



BLOOD LEAD LEVELS IN CALIFORNIA WORKERS, 2008-2011

This report presents data from the California Occupational Blood Lead Registry for 2008 through 2011.

Introduction

Laboratories performing lead analyses on blood samples drawn in California are required by law to report electronically all results to the California Department of Public Health (CDPH). The Occupational Lead Poisoning Prevention Program (OLPPP) collects test results for adults 16 years of age and over and enters them into the California Occupational Blood Lead Registry. We use this information to identify cases of lead poisoning that need follow-up as well as to target employers and industries for OLPPP's prevention efforts.

Scientists and medical professionals now recommend that blood lead levels (BLLs) be maintained below 10 micrograms per deciliter ($\mu\text{g}/\text{dL}$) to prevent long-term health effects (OLPPP, 2009). The Centers for Disease Control and Prevention (CDC) and the Adult Blood Lead Epidemiology and Surveillance Program (ABLES) of the National Institute of Occupational Safety and Health (NIOSH) have recently revised their definitions of "elevated" to reflect this new information (CDC, 2012; ABLES, 2009). OLPPP now defines an elevated BLL as a BLL at or above 10 $\mu\text{g}/\text{dL}$.

In this report we discuss the limitations of our data, present the key findings for 2008-2011, and briefly review our efforts to improve tracking of work-related lead overexposure.

Limitations

The data presented here are incomplete and cannot fully describe the magnitude and distribution of elevated BLLs among California workers. The most significant limitation is that many employers fail to provide BLL testing to their lead-exposed workers. OLPPP previously (1996-2008) looked at how many employers were providing BLL testing in 5 industries in which significant lead exposure is possible: 87% of battery manufacturers, 56% of non-ferrous foundries (lead-using), 14% of radiator repair (copper-brass), 8% of painting companies (licensed San Francisco painting contractors), and only 1% of wrecking and demolition companies were BLL testing (OLPPP, 2002; OLPPP, unpublished data, 2008).

The result of this large testing deficiency is that we do not know the true numbers of California workers with elevated BLLs, nor can we determine the relative risk of lead overexposure since the proportion of employers testing varies widely by industry. We believe that the numbers presented here likely represent a significant underestimate of the number of California workers overexposed to lead.

Our data are also incomplete because the majority of BLL reports the program receives do not identify the individual's employer, making it difficult for us to determine if the exposure source is occupational and, if so, which industry the individual works in. OLPPP contacts the laboratory or the health care provider who ordered the test to obtain complete information on all BLLs 10 µg/dL or above; however we do not have the resources to contact providers on the thousands of BLL results below 10 that lack employer information.

Despite these limitations, the data we collect provide valuable information on industries where BLL testing is more consistent and those where more testing is needed. Additionally, among industries where testing is more robust, BLL distributions shed light on which of those appear to be more successful in controlling worker exposure. We can learn from these findings and direct our prevention efforts to areas where more attention is needed to increase testing and/or improve worker protections.

Key findings for the Registry for the four-year period 2008-2011

- Each year OLPPP receives over 56,000 reports for approximately 50,000 individuals. We do not know the type of lead exposure for the majority (~55%) of reports. (*Table 1*)
- For those individuals for whom we know the exposure source, approximately 17,000 – 18,000 are exposed at work and approximately 2,000 have a non-occupational exposure. (*Table 1*)

Table 1. Number of BLL Results and Persons Tested, By Type of Lead Exposure, 2008 - 2011

	2008		2009		2010		2011	
	Results	Persons	Results	Persons	Results	Persons	Results	Persons
Non-occupational	2,529	2,102	2,190	1,806	1,977	1,647	2,471	2,163
Occupational	23,938	18,314	23,107	17,477	22,254	17,203	24,241	18,792
Unknown	30,488	29,282	31,757	30,391	31,142	30,019	29,771	28,823
Total	56,955	49,698	57,054	49,674	55,373	48,869	56,483	49,778

The findings below are limited to the reports where the workplace was identified as the source of exposure, and are limited to each worker's highest BLL in that year.

- **BLL Distribution:** OLPPP received elevated BLL reports (10 µg/dL or greater) for 1,393 - 1,868 workers each year; 8-10% of the workers tested. (Table 2) Workers can be tested multiple times in one year, or in succeeding years; the total number of individual workers with elevated BLLs between 2008 and 2011 was 3,615. These workers are at risk for long-term health effects such as hypertension and decrements in kidney and cognitive function.

