0)	0 (0)	9	1
Metal Window and Door Manufacturing	332321	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Sheet Metal Work Manufacturing (<i>lead shielding, roof gutters, flashing manufacturing</i>)	332322	6 (20)	1 (3)	15 (50)	6 (20)	2 (7)	30	6
Machine Shops	332710	34 (58)	23 (39)	2 (3)	0 (0)	0 (0)	59	4
Bolt, Nut, Screw, Rivet, and Washer Manufacturing	332722	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Electroplating, Plating, Polishing, Anodizing, and Coloring	332813	6 (67)	3 (33)	0 (0)	0 (0)	0 (0)	9	2
Plumbing Fixture Fitting and Trim Manufacturing (<i>manufacture of brass plumbing fixtures</i>)	332913	3 (7)	20 (49)	18 (44)	0 (0)	0 (0)	41	3

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Other Metal Valve and Pipe Fitting Manufacture	332919	12 (23)	21 (40)	18 (35)	1 (2)	0 (0)	52	1
Small Arms Ammunition Manufacturing (<i>gun ammunition manufacturing</i>)	332992	0 (0)	1 (17)	1 (17)	2 (33)	2 (33)	6	3
Small Arms Manufacturing	332994	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
All Other Miscellaneous Fabricated Metal Product Manufacturing	332999	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Oil and Gas Field Machinery and Equipment Manufacturing	333132	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Pump and Pumping Equipment Manufacturing	333911	2 (33)	4 (67)	0 (0)	0 (0)	0 (0)	6	1
Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	333923	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Electronic Computer Manufacturing	334111	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Other Electronic Component Manufacturing	334419	3 (12)	8 (32)	10 (40)	4 (16)	0 (0)	25	3
Residential Electric Lighting Fixture Manufacturing	335121	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Storage Battery Manufacturing	335911	180 (22)	257 (32)	295 (37)	64 (8)	7 (1)	803	10
Primary Battery Manufacturing	335912	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	2	1
All Other Miscellaneous Electrical Equipment and Component Manufacturing	335999	1 (50)	0 (0)	0 (0)	0 (0)	1 (50)	2	2
All Other Motor Vehicles Parts Manufacturing (<i>manufacture of radiators</i>)	336399	2 (20)	5 (50)	3 (30)	0 (0)	0 (0)	10	4
Aircraft Manufacturing (<i>complete aircraft manufacture, assembly, or rebuilding</i>)	336411	56 (93)	4 (7)	0 (0)	0 (0)	0 (0)	60	5
Other Aircraft Parts and Auxiliary Equipment Manufacturing	336413	11 (19)	15 (26)	23 (40)	9 (16)	0 (0)	58	5
Ship Building and Repair	336611	47 (94)	1 (2)	1 (2)	0 (0)	1 (2)	50	4
Jewelry (except Costume) Manufacturing	339911	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Sporting and Athletic Goods Manufacturing	339920	1 (11)	3 (33)	3 (33)	1 (11)	1 (11)	9	5
Musical Instrument Manufacturing	339992	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Wholesale Trade								
Motor Vehicle Supplies and New Parts Merchant Wholesalers	423120	2 (40)	0 (0)	3 (60)	0 (0)	0 (0)	5	3
Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	423610	5 (83)	1 (17)	0 (0)	0 (0)	0 (0)	6	3
Recyclable Material Merchant Wholesalers (<i>scrap metal wholesalers</i>)	423930	424 (68)	113 (18)	70 (11)	12 (2)	2 (<1)	621	35
Retail Trade								
Motorcycle Dealers	441221	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Sporting Goods Stores	451110	5 (63)	1 (13)	1 (13)	1 (13)	0 (0)	8	3

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Transportation and Warehousing								
General Freight Trucking, Local	484110	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Specialized Freight (except Used Goods) Trucking, Long-distance	484230	8 (73)	1 (9)	0 (0)	2 (18)	0 (0)	11	2
Mixed Mode Transit Systems	485111	10 (83)	1 (8)	1 (8)	0 (0)	0 (0)	12	2
Interurban and Rural Bus Transportation	485210	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Other Support Activities for Air Transportation	488190	30 (94)	1 (3)	1 (3)	0 (0)	0 (0)	32	1
Port and Harbor Operations	488310	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Marine Cargo Handling	488320	14 (93)	0 (0)	1 (7)	0 (0)	0 (0)	15	2
Other Support Activities for Water Transportation	488390	4 (80)	0 (0)	1 (20)	0 (0)	0 (0)	5	1
Other Support Activities for Road Transport	488490	29 (83)	3 (9)	3 (9)	0 (0)	0 (0)	35	1
Information								
Book Publishers	511130	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Real Estate and Rental and Leasing								
Lessors of Residential Buildings and Dwellings	531110	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Residential Property Managers (<i>property maintenance</i>)	531311	0 (0)	0 (0)	6 (86)	0 (0)	1 (14)	7	2
Professional, Scientific, and Technical Services								
Architectural Services	541310	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Engineering Services (<i>environmental and construction engineering firms</i>)	541330	155 (99)	1 (1)	0 (0)	0 (0)	0 (0)	156	53
Testing Laboratories	541380	12 (80)	2 (13)	1 (7)	0 (0)	0 (0)	15	8
Environmental Consulting Services (<i>site assessment, design of remediation plans</i>)	541620	98 (99)	0 (0)	1 (1)	0 (0)	0 (0)	99	34
Research and Development in the Physical, Engineering, and Life Sciences	541710	112 (97)	1 (1)	1 (1)	1 (1)	0 (0)	115	6
Administrative and Support and Waste Management and Remediation Services								
Temporary Help Services (<i>wide variety of general and construction industries</i>)	561320	34 (87)	4 (10)	1 (3)	0 (0)	0 (0)	39	6
Armored Car Services	561613	1 (25)	2 (50)	0 (0)	1 (25)	0 (0)	4	3
Solid Waste Collection	562111	1 (50)	0 (0)	0 (0)	0 (0)	1 (50)	2	2
Hazardous Waste Treatment	562211	12 (80)	1 (7)	2 (13)	0 (0)	0 (0)	15	7
Solid Waste Combustors and Incinerators (<i>solid waste incineration</i>)	562213	55 (96)	2 (4)	0 (0)	0 (0)	0 (0)	57	6

