



## California's Progress in Preventing and Managing Childhood Lead Exposure

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# EXECUTIVE SUMMARY

Recognizing the long-term damaging effects of childhood lead exposure, and the increased risk for children living in poverty, California enacted a series of legislative mandates to reduce lead exposure, beginning in the late 1980s that established a Childhood Lead Poisoning Prevention (CLPP) Program within the California Department of Public Health (CDPH). The goal of this program is to eliminate childhood lead exposure by identifying and caring for children with elevated blood lead levels (BLLs) and by working to prevent environmental exposures to lead. The CLPP Program, consisting of the state CLPP Branch (CLPPB) in partnership with contracted local childhood lead poisoning prevention programs (CLPPPs), carries out prevention activities including outreach and education, surveillance, promotes lead screening for all children at risk for lead exposure, and provides case management and follow-up for children identified with elevated BLLs.

This report provides an update on California's progress in preventing and managing childhood lead exposure. Progress is being made in both identifying and treating children with elevated BLLs and reducing exposures to lead, but there is still work to be done. In order to protect California's children, we must not only identify and treat children with elevated BLLs but also remove lead from the environments in which they live, learn, and play.

## Key findings

- Although there seems to be a downward trend in elevated BLLs overall, there is significant variability between counties in the rates of elevated BLLs. Because not all young children receive blood lead tests, it is not clear whether the overall decline or geographic variability is due to actual variability in the prevalence of elevated BLLs, or to variability in the extent to which the highest at-risk children in the county are being identified and tested.
- In a joint analysis between CDPH and the Department of Health Care Services (DHCS), it was determined that among children who turned 3 in Federal Fiscal Year (FFY) 2016 and were enrolled in Medi-Cal (California Medicaid) at some time before their third birthday, 65 % had a blood lead test at some point between the ages of 6 and 35 months.
- On July 1, 2016, the CLPP Program expanded the reach of services to lead exposed children by lowering the definition of a case eligible for full case management services from a single confirmed 20 micrograms per deciliter (mcg/dL) or persistent 15 mcg/dL, to a single confirmed 15 mcg/dL or persistent 10 mcg/dL. This led to almost a tripling of the number of children who received both clinical and environmental case management services from 188 in the 12-month period before July 1, 2016, to 570 in the 12 months following July 1, 2016. Additionally, CDPH expanded services to include tiered case management for over 7,000 children with BLLs  $\geq$  4.5 mcg/dL not meeting full case criteria.

- By expanding the number of children considered at risk for lead exposure due to requirements of Assembly Bill (AB) 1316 (Quirk, Chapter 507, Statutes of 2018), we expect to identify more children who have elevated BLLs.
- There are opportunities to strengthen the program, as disparities persist by geographic area and individual zip codes. In 2018, the percentage of tested children with elevated BLLs ranged from 7.7% in Humboldt County, to 0.5% in Riverside County. In one zip code, 1 of 5 children tested had elevated BLLs. CDPH identified that 99% of California zip codes were identified as being “at risk” for childhood lead exposure.
- Additional work is needed to remediate lead sources found in the environment to address the primary goal of preventing childhood lead exposure by identifying sources of lead exposure through environmental assessments; assisting local enforcement agencies in enforcing corrective actions by property owners, and identifying and applying for federal funds for remediation.

### **CDPH Plans to Strengthen CLPP Program**

CDPH is committed to strengthening the CLPP Program and has identified four objectives and strategies:

- Increased blood lead testing of at-risk children by:
  - Collaborating with DHCS to ensure that all children enrolled in Medi-Cal receive recommended blood lead testing.
  - Publishing data identifying geographic areas that may be at high risk for lead contamination for state intervention and assisting in application for funding for remediation.
  - Developing regulations to enhance health care providers’ ability to identify children at risk for lead exposure.
  - Increasing CDPH outreach to providers and parents to ensure they are aware of the dangers of childhood lead exposure, the criteria for identifying children at risk for lead exposure, and the importance of screening and follow-up blood lead testing.
- Providing appropriate case management services to all children with identified elevated BLLs so that sources of lead exposure are removed and BLLs decline by:
  - Developing a robust database to better track data to allow timely identification of potential issues with blood lead testing or case management.
  - Providing increased oversight of, and technical assistance to, local CLPPs to ensure children with elevated BLLs receive all follow-up services in a timely manner.
- Decreasing sources of lead in the environment to prevent childhood lead exposure by:
  - Assisting local agencies to identify and apply for federal funding to remediate identified sources of lead.

- Strengthening the CDPH Lead-Related Construction (LRC) program to increase workforce trained to conduct lead abatement work. The LRC Program provides training to lead construction workers to ensure safe practices when eliminating sources of lead in buildings.
- Increasing partnerships with stakeholders to strengthen multi-disciplinary approaches to decreasing childhood lead exposure by:
  - Partnering with governmental programs, such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), Child Health and Disability Prevention (CHDP), and Head Start, to educate parents about the dangers of childhood lead exposure and the need for blood lead screening.
  - Increasing partnerships with schools to address sources of lead exposure within schools, and state and local environmental health agencies to identify and prioritize geographic areas most in need of lead abatement.

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June 2020

“The California Department of Public Health is committed to children’s health and has made progress in identifying and treating children with elevated blood lead levels and reducing exposure to lead. In partnership with contracted local lead poisoning prevention programs, we are committed to strengthening the Childhood Lead Poisoning Prevention Program to not only identify and treat children with elevated blood lead levels but also remove lead from the environments in which they live, learn, and play.”

# INTRODUCTION

Young children are considered most at risk for lead exposure because they have hand-to-mouth behaviors that introduce lead into the gastrointestinal tract where it is absorbed, and because their nervous systems and other organs are still developing.<sup>1,2</sup> At very high levels of exposure, lead can cause seizures, coma, and death.<sup>1,2</sup> Lower levels of lead affect the nervous system and cause lowered intelligence and learning deficits.<sup>3,4</sup> Lead can also affect the kidneys, decrease growth, decrease hearing acuity, cause anemia (low red blood count), and delay sexual maturation.<sup>1,5,6</sup> Prenatal and postnatal increased BLLs have been significantly associated with self-reported frequencies of antisocial and delinquent behaviors in adolescents.<sup>7</sup> Increased levels of bone lead have been associated with an increased risk for adolescent arrest and adjudication.<sup>8</sup> Lead compounds are also considered probable human carcinogens.<sup>9</sup> Lead exposure causes a wide range of problems and can result in lifelong damaging effects.<sup>1,3</sup>

The threshold for BLLs considered to be elevated by the United States Centers for Disease Control and Prevention (CDC) has decreased over time, as new information on neurodevelopmental and long-term effects have indicated effects of lead exposure at progressively lower levels.<sup>10</sup> Currently, CDC considers BLLs of 5 micrograms per deciliter (mcg/dL) the "Blood Level Reference Value." Values at and above this level identify children who have been exposed to lead and require case management.<sup>11</sup> While considerable progress has been made in reducing lead exposure and decreasing the prevalence of children with elevated BLLs in the United States, elevated childhood BLLs remains a major preventable environmental health problem.<sup>1,2</sup>

## Report

Senate Bill (SB) 1097 (Hueso, Chapter 691, Statutes of 2018) expanded CDPH reporting requirements to include information for each county about the total number of children tested for lead poisoning, the results of blood lead testing by ranges of lead levels, environmental investigations, home visits, and family education. SB 1041, (Leyva, Chapter 690, Statutes of 2018) expanded the report to include blood lead testing information for children enrolled in Medi-Cal. AB 1316 (Quirk, Chapter 507, Statutes of 2017) requires CDPH to post information that evaluates the department's progress in meeting the goals of the Childhood Lead Poisoning Prevention Act, including to the greatest extent possible, a list of the census tracts in which children test positive at a rate higher than the national average for blood lead in exceedance of the CDC's reference level for elevated blood lead.

The report is structured to provide the reader with background on program requirements, followed by key data indicators on program progress, and a summary of objectives and strategies for improving program outcomes.

## Definitions and Terms

- Anticipatory guidance means health care providers informing all parents and guardians at each periodic assessment from 6 months to 6 years about: the risks and effects of childhood lead exposure; the requirement that children enrolled in Medi-Cal receive blood lead tests; and the requirement that children not enrolled in Medi-Cal who are at high risk of lead exposure receive blood lead tests.
- Appropriate case management means health care referrals, environmental assessments, and educational activities, performed by the appropriate person, professional, or entity, necessary to reduce a child's exposure to lead and the consequences of the exposure, as determined by the CDC, or as determined by the department. (HSC section 105280 (a))
- Blood lead level (BLL) means a whole blood test result indicating the presence of lead. CDPH rounds BLLs to the nearest whole number (for example, 5 includes 4.5 mcg/dL and 10 includes 9.5 mcg/dL).
- CDC reference value is the "reference value" that physicians should use to consider a child's BLL elevated and to warrant further evaluation and monitoring. In 2012, the CDC determined that a BLL of 5 mcg/dL in a child under age 6 is the "reference value".
- Elevated BLL means a BLL at or over 5 mcg/dL detected in capillary, whole venous, arterial, or cord blood (CDPH rounds BLLs to the nearest whole number so 4.5 mcg/dL would round to 5 mcg/dL).
- Local enforcement agency means the health department, environmental agency, housing department, or building department of any city, county, or city and county.
- Local health jurisdiction (LHJ) includes the 58 county health departments and an additional 3 city health departments (Alameda, Berkeley, and Pasadena) that provide local public health services.
- Basic case since July 1, 2016, means a child from birth up to age 21 years of age with a BLL  $\geq$  5 mcg/dL but not meeting full case criteria. These children are eligible for basic case management services and receive at a minimum monitoring, outreach and education, and follow-up to encourage venous retesting. Services may include other graded responses up to and including public health nursing and environmental investigation as for full cases, as resources allow.
- Full case since July 1, 2016, means a child from birth up to age 21 years of age with one venous BLL  $\geq$  15 mcg/dL; or two BLLs  $\geq$  10 mcg/dL, the second of which must be

venous and drawn at least 30 days after the first BLL. These BLLs do not have to be consecutive specimens. These children are eligible for full case management services. Prior to July 1, 2016, a child from birth up to age 21 years of age was eligible for full case management services if they had one venous BLL  $\geq 20$  mcg/dL; or two BLLs  $\geq 15$  mcg/dL, the second of which must have been venous and drawn at least 30 days after the first BLL. These BLLs must have been drawn at least 30 days apart but did not have to be consecutive specimens.



# CHAPTER 1: PROGRAM MANDATES AND REPORTING REQUIREMENTS

The CLPP Act of 1991 (AB 2038, Connelly, Chapter 799, Statutes of 1991) charged the Department of Health Services (now the California Department of Public Health (CDPH)), with collecting and analyzing information on lead testing; developing protocols for screening for lead; identifying children with elevated BLLs, ensuring that children with elevated BLLs receive appropriate case management; and reducing exposure to lead and the consequences of that exposure. Below are the broad categories of program requirements.

For a full list of mandates and authorities, please see Appendix A.

## 1) Universal Laboratory Reporting of Blood Lead Level Tests

California Health and Safety Code (HSC) Section 124130 requires that all results of lead tests performed on blood drawn in California be reported to CDPH. Universal laboratory reporting of blood lead tests to the State began January 1, 2003, and full electronic reporting began in 2007.

## 2) Geographic Distribution of California Children with Elevated Blood Lead Levels

HSC Section 105295 requires CDPH to include information in a report available to local health departments and the general public about the total number of children tested for lead and the results of blood lead testing by ranges of lead levels for each county.

HSC Section 124125 requires CDPH to post information on its Internet Web site that evaluates the department's progress in meeting the goals of the Childhood Lead Poisoning Prevention Act. The information is required, to the extent possible, to include a list of the census tracts in which children test positive at a rate higher than the national average for blood lead in exceedance of the CDC's reference level for elevated blood lead. The posted information is required to comply with all applicable state and federal laws for the protection of the privacy and security of data.

## 3) Targeted Screening to Identify Children with Lead Exposure

California's blood lead screening regulations focus on children believed to be at greatest risk for lead poisoning.<sup>12,13,14</sup> Currently, these include children under age 6 years who receive services through a publicly funded health program for low-income children. These programs include: Medi-Cal, CHDP, and WIC. This also includes any federally funded or State of California-funded program that provides medical services or preventive health care to children in families whose income is equal to or less than the maximum qualifying income level for participation in any of the specified programs.

Children not in publicly funded health programs are targeted and considered at increased risk for elevated BLLs if they are exposed to a place built before 1978 that has peeling or chipped paint, or that has recently been renovated.

Children in the targeted at-risk groups are required by California regulations to receive a blood lead test.<sup>14</sup> Testing is to be carried out at ages 12 months, 24 months, and any time up to 6 years old, if testing was previously missed.

## **Screening of Medi-Cal Population**

Because poverty places children at high risk for lead exposure, both state and federal regulations require that children served by Medicaid be screened for lead with a blood lead screening test at ages 12 and 24 months, and up to 6 years old, if not previously tested.<sup>14,15</sup>

HSC Section 105295 requires reporting on Medi-Cal blood lead testing to ensure children enrolled in Medi-Cal are receiving mandated testing and follow up. CDPH is required to report the total number of children enrolled in Medi-Cal, broken down by county and by year of age, who have received and who have not received blood lead screening tests. CDPH must also include the number of children not enrolled in Medi-Cal who have received blood lead screening tests.

### **4) CDPH Outreach to Health Care Providers to Increase Screening**

HSC Section 105286 requires CDPH to notify health care providers who perform periodic health assessments for children about the risks and effects of childhood lead exposure, and the blood lead testing requirements for children enrolled in Medi-Cal and children not enrolled in Medi-Cal with a high risk of exposure to lead. It also requires those health care providers to provide the same information to parents and guardians of children.

### **5) Family and Community Outreach on Lead Poisoning Screening and Prevention**

Current regulations require that medical providers provide anticipatory guidance on lead exposure to parents or guardians of children, and that they conduct blood lead screening of targeted at-risk children.<sup>14</sup> These regulations specify:

- For all children, anticipatory guidance on lead exposure and preventing lead poisoning be given to a parent or guardian at each periodic health assessment from the time the child begins to crawl (age 6 months) to 72 months. This guidance must include at a minimum, the information that children can be harmed by exposure to lead, especially deteriorating or disturbed lead-based paint and the dust from it, and are particularly at risk of lead poisoning from the time the child begins to crawl until 72 months of age;
- Children receiving services from a publicly funded health program are to be screened for lead poisoning by blood lead testing at 12 months and 24 months of age and, if tests are missed, children are

- to be screened up to age 72 months;
- Children not in publicly funded programs are to be assessed for risk of lead exposure by the provider asking, "Does your child live in, or spend a lot of time in, a place built before 1978 that has peeling or chipped paint or that has been recently renovated?" A blood lead test is done if the answer is "yes" or "don't know" and, screening by blood lead testing is to be conducted whenever a health care provider performing an assessment of a child 12 months to 72 months of age becomes aware that a change in circumstances has put the child at risk of lead poisoning.

## **6) Case Management Services**

HSC Section 105290 requires when a child is identified with lead poisoning, the department shall ensure appropriate case management.

HSC Section 105295 -- report the number of children, by BLL range, who were referred for case management and environmental services and who received a home visit, an environmental investigation, family education, provision of educational materials, a nutrition assessment, and nutritional education.

## **7) Sources of Lead Exposure**

HSC Section 105295 requires analysis and reporting on identified sources of exposure for lead-exposed children and whether these lead hazards have been addressed by being removed, ameliorated, or abated.

## **8) Identification of Populations at Risk**

HSC Section 105285 requires CDPH to adopt regulations establishing an expanded standard of care to determine whether a child is at risk for lead poisoning by considering additional environmental risk factors for lead exposure that consider:

- Proximity to a former lead or steel smelter or an industrial facility that historically emitted or currently emits lead;
- A child's proximity to a freeway or heavily traveled roadway; and
- Other potential risk factors for lead exposure and known sources of lead contamination.

## CHAPTER 2: KEY DATA

### 1) Universal Laboratory Reporting of Blood Lead Level Tests

Over 600,000 blood lead tests (representing over 500,000 individual children) are reported to CDPH each year by over 400 laboratories. Test results are stored in CDPH's web-based Response and Surveillance System for Childhood Lead Exposures (RASSCLE) data system and are accessible to CLPPPs in LHJs. Existing law requires laboratories to report patient information including name, birthdate, and address to CDPH. Enrollment in Medi-Cal or other publicly funded programs is not required to be reported to CDPH.

### 2) Geographic Distribution of California Children with Elevated Blood Lead Levels

The CLPP Program, which includes the state CLPPB and the local contracted CLPPPs (Appendix B), has demonstrated a decreased percentage of tested children with elevated BLLs over time. Elevated BLLs among tested children in California have declined substantially in the last decade and continues to steadily decline. It should be noted that in California, BLLs of 5 mcg/dL (the CDC blood lead reference value) include BLLs of 4.5 mcg/dL as California rounds BLLs up to the next whole number.

Results of blood lead tests reported to CDPH for 2010, 2016, 2017, and 2018 for the state are shown in Table 1 below.

**Table 1. Number of Individual California Children Screened for Lead, by Highest Level, 2010, 2016, 2017, 2018**

California Totals	Age Group (Years)	Blood Lead Level (BLL) < 4.5 n	BLL < 4.5 % (row)	BLL ≥ 4.5 to < 9.5 n	BLL ≥ 4.5 to < 9.5 % (row)	BLL ≥ 9.5 n	BLL ≥ 9.5% (row)	Totals
2010	Age < 6	648,023	96.76%	19,657	2.94%	2,035	0.30%	669,715
	Age 6 to < 21	55,265	96.40%	1,800	3.14%	262	0.46%	57,327
	Local Total Age < 21	703,288	96.73%	21,457	2.95%	2,297	0.32%	727,042
2016	Age < 6	523,121	98.28%	7,576	1.42%	1,567	0.29%	532,264
	Age 6 to < 21	46,853	97.64%	931	1.94%	201	0.42%	47,985
	Local Total Age < 21	569,974	98.23%	8,507	1.47%	1,768	0.30%	580,249
2017	Age < 6	505,695	98.40%	6,609	1.29%	1,625	0.32%	513,929
	Age 6 to < 21	48,858	97.26%	1,134	2.26%	243	0.48%	50,235
	Local Total Age < 21	554,553	98.30%	7,743	1.37%	1,868	0.33%	564,164

2018	Age < 6	473,813	98.52%	5,850	1.22%	1,291	0.27%	480,954
	Age 6 to < 21	46,643	97.46%	984	2.06%	232	0.48%	47,859
	Local Total Age < 21	520,456	98.42%	6,834	1.29%	1,523	0.29%	528,813

- Data for 2010 are from the RASSCLE surveillance database archive of 1/12/12. Data for 2016 and 2017 are from the RASSCLE surveillance database archive of 1/3/2019. Data for 2018 are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once per year, using their highest BLL.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”

- In 2016, among the 580,249 children < 21 years old tested in California, 10,275 (1.77 percent) had BLLs  $\geq$  4.5 mcg/dL.
- Among the 564,164 children < 21 years old tested in 2017, 9,611 (1.70 percent) had BLLs  $\geq$  4.5 mcg/dL.
- In 2018, among the 528,813 children < 21 years old tested in California, 8,357 (1.58 percent) had BLLs  $\geq$  4.5 mcg/dL. This reflects a decline in the percentage of children tested whose BLL was  $\geq$  4.5 mcg/dL of almost twofold (51.6 percent) from 2010, when 3.27 percent of children tested had BLLs  $\geq$  4.5 mcg/dL.
- Among children < 6 years old, the reduction in the percentage of children tested with BLLs  $\geq$  4.5 mcg/dL declined from 3.24 percent in 2010 to 1.49 percent in 2018, a 54.4 percent decline.

While the number of children with elevated BLLs is decreasing, the total number of children screened has been decreasing. It is unclear if there are fewer children considered at risk, or if fewer at-risk children are being screened by providers. CDPH is currently analyzing birth certificate and Medi-Cal data in order to determine the number of children at risk for lead poisoning and how many of these children are being screened by providers. If fewer children at-risk for lead exposure are being screened by providers, CDPH will take steps to further educate providers caring for children not being screened, on the mandated screening requirements.