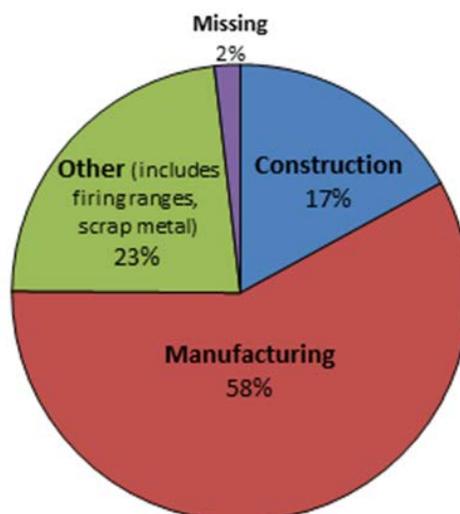
Table 2. BLL Distribution of Workers Tested, 2008 - 2011

BLL (µg/dL)	2008	2009	2010	2011
Under 10	16,446	15,808	15,810	17,317
10-19	1,297	1,169	1,023	1,095
20-29	380	372	280	285
30+	191	128	90	95
≥10 (Total elevated)	1,868	1,669	1,393	1,475
Total tested	18,314	17,477	17,203	18,792

- **Gender and Age:** The overwhelming majority of workers with elevated BLLs reported to the Registry were male (96-97%), with an age range typical of a working population (88% between the ages of 20 and 59 years). ([Table 3. Workers with Elevated BLLs: Demographics, 2008-2011](#))
- **Hispanic Surname:** Workers with Hispanic surname were disproportionately represented among workers with elevated BLLs. California's workforce is 36% Hispanic (BLS, 2011), whereas the proportion of Hispanic surnames among individuals with elevated BLLs reported to the Registry was 64-70%, suggesting that Hispanic workers are more likely to be exposed to lead on the job. ([Table 3. Workers with Elevated BLLs: Demographics, 2008-2011](#)) The proportion of individuals with Hispanic surnames and BLLs below 10 µg/dL was 41-43%.
- **Place of Employment:** A large proportion of workers with elevated BLLs was employed in Los Angeles County (44-49%). This reflects the concentration of lead industries, as well as population, in this county. Riverside County had the next highest proportion of workers with elevated BLLs, at 7-9%. ([Table 4. Workers with Elevated BLLs: County of Employment](#))

- **Place of Residence:** The largest numbers of workers with elevated BLLs live in Los Angeles, San Bernardino, Riverside, Orange, and Alameda counties. Children and pregnant woman living with these workers are at risk of take-home lead exposure and may need follow-up by local childhood lead poisoning prevention programs. ([Table 5. Workers with Elevated BLLs: County of Residence](#))
- **Industry Distribution, all reported workers:** Individuals reported to the Registry (with elevated and non-elevated BLLs) worked in 212 different industries. However, a few industries accounted for the largest number of workers receiving BLL tests: Remediation Services (primarily lead abatement); Storage Battery Manufacture; Site Preparation Contractors (primarily wrecking and demolition); Painting Contractors; Government Air, Water, and Waste Programs; Secondary Smelting (primarily battery recycling); and Recyclable Material (primarily scrap metal and electronic recycling). OLPPP codes industries using the North American Industry Classification System (NAICS, 2002). ([Table 6A. Workers Reported to CDPH/OLPPP: Industry Distribution, 2008-2011](#))
- **Type of Industry:** 58% of workers with elevated BLLs reported to the Registry in 2011 worked in manufacturing, 17% worked in construction, and 23% worked in other industries. ([Figure 1](#))

Figure 1: Workers with Elevated (≥ 10 $\mu\text{g}/\text{dL}$) BLLs, 2011: Industry Sector of Employment



- ***BLL Distribution by Industry:*** The BLL distribution for reported workers varies significantly by industry. Among industries reported in 2011:
 - Only 4% of workers in lead remediation and 5% of workers in wrecking and demolition had BLLs above 10 µg/dL;
 - Storage battery manufacture and secondary smelting (primarily battery recycling) had much higher percentages of workers with BLLs above 10 µg/dL (41% and 70% respectively); and
 - Approximately one quarter of workers in two other industries of interest, painting and scrap metal recycling, had BLLs above 10 µg/dL.

By looking at detailed data on worker BLLs < 10 µg/dL, it is clear that many employers who test have been successful in controlling lead exposure. Due to significant under testing, we cannot say whether these data represent the real BLL distribution in all of these industries. The exception to this is the battery manufacturing and recycling industries in which almost all employers conduct periodic BLL testing. ([Tables 6B. – 6E., Blood Lead Distributions of Workers Tested, By Industry and Year, 2008-2011](#))

Efforts to improve tracking

Current Cal/OSHA (California Division of Occupational Safety and Health) and Federal OSHA (Occupational Safety and Health Administration) regulations tie BLL testing requirements to air monitoring. Employers must do initial air monitoring and, if air lead concentrations are above 30 µg/m³ more than 30 days per year, employers are required to provide employees with BLL testing. Since many employers never conduct the required air monitoring, the BLL testing requirement is not triggered. In addition, tying BLL testing to air monitoring misses possible dangerous ingestion exposure that can occur even when airborne lead levels are low.