NAICS Industry Category <i>(additional description)</i>	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Remediation Services <i>(lead paint abatement, environmental clean-up)</i>	562910	1,102 (90)	83 (7)	31 (3)	6 (<1)	0 (0)	1222	132
Materials Recovery Facilities	562920	7 (88)	1 (13)	0 (0)	0 (0)	0 (0)	8	2
All Other Miscellaneous Waste Management Services <i>(industrial cleaning contractors, storage tank cleaning)</i>	562998	106 (97)	2 (2)	1 (1)	0 (0)	0 (0)	109	7
Educational Services								
Elementary and Secondary Schools <i>(maintenance workers)</i>	611110	210 (98)	4 (2)	0 (0)	0 (0)	0 (0)	214	6
Sports and Recreation Instruction <i>(shooting instruction)</i>	611620	0 (0)	3 (50)	2 (33)	0 (0)	1 (17)	6	4
All Other Miscellaneous Schools and Instruction	611699	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	2
Health Care and Social Assistance								
Residential Intellectual and Developmental Disability Facilities <i>(plant operations workers)</i>	623210	37 (97)	0 (0)	1 (3)	0 (0)	0 (0)	38	1
Child Day Care Services	624410	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Arts, Entertainment, and Recreation								
Independent Artists, Writers, and Performers	711510	0 (0)	0 (0)	3 (100)	0 (0)	0 (0)	3	3
Amusement and Theme Parks <i>(maintenance)</i>	713110	42 (98)	1 (2)	0 (0)	0 (0)	0 (0)	43	1
All Other Amusement and Recreation Industries <i>(shooting ranges)</i>	713990	14 (9)	16 (10)	73 (46)	34 (22)	21 (13)	158	40
Other Services (except Public Administration)								
General Automotive Repair	811111	1 (25)	0 (0)	3 (75)	0 (0)	0 (0)	4	4
Automotive Exhaust System Repair	811112	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Other Automotive Mechanical and Electrical Repair and Maintenance <i>(automotive radiator repair)</i>	811118	2 (11)	4 (21)	7 (37)	3 (16)	3 (16)	19	15
Automotive Body, Paint, and Interior Repair and Maintenance	811121	2 (50)	0 (0)	2 (50)	0 (0)	0 (0)	4	4
Other Electronic and Precision Equipment Repair and Maintenance <i>(repair/servicing of batteries, sonar, radar, and precision instruments)</i>	811219	58 (64)	25 (27)	7 (8)	1 (1)	0 (0)	91	7
Commercial and Industrial Machinery and Equipment (except Automotive and Electric) Repair and Maintenance	811310	15 (75)	2 (10)	2 (10)	1 (5)	0 (0)	20	3
Reupholstery and Furniture Repair	811420	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Other Personal and Household Goods Repair and Maintenance <i>(gun repair)</i>	811490	0 (0)	0 (0)	2 (67)	1 (33)	0 (0)	3	3
Religious Organizations	813110	5 (71)	1 (14)	0 (0)	1 (14)	0 (0)	7	1

NAICS Industry Category <i>(additional description)</i>	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Labor Unions and Similar Labor Organizations <i>(BLL testing programs run by labor unions; hiring halls)</i>	813930	70 (96)	3 (4)	0 (0)	0 (0)	0 (0)	73	3
Public Administration								
Other General Government Support	921190	43 (96)	2 (4)	0 (0)	0 (0)	0 (0)	45	8
Police Protection	922120	206 (73)	54 (19)	22 (8)	1 (<1)	0 (0)	283	55
Parole Offices and Probation Officers	922150	55 (98)	1 (2)	0 (0)	0 (0)	0 (0)	56	2
Fire Protection <i>(city and county fire departments)</i>	922160	361 (99)	3 (1)	0 (0)	0 (0)	0 (0)	364	19
Other Justice, Public Order, and Safety Activities	922190	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	2
Administration of Public Health Programs <i>(city and county environmental public health programs)</i>	923120	87 (99)	1 (1)	0 (0)	0 (0)	0 (0)	88	14
Administration of Air Water Resource and Solid Waste Management Programs <i>(government air, water, and waste program employees)</i>	924110	555 (98)	8 (1)	2 (0)	1 (<1)	0 (0)	566	20
Administration of Conservation Programs <i>(government fish and wildlife programs, parks & recreation departments)</i>	924120	15 (94)	1 (6)	0 (0)	0 (0)	0 (0)	16	8
Administration of Housing Programs	925110	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Regulation and Administration of Transportation Programs <i>(Coast Guard and ports)</i>	926120	63 (89)	7 (10)	1 (1)	0 (0)	0 (0)	71	5
Regulation and Administration of Communications, Electric, Gas, and Other Utilities	926130	87 (97)	2 (2)	1 (1)	0 (0)	0 (0)	90	3
National Security <i>(Armed Forces)</i>	928110	207 (94)	7 (3)	7 (3)	0 (0)	0 (0)	221	18
Unknown Industry (occupational)		8,079 (92)	663 (8)	12 (<1)	6 (<1)	3 (<1)	8,763	
Total Tested in Year		15,270 (83)	1,733 (9)	1,097 (6)	276 (1)	73 (<1)	18,449	