Results by individual LHJs are provided in Appendix C and D. It is not possible to report rates in some smaller LHJs, because so few children were tested. See Appendix E for data suppression methodology based on California Health and Human Services Agency (CHHS) Data De-identification Guidelines (DDGs).<sup>16</sup>

For purposes of analysis of BLL data by geographic region and age group, both the total population in the geographic region and the number of children with elevated BLLs in the geographic region and age group must be considered. Geographic region is defined as the 61 LHJs.

In LHJs with small numbers of children tested, a few children with elevated BLLs will have a greater effect on the percentage of children with elevated BLLs than a few children with elevated BLLs would have in a larger LHJs.

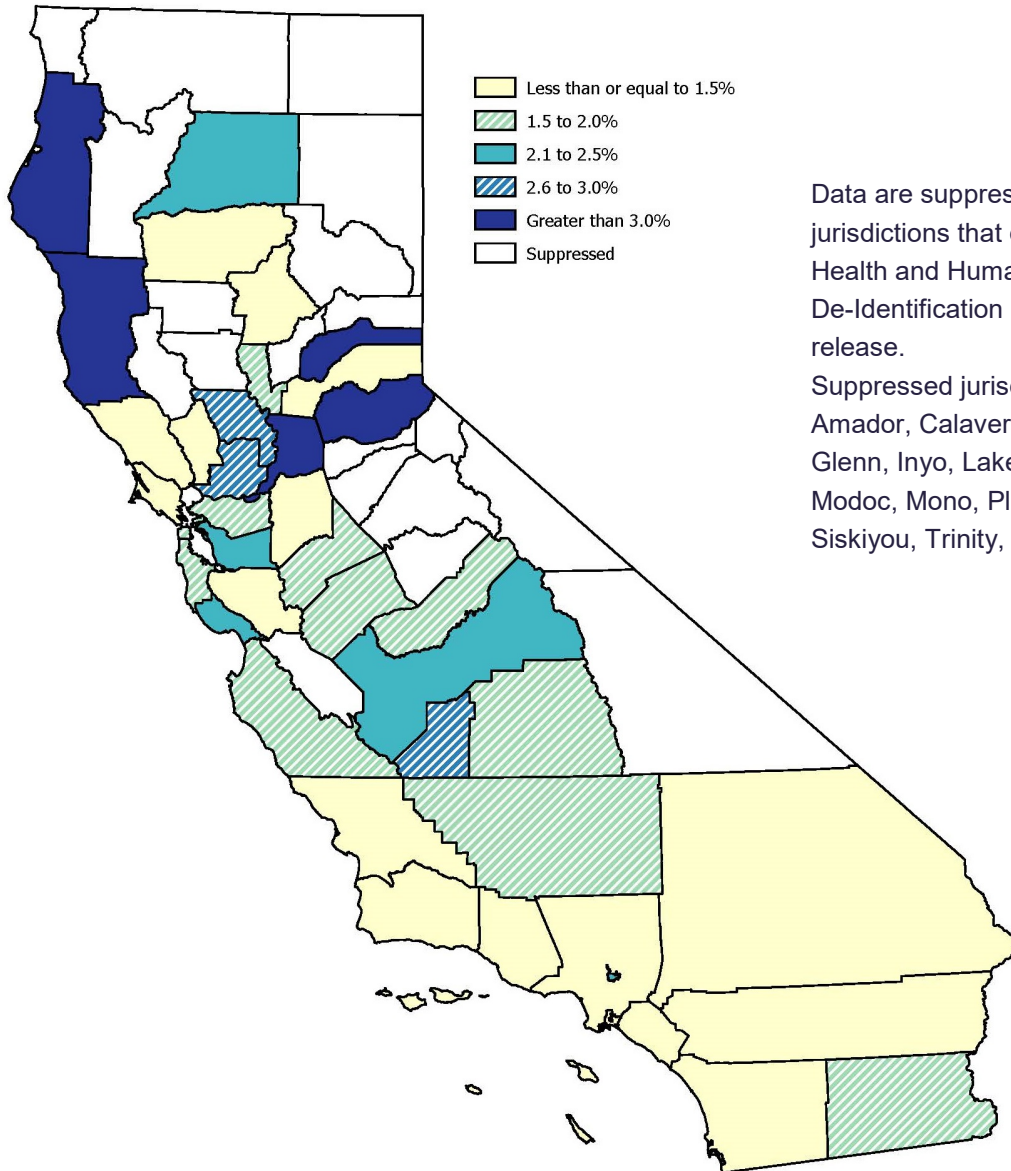
Application of the DDGs results in suppression of data for many of the smaller LHJs. Aggregated data is reported for the LHJs whose individual data were suppressed (Table 2, Table 3, and Appendix C) and trends are discussed for individually suppressed jurisdictions (Table 5 and Table 6). CDPH shares all data with LHJs in a secure manner by sending quarterly and yearly blood lead test data to each jurisdiction. In addition, when a child is identified with an elevated BLL ( $\geq 4.5$  mcg/dL), CDPH refers the case directly to the LHJ as soon as the child is identified.

In 2018:

- The percentage of tested children (< 6 years old) with elevated BLLs ( $\geq 4.5$  mcg/dL) varied by county from 7.67 percent in Humboldt County to 0.53 percent in Riverside (Figure 1 and Table 2).
- The percentage of children (< 6 years old) with BLLs  $\geq 9.5$  mcg/dL varied from 0.99 percent in Sacramento County to 0.08 percent in Riverside County (Figure 2 and Table 3).
- The largest percentage of children (< 6 years old) with BLLs  $\geq 4.5$  mcg/dL was found in Humboldt, Mendocino, and Nevada (Table 2) and the greatest percentage with BLLs  $\geq 9.5$  mcg/dL was found in Humboldt, Sacramento, and El Dorado counties (Table 3).
- In 8 out of the 42 jurisdictions that were able to be reported, more than 2.5 percent of the children tested had BLLs  $\geq 4.5$  mcg/dL (Table 2).

Maps and tables of children under 6 years old with BLLs of  $\geq 4.5$  mcg/dL and  $\geq 9.5$  mcg/dL for 2016 and 2017 can be found in Appendix C. BLLs for children of all ages (including older children age 6 to < 21) are illustrated by LHJs for 2016, 2017, and 2018 in Appendix D. A discussion of trends from 2016 to 2018 for individual jurisdictions follows Table 3 below.

**Figure 1: Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2018**



Data are suppressed for local health jurisdictions that did not meet the California Health and Human Service Agency's Data De-Identification Guidelines for public release.

Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, San Benito, Sierra, Siskiyou, Trinity, Tuolumne and Yuba.

- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest blood lead level (BLL) during 2018.
- Measures are in mcg/dL (micrograms per deciliter) of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL”.
- If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by using a geocoded county boundary layer i.e. the X and Y coordinates projected using Web Mercator Auxiliary Sphere 1984.
- Refer to Appendix D for data table.

**Table 2. California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, in Descending Order, with Estimates of Children in Medi-Cal and Total Population, 2018**

Local Health Jurisdiction	BLL < 4.5 n	BLL < 4.5 % (row)	BLL ≥ 4.5 n	BLL ≥ 4.5 % (row)	Total number of children under 6 screened	Estimate of the number of children under 6 in Medi-Cal	Estimate of the number of children under 6
Humboldt	1,686	92.33%	140	7.67%	1,826	5,359	8,387
Mendocino	967	96.03%	40	3.97%	1,007	Cannot estimate	6,603
Nevada	270	96.09%	11	3.91%	281	Cannot estimate	4,776
El Dorado	521	96.13%	21	3.87%	542	2,968	9,560
Sacramento	14,490	96.27%	561	3.73%	15,051	56,050	118,765
Solano	4,470	97.05%	136	2.95%	4,606	14,188	32,701
Yolo	2,221	97.28%	62	2.72%	2,283	5,624	14,183
Kings	2,194	97.29%	61	2.71%	2,255	5,772	14,020
Fresno	15,221	97.53%	386	2.47%	15,607	59,131	90,338
Alameda	15,945	97.78%	362	2.22%	16,307	32,969	107,004
Pasadena	1,346	97.89%	29	2.11%	1,375	Cannot estimate	10,264
Santa Cruz	2,214	97.96%	46	2.04%	2,260	8,759	17,250
Shasta	534	97.98%	11	2.02%	545	6,961	12,595
San Mateo	5,938	98.04%	119	1.96%	6,057	12,519	52,353
Tulare	5,711	98.04%	114	1.96%	5,825	25,409	43,640
Suppressed jurisdictions	4,539	98.14%	86	1.86%	4,625	Cannot estimate	39,237
Merced	3,706	98.15%	70	1.85%	3,776	18,572	25,692
Monterey	7,354	98.20%	135	1.80%	7,489	Cannot estimate	37,482
Kern	16,998	98.20%	312	1.80%	17,310	49,515	81,996
Stanislaus	7,448	98.22%	135	1.78%	7,583	25,873	46,011
Berkeley	616	98.25%	11	1.75%	627	Cannot estimate	8,477



Imperial	4,447	98.28%	78	1.72%	4,525	11,271	18,886
San Francisco	8,073	98.28%	141	1.72%	8,214	12,724	51,719
Sutter	1,188	98.34%	20	1.66%	1,208	Cannot estimate	8,125
Madera	3,898	98.38%	64	1.62%	3,962	9,550	13,170
Contra Costa	7,062	98.48%	109	1.52%	7,171	25,272	75,481
Santa Clara	18,542	98.53%	277	1.47%	18,819	40,116	141,833
San Joaquin	10,426	98.56%	152	1.44%	10,578	33,027	60,278
Santa Barbara	4,499	98.60%	64	1.40%	4,563	17,600	33,325
San Diego	38,639	98.63%	537	1.37%	39,176	87,710	254,756
Los Angeles	140,141	98.67%	1,882	1.33%	142,023	352,592	686,779
Sonoma	2,782	98.90%	31	1.10%	2,813	11,596	28,089
Tehama	1,550	98.92%	17	1.08%	1,567	Cannot estimate	4,918
Orange	32,094	98.98%	332	1.02%	32,426	94,529	231,137
Placer	987	99.00%	10	1.00%	997	5,456	23,106
San Luis Obispo	1,279	99.07%	12	0.93%	1,291	5,682	15,494
Butte	1,817	99.07%	17	0.93%	1,834	8,034	14,930
Napa	893	99.11%	8	0.89%	901	3,419	8,781
Marin	1,690	99.12%	15	0.88%	1,705	3,858	13,667
Long Beach	5,689	99.18%	47	0.82%	5,736	Cannot estimate	34,021
San Bernardino	32,832	99.24%	251	0.76%	33,083	100,739	180,438
Ventura	7,009	99.31%	49	0.69%	7,058	25,537	61,179
Riverside	33,866	99.47%	180	0.53%	34,046	91,722	181,235
CLPPB (including unknown jurisdictions)	21	100.00%	0	0.00%	21	Cannot estimate	Cannot estimate
California Totals	473,813	98.52%	7,141	1.48%	480,954	1,354,097	2,922,681

## Notes for BLL data:

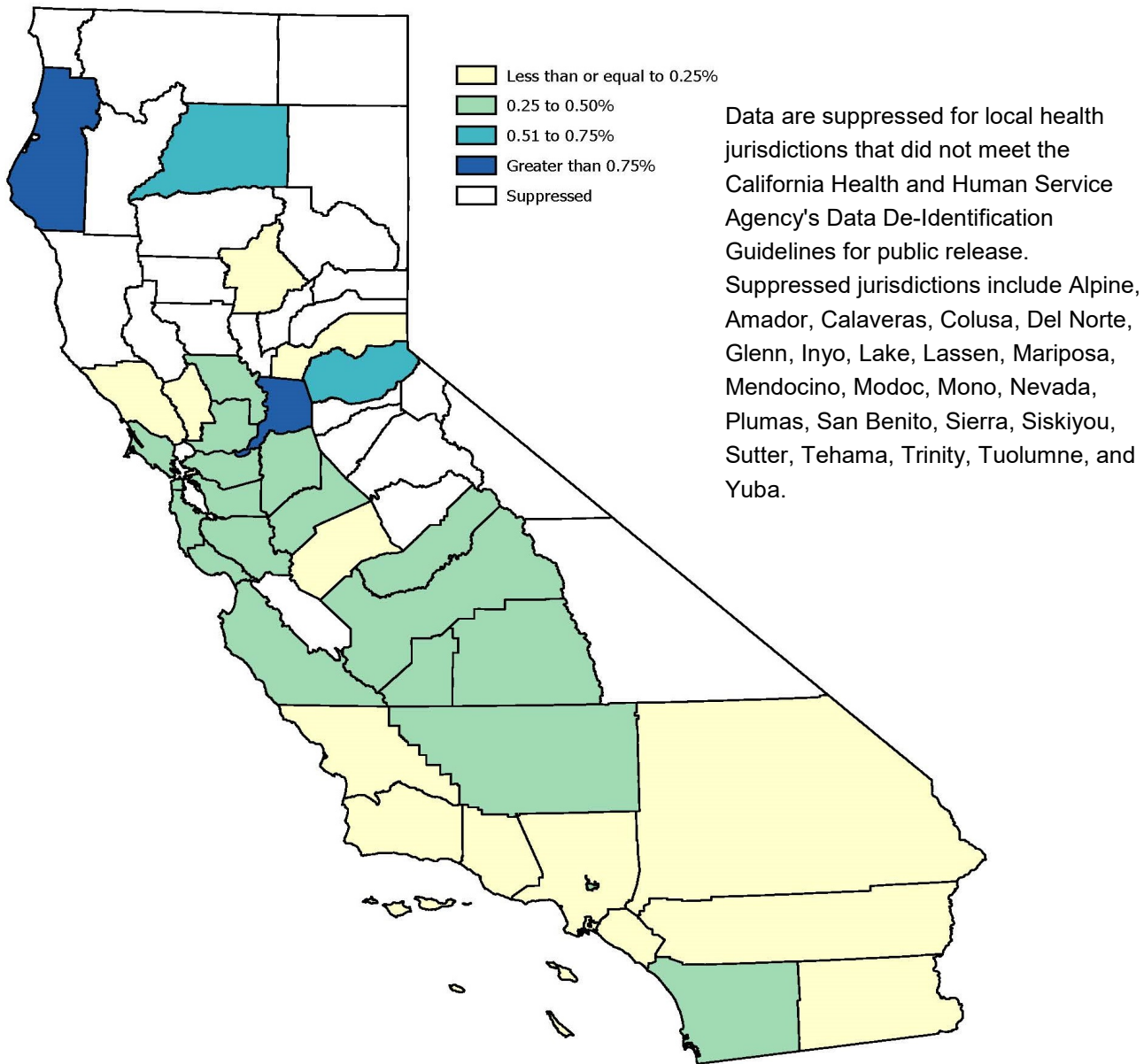
- Data are from the RASSCLE surveillance database archive of 4/3/2019. Analysis was completed on 12/11/2019.
- Each individual is counted only once, using their highest BLL during 2018.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.

- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “<5 mcg/dL” are included in the category “BLL <4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child’s jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by geocoding the address associated with the child’s highest BLL and spatially joining it to a jurisdiction boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency’s Data De-Identification Guidelines for public release. Therefore, not all jurisdictions are shown in this table.

Notes for estimates of number of children on Medi-Cal and number of children under 6 in California for 2018:

- The estimate of the number of children under 6 was based on the California Department of Finance County Population Projections by Age. We also created estimates for the following cities: Berkeley, Long Beach, and Pasadena,
- The estimate of the number of children on Medi-Cal in 2018 were based on the percentage of under 6-year-olds that are on Medicaid were based on the 2013-2017 American Community Survey (ACS; 5-Year Estimates).
- The smallest geographic areas in the available ACS data were Public Use Microdata Areas (PUMAs). Since PUMAs must contain at least 100,000 people, some counties are grouped together in one PUMA. Therefore, we do not have estimates for several individual counties. We did not try to create estimates for the following cities: Berkeley, Long Beach, and Pasadena.
- For some of the smaller geographies, we have less certainty of the percentage. Confidence intervals were calculated but are not shown in the table.

**Figure 2: Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2018**



- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest blood lead level (BLL) during 2018.
- Measures are in mcg/dL (micrograms per deciliter) of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL”.
- If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by using a geocoded county boundary layer i.e. the X and Y coordinates projected using Web Mercator Auxiliary Sphere 1984.
- Refer to Appendix D for data table.

**Table 3. California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, in Descending Order, 2018**

Local Health Jurisdiction	BLL < 9.5 n	BLL < 9.5 % (row)	BLL ≥9.5 n	BLL ≥9.5 % (row)	Totals
Humboldt	1,808	99.01%	18	0.99%	1,826
Sacramento	14,921	99.14%	130	0.86%	15,051
El Dorado	539	99.45%	3	0.55%	542
Shasta	542	99.45%	3	0.55%	545
Yolo	2,272	99.52%	11	0.48%	2,283
Solano	4,585	99.54%	21	0.46%	4,606
Fresno	15,541	99.58%	66	0.42%	15,607
Monterey	7,456	99.56%	33	0.44%	7,489
San Francisco	8,182	99.61%	32	0.39%	8,214
Suppressed jurisdictions	8,654	99.61%	34	0.39%	8,688
Alameda	16,245	99.62%	62	0.38%	16,307
Santa Clara	18,750	99.63%	69	0.37%	18,819
Marin	1,699	99.65%	6	0.35%	1,705
Santa Cruz	2,252	99.65%	8	0.35%	2,260
Stanislaus	7,557	99.66%	26	0.34%	7,583
Contra Costa	7,147	99.67%	24	0.33%	7,171
Kern	17,254	99.68%	56	0.32%	17,310
San Mateo	6,038	99.69%	19	0.31%	6,057
Kings	2,248	99.69%	7	0.31%	2,255
San Joaquin	10,547	99.71%	31	0.29%	10,578
Pasadena	1,371	99.71%	4	0.29%	1,375
Tulare	5,809	99.73%	16	0.27%	5,825
San Diego	39,074	99.74%	102	0.26%	39,176
Madera	3,952	99.75%	10	0.25%	3,962
Santa Barbara	4,552	99.76%	11	0.24%	4,563
San Luis Obispo	1,288	99.77%	3	0.23%	1,291
Los Angeles	141,713	99.78%	310	0.22%	142,023
Imperial	4,515	99.78%	10	0.22%	4,525
Sonoma	2,807	99.79%	6	0.21%	2,813
Placer	995	99.80%	2	0.20%	997
Orange	32,365	99.81%	61	0.19%	32,426
Long Beach	5,726	99.83%	10	0.17%	5,736
Berkeley	626	99.84%	1	0.16%	627
Ventura	7,048	99.86%	10	0.14%	7,058
Merced	3,771	99.87%	5	0.13%	3,776
San Bernardino	33,041	99.87%	42	0.13%	33,083
Napa	900	99.89%	1	0.11%	901
Butte	1,832	99.89%	2	0.11%	1,834
Riverside	34,020	99.92%	26	0.08%	34,046