OLPPP has recommended to Cal/OSHA that the lead standards be revised to require that BLL testing be provided to all workers who use, alter, or disturb lead or lead-containing materials in a way that releases lead dust, mist, fume, or other particles. If this recommendation were adopted we expect that the number of workers receiving a BLL test would increase significantly, allowing OLPPP to provide a more complete picture of workplace lead exposure in California in the future. Cal/OSHA has initiated the Advisory Committee process for revising its two lead standards covering general industry and construction. CDPH staff is actively participating in this process. For more information and to read CDPH/OLPPP's recommendations, see www.cdph.ca.gov/programs/olppp/Pages/leadStdRecs.aspx

For the vast majority of BLL reports (80%), we do not know the individual's employer. This greatly hinders our ability to determine whether lead exposure is work-related and identify employers where lead is a problem. In the future, we hope to improve reporting regulations so that laboratories are required to report employer information to CDPH for all adult BLL tests.

Conclusion

Overexposure to lead continues to be a serious occupational health problem in California. Between 2008 and 2011 thousands of workers with elevated BLLs were reported to the California Occupational Blood Lead Registry. These individuals are at risk for serious long-term effects on their health. Many additional workers may be overexposed without knowing it, because many lead-exposed workers never get a BLL test. OLPPP will continue its efforts toward improving the Cal/OSHA lead standards so that more workers will receive BLL testing.

References

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Centers for Disease Control and Prevention (CDC), 2012 Nationally Notifiable Diseases and Conditions and Current Case Definitions, 2012. http://wwwn.cdc.gov/nndss/document/2012_Case%20Definitions.pdf

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TABLES

Table 3. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: Demographics, 2008-2011

Table 4. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: County of Employment, 2008-2011

Table 5. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: County of Residence, 2008-2011

Table 6A. Workers Reported to CDPH/OLPPP: Industry Distribution, 2008-2011

Table 6B. Blood Lead Distributions of Workers Tested, By Industry and Year, 2008

Table 6C. Blood Lead Distributions of Workers Tested, By Industry and Year, 2009

Table 6D. Blood Lead Distributions of Workers Tested, By Industry and Year, 2010

Table 6E, Blood Lead Distributions of Workers Tested, By Industry and Year, 2011

Table 3. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: Demographics, 2008 – 2011

Sex	2008		2009		2010		2011	
	n	(%)	n	(%)	n	(%)	n	(%)
Male	1,812	(97)	1,604	(96)	1,354	(97)	1,413	(96)
Female	56	(3)	64	(4)	39	(3)	62	(4)
Unk	0	(0)	1	(<1)	0	(0)	0	(0)
Total	1,868	(100)	1,669	(100)	1,393	(100)	1,475	(100)
Age (yrs)								
16-19	19	(1)	19	(1)	10	(1)	12	(1)
20-29	366	(20)	335	(20)	231	(17)	249	(17)
30-39	419	(22)	334	(20)	297	(21)	303	(21)
40-49	513	(27)	422	(25)	344	(25)	338	(23)
50-59	386	(21)	405	(24)	353	(25)	399	(27)
60-69	144	(8)	142	(9)	141	(10)	151	(10)
70+	21	(1)	12	(1)	17	(1)	23	(2)
Total	1,868	(100)	1,669	(100)	1,393	(100)	1,475	(100)
Hispanic surname*								
Yes	1,209	(65)	1,076	(64)	973	(70)	938	(64)
No	659	(35)	593	(36)	420	(30)	537	(36)
Total	1,868	(100)	1,669	(100)	1,393	(100)	1,475	(100)

*Based on U.S. Department of Commerce, Bureau of the Census, Census of Population and Housing, 1980 Spanish Surname List.

Table 4. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: County* of Employment, 2008 - 2011
Ordered By Total 4-year Frequency**

County	2008		2009		2010		2011	
	n	(%)	n	(%)	n	(%)	n	(%)
Los Angeles	877	(47)	823	(49)	638	(46)	653	(44)
Riverside	129	(7)	116	(7)	122	(9)	117	(8)
San Bernardino	153	(8)	109	(7)	98	(7)	95	(6)
Orange	94	(5)	82	(5)	66	(5)	72	(5)
Alameda	117	(6)	63	(4)	61	(4)	61	(4)
Kern	57	(3)	44	(3)	38	(3)	41	(3)
San Diego	57	(3)	58	(3)	26	(2)	32	(2)
Santa Clara	30	(2)	34	(2)	62	(4)	35	(2)
Fresno	46	(2)	53	(3)	30	(2)	25	(2)
San Francisco	47	(3)	32	(2)	18	(1)	23	(2)
Solano	11	(1)	32	(2)	35	(3)	41	(3)
Sacramento	34	(2)	24	(1)	30	(2)	22	(1)
Santa Barbara	6	(<1)	24	(1)	10	(1)	30	(2)
Contra Costa	21	(1)	20	(1)	9	(1)	16	(1)
Long Beach*	15	(1)	8	(<1)	6	(<1)	12	(1)
San Mateo	12	(1)	11	(1)	10	(1)	4	(<1)
Sonoma	4	(<1)	7	(<1)	8	(1)	10	(1)
Ventura	8	(<1)	10	(1)	1	(<1)	9	(1)
Marin	4	(<1)	2	(<1)	4	(<1)	16	(1)
San Luis Obispo	0	(0)	3	(<1)	10	(1)	3	(<1)
Butte	5	(<1)	4	(<1)	3	(<1)	2	(<1)
San Joaquin	3	(<1)	1	(<1)	3	(<1)	7	(<1)
Stanislaus	7	(<1)	2	(<1)	4	(<1)	1	(<1)
Berkeley*	5	(<1)	0	(0)	6	(<1)	0	(0)
Yolo	3	(<1)	2	(<1)	1	(<1)	4	(<1)