*Twenty industries with the greatest number of total workers tested during 2012–2014 are bolded

Table 7. Blood Lead Distributions of Workers Tested in 2013, by Industry
Industries where at least one worker had an elevated (≥ 5 $\mu\text{g/dL}$) BLL, ordered by NAICS code

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL ($\mu\text{g/dL}$)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Mining								
Gold Ore Mining	212221	1 (14)	3 (43)	2 (29)	0 (0)	1 (14)	7	3
Utilities								
Fossil Fuel Electric Power Generation*	221112	227 (97)	6 (3)	2 (1)	0 (0)	0 (0)	235	4
Electric Power Distribution	221122	39 (91)	2 (5)	2 (5)	0 (0)	0 (0)	43	2
Steam and Air-conditioning Supply	221330	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Construction								
Residential Remodelers	236118	10 (91)	0 (0)	1 (9)	0 (0)	0 (0)	11	4
Industrial Building Construction	236210	17 (26)	14 (21)	24 (36)	10 (15)	1 (2)	66	3
Commercial and Institutional Building Construction	236220	80 (78)	6 (6)	13 (13)	3 (3)	0 (0)	102	21
Water and Sewer Line and Related Structures Construction	237110	83 (97)	1 (1)	2 (2)	0 (0)	0 (0)	86	11
Highway, Street, and Bridge Construction	237310	121 (85)	16 (11)	6 (4)	0 (0)	0 (0)	143	10
Other Heavy and Civil Engineering Construction (<i>heavy construction contractors incl bridge seismic retrofit</i>)	237990	101 (97)	3 (3)	0 (0)	0 (0)	0 (0)	104	8
Structural Steel and Precast Concrete Contractors (<i>structural steel erection, seismic retrofit</i>)	238120	12 (71)	2 (12)	3 (18)	0 (0)	0 (0)	17	6
Glass and Glazing Contractors	238150	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	2
Other Foundation, Structure, and Building Exterior Contractors	238190	15 (94)	1 (6)	0 (0)	0 (0)	0 (0)	16	2
Electrical Contractors	238210	79 (98)	1 (1)	1 (1)	0 (0)	0 (0)	81	7
Plumbing, Heating, and Air-Conditioning Contractors (<i>industrial ventilation installation and maintenance</i>)	238220	20 (80)	3 (12)	2 (8)	0 (0)	0 (0)	25	5
Other Building Equipment Contractors (<i>install/dismantle machinery, insulate industrial pipes, maintain building equipment</i>)	238290	32 (78)	4 (10)	5 (12)	0 (0)	0 (0)	41	9
Drywall and Insulation Contractors	238310	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	1
Paint and Wall Covering Contractors	238320	341 (71)	68 (14)	54 (11)	12 (3)	4 (1)	479	50
Finish Carpentry Contractors	238350	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Other Building Finishing Contractors (<i>waterproofing</i>)	238390	9 (82)	2 (18)	0 (0)	0 (0)	0 (0)	11	5
Site Preparation Contractors (<i>wrecking and demolition</i>)	238910	272 (80)	29 (9)	38 (11)	0 (0)	2 (1)	341	50
All Other Specialty Trade Contractors (<i>sandblasting, scaffolding, tank lining contractors</i>)	238990	145 (90)	12 (7)	5 (3)	0 (0)	0 (0)	162	21
Construction (specific industry unknown)	239999	7 (70)	1 (10)	1 (10)	1 (10)	0 (0)	10	5
Manufacturing								
Wood Container and Pallet Manufacturing	321920	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	1
Adhesive Manufacturing (manufacture of lead-containing adhesive)	325520	210 (99)	2 (1)	0 (0)	0 (0)	0 (0)	212	3
Ceramic Wall and Floor Tile Manufacturing	327122	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Glass Product Manufacturing Made of Purchased Glass	327215	1 (5)	3 (14)	14 (67)	3 (14)	0 (0)	21	18
Cement Manufacturing	327310	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	327999	1 (33)	2 (67)	0 (0)	0 (0)	0 (0)	3	1
Secondary Smelting Refining and Alloying of Copper	331423	0 (0)	2 (20)	7 (70)	1 (10)	0 (0)	10	1
Nonferrous Metal (ex. Copper and Aluminum) Rolling, Drawing, Extruding, and Alloying	331491	0 (0)	1 (5)	12 (57)	7 (33)	1 (5)	21	1
Secondary Smelting, Refining, and Alloying of Nonferrous Metal (<i>lead recovery from scrap</i>)	331492	46 (11)	100 (24)	205 (49)	52 (13)	13 (3)	416	10
Copper Foundries (except Die-Casting)	331525	1 (11)	4 (44)	4 (44)	0 (0)	0 (0)	9	2
Other Nonferrous Foundries (except Die-casting)	331528	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Fabricated Structural Metal Manufacturing	332312	7 (78)	2 (22)	0 (0)	0 (0)	0 (0)	9	2
Sheet Metal Work Manufacturing (<i>lead shielding, roof gutters, flashing manufacturing</i>)	332322	12 (29)	5 (12)	14 (34)	9 (22)	1 (2)	41	5
Machine Shops	332710	13 (52)	7 (28)	3 (12)	1 (4)	1 (4)	25	4
Bolt, Nut, Screw, Rivet, and Washer Manufacturing	332722	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Plumbing Fixture Fitting and Trim Manufacturing (<i>manufacture of brass plumbing fixtures</i>)	332913	1 (3)	27 (69)	11 (28)	0 (0)	0 (0)	39	3
Other Metal Valve and Pipe Fitting Manufacture	332919	20 (45)	11 (25)	12 (27)	1 (2)	0 (0)	44	1
Small Arms Ammunition Manufacturing	332992	0 (0)	0 (0)	5 (71)	1 (14)	1 (14)	7	3