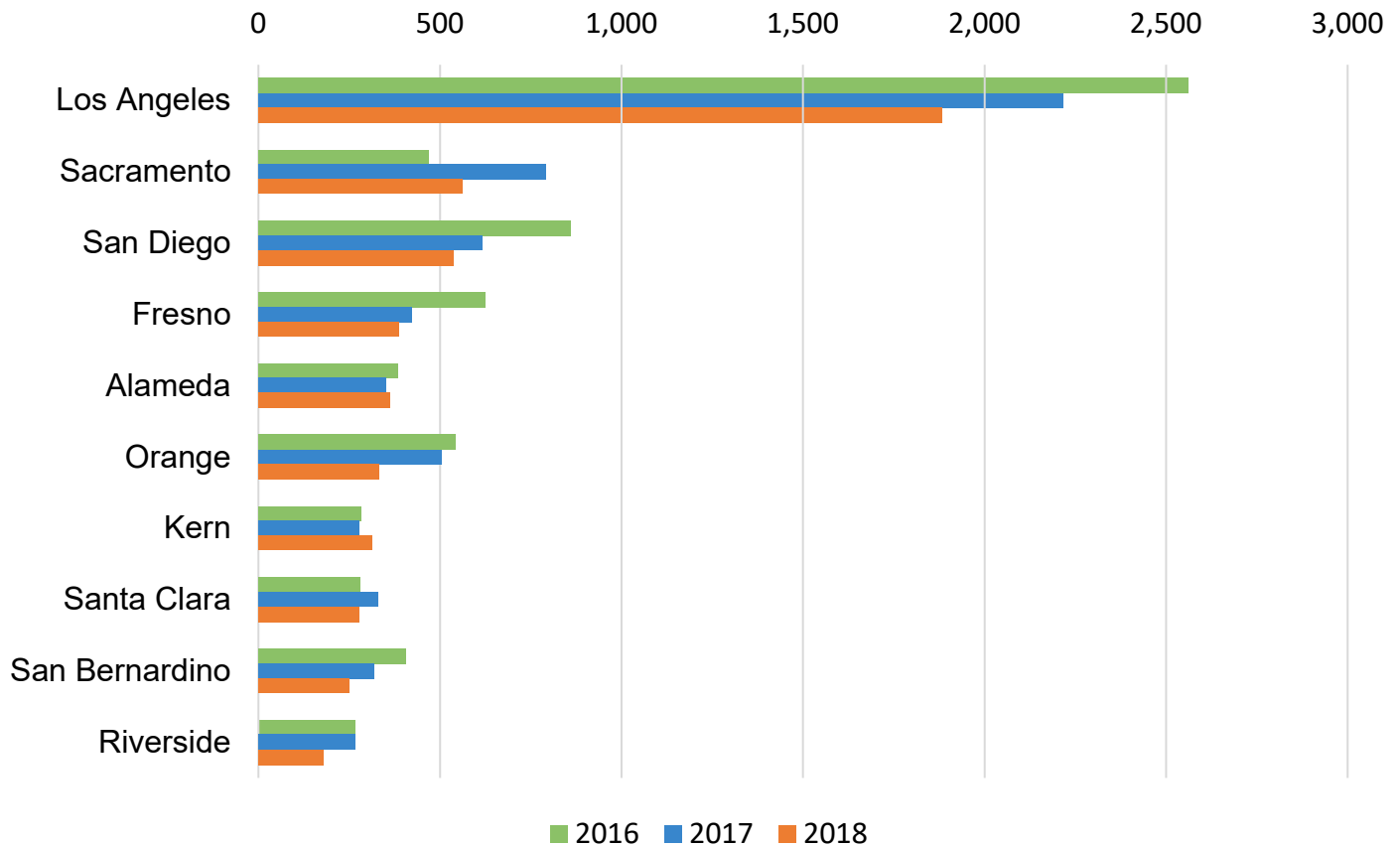
CLPPB	21	100.00%	0	0.00%	21
California Totals	479,663	99.73%	1,291	0.27%	480,954

- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest BLL during 2018.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by geocoding the address associated with the child's highest BLL and spatially joining it to a jurisdiction boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Plumas, San Benito, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne, and Yuba.

### Trends from 2016 to 2018 for Individual Jurisdictions

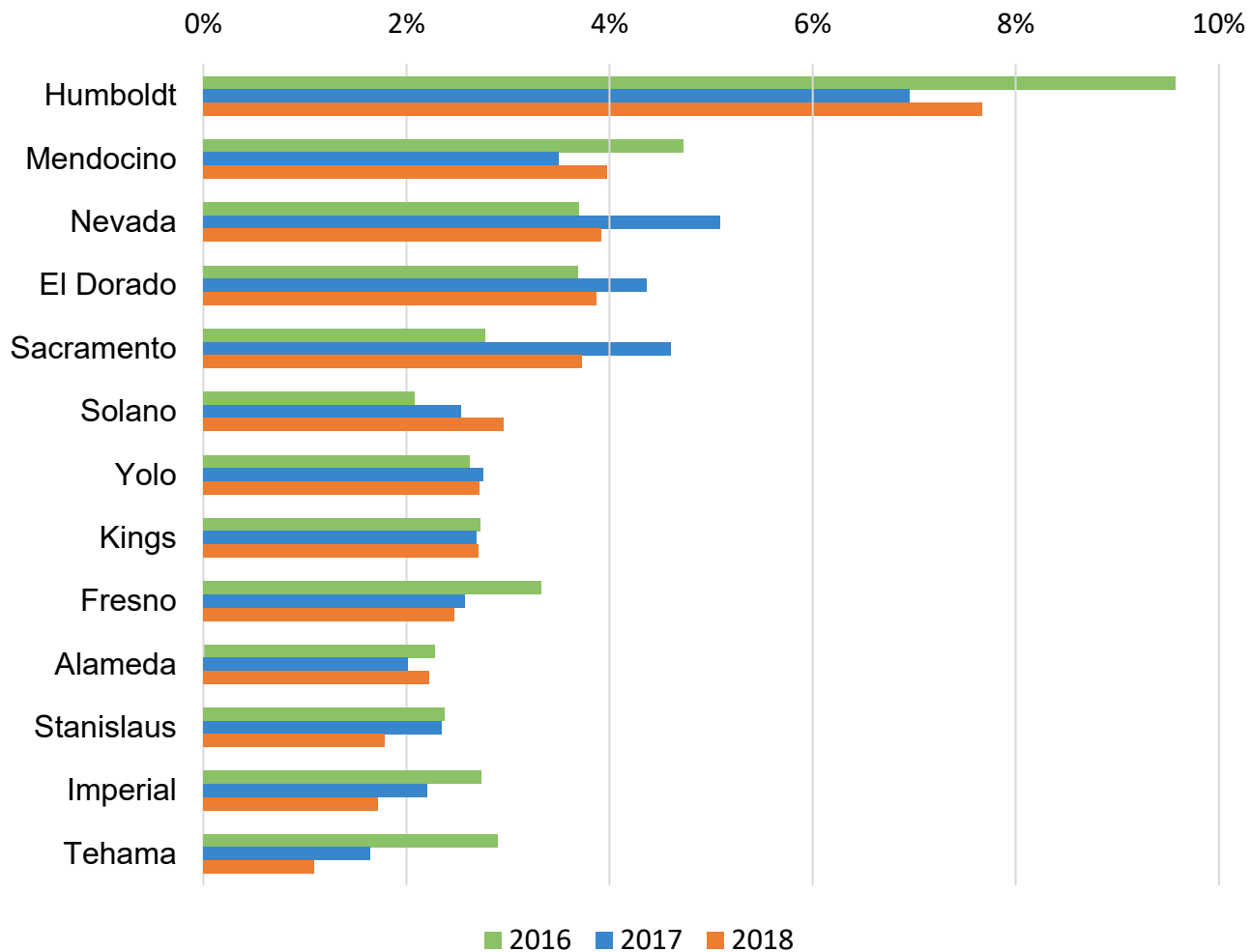
- When examining BLL trends from 2016 to 2018 by LHJ, the same ten jurisdictions had the highest number of children under 6 years old having a BLL of  $\geq 4.5$  mcg/dL (Figure 3).
- Eight of the LHJs shown have a lower number in 2018 than they did in 2016, including Los Angeles County, which has the highest number for all years.
- Figure 3 reflects raw numbers of children with BLLs that were  $\geq 4.5$  mcg/dL.
- Figure 4 displays LHJs with the highest percentage of tested children with BLLs that were  $\geq 4.5$  mcg/dL from 2016 to 2018. While Humboldt County has the highest percentage of tested children with BLLs that were  $\geq 4.5$  mcg/dL for all three years, the top ten LHJs differed for each year. In 2018, Stanislaus, Imperial, and Tehama counties had a lower percentage of tested children with BLLs  $\geq 4.5$  mcg/dL when compared in previous years. Five other LHJs also had a lower percentage in 2018 than they did in 2016, including Humboldt County.

**Figure 3. Number of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, by Top California Local Health Jurisdiction (Top 10 from any Year 2016 to 2018), in Descending Order, 2018**



- Data for 2016 and 2017 are from the RASSCLE surveillance database archive of 1/3/2019. Data for 2018 are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once per year, using their highest BLL.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”

**Figure 4. Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, by Top California Local Health Jurisdiction (Top 10 from any Year 2016 to 2018), in Descending Order, 2018**

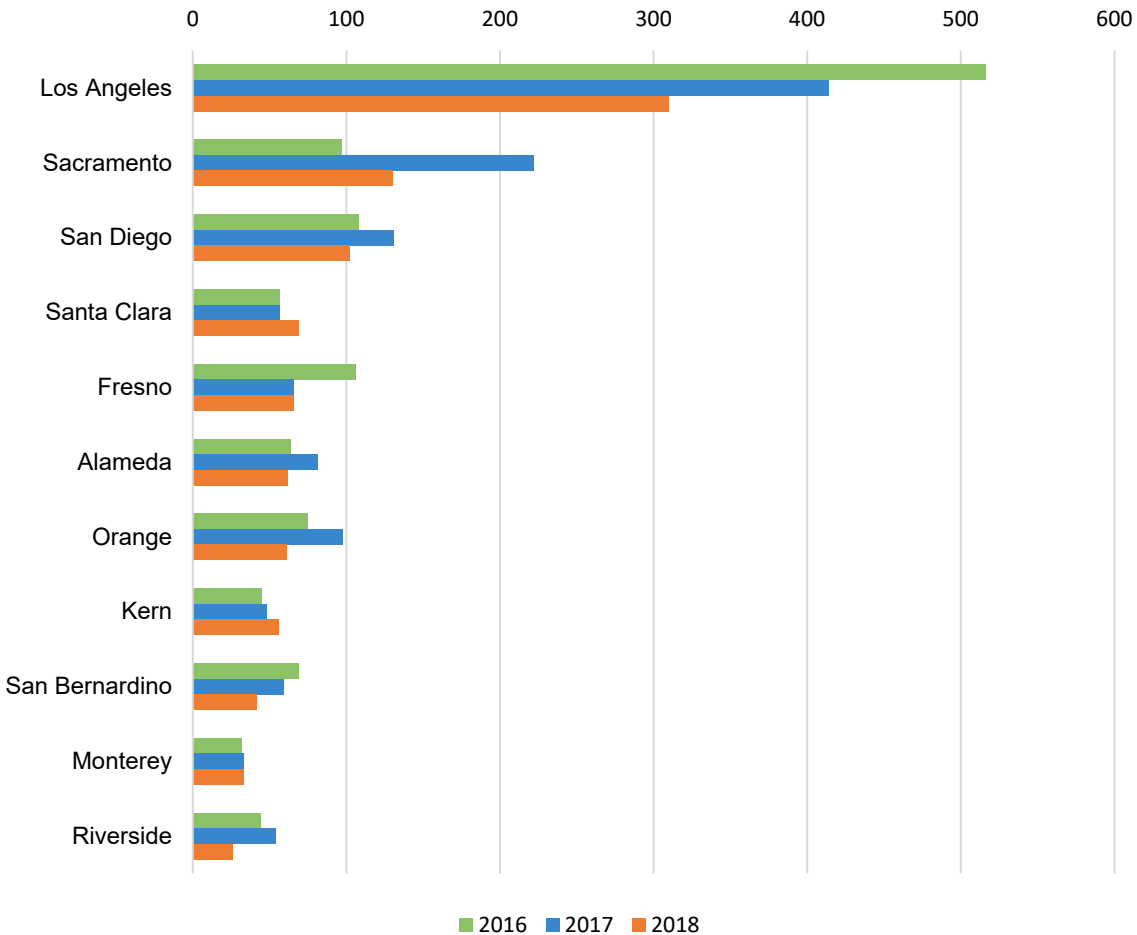


- Data for 2016 and 2017 are from the RASSCLE surveillance database archive of 1/3/2019. Data for 2018 are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once per year, using their highest BLL.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”

Similar trends for the number and percentage of tested children with BLLs  $\geq 4.5$  mcg/dL are seen for the number and percentage of tested children with BLLs that were  $\geq 9.5$  mcg/dL. Los Angeles County had the highest number of BLLs  $\geq 9.5$  mcg/dL for all years and was also one of the seven jurisdictions that had a lower number of BLLs  $\geq 9.5$  mcg/dL in 2018 (Figure 5). Figure 6 shows the percent of BLLs that were  $\geq 9.5$  mcg/dL for the jurisdictions with the highest percentages for the years 2016 to 2018. Nine of the

jurisdictions shown have a lower percentage of BLLs  $\geq$  9.5 mcg/dL in 2018 than they did in 2016, including Humboldt County, which has the highest percentage for years 2016 and 2018.

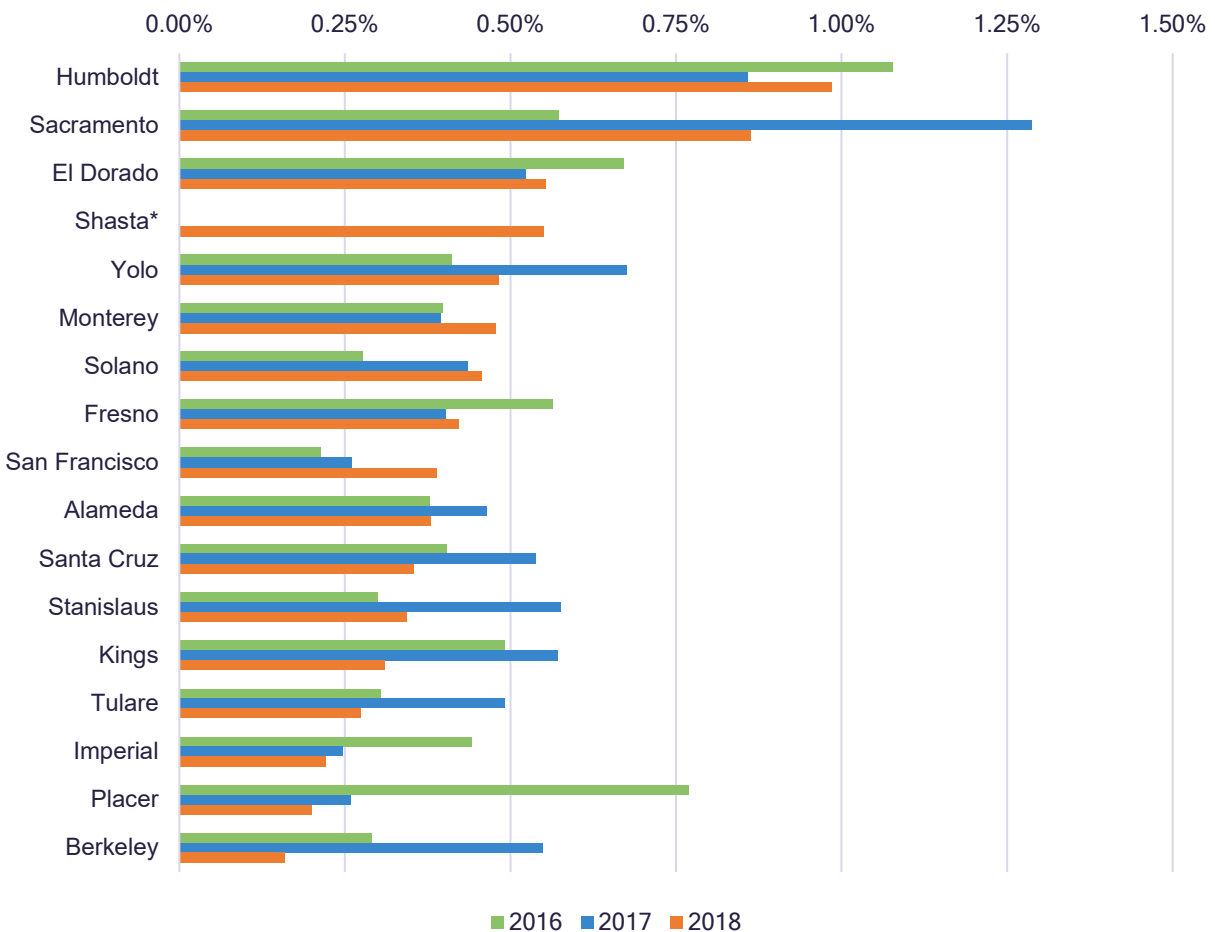
**Figure 5. Number of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, by Top California Local Health Jurisdiction (Top 10 from any Year 2016 to 2018), in Descending Order, 2018**





- Data for 2016 and 2017 are from the RASSCLE surveillance database archive of 1/3/2019. Data for 2018 are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once per year, using their highest BLL.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting.
- Results that are not submitted to the State, however, would not be included here.

**Figure 6. Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, by Top California Local Health Jurisdiction (Top 10 from any Year 2016 to 2018), in Descending Order, 2018**



\*Shasta had 0 tests greater than or equal to 9.5 mcg/dL in 2016 and 2017

- Data for 2016 and 2017 are from the RASSCLE surveillance database archive of 1/3/2019. Data for 2018 are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once per year, using their highest BLL.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting.
- Results that are not submitted to the State, however, would not be included here.

While we must suppress data for several LHJs, we have provided Table 4 and Table 5 to show the trends of percentage of children with BLLs 4.5 and 9.5 mcg/dL and greater for individual suppressed jurisdictions for 2016, 2017, and 2018. For example, the percentage of tests of 4.5 mcg/dL or greater stayed the same for 2016, 2017, and 2018 in Alpine County, increased from 2016 to 2017 as well as 2017 to 2018 in Amador County, and decreased from 2016 to 2017 and increased from 2017 to 2018 in Calaveras County.

**Table 4. Trends of Percentage of Tested Children Under Age 6 with BLLs  $\geq$  4.5mcg/dL From 2016, 2017, 2018 for Suppressed Local Health Jurisdictions**

<b>Jurisdictions that were suppressed for all three years</b>	<b>Trends* of percentage of tested children under age 6 with BLLs <math>\geq</math> 4.5mcg/dL from 2016, 2017, 2018</b>
Alpine	Same
Amador	Increase
Calaveras	Decrease then increase
Colusa	Increase then decrease
Del Norte	Decrease
Glenn	Increase then decrease
Inyo	Decrease
Lake	Decrease
Lassen	Decrease
Mariposa	Increase
Modoc	Decrease
Mono	Decrease
Plumas	Decrease then increase
Sierra	Decrease
Siskiyou	Increase then decrease
Trinity	Increase then decrease
Tuolumne	Decrease then increase
<p>* "Same" means that the percentage of tested children with BLLs <math>\geq</math> 4.5mcg/dL stayed the same from 2016-2018.            "Increase" means that the percentage of tested children with BLLs <math>\geq</math> 4.5mcg/dL increased every year from 2016-2018.            "Decrease" means that the percentage of tested children with BLLs <math>\geq</math> 4.5mcg/dL decreased every year from 2016-2018.            "Decrease then increase" means the percentage of tested children with BLLs <math>\geq</math> 4.5mcg/dL decreased from 2016 to 2017 but then increased from 2017 to 2018.            "Increase then decrease" means the percentage of tested children with BLLs <math>\geq</math> 4.5mcg/dL increased from 2016 to 2017 but then decreased from 2017 to 2018.</p>	

**Table 5. Trends of the Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater from 2016, 2017, 2018 for Suppressed California Local Health Jurisdictions**

<b>Jurisdictions that were suppressed for all three years</b>	<b>Trends* of percentage of tested children under age 6 with BLLs <math>\geq</math> 9.5mcg/dL from 2016, 2017, 2018</b>
Alpine	Same
Amador	Increase
Calaveras	Increase
Colusa	Increase
Del Norte	Decrease
Glenn	Increase then decrease
Inyo	Same
Lake	Decrease then increase
Lassen	Increase then decrease
Mariposa	Same
Mendocino	Decrease
Modoc	Decrease
Mono	Increase then decrease
Nevada	Increase then decrease
Plumas	Increase
San Benito	Decrease
Sierra	Same
Siskiyou	Decrease
Sutter	Increase then decrease
Tehama	Decrease
Trinity	Increase
Tuolumne	Increase then decrease
Yuba	Decrease then increase

\* "Same" means that the percentage of tested children with BLLs  $\geq$  4.5mcg/dL stayed the same from 2016-2018.