(continued)

* Berkeley, Long Beach, and Pasadena are shown separately from their counties as they operate as independent local health jurisdictions.

** The following 15 counties (ordered alphabetically) employed zero (0) workers with elevated BLLs reported 2008-2011: Alpine, Calaveras, Colusa, Del Norte, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, San Benito, Sierra, Siskiyou, Trinity.

Table 4. Workers with Elevated ($\geq 10\mu\text{g/dL}$) BLLs: County* of Employment, 2008 – 2011, cont.

County	2008		2009		2010		2011	
	n	(%)	n	(%)	n	(%)	n	(%)
Monterey	2	(<1)	2	(<1)	2	(<1)	2	(<1)
Humboldt	2	(<1)	1	(<1)	3	(<1)	1	(<1)
Madera	0	(0)	3	(<1)	0	(0)	4	(<1)
Mendocino	2	(<1)	1	(<1)	1	(<1)	3	(<1)
Santa Cruz	1	(<1)	1	(<1)	3	(<1)	1	(<1)
Amador	0	(0)	0	(0)	0	(0)	5	(<1)
Napa	2	(<1)	1	(<1)	0	(0)	2	(<1)
Shasta	2	(<1)	1	(<1)	0	(0)	2	(<1)
Nevada	0	(0)	1	(<1)	1	(<1)	2	(<1)
Yuba	1	(<1)	0	(0)	0	(0)	3	(<1)
El Dorado	1	(<1)	0	(0)	1	(<1)	1	(<1)
Sutter	1	(<1)	0	(0)	1	(<1)	1	(<1)
Pasadena*	1	(<1)	0	(0)	1	(<1)	0	(0)
Tuolumne	1	(<1)	0	(0)	1	(<1)	0	(0)
Glenn	0	(0)	0	(0)	1	(<1)	0	(0)
Imperial	0	(0)	0	(0)	0	(0)	1	(<1)
Kings	0	(0)	0	(0)	0	(0)	1	(<1)
Merced	1	(<1)	0	(0)	0	(0)	0	(0)
Placer	0	(0)	0	(0)	0	(0)	1	(<1)
Tehama	0	(0)	1	(<1)	0	(0)	0	(0)
Tulare	1	(<1)	0	(0)	0	(0)	0	(0)
OOS***, lives in CA	17	(1)	12	(1)	9	(1)	53	(4)
Missing info	88	(5)	81	(5)	70	(5)	61	(4)
Total	1,868	(100)	1,669	(100)	1,393	(100)	1,475	(100)

***OOS = Out Of State

Table 5. Workers with Elevated (≥ 10 $\mu\text{g/dL}$) BLLs: County* of Residence, 2008 - 2011
Ordered By Total 4-year Frequency**

County	2008		2009		2010		2011	
	n	(%)	n	(%)	n	(%)	n	(%)
Los Angeles	785	(42)	714	(43)	555	(40)	586	(40)
San Bernardino	213	(11)	179	(11)	186	(13)	191	(13)
Riverside	136	(7)	142	(9)	132	(9)	135	(9)
Orange	84	(4)	74	(4)	60	(4)	49	(3)
Alameda	96	(5)	56	(3)	53	(4)	57	(4)
Kern	60	(3)	54	(3)	47	(3)	45	(3)
Contra Costa	51	(3)	33	(2)	32	(2)	41	(3)
San Diego	46	(2)	42	(3)	32	(2)	32	(2)
Santa Clara	24	(1)	30	(2)	63	(5)	31	(2)
Fresno	21	(1)	43	(3)	33	(2)	32	(2)
Sacramento	36	(2)	24	(1)	35	(3)	31	(2)
San Francisco	35	(2)	23	(1)	22	(2)	35	(2)
Santa Barbara	7	(<1)	25	(2)	14	(1)	30	(2)
Solano	15	(1)	11	(1)	8	(1)	31	(2)
Long Beach*	24	(1)	14	(1)	11	(1)	10	(1)
San Joaquin	15	(1)	15	(1)	11	(1)	12	(1)
San Mateo	20	(1)	15	(1)	8	(1)	10	(1)
Sonoma	5	(<1)	8	(<1)	10	(1)	16	(1)
Ventura	9	(<1)	10	(1)	6	(<1)	7	(<1)
Stanislaus	10	(1)	2	(<1)	6	(<1)	8	(1)
San Luis Obispo	5	(<1)	1	(<1)	11	(1)	3	(<1)
Butte	8	(<1)	6	(<1)	2	(<1)	2	(<1)
Marin	4	(<1)	4	(<1)	4	(<1)	4	(<1)
Pasadena*	4	(<1)	5	(<1)	4	(<1)	2	(<1)
Monterey	3	(<1)	3	(<1)	3	(<1)	3	(<1)
Sutter	5	(<1)	3	(<1)	3	(<1)	1	(<1)