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Small Arms Manufacturing	332994	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
All Other Miscellaneous Fabricated Metal Product Manufacturing	332999	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Pump and Pumping Equipment Manufacturing	333911	0 (0)	2 (40)	2 (40)	1 (20)	0 (0)	5	1
Electronic Computer Manufacturing	334111	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Radio and Television Broadcasting and Wireless Equipment Manufacturing	334220	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	1
Other Electronic Component Manufacturing	334419	2 (8)	7 (29)	12 (50)	3 (13)	0 (0)	24	3
Irradiation Apparatus Manufacturing	334517	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	335122	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Storage Battery Manufacturing	335911	228 (28)	247 (30)	289 (35)	52 (6)	7 (1)	823	7
Primary Battery Manufacturing	335912	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	1
Carburetor Piston, Ring, and Valve Manufacturing	336311	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
All Other Motor Vehicles Parts Manufacturing (<i>manufacture of radiators</i>)	336399	0 (0)	0 (0)	10 (67)	5 (33)	0 (0)	15	3
Aircraft Manufacturing (<i>complete aircraft manufacture, assembly, or rebuilding</i>)	336411	54 (95)	2 (4)	0 (0)	1 (2)	0 (0)	57	5
Other Aircraft Parts and Auxiliary Equipment Manufacturing	336413	13 (21)	15 (24)	27 (44)	6 (10)	1 (2)	62	6
Ship Building and Repair	336611	79 (99)	1 (1)	0 (0)	0 (0)	0 (0)	80	3
Sporting and Athletic Goods Manufacturing	339920	5 (45)	1 (9)	5 (45)	0 (0)	0 (0)	11	2
Wholesale Trade								
Electrical Apparatus and Equipment Wiring, Supplies, and Equipment Wholesalers	423610	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Industrial Machinery and Equipment Wholesalers	423830	4 (57)	0 (0)	1 (14)	2 (29)	0 (0)	7	4
Recyclable Material Merchant Wholesalers (<i>scrap metal wholesalers</i>)	423930	446 (70)	104 (16)	71 (11)	12 (2)	2 (<1)	635	23
Retail Trade								
Automotive Parts and Accessories Stores	441310	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	1	1
Sporting Goods Stores	451110	3 (38)	2 (25)	1 (13)	1 (13)	1 (13)	8	5
Transportation and Warehousing								
Line-Haul Railroads	482111	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	1
Other Support Activities for Air Transportation	488190	46 (92)	3 (6)	1 (2)	0 (0)	0 (0)	50	1

NAICS Industry Category <i>(additional description)</i>	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Other Support Activities for Water Transportation	488390	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	1
Other Support Activities for Road Transport	488490	56 (93)	2 (3)	2 (3)	0 (0)	0 (0)	60	1
Information								
Book Publishers	511130	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	1
Motion Picture and Video Production	512110	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Real Estate and Rental and Leasing								
Construction Mining and Forestry Machinery/Equipment Rental and Leasing	532412	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	1
Professional, Scientific, and Technical Services								
Architectural Services	541310	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Engineering Services (environmental and construction engineering firms)	541330	136 (99)	0 (0)	2 (1)	0 (0)	0 (0)	138	48
Building Inspection Services	541350	4 (80)	0 (0)	1 (20)	0 (0)	0 (0)	5	4
Testing Laboratories	541380	13 (93)	1 (7)	0 (0)	0 (0)	0 (0)	14	9
Computer Systems Design Services	541512	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Environmental Consulting Services (site assessment, design of remediation plans)	541620	101 (97)	2 (2)	1 (1)	0 (0)	0 (0)	104	29
Administrative and Support and Waster Management and Remediation Services								
Employment Placement Agencies	561310	4 (44)	0 (0)	5 (56)	0 (0)	0 (0)	9	5
Temporary Help Services <i>(wide variety of general and construction industries)</i>	561320	12 (92)	1 (8)	0 (0)	0 (0)	0 (0)	13	5
Security Guards and Patrol Services	561612	7 (88)	1 (13)	0 (0)	0 (0)	0 (0)	8	3
Armored Car Services	561613	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Solid Waste Collection	562111	3 (75)	0 (0)	0 (0)	1 (25)	0 (0)	4	2
Hazardous Waste Treatment	562211	13 (81)	3 (19)	0 (0)	0 (0)	0 (0)	16	5
Solid Waste Combustors and Incinerators <i>(solid waste incineration)</i>	562213	79 (94)	5 (6)	0 (0)	0 (0)	0 (0)	84	8
Remediation Services (lead paint abatement, environmental clean-up)	562910	1,030 (83)	105 (8)	107 (9)	3 (<1)	0 (0)	1245	122
All Other Miscellaneous Waste Management Services <i>(industrial cleaning contractors, storage tank cleaning)</i>	562998	85 (99)	0 (0)	1 (1)	0 (0)	0 (0)	86	6
Educational Services								
Elementary and Secondary Schools (maintenance workers)	611110	155 (95)	8 (5)	1 (1)	0 (0)	0 (0)	164	4