"Increase" means that the percentage of tested children with BLLs  $\geq$  4.5mcg/dL increased every year from 2016-2018.

"Decrease" means that the percentage of tested children with BLLs  $\geq$  4.5mcg/dL decreased every year from 2016-2018.

"Decrease then increase" means the percentage of tested children with BLLs  $\geq$  4.5mcg/dL decreased from 2016 to 2017 but then increased from 2017 to 2018.

"Increase then decrease" means the percentage of tested children with BLLs  $\geq$  4.5mcg/dL increased from 2016 to 2017 but then decreased from 2017 to 2018.

## Disparities by Jurisdiction

When examining all LHJs by year, CDPH continues to see disparities by jurisdiction in the percentage of tested children with elevated BLLs (Table 6). Interestingly, the range of percentage of tested young children under 6-years-old with BLLs  $\geq 4.5$  mcg/dL decreases from 2016 to 2017 but then increases for 2018. The opposite trend is seen for the variation in the percentage of tested children with BLLs  $\geq 9.5$  mcg/dL. The range increases from 2016 and 2017 and then decreases for 2018. However, the number of LHJs in which  $\geq 2.5\%$  of tested children had BLLs  $\geq 4.5$  mcg/dL is decreasing. Note that the total number of LHJs varies between years because of data suppression.

**Table 6: Comparison of elevated BLLs by local health jurisdiction by Year**

Comparisons	2016	2017	2018
Range in percentage of tested young children (< 6 years old) with EBLLs ( $\geq 4.5$ mcg/dL)	0.70% - 9.58%	0.56% - 6.95%	0.53% - 7.67%
Range in percentage of tested children with BLLs $\geq 9.5$ mcg/dL	0.08% - 0.99%	0.0% to 1.29%	0.0% -1.08%
Number of jurisdictions in which $\geq 2.5\%$ of tested children had BLLs $\geq 4.5$ mcg/dL	12 of 45 jurisdictions	9 of 44 jurisdictions	8 of 42 jurisdictions

## Smaller Geographic Area Analysis Unsuppressed ZIP Codes and Census Tracts, 2018

For reported BLL results for children < 6 years old tested in 2018, ArcGIS geocoding software was used to assign test results to postal ZIP codes and determine the percentage of reported test results in the ZIP codes that were  $\geq 4.5$  mcg/dL. The CHHS DDGs were then applied to the results for each ZIP code to determine whether findings could be reported. BLL results for children < 6 years old tested in 2018 were reported to CDPH from 1,470 of California's 1,721 non-P.O. Box ZIP codes. For ZIP Codes without reported results there may be no at-risk children, no testing, or no reported results.

After applying the DDGs, data could only be reported for 107 (7.3 percent) of the 1,470 ZIP codes with reported BLLs. Data for unsuppressed ZIP codes is shown in Table 7, ranked by the percentage of reported BLLs  $\geq 4.5$  mcg/dL. Percentages range from 20.4 percent in ZIP code 95821 in the city of Sacramento to 0.45 percent in ZIP code 92335 in the city of Fontana. Because the DDG's required suppression of data for 93.5 percent of California ZIP codes with reported BLLs, this publicly reportable data is of limited use for identifying geographic areas with high percentages of children with elevated BLLs.

AB 1316 mandates reporting of census tract information to the greatest extent possible. A similar analysis was conducted to determine the percentage of children (< 6 years old) in each census tract with BLLs  $\geq 4.5$  mcg/dL. After applying the DDGs, there was no census tract for which results could be reported.

While there are limitations on the level of detail that can be publicly reported without risking identification of individual children, state and local lead programs can use this information internally to guide programmatic decision making, and to develop approaches to preventing lead exposure and identifying children with elevated BLLs.

**Table 7. Percent of Children with a Blood Lead Levels of 4.5 mcg/dL and Greater, in Descending Order, by ZIP Code, 2018**

ZIP Code	Postal District Name	Number of BLLs 4.5 or greater for children under 6	Percent of BLLs 4.5 or greater for children under 6	Total number of BLLs for children under 6
95821	Sacramento	138	20.41%	676
95608	Carmichael	52	11.40%	456
94539	Fremont	15	7.18%	209
95670	Rancho Cordova	31	6.81%	455
94538	Fremont	46	6.76%	680
90037	Los Angeles	79	6.71%	1178
94536	Fremont	43	5.47%	786
94087	Sunnyvale	23	5.35%	430

95014	Cupertino	13	4.48%	290
95350	Modesto	29	4.39%	661
90003	Los Angeles	59	4.35%	1355
90011	Los Angeles	98	4.23%	2318
92021	El Cajon	45	4.20%	1072
90006	Los Angeles	33	3.84%	859
90033	Los Angeles	29	3.66%	793
94015	Daly City	15	3.55%	422
93308	Bakersfield	26	3.34%	778
90018	Los Angeles	23	3.33%	690
95076	Watsonville	42	3.27%	1284
90044	Los Angeles	58	3.25%	1786
92020	El Cajon	38	3.18%	1194
94601	Oakland	31	3.13%	989
92570	Perris	33	3.13%	1054
92701	Santa Ana	33	3.08%	1071
95823	Sacramento	36	2.95%	1219
94533	Fairfield	30	2.92%	1026
92126	San Diego	15	2.88%	520
92410	San Bernardino	32	2.73%	1172
95051	Santa Clara	18	2.71%	664
92571	Perris	28	2.70%	1036
93230	Hanford	22	2.69%	817
90019	Los Angeles	19	2.66%	713
90034	Los Angeles	12	2.65%	453
94110	San Francisco	14	2.64%	530
90255	Huntington Park	37	2.61%	1416
95355	Modesto	13	2.59%	502
95035	Milpitas	20	2.55%	783
90001	Los Angeles	34	2.55%	1333
93638	Madera	40	2.51%	1593
94587	Union City	16	2.45%	653
92069	San Marcos	15	2.38%	631
90063	Los Angeles	19	2.23%	851
90002	Los Angeles	27	2.22%	1218
93304	Bakersfield	22	2.20%	999
92243	El Centro	29	2.19%	1322
90026	Los Angeles	15	2.12%	709
93458	Santa Maria	34	2.08%	1636
92703	Santa Ana	25	2.07%	1205

93307	Bakersfield	37	2.04%	1814
94541	Hayward	15	1.98%	759
90220	Compton	20	1.96%	1021
92115	San Diego	15	1.95%	769
92530	Lake Elsinore	16	1.90%	843
92707	Santa Ana	18	1.89%	953
91801	Alhambra	12	1.86%	644
93274	Tulare	14	1.86%	752
91950	National City	22	1.86%	1185
93905	Salinas	31	1.85%	1680
91732	El Monte	19	1.83%	1036
90022	Los Angeles	18	1.83%	986
91770	Rosemead	18	1.82%	991
95376	Tracy	11	1.79%	613
92627	Costa Mesa	11	1.76%	626
93722	Fresno	16	1.74%	921
91343	North Hills	14	1.73%	807
92509	Riverside	22	1.71%	1284
90201	Bell Gardens	30	1.67%	1793
90813	Long Beach	15	1.67%	898
92114	San Diego	19	1.66%	1145
93257	Porterville	16	1.66%	966
90042	Los Angeles	11	1.63%	676
91352	Sun Valley	11	1.62%	677
94806	San Pablo	12	1.62%	741
93030	Oxnard	12	1.61%	747
95206	Stockton	23	1.57%	1469
93906	Salinas	20	1.56%	1281
90004	Los Angeles	11	1.53%	721
92704	Santa Ana	20	1.51%	1328
91706	Baldwin Park	17	1.49%	1144
92801	Anaheim	14	1.48%	944
92113	San Diego	19	1.42%	1334
92683	Westminster	13	1.42%	914
90221	Compton	17	1.39%	1226
94544	Hayward	12	1.28%	941
91977	Spring Valley	11	1.27%	864
92404	San Bernardino	16	1.25%	1277
91402	Panorama City	14	1.24%	1131
92805	Anaheim	15	1.22%	1228



94565	Pittsburg	13	1.22%	1065
92324	Colton	11	1.16%	946
93306	Bakersfield	13	1.14%	1138
90280	South Gate	19	1.14%	1673
93309	Bakersfield	11	1.13%	972
93033	Oxnard	14	1.10%	1271
92154	San Diego	15	1.07%	1403
91744	La Puente	14	1.04%	1342
91766	Pomona	12	1.02%	1178
92105	San Diego	14	1.00%	1394
91910	Chula Vista	12	1.00%	1201
90262	Lynwood	13	0.97%	1343
91911	Chula Vista	15	0.95%	1572
93727	Fresno	12	0.94%	1280
92804	Anaheim	12	0.89%	1352
93535	Lancaster	12	0.83%	1449
91331	Pacoima	13	0.78%	1675
90650	Norwalk	9	0.56%	1601
92335	Fontana	9	0.45%	2020

- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest BLL during 2018.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”
- Patient ZIP code is determined by geocoding the address associated with the child’s highest BLL and spatially joining it to a ZIP code boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
- Data are suppressed for ZIP codes that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency’s Data De-Identification Guidelines for public release. Therefore, not all ZIP codes are shown in this table.

### 3) Targeted Screening to Identify Children with Lead Exposure: Screening of Medi-Cal Population

CDPH and DHCS are collaborating to assess screening rates of children who are enrolled in Medi-Cal. Data relevant to assessing BLL screening rates among children enrolled in Medi-Cal are available in data repositories managed by CDPH and DHCS. Each system separately offers an incomplete picture of screening rates. The data from both departments create a more complete view of blood lead screening in children under the age of 6 years old, who receive Medi-Cal services than could be obtained

using either department's data alone.

CDPH and DHCS recently conducted a cohort analysis of children enrolled in Medi-Cal. By combining lab data from CDPH and enrollment and billing/claims data from DHCS, it was determined that among children who turned 3 years old in FFY 2016, and were enrolled in Medi-Cal at some time before their third birthday, 65 percent had a blood lead test at some point between the ages of 6 to 35 months. To understand completeness of screening for those continuously enrolled in Medical, CDPH and DHCS also ran an analysis restricted to children who turned 3 years old in FFY 2016 and had been enrolled in Medi-Cal continuously (since they were 6 months old). In this cohort the percentage of children screened increased to 72.6 percent. (Appendix F.)

There are a number of reasons a BLL screening test may not be found in either the CDPH or DHCS lab and administrative data. Limitations in capacity to match data from CDPH and DHCS databases may lead to a conclusion that a child did not receive testing. BLL testing before a child was enrolled in Medi-Cal or lived in another state may only be documented in the patient's medical record and not available to DHCS or CDPH. Additionally, providers may have ordered a BLL test, but parents may not have taken the child to a laboratory to receive the test. CDPH and DHCS are continuing collaboration to improve capacity to assess and improve information.

CDPH and DHCS continue to work to improve data collection methods to identify children who have and have not been tested, assessing the degree to which Medi-Cal beneficiaries received appropriate follow-up testing when their blood lead test indicated that they had elevated BLLs, and, assessing how many Medi-Cal beneficiaries receive two screenings (at 12 and 24 months), as mandated by both California regulations and the federal Medicaid program.

#### **4) CDPH Outreach to Health Care Providers to Increase Screening**

CDPH provides extensive outreach to health care providers about sources of lead, the effects of lead exposure on the developing child, and state requirements for anticipatory guidance about lead and blood lead testing. This outreach is conducted by the state CLPPB and by the state-supported, local CLPPPs throughout the state.

To encourage medical provider compliance with mandated screening, a CLPPB public health medical officer provides in-person presentations to physicians and other providers throughout California. These presentations provide information on the effects of lead, lead screening and management of lead-exposed children, and inform health care providers about state regulations regarding childhood blood lead testing. The presentations are given at meetings, conferences, in medical offices, to medical residency programs, and to hospital and clinic staff at department- and hospital-wide presentations throughout the state.

From 2016 to 2018, these presentations were attended by over 2,000 medical providers

including physicians, mid-level practitioners, and other health care professionals. Written comments from attendees about how their current practice would change in response to the training included: “Will make sure to check screening lead levels at 12 and 24 months and also to check if new patients have never been screened”; “Emphasis on increased counseling and education”; “Awareness of cultural and environmental exposures”; and “Knowledge of at-risk activities.” A free continuing medical education course that is similar to the in-person presentations was also available on the CLPPB website.

CDPH provides guidance documents for health care providers including:

- Standards of Care Guidelines on Childhood Lead Poisoning for California Health Care Providers (screening regulations)
- Potential Sources of Lead (information on lead exposure risks)
- Health Assessment Guidelines on childhood lead poisoning for health care providers (jointly issued by CDPH and DHCS)
- California Management Guidelines on Childhood Lead Poisoning for Health Care Providers (summary handout of Health Assessment Guidelines)
- Blood Lead Testing Guidance.

These documents are available as both laminated handouts and printable documents as posted on the [health care provider section of the CDPH website](#). These documents are also mailed to health care providers throughout the state, and distributed at outreach presentations, conferences, and clinic and medical office outreach visits.

Publications and articles regarding childhood lead poisoning prevention and blood lead testing requirements are published in the California Medical Board Newsletter. The Fall 2016 California Medical Board Newsletter included an article by CDPH titled “CDPH Expands Services to Children Exposed to Lead,” which notified physicians that CDPH had lowered the BLL at which children are eligible for full case management.

The Summer 2017 California Medical Board Newsletter included CDPH-submitted information informing providers of a US Food and Drug Administration (FDA) Recall of Magellan Diagnostics’ Lead Care® Analyzers, which included information about retesting recommendations for affected patients. Providers were also notified of the recall electronically by the CDC and the FDA.

An article titled “Updates on the Childhood Lead Poisoning Prevention Program” was submitted by CDPH for inclusion in the next California Medical Board Newsletter. The article provides information for California physicians regarding childhood lead poisoning prevention, screening and management including mandated requirements, information updates, and resources. The article also notifies physicians of an updated version of “Standard of Care Guidelines on Childhood Lead Poisoning for California Health Care Providers” and “Potential Sources of Lead: Educating Families to Prevent Childhood Lead Exposure,” which incorporate recent legislative changes. [Outreach materials](#) for families are available on the CDPH website and print versions

are also available free of charge to health care providers. The materials are produced in Spanish, English, and 18 additional languages.

Public health nurses (PHNs) in local contracted CLPPPs provide direct outreach to medical providers by performing:

- Chart Reviews
- Fingerstick Trainings
- Trainings/Presentations for providers
- Trainings/Presentations for other medical professionals (Registered Nurses, PHNs, nursing students) and office staff
- Providing materials to provider offices for patients
- Mailings, phone calls
- Electronic dissemination of CDPH newsletters
- Online surveys to gauge provider testing levels
- Email blasts

From January 1, 2016, through December 2018, approximately 4,700 CLPPP medical provider office visits and presentations were conducted.

When evaluating the impact of office visits and presentations, medical office staff regularly scored 90-100 percent in post-tests, indicating a high degree of retained knowledge following trainings.

CDPH will continue to develop and improve educational materials, outreach methods, resources, curriculum and guidelines incorporating new scientific findings; information related to California lead sources, risk factors, and data; and national recommendations. Feedback collected from medical providers following in-person and on-line presentations will be used to tailor the information to meet the needs of medical providers and ensure effective outreach.

## **5) Family and Community Outreach on Lead Poisoning Screening and Prevention**

Primary prevention activities include participation in health fairs, educational mailings, presentations, newsletters, bus advertisements, and social media outreach. The CLPP Program expands the reach of its prevention work through partnerships with other state programs. CLPPB has more than 25 educational materials available that provide information about a variety of lead sources and recommendations for preventing lead exposure. All materials are available in English and Spanish, and many are available in 18 additional languages. These materials are located on the CLPPB website.

Between January 1, 2016, and December 31, 2018, approximately 9,000 community

outreach activities were performed by CLPPB and local CLPPPs. These activities reached an estimated 1.2 million families and individuals. During the same time period, targeted lead-related training and education outreach activities reached an estimated 32,000 childcare providers.

CDPH has updated local CLPPPs scope of work requirements for fiscal years 2020-23 to require evaluation of outreach activities for purposes of demonstrating effectiveness. CDPH will review local CLPPPs evaluation results and assess whether outreach activities are effective in reducing the number of children exposed to lead.

## 6) Case Management Services

Direct services to children with elevated BLLs are provided by 50 local CLPPPs in 47 counties and 3 cities that contract with CDPH CLPPB for funding. CLPPB is responsible for PHN and environmental investigations and services in 11 non-contracted jurisdictions. Non-contracted jurisdictions may collaborate with CLPPB on individual CLPP activities, such as providing some assistance with PHN services or environmental investigations, but do not choose to formally contract. The CLPPB additionally currently provides environmental services in 18 contracted jurisdictions that do not have Environmental Professionals (EP) trained to investigate the homes of lead-poisoned children. These services are free to the families regardless of Medicaid or insurance status.

### Basic Case Management

Children with BLLs  $\geq 4.5$  mcg/dL receive, at a minimum, monitoring, outreach and education, and actions to encourage appropriate venous retesting (such as provider reminder letters). Services may also include other graded responses such as visits by community workers and modified home inspections, up to and including public health nursing and environmental investigation, as resources allow.

Information about the number of children with BLLs  $\geq 4.5$  mcg/dL receiving CLPP Program services (CLPPB and local contracted CLPPPs) provided during 2016, 2017, and 2018, is based on CLPPPs self-reporting in semi-annual progress reports. For counties without CLPPPs, data was obtained from CLPPB records.

- In 2016, services were reported for 6,463 children with elevated BLLs below full case-making criteria.
- In 2017, services were reported for 9,354 children with elevated BLLs below full case-making criteria.
- In 2018, services were reported for 7,428 children with elevated BLLs below full case-making criteria.

## Full Case Management: Public Health Nurse Services

The PHN performs a home visit, which includes collecting information to assess and manage the case, identifying other at-risk children and family members, assessing the risk of take-home lead exposure, nutritional assessment and provision of nutritional information, educating the family and providing educational materials for future reference. A developmental screening of the child is also included in most jurisdictions. The PHN also tests or gathers samples of personal property for laboratory testing for lead and advises the family of steps to take to eliminate any suspected sources of lead. The PHN makes health care, housing and social services referrals as indicated, and maintains contact with the family and the child's primary care provider (PCP) to monitor BLLs, ensure repeat BLL testing occurs, and to provide additional services and follow up as needed. Repeat home visits and secondary address investigations are provided when indicated. The PHN coordinates with the PCP and family to plan for developmental needs during case management and long-term developmental follow up after case closure. Children receive PHN follow up until the BLL has declined and remains below 4.5 mcg/dL.

The following information is based on CLPPPs self-reporting in semi-annual progress reports. For counties without CLPPPs, PHN home visit data was obtained from other records and data from CLPPB.

**Table 8. Number of Children Eligible for and Receiving Full Case Management Services from a PHN, 2016, 2017, 2018**

Year	New Full Cases Identified	Number and Percent of Full Cases (%) Receiving Public Health Nurse Home Visits	Explanation
2016	440	418 (95%)	Of the 22 full cases that did not receive services: 10 families persistently refused services, 1 individual age 18–20 persistently refused services, and 11 families had left the United States or could not be located.
2017	605	579 (96%)	Of the 26 full cases that did not receive services: 12 families persistently refused services, 5 individuals age 18–20 persistently refused services, and 9 families had left the United States or could not be located.
2018	488	462 (95%)	Of the 26 full cases that did not receive services: 14 families persistently refused services, 3 individuals age 18–20 persistently refused services, and 9 families had left the United States or could not be located.

- More full cases were identified in 2017 than in 2016 because of the change in case definition on July 1, 2016.

- The drop in new full cases identified in 2018 is part of a general trend of decreasing numbers of children with elevated BLLs, which is one of the goals of the program.
- Percentages of children receiving home visits were similar in 2016, 2017, and 2018.