(continued)

* Berkeley, Long Beach, and Pasadena are shown separately from their counties as they operate as independent local health jurisdictions.

** The following 10 counties (ordered alphabetically) had zero (0) workers residing in that county with elevated BLLs reported 2008-2011: Alpine, Colusa, Del Norte, Inyo, Lassen, Mariposa, Modoc, Mono, Sierra, Trinity

County	2008		2009		2010		2011	
	n	(%)	n	(%)	n	(%)	n	(%)
Placer	4	(<1)	2	(<1)	0	(0)	5	(<1)
Santa Cruz	1	(<1)	1	(<1)	5	(<1)	3	(<1)
Shasta	2	(<1)	3	(<1)	0	(0)	5	(<1)
Humboldt	3	(<1)	1	(<1)	3	(<1)	2	(<1)
Madera	1	(<1)	4	(<1)	1	(<1)	3	(<1)
Amador	3	(<1)	2	(<1)	0	(0)	3	(<1)
Nevada	1	(<1)	1	(<1)	3	(<1)	3	(<1)
El Dorado	1	(<1)	3	(<1)	2	(<1)	1	(<1)
Mendocino	2	(<1)	1	(<1)	1	(<1)	3	(<1)
Napa	2	(<1)	2	(<1)	1	(<1)	2	(<1)
Glenn	2	(<1)	1	(<1)	3	(<1)	0	(0)
Berkeley*	1	(<1)	0	(0)	3	(<1)	1	(<1)
Kings	0	(0)	1	(<1)	0	(0)	3	(<1)
Merced	2	(<1)	0	(<1)	1	(<1)	1	(<1)
Plumas	0	(0)	1	(<1)	1	(<1)	2	(<1)
Tulare	3	(<1)	1	(<1)	0	(0)	0	(0)
Yolo	2	(<1)	0	(0)	0	(0)	2	(<1)
Calaveras	1	(<1)	1	(<1)	0	(<1)	1	(<1)
Imperial	0	(0)	0	(0)	1	(<1)	2	(<1)
San Benito	0	(0)	1	(<1)	1	(<1)	1	(<1)
Tuolumne	0	(0)	2	(<1)	1	(<1)	0	(0)
Yuba	2	(<1)	0	(0)	0	(0)	1	(<1)
Siskiyou	0	(0)	0	(0)	0	(0)	2	(<1)
Tehama	0	(0)	1	(<1)	1	(<1)	0	(0)
Lake	1	(<1)	0	(0)	0	(0)	0	(0)
OOS***, works in CA	9	(<1)	16	(1)	1	(<1)	15	(1)
Missing info	104	(6)	88	(5)	13	(1)	10	(1)
Total	1,868	(100)	1,669	(100)	1,393	(100)	1,475	(100)

***OOS = Out of State

Table 6A. Workers Reported To CDPH/OLPPP: Industry Distribution, 2008 – 2011
(20 industries with the greatest number of workers tested)

Industry	NAICS	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)
Remediation Services (lead paint abatement, environmental cleanup)	562910	1,134 (6)	952 (5)	1,174 (7)	1,053 (6)
Storage Battery Manufacture	335911	681 (4)	700 (4)	774 (5)	800 (4)
Site Preparation Contractors (wrecking and demolition)	238910	471 (3)	433 (2)	556 (3)	651 (3)
Paint and Wall Covering Contractors	238320	533 (3)	529 (3)	573 (3)	466 (2)
Administration of Air & Water Resources (government air, water, and waste programs)	924110	373 (2)	436 (2)	515 (3)	504 (3)
Secondary Smelting (battery recycling, lead recovery from scrap)	331492	459 (3)	454 (3)	419 (2)	419 (2)
Recyclable Material (scrap metal and electronics recycling)	423930	544 (3)	373 (2)	393 (2)	322 (2)
Highway, Street, and Bridge Construction	237310	227 (1)	236 (1)	191 (1)	246 (1)
Police Protection	922120	189 (1)	205 (1)	240 (1)	208 (1)
Engineering Services (environmental / construction engineering firms)	541330	286 (2)	169 (1)	208 (1)	158 (1)
Fire Protection (city and county fire departments)	922160	123 (1)	122 (1)	234 (1)	328 (2)
Elementary and Secondary Schools (maintenance workers)	611110	76 (<1)	160 (1)	311 (2)	230 (1)
Fossil Fuel Electric Power Generation	221112	208 (1)	176 (1)	206 (1)	121 (1)
Regulation & Administration of Transportation (Coast Guard and ports)	926120	116 (1)	115 (1)	292 (2)	125 (1)
Commercial and Institutional Building Construction	236220	127 (1)	188 (1)	149 (1)	140 (1)