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Junior Colleges	611210	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	2
Colleges Universities	611310	35 (92)	2 (5)	1 (3)	0 (0)	0 (0)	38	5
Other Technical and Trade Schools (<i>security training programs</i>)	611519	0 (0)	0 (0)	3 (50)	1 (17)	2 (33)	6	6
Sports and Recreation Instruction (<i>shooting instruction</i>)	611620	1 (33)	0 (0)	1 (33)	0 (0)	1 (33)	3	2
All Other Miscellaneous Schools and Instruction	611699	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Arts, Entertainment, and Recreation								
Historical Sites	712120	21 (95)	0 (0)	1 (5)	0 (0)	0 (0)	22	2
Amusement and Theme Parks (<i>maintenance</i>)	713110	55 (98)	1 (2)	0 (0)	0 (0)	0 (0)	56	1
All Other Amusement and Recreation Industries(<i>shooting ranges</i>)	713990	5 (4)	20 (14)	62 (45)	32 (23)	19 (14)	138	39
Other Services (except Public Administration)								
General Automotive Repair	811111	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	2
Automotive Exhaust System Repair	811112	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Other Automotive Mechanical and Electrical Repair and Maintenance (<i>automotive radiator repair</i>)	811118	1 (5)	3 (15)	13 (65)	3 (15)	0 (0)	20	12
Other Electronic and Precision Equipment Repair and Maintenance (<i>repair/servicing of batteries, sonar, radar, and precision instruments</i>)	811219	70 (69)	26 (26)	5 (5)	0 (0)	0 (0)	101	5
Commercial and Industrial Machinery and Equipment (except Automotive and Electric) Repair and Maintenance	811310	15 (83)	1 (6)	2 (11)	0 (0)	0 (0)	18	3
Other Personal and Household Goods Repair and Maintenance (<i>gun repair</i>)	811490	0 (0)	0 (0)	3 (33)	3 (33)	3 (33)	9	6
Labor Unions and Labor Organizations (<i>BLL testing programs run by labor unions; hiring halls</i>)	813930	53 (85)	6 (10)	3 (5)	0 (0)	0 (0)	62	3
Public Administration								
Other General Government Support	921190	18 (90)	2 (10)	0 (0)	0 (0)	0 (0)	20	5
Police Protection	922120	135 (74)	29 (16)	18 (10)	1 (1)	0 (0)	183	51
Correctional Institutions	922140	6 (75)	1 (13)	1 (13)	0 (0)	0 (0)	8	5
Parole Offices and Probation Officers	922150	52 (98)	1 (2)	0 (0)	0 (0)	0 (0)	53	2
Fire Protection (<i>city and county fire departments</i>)	922160	349 (99)	4 (1)	1 (<1)	0 (0)	0 (0)	354	24
Other Justice, Public Order, and Safety Activities	922190	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1

NAICS Industry Category <i>(additional description)</i>	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Administration of Public Health Programs <i>(city and county environmental health programs)</i>	923120	85 (98)	0 (0)	2 (2)	0 (0)	0 (0)	87	9
Administration of Air Water Resource and Solid Waste Management Programs <i>(government air, water, and waste program employees)</i>	924110	622 (98)	11 (2)	2 (<1)	0 (0)	0 (0)	635	23
Regulation and Administration of Transportation Programs <i>(Coast Guard and ports)</i>	926120	41 (91)	4 (9)	0 (0)	0 (0)	0 (0)	45	7
Regulation and Administration of Communications, Electric, Gas, and Utilities	926130	57 (97)	2 (3)	0 (0)	0 (0)	0 (0)	59	3
National Security <i>(Armed Forces)</i>	928110	206 (90)	9 (4)	10 (4)	3 (1)	0 (0)	228	14
Unknown Industry (occupational)		8,182 (92)	726 (8)	22 (<1)	4 (<1)	2 (<1)	8,936	
Total Tested in Year		14,996 (83)	1,707 (9)	1,164 (6)	238 (1)	64 (<1)	18,168	

*Twenty industries with the greatest number of total workers tested during 2012–2014 are bolded

Table 8. Blood Lead Distributions of Workers Tested in 2014, by Industry
Industries where at least one worker has an elevated (≥ 5 $\mu\text{g/dL}$) BLL, ordered by NAICS code

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL ($\mu\text{g/dL}$)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Mining								
Gold Ore Mining	212221	2 (33)	1 (17)	3 (50)	0 (0)	0 (0)	6	4
Utilities								
Fossil Fuel Electric Power Generation*	221112	221 (97)	5 (2)	1 (<1)	0 (0)	0 (0)	227	4
Electric Power Distribution	221122	21 (75)	6 (21)	0 (0)	1 (4)	0 (0)	28	2
New Single-Family Housing Construction	236115	5 (83)	0 (0)	1 (17)	0 (0)	0 (0)	6	5
Construction								
Residential Remodelers	236118	4 (67)	0 (0)	2 (33)	0 (0)	0 (0)	6	5
Industrial Building Construction	236210	49 (53)	17 (18)	22 (24)	3 (3)	1 (1)	92	3
Commercial and Institutional Building Construction	236220	144 (86)	6 (4)	13 (8)	3 (2)	2 (1)	168	31
Water and Sewer Line and Related Structures Construction	237110	73 (92)	2 (3)	3 (4)	1 (1)	0 (0)	79	12
Power and Communication Line and Related Structures Construction	237130	10 (83)	0 (0)	0 (0)	2 (17)	0 (0)	12	5
Highway, Street, and Bridge Construction	237310	64 (81)	7 (9)	7 (9)	1 (1)	0 (0)	79	12
Other Heavy and Civil Engineering Construction (<i>heavy construction contractors incl bridge seismic retrofit</i>)	237990	67 (92)	4 (5)	2 (3)	0 (0)	0 (0)	73	9
Structural Steel and Precast Concrete Contractors (<i>structural steel erection, seismic retrofit</i>)	238120	23 (72)	8 (25)	1 (3)	0 (0)	0 (0)	32	5
Glass and Glazing Contractors	238150	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	2	2
Electrical Contractors	238210	37 (97)	1 (3)	0 (0)	0 (0)	0 (0)	38	7
Plumbing Heating Air Conditioning Contractors (<i>industrial ventilation, installation, and maintenance</i>)	238220	14 (93)	1 (7)	0 (0)	0 (0)	0 (0)	15	4
Other Building Equipment Contractors (<i>install/dismantle machinery, insulate industrial pipes, maintain building equipment</i>)	238290	38 (78)	6 (12)	5 (10)	0 (0)	0 (0)	49	9
Drywall and Insulation Contractors	238310	7 (88)	1 (13)	0 (0)	0 (0)	0 (0)	8	2
Paint and Wall Covering Contractors	238320	382 (76)	52 (10)	47 (9)	16 (3)	5 (1)	502	51