## Full Case Management: Environmental Investigations

Every child meeting the full case definition is eligible to receive both PHN case management services and an environmental investigation (EI) by an environmental professional (EP). During an EI, the EP assesses the child's environment for lead exposure sources in paint, dust, soil, and water, and documents the results. The investigation focuses on areas the child frequents or may access and includes both interior and exterior sampling. Tenants are immediately advised of short-term steps they can take to reduce exposure to a hazard until long-term remediation is implemented. Identifying environmental lead hazards associated with the property is the EP's primary responsibility during an EI. In addition, the EP may assist the PHN to identify suspect non-housing items and may submit these items for laboratory analysis.

The following information about the number of EIs performed during 2016, 2017 and 2018 is based on data reported by CLPPPs in semi-annual progress reports. For counties without CLPPPs, data was drawn from records of EIs performed by the state CLPPB.

**Table 9. Number of Referrals, Environmental Investigations, and Properties with a Lead Hazard, 2016, 2017, 2018**

Year	2016	2017	2018
Number of PHN referrals for an EI	433	607	501
Number of initial EIs performed and percentage	396 (91% of referrals)	577 (95% of referrals)	473 (94 % of referrals)
Number of properties identified as having a lead hazard using criteria described on Table 9.	138	162	150

- An increase in full cases and subsequent EI referrals was noted towards the end of 2016 and through 2017, corresponding with the change in full case definition which went into effect July 1, 2016.

Factors that impact the number of EIs is fewer than the number of referrals. Sometimes a referral is received near the end of a reporting period and the EI is performed during the subsequent reporting period. Additionally, families sometimes repeatedly refuse services or do not respond after multiple contact attempts. In other instances, families moved or were out of town shortly after the referral, which delayed services. Lastly, when sibling cases are identified within 30 days of the index case, the initial EI might be counted for both children, if the sampling pattern considers both children's habits and mobility.

Factors that may contribute to the small variance in reported number of EI referrals and cases identified for PHN case management home visits. Home visits may have been reported at the end of the prior year, whereas the corresponding referral for the associated EI was not reported until the beginning of the following year. Two sibling cases who received one EI covering both children may have been reported as two identified cases for PHN home visits, but only one referral for an EI. Some families accept a PHN home visit but persistently refuse an EI, and, in some of these situations, the EI might not have been referred. Finally, there may be some barriers to data collection and reporting that we are currently working with local CLPPPs to identify.

### **Remediation of Identified Lead Hazards**

When lead hazards are identified, EPs work with property owners to remediate them expediently. Properties remain open to follow up until the property passes a clearance inspection. A successful clearance inspection includes, at a minimum, a visual inspection to verify all required work was completed properly, as well as collection and analysis of dust wipe samples.

The numbers of EI properties passing clearance inspections self-reported by CLPPPs in biannual progress reports were 92 in 2016, 123 in 2017, and 170 in 2018. Reported clearance inspections may or may not be associated with the EIs reported during the same time period.

## **7) Sources of Lead Exposure**

Media of paint, dust, and soil were categorized as lead exposure sources based on regulatory levels found in Title 17, California Code of Regulations (CCR), Sections 35001 and following. Local Jurisdictions with local regulatory levels categorized lead hazards per their statute (e.g. Los Angeles County Code Section 11.28.010). Water results were categorized as exposure sources based on the United States Environmental Protection Agency (US EPA) action level (40 Code of Federal Regulations [CFR] Section 141.80). Lastly, EPs identified lead hazards based on direct known exposure to lead-poisoned children, including media below current regulatory standards but found to be significant based on a child's specific behavior



and activity. All of these items were recorded as exposure sources at the levels found in Appendix G.

Any EI property found to have a lead hazard source must have it removed, remediated, or abated. Those properties remain open to EP follow-up until the completion of a clearance inspection. Passing a clearance inspection requires visual confirmation that lead hazards have been corrected and furthermore quantifiable evidence through dust wipes that no lead-contaminated dust remains. CDPH reviewed documentation from the corresponding EI properties in FYs 2015-16 and 2016-17 to assess how many had passed clearance inspection.

There may be a number of potential lead exposure sources identified for a child with BLLs meeting full case criteria. When multiple potential exposure sources are identified, the exact contribution of each source to the child's initial BLL cannot be verified. It is common for children to have multiple potential sources of lead exposure, and exposures may be cumulative over time.

It should be noted that the age of the housing may reflect the age of the neighborhood and the years of lead deposition in the soil from petroleum and other air lead emitters. Hundreds of thousands of metric tons of lead remain in California soil and act as a "reservoir" for dust and soil contamination in and around homes and communities.<sup>17</sup> The levels of lead in soil, paint, and house dust are all highly inter-correlated with each other and with the age of the house.

### **Distribution of Environmental Sources**

In 2018 and 2019, CLPPB undertook an analysis of the sources of exposure to lead for children who were newly identified as full cases in FY 2015-16 and FY 2016-17 who consented to full case management and environmental investigation (EI) services. This combines the PHN's information about case behavior and possible non-housing sources of lead exposure as well as EI findings regarding paint, dust, soil, and water. Complete source information is not yet available for FY 2017-18, since identifying all lead exposure sources associated with a case may take an extended period of time. Families sometimes do not share all potential exposure sources immediately and new information may be identified as case management continues. If the child's BLL is not decreasing as expected, case management may require multiple follow-up visits and investigation of secondary locations.

For the analysis of full cases for FY 2015-16, CDPH included 188 children whose full case-making BLL result was received by CDPH from July 1, 2015, to June 30, 2016.

On July 1, 2016, CDPH lowered the BLL criteria used to define a full case, resulting in an increased number of children who received case management and EI services. For the analysis of full cases for FY 2016-17, sources of exposure were

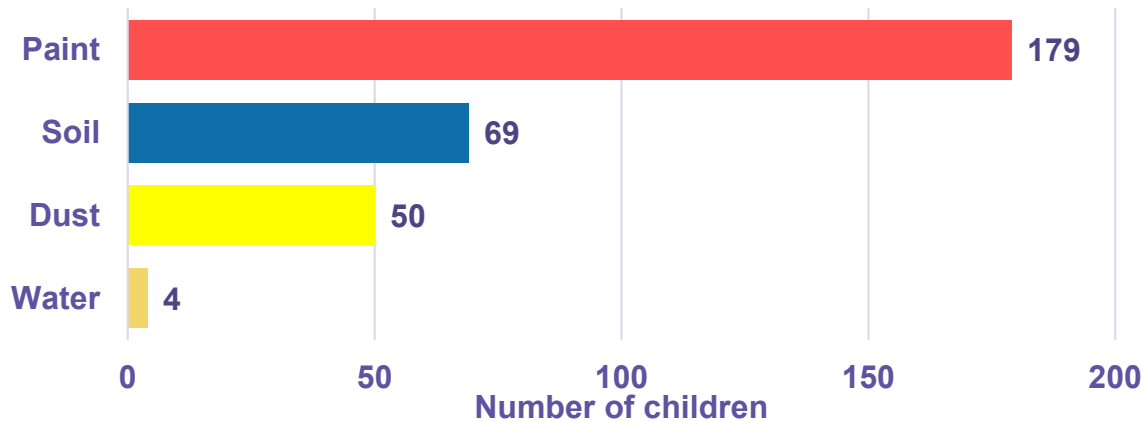
assessed in 570 children whose full case-making BLL result was received between July 1, 2016 and June 30, 2017.

CDPH reviewed EI documentation from FY 2015-16 and FY 2016-17 to identify environmental sources associated with full cases. For each investigation, CDPH recorded ranges of lead found in deteriorated paint, dust, and bare soil. Results of first and second draw water samples from kitchen sinks were also recorded, as well as water draws from other frequent drinking water locations.

Of the 188 full cases in the analysis for FY2015-2016, depending on which “actionable” levels of paint, dust, soil and water were used (Appendix H), cases for which no sources of lead exposure were found ranged from 14 children (7.5 percent) to 38 children (20.2 percent). The majority of the remaining children had exposure from paint, dust, or soil. Depending on which “actionable” levels of paint, dust, soil and water were used, the proportion of cases whose homes displayed any actionable paint, dust, soil or water ranged from a low of 58 percent, to a high of 82 percent. The distribution of environmental lead hazards from FY 2015-16 can be found in Appendix G.

Of the 570 full cases in the analysis for FY2016-17, depending on which “actionable” levels of paint, dust, soil and water were used, cases for which no sources of lead exposure were found ranged from 79 children (13.9 percent) to 142 children (24.9 percent). Depending on which “actionable” levels of paint, dust, soil and water were used, the proportion of cases whose homes displayed any actionable paint, dust, soil or water ranged from a low of 46 percent, to a high of 68 percent. The scientific validity of the regulatory “actionable” levels that influence the above-mentioned proportions have not been well established. The distribution of environmental lead hazards from FY 2016-17 is described below in Figure 7. For both FY 2015-16 and FY 2016-17, paint was the main environmental hazard identified among full cases followed by soil, dust, and water.

**Figure 7. Total Occurrences<sup>1</sup> of Environmental Lead Hazards<sup>2</sup> at Current Regulatory Levels Identified Among Full Cases, Fiscal Year 2016-17**



<sup>1</sup>A child may have more than one type of environmental lead hazard and therefore, the total occurrences of environmental lead hazards will be greater than the number of children identified with a lead hazard.

<sup>2</sup>Environmental lead hazards include:

- A paint hazard signifies the presence of deteriorated lead-based paint, tested at the state regulatory level of  $\geq 1.0$  mg/cm<sup>2</sup>. In addition, full cases were attributed to paint hazards at local regulatory levels: Los Angeles at  $\geq 0.7$  mg/cm<sup>2</sup>. (17 CCR Sections 35022, 35033, 35037; Los Angeles County Code Section 11.28.010)
- Dust is considered a hazard when it is lead-contaminated at  $\geq 40$  mcg/ft<sup>2</sup> for interior floor surfaces,  $\geq 250$  mcg/ft<sup>2</sup> for interior horizontal surfaces, and  $\geq 400$  mcg/ft<sup>2</sup> for exterior floor and exterior horizontal surfaces. (17 CCR Sections 35035, 35037)
- Soil is considered a hazard when it is lead-contaminated at  $\geq 400$  ppm in children's play areas.
- Water levels are categorized by an action level; according to the US EPA,  $\geq 0.015$  mg/L is above the action level (40 CFR Section 141.80). Four water samples above the action level were found to be potential exposure sources to lead. Follow-up steps were taken to mitigate these potential exposures and subsequent re-sampling showed non-detect levels of lead. Two additional water samples were above the action level due to sampling errors. The first error was due to the water valve being closed at the bottom of the sink. The second error was due to the water main being shut off to the residence. These errors are not indicative of potential exposure sources. Subsequent testing under normal conditions at both residences, of water standing for  $> 6$  hours, measured non-detect lead levels.

## Removal, Remediation, or Abatement of identified Sources

Of the 188 full cases in our analysis for FY 2015-2016, 87 had an environmental lead hazard identified at current regulatory levels. Of the 87 children who were identified as having a lead hazard exposure, 70 properties (80.46 percent) had their hazards removed, remediated, or abated while 17 properties (19.54 percent) are still in the process of having lead hazards removed, remediated, or abated.

Of the 570 full cases in our analysis for FY 2016-17, 196 had an environmental lead hazard identified at current regulatory levels. Of the 196 children who were identified as having a lead hazard exposure, 168 properties (85.71 percent) had their hazards removed, remediated, or abated while 28 properties (14.29 percent) are still in the process of having lead hazards removed, remediated, or abated.

CDPH discussed each pending property with local jurisdiction EPs to verify that removal, remediation, or abatement of hazards is still underway. There are many reasons why properties are still pending. For example:

- The work at some homes was completed expediently, but a clearance inspection has not yet passed due to the difficulty of cleaning very small dust particles from rough, porous, or carpeted surfaces.
- Properties have changed hands over a short period of time, which has slowed the remediation process.
- Property owner neglect or refusal to complete the work has complicated the remediation process.
- Some properties have an extensive number of hazards throughout the home, requiring extra time to properly develop abatement plans, acquire permits, and hire certified personnel to complete the work.

Each of these scenarios is unique and requires diligent work with property owners and, sometimes, use of local enforcement to ensure that work is completed safely to protect the health of children and their families.

## Distribution of Non-Housing Sources

“Non-housing sources” are sources of lead exposure other than property-associated paint, dust, soil, and water. Information about the child’s possible exposure to these sources was obtained through interviews with family members and the child’s primary care provider by EPs and PHNs providing case management services to the family. Quantitative information about possible sources of lead in the child’s environment included results available from X-Ray Fluorescence (XRF) screening performed by EPs, and results from laboratory analysis of non-housing items.

Information reported to CDPH about housing and non-housing sources was reviewed by a CDPH physician to determine whether each potential source was a probable source of lead exposure for the child. Determination of whether a potential

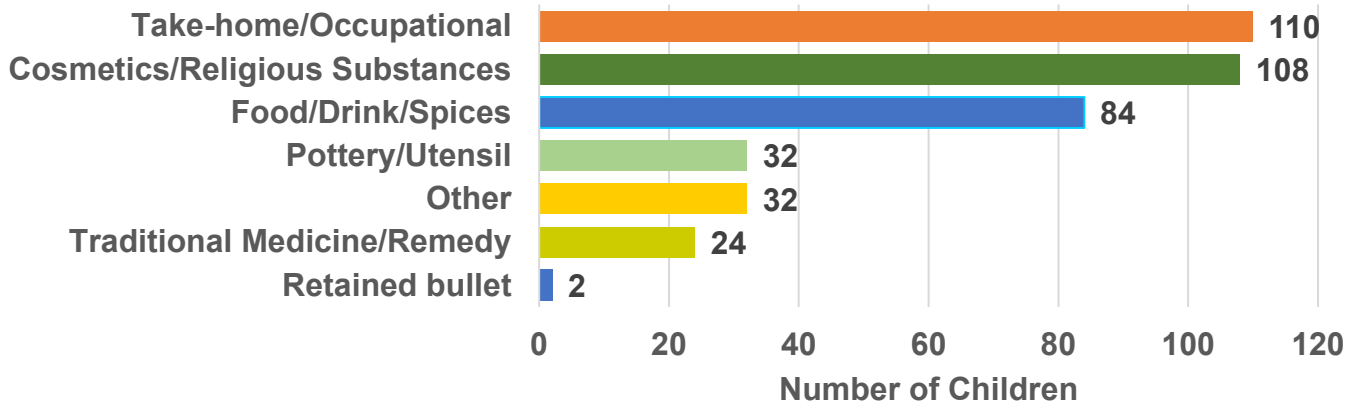
source was a probable source of lead exposure for a child was based on quantitative XRF and/or laboratory results; results of testing the item with a qualitative method (chemical test kit lead swab); amount, timing and length of the child's access to the item; and whether there is a significant history of demonstrated high lead content for a given potential source. In addition, the physician considered information about whether removal of the item from the child's environment was associated with a decline in BLL.

In FY 2015-16 and 2016-17, non-housing sources were found to be associated with 408 of the 758 full cases. The majority of the full cases with non-housing lead exposure sources also had property-associated environmental sources of lead. Table 9 shows a list of non-housing sources identified in FY 2015-16 (Appendix G) and 2016-17 (Figure 8).

For FY2015-16 and FY2016/17, the main non-housing exposure identified was take-home/occupational exposure and cosmetics/religious substances. However, the third non-housing exposure identified was pottery/utensils for FY2015-16 and food/drink/spices for FY2016-17.

<b>Table 10. Non-housing Sources Identified, Fiscal Year 2015-16 and 2016-17</b>	
<b>Category</b>	<b>Specific examples</b>
Traditional Medicine/Remedies	Azarcon, greta, ayurvedic remedy, paylooah*, traditional Chinese remedies*, other remedy
Dishware	Vintage/hand-made/imported pottery, leaded glassware, water dispenser/urn/samovar, food grinder*, other dishware.
Religious Substances/Cosmetics	Black powder (e.g., kohl, surma, tiro), sindoor, Hindu ritual powder, red dot (bindi) applied to forehead*, applied to skin, other cosmetics.
Food/Spices/Drink	Dried grasshoppers (chapulines), turmeric, other food, imported candy, other spices.
Take-home or occupational	Exposed through either personal or parental work or hobby.
Retained bullet	None
Other	Fishing weight, jewelry/charm/amulet, painted object, metal object, lead ammunition, deteriorated vinyl/plastic, game meat/fish (from leaded bullets/sinkers)*, juice/acidic liquid in leaded container*, lead batteries*, and lead solder.*
*Additional sources that have been identified in other time periods	

**Figure 8. Total Occurrences<sup>1</sup> of Non-Housing Exposures Identified, Fiscal Year 2016-17**



<sup>1</sup>A child may have more than one type of non-housing exposure and therefore the total occurrences of non-housing exposures hazards will be greater than the number of children identified with a non-housing hazard (n = 313).

## 8) Identification of Populations at Risk

CLPPB has been using multiple sources of data to improve the identification of geographic areas and populations with increased lead exposure risk, so that jurisdictions where children are likely to be at increased risk can be identified and interventions targeted. Table 10 lists the ten non-suppressed California jurisdictions with the highest percentage of young children (under age 6 years) who were tested for lead with BLLs  $\geq$  4.5 mcg/dL, in 2018. One risk indicator is increased percentages of tested children with elevated BLLs. LHJs with the highest percentage of young children enrolled in Medi-Cal, and counties with the highest percentage of young children living in old housing units (pre-1960 and pre-1980), factors considered as increasing risk for lead poisoning, are also provided. A listing of this information for all non-suppressed California jurisdictions is provided in Appendix I. Appendix J provides detailed age of housing data by jurisdiction for all California jurisdictions.

**Table 11. Top 10 California Local Health Jurisdictions with Highest Rank for Percent of Children under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or greater in 2018, Living in Pre-1960 and Pre-1980 housing, and on Medi-Cal**

% Children Under the Age of 6 with BLLs $\geq$ 4.5 mcg/dL in 2018		% Children Under the Age of 6 Living in Pre-1960 housing		% Children Under the Age of 6 Living in Pre-1980 housing		% Children Under the Age of 6 on Medi-Cal	
Humboldt	7.67%	San Francisco	70.66%	San Francisco	81.55%	Madera County	72.51%

Mendocino	3.97%	Los Angeles	47.39%	Marin	78.26%	Merced County	72.29%
Nevada	3.91%	San Mateo	44.57%	San Mateo	77.74%	Lake & Mendocino	68.39%
El Dorado	3.87%	Marin	38.21%	Los Angeles	74.24%	Fresno	65.46%
Sacramento	3.73%	Alameda	37.14%	Humboldt	68.37%	Humboldt	63.90%
Solano	2.95%	Humboldt	33.92%	Ventura	65.53%	Colusa, Glenn, Tehama & Trinity	60.95%
Yolo	2.72%	Santa Cruz	29.86%	Alameda	65.19%	Kern	60.39%
Kings	2.71%	Del Norte, Lassen, Modoc, Plumas & Siskiyou	29.47%	Santa Cruz	63.80%	Imperial	59.68%
Fresno	2.47%	Napa	26.90%	Orange	63.58%	Monterey & San Benito	58.54%
Alameda	2.22%	Contra Costa	24.19%	Santa Clara	63.52%	Tulare	58.22%

- Data are from the RASSCLE surveillance database archive of 4/3/2019. Analysis was completed on 12/11/2019.
  - Each individual is counted only once, using their highest BLL during 2018.
  - Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
  - Results later determined to be false positive and errors have been excluded.
  - All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
  - Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”
  - If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
  - Patient jurisdiction is determined by geocoding the address associated with the child's highest BLL and spatially joining it to a jurisdiction boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
  - Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. Therefore, not all jurisdictions are shown in this table.
  - In January 2012, the Centers for Disease Control and Prevention adopted a BLL of concern of 5 mcg/dL, which is based on the population of children aged 1-5 years in the United States who are in the top 2.5% of children when tested for lead in their blood.
- Notes for estimates of percentage of children living in pre-1960 housing, pre-1980 housing, and on Medi-Cal:
- The percentages of children under 6 years old who live in older housing and are on Medicaid were based on the 2013-17 American Community Survey (ACS; 5-Year Estimates).
  - The smallest geographic areas in the available ACS data were Public Use Microdata Areas (PUMAs). Since PUMAs must contain at least 100,000 people, some counties are grouped together in one PUMA. Therefore, CLPPB does not have estimates for several individual counties. CLPPB did not try to create estimates for the following cities: Berkeley, Long Beach, and Pasadena.
  - For some of the smaller geographies, CLPPB has less certainty of the percentage. Confidence intervals were calculated but are not shown in the table.