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Table 6A. Workers Reported To CDPH/OLPPP: Industry Distribution, 2008 – 2011, cont.

Industry	NAICS	2008 n (%)	2009 n (%)	2010 n (%)	2011 n (%)
National Security (armed forces)	928110	104 (1)	113 (1)	169 (1)	215 (1)
Electrical Contractors	238210	127 (1)	149 (1)	145 (1)	83 (<1)
Environmental Consulting (site assessment, design of remediation plans)	541620	111 (1)	134 (1)	110 (1)	91 (<1)
Solid Waste Combustion (solid waste incineration)	562213	86 (<1)	116 (1)	118 (1)	116 (1)
All Other Amusement (firing ranges)	713990	121 (1)	111 (1)	71 (<1)	108 (1)
Total for 20 industries with the greatest number of workers tested		6,096 (33)	5,871 (34)	6,848 (40)	6,384 (34)
All Other Industries		3,196 (18)	3,392 (19)	3,351 (20)	3,198 (17)
Unknown Industry (occupational)		9,022 (49)	8,214 (47)	7,004 (41)	9,210 (49)
Total		18,314 (100)	17,477 (100)	17,203 (100)	18,792 (100)

Table 6B. Blood Lead Distributions of Workers Tested, By Industry and Year, 2008
(20 industries with the greatest number of workers tested)

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Remediation Services (lead paint abatement, environmental clean-up)	562910	1,104 (97)	26 (2)	3 (<1)	1 (<1)	1,134	105
Storage Battery Manufacture	335911	279 (41)	309 (45)	83 (12)	10 (1)	681	11
Recyclable Material (scrap metal and electronics recycling)	423930	353 (65)	113 (21)	37 (7)	41 (8)	544	49
Paint and Wall Covering Contractors	238320	450 (84)	58 (11)	17 (3)	8 (2)	533	73
Site Preparation Contractors (wrecking and demolition)	238910	444 (94)	18 (4)	7 (1)	2 (<1)	471	45
Secondary Smelting (battery recycling, lead recovery from scrap)	331492	115 (25)	207 (45)	87 (19)	50 (11)	459	6
Administration of Air & Water Resources (government air, water, and waste program employees)	924110	372 (100)	1 (<1)	0 (0)	0 (0)	373	16
Engineering Services (environmental and construction engineering firms)	541330	284 (99)	2 (1)	0 (0)	0 (0)	286	67
Highway, Street, and Bridge Construction	237310	221 (97)	6 (3)	0 (0)	0 (0)	227	13
Fossil Fuel Electric Power Generation	221112	205 (99)	3 (1)	0 (0)	0 (0)	208	2
Police Protection	922120	152 (80)	35 (19)	2 (1)	0 (0)	189	40

(continued)

Table 6B. Blood Lead Distributions of Workers Tested, By Industry and Year, 2008, cont.

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Iron and Steel Mills	331111	95 (65)	43 (29)	7 (5)	2 (1)	147	3
Oil and Gas Pipeline & Related Structure Construction (pipeline construction, installation/repair, oil tank co.)	237120	133 (99)	2 (2)	0 (0)	0 (0)	135	3
Commercial and Institutional Building Construction	236220	112 (88)	9 (7)	4 (3)	2 (2)	127	28
Electrical Contractors	238210	123 (97)	4 (3)	0 (0)	0 (0)	127	6
Fire Protection (city and county fire departments)	922160	123 (100)	0 (0)	0 (0)	0 (0)	123	12
All Other Amusement (firing ranges)	713990	33 (27)	49 (41)	25 (21)	14 (12)	121	22
Amusement and Theme Parks (maintenance)	713110	116 (100)	0 (0)	0 (0)	0 (0)	116	1
Regulation & Administration of Transportation (Coast Guard and ports)	926120	115 (99)	1 (1)	0 (0)	0 (0)	116	5
Environmental Consulting (site assessment, design of remediation plans)	541620	109 (98)	2 (2)	0 (0)	0 (0)	111	17
All Other Industries		2,525 (82)	376 (12)	103 (3)	60 (2)	3,064	468
Unknown Industry (occupational)		8,983 (100)	33 (<1)	5 (<1)	1 (<1)	9,022	40
Total Tested in Year		16,446	1,297	380	191	18,314	1,032