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Other Building Finishing Contractors (<i>waterproofing</i>)	238390	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Site Preparation Contractors (<i>wrecking and demolition</i>)	238910	267 (82)	39 (12)	11 (3)	6 (2)	2 (1)	325	39
All Other Specialty Trade Contractors (<i>sandblasting, scaffolding, tank lining contractors</i>)	238990	81 (84)	15 (16)	0 (0)	0 (0)	0 (0)	96	19
Construction (<i>specific industry unknown</i>)	239999	3 (60)	0 (0)	2 (40)	0 (0)	0 (0)	5	4
Manufacturing								
Petroleum, Lubricating Oil, and Grease Manufacturing	324191	80 (96)	3 (4)	0 (0)	0 (0)	0 (0)	83	1
Ceramic Wall and Floor Tile Manufacturing	327122	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Glass Product Manufacturing Made of Purchased Glass	327215	2 (11)	2 (11)	9 (47)	5 (26)	1 (5)	19	15
All Other Non-metallic Mineral Product Manufacturing	327999	1 (33)	2 (67)	0 (0)	0 (0)	0 (0)	3	1
Iron and Steel Mills	331111	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Primary Smelting and Refining of Nonferrous Metal (except Copper and Aluminum)	331419	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	2
Secondary Smelting, Refining, and Alloying of Copper	331423	0 (0)	2 (22)	7 (78)	0 (0)	0 (0)	9	1
Nonferrous Metal (ex. Copper and Aluminum) Rolling, Drawing, Extruding, and Alloying	331491	1 (4)	1 (4)	14 (56)	8 (32)	1 (4)	25	1
Secondary Smelting, Refining, and Alloying of Nonferrous Metal (<i>lead recovery from scrap</i>)	331492	61 (14)	131 (31)	190 (45)	34 (8)	8 (2)	424	8
Aluminum Foundries (except Die-Casting)	331524	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Copper Foundries (except Die-Casting)	331525	1 (11)	3 (33)	3 (33)	1 (11)	1 (11)	9	4
Other Nonferrous Foundries (except Die-Casting)	331528	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Sheet Metal Work Manufacturing (<i>lead shielding, roof gutters, flashing manufacturing</i>)	332322	6 (16)	6 (16)	20 (54)	5 (14)	0 (0)	37	5
Machine Shops	332710	7 (47)	5 (33)	2 (13)	0 (0)	1 (7)	15	2
Bolt, Nut, Screw, Rivet, and Washer Manufacturing	332722	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1	1
Electroplating, Plating, Polishing, Anodizing, and Coloring	332813	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Plumbing Fixture Fitting and Trim Manufacturing (<i>manufacture of brass</i>)	332913	1 (6)	1 (6)	13 (72)	3 (17)	0 (0)	18	3

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
<i>plumbing fixtures)</i>								
Other Metal Valve and Pipe Fitting Manufacture	332919	14 (38)	15 (41)	8 (22)	0 (0)	0 (0)	37	1
Small Arms Ammunition Manufacturing	332992	0 (0)	0 (0)	7 (70)	1 (10)	2 (20)	10	6
Pump and Pumping Equipment Manufacturing	333911	1 (20)	3 (60)	1 (20)	0 (0)	0 (0)	5	1
Electronic Computer Manufacturing	334111	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Semiconductor and Related Device Manufacturing	334413	1 (50)	0 (0)	0 (0)	0 (0)	1 (50)	2	2
Other Electronic Component Manufacturing	334419	3 (14)	6 (27)	12 (55)	1 (5)	0 (0)	22	1
Storage Battery Manufacturing	335911	243 (28)	259 (30)	304 (35)	55 (6)	5 (1)	866	9
Primary Battery Manufacturing	335912	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	1
All Other Motor Vehicles Parts Manufacturing (<i>manufacture of radiators</i>)	336399	0 (0)	1 (6)	13 (76)	2 (12)	1 (6)	17	1
Aircraft Manufacturing (<i>complete aircraft manufacture, assembly, or rebuilding</i>)	336411	53 (93)	0 (0)	3 (5)	1 (2)	0 (0)	57	4
Other Aircraft Parts and Auxiliary Equipment Manufacturing	336413	5 (16)	8 (26)	15 (48)	3 (10)	0 (0)	31	4
Ship Building and Repair	336611	55 (89)	5 (8)	1 (2)	1 (2)	0 (0)	62	4
Sporting and Athletic Goods Manufacturing	339920	3 (43)	1 (14)	2 (29)	1 (14)	0 (0)	7	2
Wholesale Trade								
Motor Vehicle Supplies and New Parts Merchant Wholesalers	423120	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	2
Electrical Apparatus and Equipment Wiring Supplies and Related Equipment Merchant Wholesalers	423610	2 (50)	0 (0)	2 (50)	0 (0)	0 (0)	4	4
Industrial Machinery and Equipment Merchant Wholesalers	423830	4 (57)	3 (43)	0 (0)	0 (0)	0 (0)	7	4
Recyclable Material Merchant Wholesalers (<i>scrap metal wholesalers</i>)	423930	381 (67)	127 (22)	53 (9)	9 (2)	0 (0)	570	22
Retail Trade								
Other Building Material Dealers	444190	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Sporting Goods Stores	451110	2 (40)	1 (20)	0 (0)	2 (40)	0 (0)	5	3
Used Merchandise Stores	453310	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Transportation and Warehousing								
Other Support Activities for Air Transportation	488190	57 (93)	1 (2)	3 (5)	0 (0)	0 (0)	61	2