- The Census Bureau classifies all people not living in housing units (house, apartment, mobile home, rented rooms) as living in group quarters. There is no year structure built for group quarters.
- See Appendix I and J for a listing of this information for all California jurisdictions.

## Characterizing Geographic Areas and Populations at Risk for Lead Exposure

Existing law requires CDPH to develop regulations that take into account factors including but not limited to: a child's time spent in a school, home or building built before 1978, a child's proximity to industrial facilities that currently or historically emitted lead, proximity to a freeway or heavily traveled roadway, and other potential or known risk factors for lead exposure. In 2016, the American Academy of Pediatrics (AAP) recommended universal screening of children 12-24 months of age living in geographic areas where at least 25 percent of houses were built before 1960, or 5 percent or more of tested children had BLLs  $\geq 5$  mcg/dL.<sup>18</sup> Using the criteria listed above, CDPH mapped these risk indicators by ZIP code to identify ZIP codes where children might be at an increased risk for lead exposure. Some ZIP codes are not associated with residences, such as ZIP codes associated with specific post offices. In the Esri GIS layer of ZIP codes from December 2017, California had a total of 1,689 ZIP codes associated with places such as schools, homes, or buildings.

As additional lead exposure risk factors are identified by CDPH and as additional information about environmental risk indicators becomes available through research studies, literature reviews, and analysis of California-specific data, this analysis will be updated to reflect geospatial risk indicators for children exposed to lead in California. This information will be incorporated into future reports to the extent possible while protecting children's privacy. These risk factors may also be used to inform targeting of screening (blood lead testing).

As illustrated in Table 11 below, based on the AAP recommendation to screen children living in ZIP codes where more than 25 percent of homes were built before 1960, children living in 852 (50.4 percent) of the 1,689 ZIP codes would be considered at risk for lead exposure. Applying the same 25 percent criteria to homes built from 1960 through 1977, would add an additional 537 ZIP codes, bringing the cumulative number of targeted ZIP codes to 82.2 percent. While there were 99 ZIP codes meeting the AAP criteria of having at least 5 percent of children with BLLs at least 5 mcg/dL, adding this criterion only added fifteen ZIP codes to the cumulative list of ZIP codes because many of the ZIP codes had already been included based on the previous two criteria. Adding in the 264 ZIP codes where 2.5 percent of children had BLLs 4.5 mcg/dL or greater added 21 additional ZIP codes to the cumulative list. Taking into account the 840 ZIP codes within 1.7 miles of a known air emitter added an additional 145 ZIP codes to the cumulative list. Including the 1,490 ZIP codes for which a portion of the ZIP code was within 1,000 feet of a major highway added 99 ZIP codes to the cumulative list. Adding 134 ZIP codes for cities with a former smelter adds 2 ZIP codes to the cumulative risk. Adding 264 ZIP codes where a portion of the ZIP code was within 1 kilometer (km) of a small craft airport (where leaded aviation fuel [avgas]



continues to be used) did not add any ZIP codes. Adding in the 979 ZIP codes where a portion of the ZIP code is within 1 km of railroad tracks adds 5 ZIP codes to the cumulative list. All of the 84 ZIP codes that were within 1,000 feet of a speedway were already covered by previous criteria. Two hundred and sixteen ZIP codes overlapped with a water district with at least one known leaded service line or fitting, adding 1 ZIP code. Taking into account all the geospatial risk indicators listed above, a total of 99.3 percent of California ZIP codes are included (see Appendix K for ZIP code listing.)

**Table 12. Geospatial Indicators of Risk for Childhood Lead Poisoning**

Criteria <sup>2</sup>	ZIP Codes in California (December 2017) <sup>1</sup>			
	ZIP Codes <sup>3</sup>	Additional ZIP Codes <sup>4</sup>	Cumulative ZIP Codes <sup>5</sup>	Percent of ZIP Codes Covered <sup>6</sup>
AAP – 25% pre-1960 <sup>7</sup>	852	852	852	50.4%
25% pre-1978 <sup>8</sup>	1,389	537	1,389	82.2%
AAP – 5% BLLs 4.5+ <sup>9</sup>	99	15	1,404	83.1%
2.5% BLLs 4.5+ <sup>10</sup>	264	21	1,425	84.4%
1.7mi air emitter <sup>11</sup>	840	145	1,570	93.0%
1,000 feet SHN <sup>12</sup>	1,490	99	1,669	98.8%
City with a smelter <sup>13</sup>	134	2	1,671	98.8%
1km airport <sup>14</sup>	264	0	1,671	98.9%
1km railroad <sup>15</sup>	979	5	1,676	99.2%
1,000 feet speedway <sup>16</sup>	84	0	1,676	99.2%
In water district with at least one known leaded service line <sup>17</sup>	216	1	1,677	99.3%
Remaining <sup>18</sup>	--	12	1,689	100.0%
Total	--	1,689	--	--

<sup>1</sup> The ZIP code data comes from two sources. Parcel data provided in July 2018 from Digital Map Products was used to obtain the year built for each house, which was then aggregated to the ZIP code level to get the percent of housing built before a certain year. This table is then joined to Esri's shapefile of 2017 ZIP codes to be able to analyze the data spatially and join it to other geospatial risk factors. Although California has 2,589 ZIP codes (between 90001 and 96162), the list of parcel data ZIP codes is different from the Esri ZIP codes for various reasons. One reason is because parcel data ZIP codes only include ZIPs with at least one residential parcel. Another reason for the discrepancy is that some parcel data addresses specify a P.O. Box ZIP code, which Esri does not have mapped. There were 1,721 total ZIP codes in the Esri layer, but 32 ZIP codes starting with "000" represent large unpopulated government lands and are excluded from this analysis.<sup>19,20</sup>

<sup>2</sup> These criteria were compiled from existing recommendations by the American Academy of Pediatrics, mandated by the legislature (pre-1978 buildings, air emitters, highways, and smelters), and by literature (airports, railroads, speedways, lead water service lines).

<sup>3</sup> The values in this column represent the total number of ZIP codes that fall into the row's criterion. For those related to a point source, a ZIP code is counted if any part of it intersects that point source's buffer.

<sup>4</sup> The values in this column represent the additional ZIP codes that are covered beyond the criteria in the rows above. The top row is the baseline. For example, 99 of the 1,490 ZIP codes that at least partially intersected 1,000 feet of a state highway were not already represented in the five rows above.

<sup>5</sup> The values in this column represent the cumulative number of ZIP codes that are covered by that row's criterion or any criteria in the rows above. For example, 1,669 ZIP codes were covered by at least partially intersecting 1,000 feet of a state highway or meeting any of the criteria in the five rows above.

<sup>6</sup> The values in this column represent the cumulative percent of all ZIP codes that are covered by that row's criterion or any criteria above. For example, 98.8% of ZIP codes are covered by at least partially intersecting 1,000 feet of a state highway or meeting any of the criteria in the five rows above.

<sup>7</sup> The AAP recommends blood lead testing for children ages 12 to 24 months living in communities where at least 25% of the housing stock was built before 1960. A ZIP code met this criterion if at least 25% of its residential housing, based on Digital Map Product's parcel data from July 2018, was built before 1960. Residential parcels with a missing year built were excluded from these calculations.<sup>18,19,21</sup>

<sup>8</sup> To acknowledge the risk of lead hazards in houses built before 1978, the AAP criterion was repeated but using 1978 instead of 1960.

<sup>9</sup> The AAP recommends blood lead testing for children ages 12 to 24 months living in communities where at least 5% of blood lead tests are  $\geq 5$  mcg/dL. The State rounds and considers a level of 4.5 mcg/dL a 5. The blood lead data are from the RASSCLE surveillance database archive of April 3, 2019, the BLL dataset was created on April 15, 2019, and was analyzed on November 13, 2019.<sup>18,21</sup>

<sup>10</sup> The current CDC reference value for childhood blood lead is 5 mcg/dL, obtained from the 97.5<sup>th</sup> percentile of BLLs in children less than 6 years old in the two most recent NHANES surveys. Communities where more than 2.5% of children have BLLs above the reference value have a higher prevalence of childhood lead poisoning than the nation as a whole. The State rounds and considers a level of 4.5 mcg/dL a 5.<sup>10</sup>

<sup>11</sup> AB 1316 requires that the state consider a child's proximity to a facility that historically or currently emits lead. A list of sites from the EPA Toxic Release Inventory that emitted lead since 1988 (extracted on August 21, 2019) was mapped and a 1.7-mile buffer was drawn. The 1.7-mile buffer was chosen in accordance with literature on the lead contamination from two major emitters, Exide and Quemetco.<sup>22,23,24</sup>

<sup>12</sup> AB 1316 requires that the state consider a child's proximity to a freeway or heavily trafficked roadway. A layer for the California State Highway Network from a December 31, 2017 extraction from the Transportation System Network database maintained by the California Department of Transportation was used with a 1,000-foot buffer. The 1,000-foot buffer was determined based on a California Air Resources Board Technical Advisory about air pollution around freeways.<sup>25,26</sup>

<sup>13</sup> AB 1316 requires that the state consider a child's proximity to a former lead or steel smelter. A list was compiled of the location and activities of iron and steel plants, metal foundries, lead smelters, storage battery manufacturing plants, scrap metal plants, mines that may have mined lead along with zinc, iron, or copper, metal rolling, stamping and metal powder producers, brass and copper smelters, and babbitt and solder manufacturers in California. Some of the texts used were rare and required special handling. Many of the locations were not specific (only the name of the city or town was given) and in two instances, references were only found in older newspapers. Due to the lack of an address and site size for most sites, all ZIP codes within a city listed as having one of these facilities are included.

<sup>14</sup> Lead continues to be used in avgas for small-craft airplanes. A list of 185 airports where leaded fuel is recorded as being used in the Airport Data and Information Portal from the Federal Aviation Administration (extracted on September 16, 2019) were mapped and a 1 km buffer was drawn. An article by Miranda found lead soil contamination up to 1 km away from airports where planes use avgas.<sup>27,28</sup>

<sup>15</sup> Trains carrying coal are often uncovered, allowing coal dust to travel into the areas surrounding the tracks. Coal has historically and is currently being transported in this manner in California. A layer of railroads in California from Caltrans was used with a 1 km buffer. A study by Li found lead-contaminated dust up to 1 km away from railroad tracks.<sup>29,30</sup>

<sup>16</sup> While leaded fuel for on-road vehicles was banned in the 1990s, the ban did not cover race car fuel, which continued to be used into the 2000s. The US EPA noted in their 2006 report on sources of lead that populations living in the vicinity of race tracks were at an increased risk of lead exposure. A list of speedways in California was extracted from a racing website on April 11, 2019. A 1,000-foot buffer was used with the assumption that on-road vehicles on highways and race cars on speedways will emit lead particles in a similar manner.<sup>31</sup>

<sup>17</sup> Water service lines that contain lead pose a risk of drinking water contamination. A list of water service areas with at least one known leaded service lines was extracted from the California Water Board's Lead Service Line Replacement Inventory Status database (last updated August 21, 2019) and was joined to Tracking California's Water Service Area's boundaries extracted on September 25, 2019.<sup>32,33</sup>

<sup>18</sup> The "remaining" ZIP codes are those that did not fall into any of the above criteria.

## CHAPTER 3: MOVING FORWARD

California's commitment to protecting children from the harmful effects of lead exposure has led to improvements in the CLPP Program in identifying and treating children with elevated BLLs and reducing exposures to lead, but there is still more work to be done to ensure all at-risk children are tested across the state. Between 2010 and 2018, among California children < 6 years old tested for lead, the percentage with elevated BLLs ( $\geq 4.5$  mcg/dL) dropped by more than half from 3.24% to 1.49%. Although this decline is promising, the percentage of tested children with elevated BLLs varies widely by jurisdiction. In 2018, the percentage of children tested ranged from 7.67% in Humboldt County, to 0.53% in Riverside County.

California's CLPP Program has been ensuring that children with BLLs that make them eligible for full case management services, receive those services. Approximately 95% of children eligible for full medical and environmental case management services are receiving those services from either local or state public health nurses and environmental professionals. In instances where children did not receive services families persistently refused services, had left the United States, or could not be located.

Expansion of the full case definition has led to a substantial increase in the number of children receiving full case management services. In addition to clinical case management, these children and families receive environmental case management services to identify the source(s) of lead exposure (lead found in paint, dust, and soil continues to be a major source of lead exposure for California children), and to remove the sources so that the child is not re-exposed, and that other children are not exposed in the future. While these services represent secondary prevention for the children identified as "full cases", they also represent primary prevention of lead exposure for children whose initial exposure was prevented because the lead hazards in their environment were detected and mitigated.

CDPH is mandated to explore additional risk factors to include in criteria to trigger provider screening of blood lead levels. Specific criteria under consideration included geographic proximity to a former lead or steel smelter or an industrial facility that historically emitted or currently emits lead, a child's proximity to a freeway or heavily traveled roadway; and other potential risk factors for lead exposure and known sources of lead contamination. When these factors were added to already identified criteria, such as presence of older housing, 99% of California zip codes were identified as being "at risk" and children spending time in those zip codes may be subject to lead exposure.

Increased efforts are needed to reduce the amount of lead in the environment to protect California's children. Broad disparities by geographic location continue, and in at least one location, one in five children tested has an elevated BLL. There continues to be a substantial burden of lead in the California environment due to historic intentional addition of lead to paint and gasoline. While lead is no longer permitted as an additive to

household paint or to car fuel, residual lead continues to be present around properties that were previously painted with leaded paint, or that are located near highways where leaded fuel was historically used.

Despite extensive CDPH efforts to educate families about lead exposure, and the widespread media publicity about the hazards of lead exposure, rates of blood lead testing in young California children have been dropping. While this report has focused on CDPH's role in preventing and treating childhood lead exposures, many other state and federal agencies play an important role in protecting Californians from the toxic effects of lead. For example, the Water Resources Control Board in CalEPA is charged with ensuring that public water supplies do not expose children to lead. Similarly, the California Department of Social Services (CDSS) has responsibility for ensuring that licensed child care facilities are lead-free. The California Department of Education is charged with ensuring that water supplied in schools is free of lead. CDPH is committed to supporting these partner agencies in protecting California's children.

### **Strategies for Moving Forward**

Over the next 12-24 months CDPH will focus on meeting four objectives:

- **Increased blood lead testing of at-risk children.**
  - CDPH is working with DHCS to identify young Medi-Cal beneficiaries who did not receive screening and to understand barriers to receiving appropriate screening. The two departments are working together to develop a protocol for identifying providers with low rates of performing mandated screenings and improve practices among these providers. CDPH and DHCS will continue to conduct data matches to identify children who have not been screened.
  - CDPH will target high-risk geographic areas for more focused interventions and funding and publishing data identifying geographic areas of concern
  - CDPH is currently promulgating regulations expanding the lead risk factor criteria for children. CDPH held public stakeholder meetings for input, and has completed extensive fact finding and analysis considering lead exposure risk associated with a child's proximity to historical or current lead emitting industrial facilities, freeways and heavily traveled roadways, other potential risk factors for lead exposure, and known sources of lead contamination. CDPH anticipates formally noticing the rulemaking in the fall of 2020.
  - CDPH will increase the number of provider outreach efforts in counties with low screening rates. To further ensure California medical providers are aware of lead poisoning risk factors and screening requirements, CDPH will directly distribute information about mandated screening requirements, exposure risk factors, and information about free patient educational materials available for provider offices. In addition, CDPH will continue to work with providers to educate them about patient education,

assessment and testing guidelines, and ensure consistency with regulations and recommendations for testing.

- CDPH will conduct further analysis to better understand why testing of children for blood lead has declined in some locations despite widespread public education about the hazards of lead exposure. As noted earlier, the decline in testing rates varies by county. Future investigations will focus on determining whether there are demographic or behavioral characteristics that lead some children to be less likely to receive screening and testing than other children.
- **Providing appropriate case management services to all children with identified elevated BLLs so that sources of lead exposure are removed and BLLs decline.**
  - CDPH is committed to working with LHJs to develop a data system to fully support clinical and environmental case management services, as well as supporting program evaluation.
  - CDPH will conduct an analysis of alternative methods for allocating funds to local prevention programs to account for high risk jurisdictions. CDPH will annually review the number of children with lead poisoning and ensure funding allocations remain equitable based on burden.
  - Providing increased oversight and technical assistance to local CLPPPs to proactively ensure children with elevated BLLs receive all follow-up services
  - CDPH will continue to conduct site visits with local CLPPPs to review work activities for each new contract cycle. CDPH will continue to assess performance through biannual progress reports by cross-walking progress report data against scope of work requirements.
- **Decreasing sources of lead in the environment to prevent childhood lead exposure.**
  - CDPH will work with local CLPPPs will use proactive inspection to identify and reduce lead hazards in high-risk areas in their jurisdictions. CLPPB will provide guidance and assistance to local code enforcement agencies in all jurisdictions to reduce lead hazards statewide.
  - CDPH will create a list of lead prevention funding opportunities and when possible apply for funding and provide technical assistance to local health jurisdictions (LHJs) to apply for funding.
  - CDPH will explore opportunities for posting lead abatement activities
  - CDPH will strengthen the Lead Related Construction program to increase the workforce trained to conduct lead abatement work.

- **Increasing partnerships with health and human services entities, schools, environmental agencies, and other stakeholders to strengthen a multi-disciplinary approach to decreasing lead exposure in children.**
  - CDPH will increase and maintain partnerships with schools, environmental agencies, and other stakeholders to strengthen a multi-disciplinary approach to decreasing lead exposure in children.
  - CDPH will continue to partner with governmental programs such as WIC, CHDP, and Head Start to educate parents about the dangers of lead poisoning and need for screening
  - CDPH will work with state and local environmental health agencies to identify and prioritize geographic areas most in need of lead abatement

There is no safe level of lead exposure. It is critical that California maintain an active program of identifying lead-exposed children, educating families and health care providers about lead poisoning, and removing lead from children's environments. California has benefited from strong activities to prevent and treat children's lead exposure. With continued support, we can expect to see further declines in children's exposure to lead and the lifelong burden caused by lead to families and the State of California.

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## **APPENDIX A: LEGISLATIVE MANDATES FOR THE CHILDHOOD LEAD POISONING PREVENTION PROGRAM**

### **Childhood Lead Poisoning Prevention Acts of 1986 and 1989 with Subsequent Legislative Revisions**

#### **Childhood Lead Poisoning Prevention Act of 1986**

[\(California Health and Safety Code Sections 124125 to 124165\)](#)

Declared childhood lead exposure as the most significant childhood environmental health problem in the state. Established the CLPP Program and instructed it to continue to take steps necessary to reduce the incidence of childhood lead exposure in California.

#### **Childhood Lead Poisoning Prevention Act of 1991**

[\(California Health and Safety Code Sections 105275 to 105310\)](#)

Reaffirmed California's commitment to lead poisoning prevention activities; provided CDPH with broad mandates on blood lead screening protocols, laboratory quality assurance, identification and management of lead-exposed children, and reducing lead exposures.

#### **Laboratory Blood Lead Reporting Requirements**

[\(California Health and Safety Code Section 124130\)](#)

Requires laboratories analyzing human blood drawn in California for lead to report all blood lead test results, on persons of any age, to the state. Analyzing laboratories must also report specific information on the person tested, the ordering physician, the analyzing laboratory, and the test performed. Information must be reported electronically.