Table 6C. Blood Lead Distributions of Workers Tested, By Industry and Year, 2009
(20 industries with the greatest number of workers tested)

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Remediation Services (lead paint abatement, environmental cleanup)	562910	928 (97)	22 (2)	1 (<1)	1 (<1)	952	107
Storage Battery Manufacture	335911	305 (44)	305 (44)	78 (11)	12 (2)	700	13
Paint and Wall Covering Contractors	238320	442 (84)	64 (12)	17 (3)	6 (1)	529	60
Secondary Smelting (battery recycling, lead recovery from scrap)	331492	100 (22)	204 (45)	109 (24)	41 (9)	454	7
Administration of Air & Water Resources (government air, water, and waste program employees)	924110	429 (98)	6 (1)	1 (<1)	0 (0)	436	17
Site Preparation Contractors (wrecking and demolition)	238910	404 (93)	21 (5)	4 (1)	4 (1)	433	47
Recyclable Material (scrap metal and electronics recycling)	423930	244 (65)	84 (23)	34 (9)	11 (3)	373	43
Highway, Street, and Bridge Construction	237310	221 (93)	13 (6)	1 (<1)	1 (<1)	236	13
Police Protection	922120	172 (84)	25 (12)	7 (3)	1 (1)	205	44
Commercial and Institutional Building Construction	236220	177 (94)	6 (3)	4 (2)	1 (1)	188	31
Fossil Fuel Electric Power Generation	221112	176 (100)	0 (0)	0 (0)	0 (0)	176	2

(continued)

Table 6C. Blood Lead Distributions of Workers Tested, By Industry and Year, 2009, cont.

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Nuclear Electric Power Generation	221113	170 (99)	1 (1)	0 (0)	0 (0)	171	1
Engineering Services (environmental and construction engineering firms)	541330	167 (99)	0 (0)	2 (1)	0 (0)	169	66
Elementary and Secondary Schools (maintenance workers)	611110	157 (98)	3 (2)	0 (0)	0 (0)	160	6
Electrical Contractors	238210	147 (99)	2 (1)	0 (0)	0 (0)	149	12
Environmental Consulting (site assessment, design of remediation plans)	541620	131 (98)	3 (2)	0 (0)	0 (0)	134	26
Fire Protection (city and county fire departments)	922160	121 (99)	0 (0)	1 (1)	0 (0)	122	16
Plumbing Fixture Fittings (manufacture of brass plumbing fixtures)	332913	103 (87)	13 (11)	2 (2)	0 (0)	118	3
Solid Waste Combustion (solid waste incineration)	562213	115 (99)	1 (1)	0 (0)	0 (0)	116	20
Regulation & Administration of Transportation (Coast Guard and ports)	926120	115 (100)	0 (0)	0 (0)	0 (0)	115	4
All Other Industries		2,815 (85)	358 (11)	106 (3)	48 (1)	3,327	527
Unknown Industry (occupational)		8,169 (99)	38 (<1)	5 (<1)	2 (<1)	8,214	56
Total Tested in Year		15,808	1,169	372	128	17,477	1,121

Table 6D. Blood Lead Distributions of Workers Tested, By Industry and Year, 2010
(20 industries with the greatest number of workers tested)

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Remediation Services (lead paint abatement, environmental cleanup)	562910	1,148 (98)	21 (2)	4 (<1)	1 (<1)	1,174	122
Storage Battery Manufacture	335911	366 (47)	316 (41)	82 (11)	10 (1)	774	8
Paint and Wall Covering Contractors	238320	497 (87)	51 (9)	16 (3)	9 (2)	573	67
Site Preparation Contractors (wrecking and demolition)	238910	541 (97)	14 (3)	1 (<1)	0 (0)	556	49
Administration of Air & Water Resources (government air, water, and waste program employees)	924110	510 (99)	5 (1)	0 (0)	0 (0)	515	19
Secondary Smelting (battery recycling, lead recovery from scrap)	331492	124 (30)	187 (45)	79 (19)	29 (7)	419	9
Recyclable Material (scrap metal and electronics recycling)	423930	316 (80)	66 (17)	10 (3)	1 (<1)	393	37
Elementary and Secondary Schools (maintenance workers)	611110	309 (99)	1 (<1)	1 (<1)	0 (0)	311	5
Regulation & Administration of Transportation (Coast Guard and ports)	926120	291 (100)	1 (<1)	0 (0)	0 (0)	292	8
Police Protection	922120	220 (92)	16 (7)	3 (1)	1 (<1)	240	39
Fire Protection (city and county fire departments)	922160	234 (100)	0 (0)	0 (0)	0 (0)	234	19

(continued)

Table 6D. Blood Lead Distributions of Workers Tested, By Industry and Year, 2010, cont.