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Other Support Activities for Water Transportation	488390	2 (67)	1 (33)	0 (0)	0 (0)	0 (0)	3	1
Other Support Activities for Road Transport	488490	15 (88)	2 (12)	0 (0)	0 (0)	0 (0)	17	1
Information								
Book Publishers	511130	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1	1
Real Estate and Rental and Leasing								
Residential Property Managers (<i>property maintenance</i>)	531311	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Professional, Scientific, and Technical Services								
Architectural Services	541310	6 (86)	0 (0)	1 (14)	0 (0)	0 (0)	7	2
Engineering Services (<i>environmental and construction engineering firms</i>)	541330	89 (95)	2 (2)	3 (3)	0 (0)	0 (0)	94	38
Testing Laboratories	541380	7 (88)	1 (13)	0 (0)	0 (0)	0 (0)	8	4
Computer Systems Design Services	541512	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Environmental Consulting Services (<i>site assessment, design of remediation plans</i>)	541620	82 (96)	3 (4)	0 (0)	0 (0)	0 (0)	85	29
Research and Development in the Physical, Engineering, and Life Sciences	541710	58 (98)	1 (2)	0 (0)	0 (0)	0 (0)	59	4
Translation and Interpretation Services	541930	0 (0)	3 (100)	0 (0)	0 (0)	0 (0)	3	1
Administrative and Support and Waste Management and Remediation Services								
Temporary Help Services (<i>wide variety of general and construction industries</i>)	561320	8 (80)	0 (0)	1 (10)	1 (10)	0 (0)	10	5
Armored Car Services	561613	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Solid Waste Collection	562111	3 (75)	1 (25)	0 (0)	0 (0)	0 (0)	4	1
Hazardous Waste Treatment	562211	10 (91)	1 (9)	0 (0)	0 (0)	0 (0)	11	5
Solid Waste Combustors and Incinerators (<i>solid waste incineration</i>)	562213	52 (98)	1 (2)	0 (0)	0 (0)	0 (0)	53	6
Remediation Services (<i>lead paint abatement, environmental clean-up</i>)	562910	751 (90)	71 (8)	14 (2)	2 (<1)	0 (0)	838	113
All Other Miscellaneous Waste Management Services (<i>industrial cleaning contractors, storage tank cleaning</i>)	562998	94 (99)	1 (1)	0 (0)	0 (0)	0 (0)	95	6
Educational Services								
Elementary and Secondary Schools (<i>maintenance workers</i>)	611110	140 (94)	7 (5)	2 (1)	0 (0)	0 (0)	149	5

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Junior Colleges	611210	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	2	2
Colleges & Universities	611310	23 (96)	0 (0)	1 (4)	0 (0)	0 (0)	24	8
Other Technical and Trade Schools (<i>security training programs</i>)	611519	0 (0)	0 (0)	2 (40)	1 (20)	2 (40)	5	5
Sports and Recreation Instruction (<i>shooting instruction</i>)	611620	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	2	2
All Other Miscellaneous Schools and Instruction	611699	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Health Care and Social Assistance								
Offices of Physicians (except Mental Health Specialists)	621111	38 (95)	0 (0)	2 (5)	0 (0)	0 (0)	40	4
Arts, Entertainment, and Recreation								
Independent Artists, Writers, and Performers	711510	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Historical Sites	712120	1 (50)	0 (0)	1 (50)	0 (0)	0 (0)	2	2
Amusement and Theme Parks (<i>maintenance</i>)	713110	69 (96)	1 (1)	2 (3)	0 (0)	0 (0)	72	1
All Other Amusement and Recreation Industries(<i>shooting ranges</i>)	713990	37 (22)	20 (12)	72 (43)	31 (18)	9 (5)	169	42
Other Services (except Public Administration)								
General Automotive Repair	811111	0 (0)	3 (60)	2 (40)	0 (0)	0 (0)	5	5
Other Automotive, Mechanical, and Electrical Repair and Maintenance (<i>automotive radiator repair</i>)	811118	1 (7)	1 (7)	6 (43)	2 (14)	4 (29)	14	13
Automotive Body, Paint, and Interior Repair and Maintenance	811121	3 (60)	0 (0)	0 (0)	2 (40)	0 (0)	5	5
Other Electronic and Precision Equipment Repair Maintenance (<i>repair/servicing of batteries, sonar, radar, and surveying instruments</i>)	811219	103 (81)	21 (17)	3 (2)	0 (0)	0 (0)	127	6
Commercial and Industrial Machinery and Equipment (except Automotive and Electric) Repair and Maintenance	811310	9 (64)	1 (7)	4 (29)	0 (0)	0 (0)	14	3
Re-upholstery and Furniture Repair	811420	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1	1
Other Personal and Household Goods Repair and Maintenance (<i>gun repair</i>)	811490	0 (0)	1 (11)	4 (44)	2 (22)	2 (22)	9	6
Religious Organizations	813110	5 (71)	1 (14)	1 (14)	0 (0)	0 (0)	7	1
Labor Unions and Similar Labor Organizations (<i>BLL testing programs run by labor unions; hiring halls</i>)	813930	32 (94)	1 (3)	1 (3)	0 (0)	0 (0)	34	3
Public Administration								