#### **Accreditation of Training Providers and Certification of Individuals**

[\(California Health and Safety Code Section 105250\)](#)

Establishes a program to accredit lead-related construction training providers and certify individuals to conduct lead-related construction activities.

#### **Lead-Safe Housing and Lead Hazards**

[\(California Civil Code Section 1941.1; California Health and Safety Code Sections 17961, 17980, 124130, 17920.10, 105250-105257\)](#)

Deems a building to be in violation of the State Housing Law if it contains lead hazards and requires local enforcement agencies to enforce provisions related to lead hazards. Makes it a crime for a person to engage in specified acts related to lead hazard evaluation, abatement, and lead-related construction courses, unless certified or accredited by the Department. Permits local enforcement agencies to order the abatement of lead hazards or issue a cease and desist order in response to lead hazards.

**Lead Exposure Screening**

[\(California Health and Safety Code Section 1367.3\)](#)

Requires health care service plans, covering hospital, medical, or surgical expenses on a group basis, to offer benefits that include screening for BLLs in at-risk children.

[\(California Insurance Code, Section 10119.8\)](#)

Requires insurers offering individual or group disability insurance policies, covering hospital, medical, or surgical expenses, to offer coverage for blood lead screening.

**Real Estate Disclosure Requirements**

[\(California Civil Code Sections 1102 to 1102.16\)](#)

Requires the disclosure of known lead-based paint hazards upon sale of a property.

**Lead-Safe Schools Protection Act**

[\(California Education Code Sections 32240 to 32245\)](#)

Implemented a lead poisoning prevention and protection program for California schools for a survey to evaluate risk factors that predicted lead contamination in public schools. The survey was completed in 1998.

**Lead-Related Activities in Construction Work**

[\(California Labor Code Sections 6716 to 6717\)](#)

Provides for the establishment of standards that protect the health and safety of employees who engage in lead-related construction work, including construction, demolition, renovation, and repair.

**Lead in Children's Toys**

[\(California Health and Safety Code Sections 108550 to 108580\)](#)

Prohibits the manufacture, sale, or exchange of toys with lead content in excess of the amount permitted by federal regulations.

**Lead in Candy**

[\(California Health and Safety Code Sections 110552\)](#)

Limits the amount of lead in candies and lead in candy wrappers to naturally occurring levels.

**Lead in Jewelry**

[\(California Health and Safety Code Sections 25214.1 to 25214.4.2\)](#)

Limits the amount of lead allowed in jewelry.

**Lead in Plumbing**

[\(California Health and Safety Code Sections 116875 to 116880\)](#)

Requires the use of lead-free pipes and fixtures in any installation or repair of a public water system or in a facility where water is provided for human consumption.

**Occupational Lead Poisoning Prevention**

[\(California Health and Safety Code Sections 105185 to 105197\)](#)

Establishes an occupational lead poisoning prevention program to register and monitor laboratory reports of adult lead toxicity cases, monitor reported cases of occupational lead poisoning to ascertain lead poisoning sources, conduct investigations of take-home exposure cases, train employees and health professionals regarding occupational lead poisoning prevention, and recommended means for lead poisoning prevention.

**Childhood Lead Poisoning Prevention**

[\(Health and Safety Code Sections 1367.3, 105280, 105285, 105290, 105310, 124125, 124130, and 124150, 124151 and Insurance Code Sections 10123.5 and 10123.55\)](#)

Requires the Department to develop regulations establishing a standard of care to include the determination of risk factors for whether a child is at risk for lead poisoning and would require the department, when determining those risk factors, to consider the most significant environmental risk factors, as specified.

**Lead Poisoning Case Management Reporting**

[\(Health and Safety Code Section 105295\)](#)

Requires the department to prepare a biennial report describing the effectiveness of appropriate case management efforts.

**Blood Lead Screening of Children Enrolled in Medi-Cal**

[\(Health and Safety Code Sections 105285, 105286, 105295, 105300, and 124125\)](#)

Requires all children at risk of lead exposure to receive blood lead screening tests, and requires the department to take action, and to require local agencies to take action, necessary to ensure these goals are met. Requires the department to report on additional content, including the total number of children enrolled in Medi-Cal and who have secured blood lead screening tests.

**Drinking Water Testing in Child Day Care Facilities**

[\(Health and Safety Code Sections 1596.7996, 1596.866, 1596.8661 and 1596.7996\)](#)

Requires a licensed child day care center that is located in a building that was constructed before January 1, 2010, to have its drinking water tested for lead contamination levels on a specified schedule.

**Drinking Water Testing at School Sites**

[\(Health and Safety Code 116277\)](#)

Requires that a community water system that serves a school site of a local educational agency with a building constructed before January 1, 2010, shall test for lead in the potable water system of the school site on or before July 1, 2019.

## **California Lead Poisoning Prevention Regulations**

### **Title 17**

[California Code of Regulations, Title 17, Sections 37000 to 37100](#)

For more information, please see [Health Care Providers](#) pages.

Specifies a standard of care for health care providers, regarding screening and assessing for childhood lead poisoning. It includes anticipatory guidance, risk assessment, and blood lead testing for children at risk for lead poisoning.

[California Code of Regulations, Title 17, Section 35001 et seq \(PDF\)](#)

For more information, see the [Lead-Related Construction](#) pages.

Requirements for lead hazard evaluation and abatement activities, accreditation of training providers, and certification of individuals engaged in lead-based paint activities.

### **Title 8**

[California Code of Regulations, Title 8, Section 1532.1 et seq](#)

Worker protection requirements for employees conducting lead-related construction activities.

## **APPENDIX B: CURRENT LEAD POISONING PREVENTION PROGRAM ORGANIZATION**

The Childhood Lead Poisoning Prevention Branch (CLPPB), through state- and local-level functions, carries out prevention, screening, case management, and follow up for lead exposure. The overall CLPP Program infrastructure consists of CLPPB in CDPH and 50 local CLPP programs (CLPPPs) in jurisdictions throughout the state that contract to provide lead activities.

The State CLPPB currently has six goals as part of its mission statement:

- An informed public able to protect children from lead exposures.
- Well-supported, effective local programs to detect, manage, and prevent childhood lead poisoning.
- Fully developed capacity to track lead exposure statewide, and to monitor the management of lead-burdened children.
- Strong infrastructure enabling the prevention of children's exposure to lead through partnerships with government agencies, community-based organizations, and private sector.
- Full compliance with federal and state statutory and regulatory requirements.
- Continued state and national leadership through research, policy development, and standard setting.

The State CLPPB:

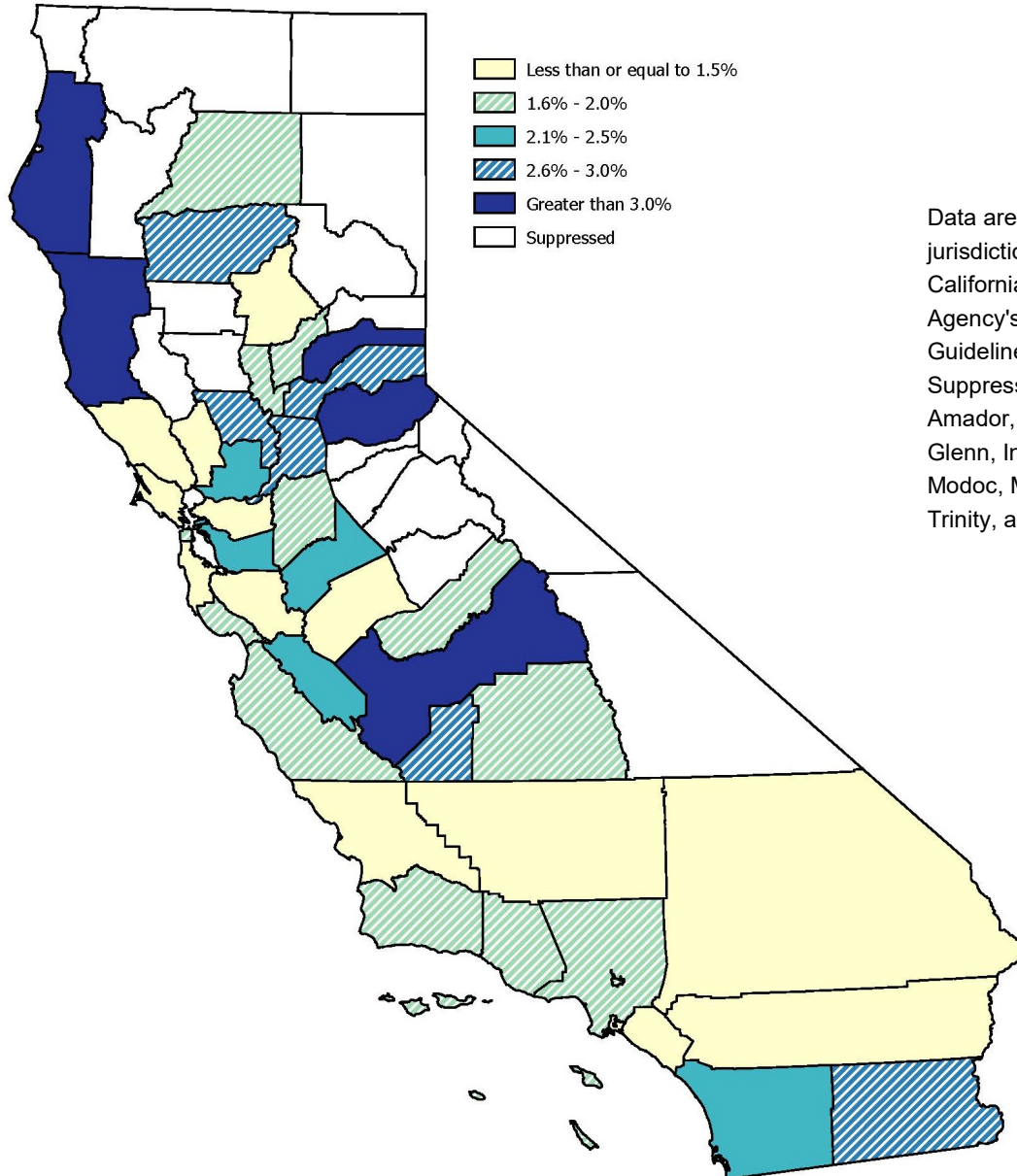
- Sets policies and establishes regulations; oversees activities of local CLPPPs; provides direct services in health jurisdictions without a local CLPP; develops educational materials; promotes screening and case identification through outreach activities and written materials; tracks follow up of children with EBLs and potential sources of exposure; seeks to assure the quality of local CLPP services; and provides scientific and technical expertise.
- Maintains a database on lead screening and lead-poisoned children and their case management, used to monitor and assist with case management of lead-poisoned children, identify sources of poisoning, and guide intervention strategies.
- Incorporates the Lead-Related Construction Program that develops regulations for lead-safe construction practices, provides training accreditation and worker certification, conducts related enforcement and compliance activities, and offers technical assistance to state and local housing and environmental agencies.

Local CLPPPs:

- Carry out public health nursing case management and environmental investigations for children with high BLLs.
- Provide extensive outreach and education activities to families, communities, and health care providers.
- Promote local screening.
- Reduce sources of lead exposure in their communities.
- Help identify additional sources of lead exposure.

## APPENDIX C: MAPS AND DATA TABLES FOR 2016 AND 2017

### Map of Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2016



Data are suppressed for local health jurisdictions that did not meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity, and Tuolumne.

- Data are from the RASSCLE surveillance database archive of 1/3/2019.
- Each individual is counted only once, using their highest BLL during 2016.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as "<5 mcg/dL" are included in the category "BLL <4.5 mcg/dL."
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.



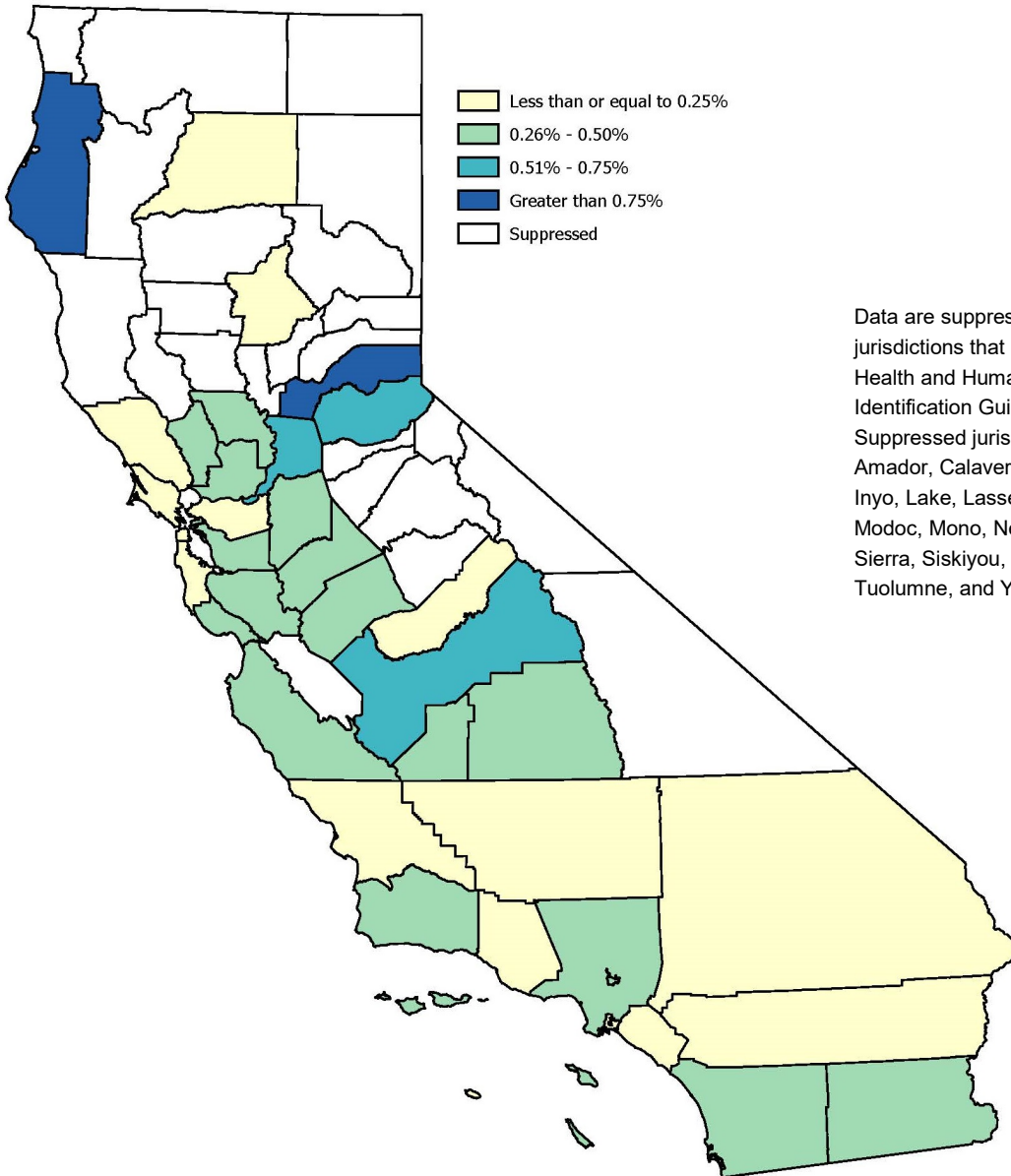
### California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, in Descending Order, 2016

Local Health Jurisdiction	BLL < 4.5 n	BLL < 4.5 % (row)	BLL ≥ 4.5 n	BLL ≥ 4.5 % (row)	Totals
Humboldt	2,181	90.42%	231	9.58%	2,412
Mendocino	746	95.27%	37	4.73%	783
Nevada	678	96.31%	26	3.69%	704
El Dorado	574	96.31%	22	3.69%	596
Fresno	18,165	96.67%	625	3.33%	18,790
<b>Suppressed Jurisdictions</b>	2,887	96.91%	92	3.09%	2,979
Tehama	1,406	97.10%	42	2.90%	1,448
Sacramento	16,461	97.23%	469	2.77%	16,930
Imperial	4,626	97.27%	130	2.73%	4,756
Kings	2,175	97.27%	61	2.73%	2,236
Yolo	1,895	97.38%	51	2.62%	1,946
Placer	1,013	97.40%	27	2.60%	1,040
Berkeley	672	97.53%	17	2.47%	689
Stanislaus	7,154	97.63%	174	2.37%	7,328
Alameda	16,519	97.72%	385	2.28%	16,904
Solano	4,948	97.92%	105	2.08%	5,053
San Benito	713	97.94%	15	2.06%	728
San Diego	41,766	97.98%	861	2.02%	42,627
Monterey	7,901	98.14%	150	1.86%	8,051
Santa Barbara	5,359	98.17%	100	1.83%	5,459
Pasadena	1,678	98.24%	30	1.76%	1,708
Santa Cruz	2,917	98.25%	52	1.75%	2,969
Los Angeles	148,884	98.31%	2,562	1.69%	151,446
Yuba	994	98.32%	17	1.68%	1,011
San Francisco	9,181	98.35%	154	1.65%	9,335
Shasta	722	98.37%	12	1.63%	734
Madera	3,591	98.38%	59	1.62%	3,650
Tulare	7,108	98.39%	116	1.61%	7,224
Ventura	7,694	98.41%	124	1.59%	7,818
San Joaquin	10,339	98.44%	164	1.56%	10,503
Sutter	1,507	98.50%	23	1.50%	1,530
Marin	1,737	98.53%	26	1.47%	1,763
San Mateo	6,414	98.56%	94	1.44%	6,508
Orange	37,995	98.59%	542	1.41%	38,537
Santa Clara	19,605	98.60%	279	1.40%	19,884

<b>Merced</b>	4,104	98.65%	56	1.35%	4,160
<b>Kern</b>	21,147	98.67%	284	1.33%	21,431
<b>Long Beach</b>	6,721	98.71%	88	1.29%	6,809
<b>San Luis Obispo</b>	1,414	98.74%	18	1.26%	1,432
<b>San Bernardino</b>	38,114	98.95%	405	1.05%	38,519
<b>Contra Costa</b>	8,512	99.00%	86	1.00%	8,598
<b>Napa</b>	1,307	99.02%	13	0.98%	1,320
<b>Sonoma</b>	3,738	99.07%	35	0.93%	3,773
<b>Butte</b>	2,140	99.21%	17	0.79%	2,157
<b>Riverside</b>	37,690	99.30%	267	0.70%	37,957
<b>CLPPB (includes tests with unknown jurisdictions)</b>	29	100.00%	0	0.00%	29
<b>California Totals</b>	523,121	98.28%	9,143	1.72%	532,264

- Data are from the RASSCLE surveillance database archive of 1/3/2019.
- Each individual is counted only once, using their highest BLL during 2016.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as "< 5 mcg/dL" are included in the category "BLL < 4.5 mcg/dL."
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2016 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity, and Tuolumne.

## Map of Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2016



Data are suppressed for local health jurisdictions that did not meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Plumas, San Benito, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne, and Yuba.