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Engineering Services (environmental and construction engineering firms)	541330	207 (100)	0 (0)	1 (<1)	0 (0)	208	57
Fossil Fuel Electric Power Generation	221112	205 (100)	1 (<1)	0 (0)	0 (0)	206	2
Highway, Street, and Bridge Construction	237310	176 (92)	7 (4)	2 (1)	6 (3)	191	13
National Security (Armed Forces)	928110	161 (95)	8 (5)	0 (0)	0 (0)	169	20
Commercial and Institutional Building Construction	236220	147 (99)	2 (1)	0 (0)	0 (0)	149	29
Electrical Contractors	238210	145 (100)	0 (0)	0 (0)	0 (0)	145	5
Water and Sewer Line Construction	237110	131 (99)	2 (2)	0 (0)	0 (0)	133	15
All Other Miscellaneous Waste Mgmt Services (industrial cleaning contractors, storage tank cleaning)	562998	131 (100)	0 (0)	0 (0)	0 (0)	131	9
Solid Waste Combustion (solid waste incineration)	562213	118 (100)	0 (0)	0 (0)	0 (0)	118	15
All Other Industries		2,864 (88)	299 (9)	77 (2)	28 (<1)	3,268	528
Unknown Industry (occupational)		6,969 (100)	26 (<1)	4 (<1)	5 (<1)	7,004	64
Total tested in year		15,810 (100)	1,023 (100)	280 (100)	90 (100)	17,203	1,139

Table 6E. Blood Lead Distributions of Workers Tested, By Industry and Year, 2011
(20 industries with the greatest number of workers tested)

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Remediation Services (lead paint abatement, environmental cleanup)	562910	1,014 (96)	30 (3)	4 (<1)	5 (<1)	1,053	128
Storage Battery Manufacture	335911	468 (59)	272 (34)	55 (7)	5 (1)	800	8
Site Preparation Contractors (wrecking and demolition)	238910	618 (95)	30 (5)	3 (<1)	0 (0)	651	56
Administration of Air & Water Resources (government air, water, and waste program employees)	924110	500 (99)	2 (<1)	1 (<1)	1 (<1)	504	16
Paint and Wall Covering Contractors	238320	349 (75)	73 (16)	35 (8)	9 (2)	466	56
Secondary Smelting (battery recycling, lead recovery from scrap)	331492	124 (30)	215 (51)	58 (14)	22 (5)	419	6
Fire Protection (city and county fire departments)	922160	326 (99)	2 (1)	0 (0)	0 (0)	328	22
Recyclable Material (scrap metal and electronics recycling)	423930	251 (78)	62 (19)	7 (2)	2 (1)	322	32
Highway, Street, and Bridge Construction	237310	242 (98)	1 (<1)	1 (<1)	2 (1)	246	14
Elementary and Secondary Schools (maintenance workers)	611110	229 (100)	0 (0)	0 (0)	1 (<1)	230	2
National Security (armed forces)	928110	214 (100)	1 (<1)	0 (0)	0 (0)	215	13

(continued)

Table 6E. Blood Lead Distributions of Workers Tested, By Industry and Year, 2011, cont.

Industry	NAICS	BLL (µg/dL)				Total Workers	No. of Employers
		<10 n (%)	10-19 n (%)	20-29 n (%)	30+ n (%)		
Police Protection	922120	183 (88)	24 (12)	1 (<1)	0 (0)	208	48
Labor Unions and Similar Labor Organizations (BLL testing programs run by labor unions; hiring halls)	813930	174 (98)	4 (2)	0 (0)	0 (0)	178	5
Engineering Services (environmental and construction engineering firms)	541330	157 (99)	1 (1)	0 (0)	0 (0)	158	59
Commercial and Institutional Building Construction	236220	135 (96)	5 (4)	0 (0)	0 (0)	140	25
Regulation & Administration of Transportation (Coast Guard and ports)	926120	123 (98)	2 (2)	0 (0)	0 (0)	125	10
Ship Building and Repair	336611	121 (98)	1 (1)	0 (0)	1 (1)	123	7
Fossil Fuel Electric Power Generation	221112	119 (98)	2 (2)	0 (0)	0 (0)	121	3
Solid Waste Combustion (solid waste incineration)	562213	116 (100)	0 (0)	0 (0)	0 (0)	116	15
All Other Amusement (firing ranges)	713990	27 (25)	46 (43)	21 (19)	14 (13)	108	26
All Other Industries		2,644 (86)	300 (10)	94 (3)	33 (1)	3,071	517
Unknown Industry (occupational)		9,183 (100)	22 (<1)	5 (<1)	0 (0)	9,210	65
Total tested in year		17,317	1,095	285	95	18,792	1,133