NAICS Industry Category (<i>additional description</i>)	NAICS Code	BLL (µg/dL)					# of Workers	# of Employers
		<5 n (%)	5–9 n (%)	10–19 n (%)	20–29 n (%)	30+ n (%)		
Legislative Bodies	921120	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	2	1
Other General Government Support	921190	42 (89)	1 (2)	4 (9)	0 (0)	0 (0)	47	8
Courts	922110	2 (67)	1 (33)	0 (0)	0 (0)	0 (0)	3	1
Police Protection	922120	107 (72)	26 (18)	12 (8)	3 (2)	0 (0)	148	38
Correctional Institutions	922140	2 (67)	0 (0)	1 (33)	0 (0)	0 (0)	3	3
Parole Offices and Probation Officers	922150	42 (98)	1 (2)	0 (0)	0 (0)	0 (0)	43	3
Fire Protection (<i>city and county fire departments</i>)	922160	352 (100)	0 (0)	0 (0)	0 (0)	0 (0)	352	19
Administration of Public Health Programs (<i>city and county environmental health programs</i>)	923120	70 (99)	0 (0)	1 (1)	0 (0)	0 (0)	71	11
Administration of Air Water Resource and Solid Waste Management Programs (<i>government air, water, and waste program employees</i>)	924110	480 (98)	10 (2)	1 (<1)	0 (0)	0 (0)	491	19
Regulation and Administration of Transportation Programs (<i>Coast Guard and ports</i>)	926120	63 (95)	3 (5)	0 (0)	0 (0)	0 (0)	66	8
Regulation of Communications, Electric, Gas, and Other Utilities	926130	48 (98)	1 (2)	0 (0)	0 (0)	0 (0)	49	3
National Security (<i>Armed Forces</i>)	928110	61 (95)	2 (3)	0 (0)	1 (2)	0 (0)	64	11
Unknown Industry (occupational)		9,180 (93)	689 (7)	10 (<1)	1 (<1)	2 (<1)	9,882	
Total Tested in Year		14,952 (84)	1,639 (9)	976 (5)	214 (1)	50 (<1)	17,831	

*Twenty industries with the greatest number of total workers tested during 2012–2014 are bolded

Table 9. Number of Workers Tested and Percent with BLLs ≥ 10 $\mu\text{g/dL}$, by Industry
 20 Industries with the greatest number of workers tested, ordered by NAICS code

NAICS Industry Category (<i>additional description</i>)	NAICS Code	2012 n	2012 % ≥ 10 $\mu\text{g/dL}$	2013 n	2013 % ≥ 10 $\mu\text{g/dL}$	2014 n	2014 % ≥ 10 $\mu\text{g/dL}$
Remediation Services (<i>lead paint abatement, environmental clean-up</i>)	562910	1,221	3	1,245	9	838	2
Storage Battery Manufacturing	335911	803	46	823	42	866	42
Painting and Wall Covering Contractors (<i>painting contractors</i>)	238320	548	16	479	15	502	13
Administration of Air Water Resource and Solid Waste Management Programs (government air, water, and waste program employees)	924110	566	<1	635	<1	491	<1
Recyclable Material Merchant Wholesalers (scrap metal wholesalers)	423930	621	14	635	14	570	11
Site Preparation Contractors (<i>wrecking and demolition</i>)	238910	427	3	341	12	325	6
Secondary Smelting, Refining, and Alloying of Nonferrous Metal (<i>lead recovery from scrap</i>)	331492	428	68	416	65	424	55
Fire Protection (<i>city and county fire departments</i>)	922160	364	0	354	<1	352	0
Police Protection	922120	283	8	183	11	148	10
Fossil Fuel Electric Power Generation	221112	205	2	235	1	227	0
Highway, Street, and Bridge Construction	237310	235	9	143	4	79	10
Elementary and Secondary Schools (<i>maintenance workers</i>)	611110	214	0	164	1	149	1
Engineering Services (<i>environmental and construction engineering firms</i>)	541330	156	0	138	1	94	3

NAICS Industry Category (<i>additional description</i>)	NAICS Code	2012 n	2012 % $\geq 10 \mu\text{g/dL}$	2013 n	2013 % $\geq 10 \mu\text{g/dL}$	2014 n	2014 % $\geq 10 \mu\text{g/dL}$
National Security (<i>Armed Forces</i>)	928110	221	3	228	6	64	2
Commercial and Institutional Building Construction	236220	182	6	102	16	168	10
All Other Amusement and Recreation Industries(<i>shooting ranges</i>)	713990	158	81	138	82	169	66
Regulation and Administration of Transportation Programs (<i>Coast Guard and ports</i>)	926120	71	1	45	0	66	0
Environmental Consulting Services (<i>site assessment, design of remediation plans</i>)	541620	99	1	104	1	85	0
Electrical Contractors	238210	85	0	81	1	38	0
All Other Specialty Trade Contractors (<i>sandblasting, scaffolding, tank lining contractors</i>)	238990	92	3	162	3	96	0
Total for 20 industries with the greatest number of workers tested		6,979	15	6,651	16	5,751	16
All other industries		2,702	13	2,574	14	2,181	14
Unknown industry (<i>occupational</i>)		8,761	<1	8,936	<1	9,917	<1
Total		18,447	8	18,168	8	17,816	7