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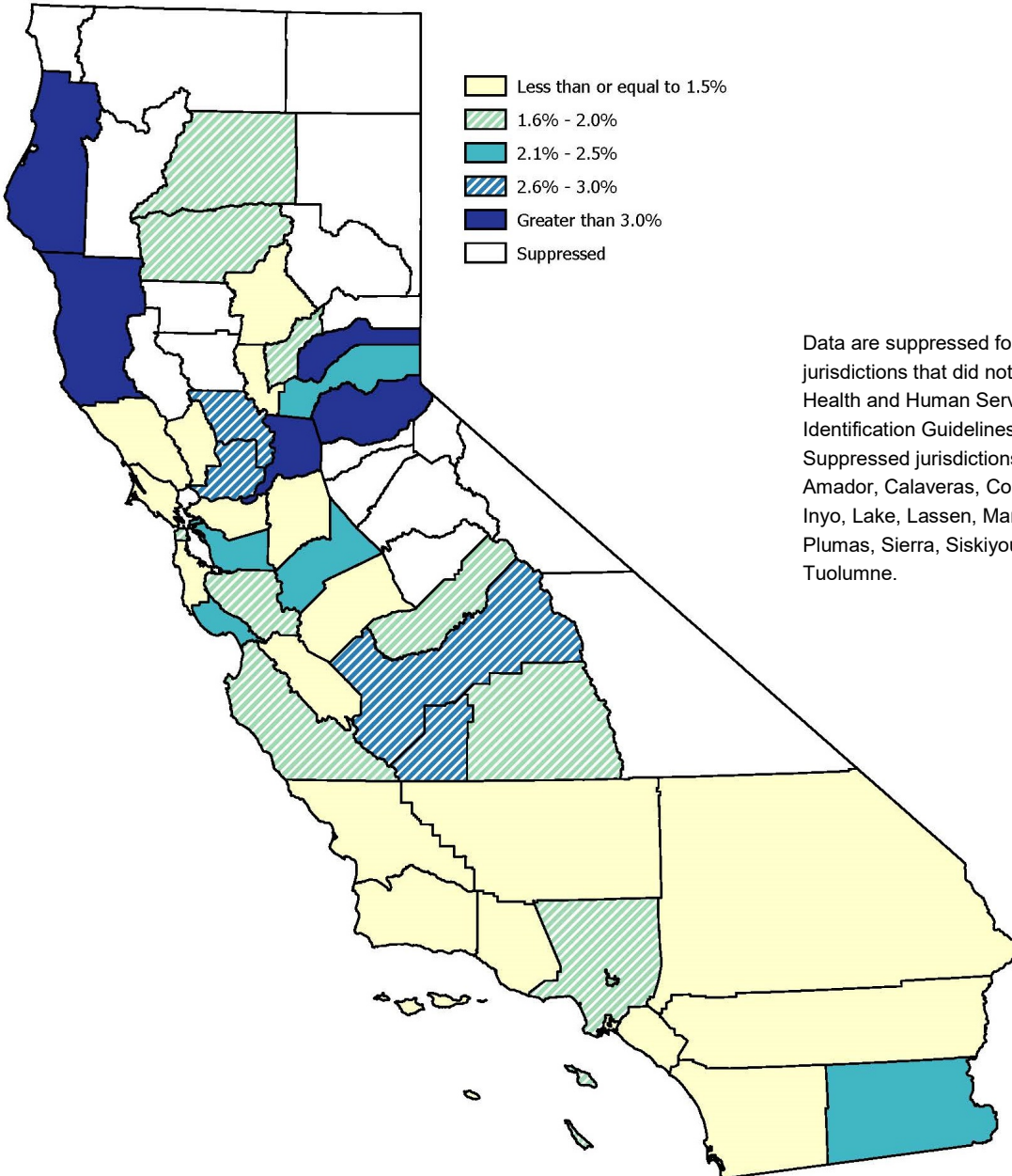
**California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, in Descending Order, 2016**

Local Health Jurisdiction	BLL < 9.5 n	BLL < 9.5 % (row)	BLL ≥9.5 n	BLL ≥9.5 % (row)	Totals
Humboldt	2,386	98.92%	26	1.08%	2,412
Placer	1,032	99.23%	8	0.77%	1,040
El Dorado	592	99.33%	4	0.67%	596
Sacramento	16,833	99.43%	97	0.57%	16,930
Fresno	18,684	99.44%	106	0.56%	18,790
Kings	2,225	99.51%	11	0.49%	2,236
Imperial	4,735	99.56%	21	0.44%	4,756
Yolo	1,938	99.59%	8	0.41%	1,946
Santa Cruz	2,957	99.60%	12	0.40%	2,969
Monterey	8,019	99.60%	32	0.40%	8,051
San Joaquin	10,463	99.62%	40	0.38%	10,503
Alameda	16,840	99.62%	64	0.38%	16,904
Suppressed Jurisdictions	9,148	99.6%	35	0.38%	9,183
Pasadena	1,702	99.65%	6	0.35%	1,708
Los Angeles	150,930	99.66%	516	0.34%	151,446
Merced	4,146	99.66%	14	0.34%	4,160
Santa Barbara	5,441	99.67%	18	0.33%	5,459
Tulare	7,202	99.70%	22	0.30%	7,224
Napa	1,316	99.70%	4	0.30%	1,320
Stanislaus	7,306	99.70%	22	0.30%	7,328
Berkeley	687	99.71%	2	0.29%	689
Santa Clara	19,827	99.71%	57	0.29%	19,884
Solano	5,039	99.72%	14	0.28%	5,053
San Diego	42,519	99.75%	108	0.25%	42,627
Madera	3,641	99.75%	9	0.25%	3,650
Marin	1,759	99.77%	4	0.23%	1,763
San Francisco	9,315	99.79%	20	0.21%	9,335
Kern	21,386	99.79%	45	0.21%	21,431
Orange	38,462	99.81%	75	0.19%	38,537
Sonoma	3,766	99.81%	7	0.19%	3,773
San Bernardino	38,450	99.82%	69	0.18%	38,519
Ventura	7,804	99.82%	14	0.18%	7,818
Contra Costa	8,584	99.84%	14	0.16%	8,598
San Luis Obispo	1,430	99.86%	2	0.14%	1,432
San Mateo	6,499	99.86%	9	0.14%	6,508
Riverside	37,913	99.88%	44	0.12%	37,957
Long Beach	6,802	99.90%	7	0.10%	6,809

<b>Butte</b>	2,156	99.95%	1	0.05%	2,157
<b>Shasta</b>	734	100.00%	0	0.00%	734
<b>CLPPB (includes tests with unknown jurisdictions)</b>	29	100.00%	0	0.00%	29
<b>California Totals</b>	530,697	99.71%	1,567	0.29%	532,264

- Data are from the RASSCLE surveillance database archive of 1/3/2019.
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## Map of Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2017



Data are suppressed for local health jurisdictions that did not meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity, and Tuolumne.

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**California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 4.5 mcg/dL or Greater, in Descending Order, 2017**

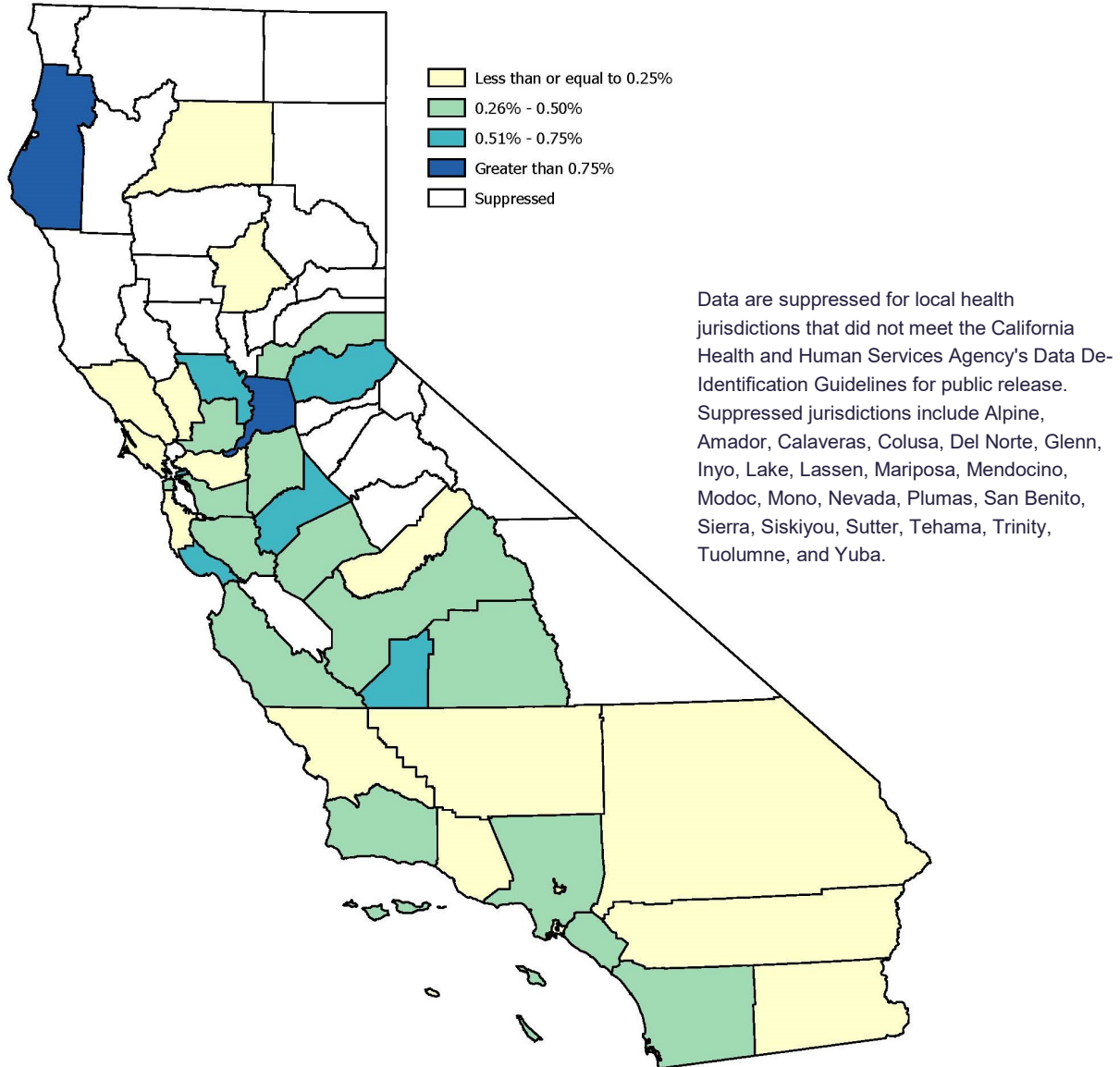
Local Health Jurisdiction	BLL < 4.5 n	BLL < 4.5 % (row)	BLL ≥ 4.5 n	BLL ≥4.5 % (row)	Totals
Humboldt	2,168	93.05%	162	6.95%	2,330
Nevada	466	94.91%	25	5.09%	491
Sacramento	16,448	95.40%	793	4.60%	17,241
El Dorado	548	95.64%	25	4.36%	573
Mendocino	854	96.50%	31	3.50%	885
Yolo	2,013	97.25%	57	2.75%	2,070
Kings	1,703	97.31%	47	2.69%	1,750
Fresno	15,981	97.43%	422	2.57%	16,403
Solano	4,694	97.47%	122	2.53%	4,816
Stanislaus	7,118	97.65%	171	2.35%	7,289
Suppressed Jurisdictions	3,000	97.66%	72	2.34%	3,072
Imperial	4,753	97.80%	107	2.20%	4,860
Placer	1,134	97.84%	25	2.16%	1,159
Santa Cruz	2,730	97.88%	59	2.12%	2,789
Berkeley	714	97.94%	15	2.06%	729
Alameda	17,071	97.99%	351	2.01%	17,422
Shasta	629	98.28%	11	1.72%	640
Pasadena	1,621	98.30%	28	1.70%	1,649
San Francisco	9,072	98.32%	155	1.68%	9,227
Santa Clara	19,513	98.34%	330	1.66%	19,843
Tehama	1,441	98.36%	24	1.64%	1,465
Yuba	965	98.37%	16	1.63%	981
Madera	4,081	98.38%	67	1.62%	4,148
Monterey	8,229	98.40%	134	1.60%	8,363
Tulare	5,603	98.44%	89	1.56%	5,692
Los Angeles	143,146	98.47%	2,217	1.53%	145,363
San Joaquin	10,786	98.50%	164	1.50%	10,950
San Diego	41,628	98.54%	618	1.46%	42,246
San Benito	813	98.55%	12	1.45%	825
Sutter	1,362	98.55%	20	1.45%	1,382
Kern	18,961	98.56%	277	1.44%	19,238
San Mateo	6,397	98.61%	90	1.39%	6,487
Orange	36,146	98.62%	506	1.38%	36,652
Merced	4,147	98.67%	56	1.33%	4,203

<b>Santa Barbara</b>	5,148	98.75%	65	1.25%	5,213
<b>Butte</b>	2,108	98.92%	23	1.08%	2,131
<b>Contra Costa</b>	8,203	98.93%	89	1.07%	8,292
<b>Marin</b>	1,892	98.95%	20	1.05%	1,912
<b>Long Beach</b>	6,421	99.06%	61	0.94%	6,482
<b>Sonoma</b>	3,558	99.08%	33	0.92%	3,591
<b>San Bernardino</b>	36,478	99.14%	318	0.86%	36,796
<b>Riverside</b>	35,635	99.26%	267	0.74%	35,902
<b>Napa</b>	1,216	99.35%	8	0.65%	1,224
<b>San Luis Obispo</b>	1,378	99.35%	9	0.65%	1,387
<b>Ventura</b>	7,648	99.44%	43	0.56%	7,691
<b>CLPPB (includes tests with unknown jurisdictions)</b>	75	100.00%	0	0.00%	75
<b>Suppressed Jurisdictions</b>	3,000	97.66%	72	2.34%	3,072
<b>California Totals</b>	505,695	98.40%	8,234	1.60%	513,929

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- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2017 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Modoc, Mono, Plumas, Sierra, Siskiyou, Trinity, and Tuolumne.



## Map of Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, by California Local Health Jurisdiction, 2017



- Data are from the RASSCLE surveillance database archive of 1/3/2019.
- Each individual is counted only once, using their highest blood lead level during 2017.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as "<5 mcg/dL" are included in the category "BLL <4.5 mcg/dL."
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.

### California Local Health Jurisdictions, by Percent of Children Under 6 Years Old with a Blood Lead Level of 9.5 mcg/dL or Greater, in Descending Order, 2017

Local Health Jurisdiction	BLL < 9.5 n	BLL < 9.5 % (row)	BLL ≥ 9.5 n	BLL ≥ 9.5 % (row)	Totals
Sacramento	17,019	98.71%	222	1.29%	17,241
Humboldt	2,310	99.14%	20	0.86%	2,330
Yolo	2,056	99.32%	14	0.68%	2,070
Stanislaus	7,247	99.42%	42	0.58%	7,289
Kings	1,740	99.43%	10	0.57%	1,750
Berkeley	725	99.45%	4	0.55%	729
Santa Cruz	2,774	99.46%	15	0.54%	2,789
El Dorado	570	99.48%	3	0.52%	573
Tulare	5,664	99.51%	28	0.49%	5,692
Alameda	17,341	99.54%	81	0.46%	17,422
Solano	4,795	99.56%	21	0.44%	4,816
Suppressed Jurisdiction	9,063	99.58%	38	0.42%	9,101
Fresno	16,337	99.60%	66	0.40%	16,403
Monterey	8,330	99.61%	33	0.39%	8,363
Merced	4,189	99.67%	14	0.33%	4,203
San Diego	42,115	99.69%	131	0.31%	42,246
Santa Barbara	5,197	99.69%	16	0.31%	5,213
Santa Clara	19,786	99.71%	57	0.29%	19,843
Los Angeles	144,949	99.72%	414	0.28%	145,363
Orange	36,554	99.73%	98	0.27%	36,652
San Joaquin	10,921	99.74%	29	0.26%	10,950
San Francisco	9,203	99.74%	24	0.26%	9,227
Placer	1,156	99.74%	3	0.26%	1,159
Kern	19,190	99.75%	48	0.25%	19,238
Imperial	4,848	99.75%	12	0.25%	4,860
Pasadena	1,645	99.76%	4	0.24%	1,649
Madera	4,138	99.76%	10	0.24%	4,148
Contra Costa	8,274	99.78%	18	0.22%	8,292
San Mateo	6,473	99.78%	14	0.22%	6,487
Marin	1,908	99.79%	4	0.21%	1,912
San Bernardino	36,737	99.84%	59	0.16%	36,796
Riverside	35,848	99.85%	54	0.15%	35,902
San Luis Obispo	1,385	99.86%	2	0.14%	1,387
Long Beach	6,474	99.88%	8	0.12%	6,482
Butte	2,129	99.91%	2	0.09%	2,131

<b>Napa</b>	1,223	99.92%	1	0.08%	1,224
<b>Ventura</b>	7,686	99.93%	5	0.07%	7,691
<b>Sonoma</b>	3,590	99.97%	1	0.03%	3,591
<b>Shasta</b>	640	100.00%	0	0.00%	640
<b>CLPPB</b> (includes tests with unknown jurisdictions)	75	100.00%	0	0.00%	75
<b>California Totals</b>	512,304	99.68%	1,625	0.32%	513,929

- Data are from the RASSCLE surveillance database archive of 1/3/2019.
- Each individual is counted only once, using their highest BLL during 2017.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “< 5 mcg/dL” are included in the category “BLL < 4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2017 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions. Suppressed jurisdictions include Alpine, Amador, Calaveras, Colusa, Del Norte, Glenn, Inyo, Lake, Lassen, Mariposa, Mendocino, Modoc, Mono, Nevada, Plumas, San Benito, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne, and Yuba.

## APPENDIX D: NUMBER OF CHILDREN TESTED FOR LEAD BY LOCAL HEALTH JURISDICTION IN 2016, 2017, AND 2018

### Number of Individual Children Screened for Lead, by California Local Health Jurisdiction and Highest Level, 2016

Local Health Jurisdiction	Age Group (Years)	Blood Lead Level (BLL) <4.5 n	BLL <4.5 % (row)	BLL ≥4.5 to <9.5 n	BLL ≥4.5 to <9.5 % (row)	BLL ≥9.5 n	BLL ≥9.5 % (row)	Totals
Alameda	Age <6	16,519	97.72%	321	1.90%	64	0.38%	16,904
	Age 6 to <21	1,940	96.57%	59	2.94%	10	0.50%	2,009
	Local Total age <21	18,459	97.60%	380	2.01%	74	0.39%	18,913
Alpine	Age <6							
	Age 6 to <21							
	Local Total age <21							
Amador	Age <6							
	Age 6 to <21							
	Local Total age <21							418
Berkeley	Age <6	672	97.53%	15	2.18%	2	0.29%	689
	Age 6 to <21	74	94.87%	4	5.13%	0	0.00%	78
	Local Total age <21	746	97.26%	19	2.48%	2	0.26%	767
Butte	Age <6	2,140	99.21%	16	0.74%	1	0.05%	2,157
	Age 6 to <21	66	98.51%	1	1.49%	0	0.00%	67
	Local Total age <21	2,206	99.19%	17	0.76%	1	0.04%	2,224
Calaveras	Age <6							
	Age 6 to <21							
	Local Total age <21							279
Colusa	Age <6							
	Age 6 to <21							
	Local Total age <21							397
Contra Costa	Age <6	8,512	99.00%	72	0.84%	14	0.16%	8,598
	Age 6 to <21	634	97.69%	11	1.69%	4	0.62%	649
	Local Total age <21	9,146	98.91%	83	0.90%	18	0.19%	9,247

<b>Del Norte</b>	Age <6							
	Age 6 to <21							
	Local Total age <21							315
<b>El Dorado</b>	Age <6	574	96.31%	18	3.02%	4	0.67%	596
	Age 6 to <21	53	100.00%	0	0.00%	0	0.00%	53
	Local Total age <21	627	96.61%	18	2.77%	4	0.62%	649
<b>Fresno</b>	Age <6	18,165	96.67%	519	2.76%	106	0.56%	18,790
	Age 6 to <21	746	95.89%	27	3.47%	5	0.64%	778
	Local Total age <21	18,911	96.64%	546	2.79%	111	0.57%	19,568
<b>Glenn</b>	Age 6							
	Age 6 to <21							
	Local Total age <21							432
<b>Humboldt</b>	Age <6	2,181	90.42%	205	8.50%	26	1.08%	2,412
	Age 6 to <21	96	95.05%	4	3.96%	1	0.99%	101
	Local Total age <21	2,277	90.61%	209	8.32%	27	1.07%	2,513
<b>Imperial</b>	Age <6	4,626	97.27%	109	2.29%	21	0.44%	4,756
	Age 6 to <21	276	96.84%	9	3.16%	0	0.00%	285
	Local Total age <21	4,902	97.24%	118	2.34%	21	0.42%	5,041
<b>Inyo</b>	Age <6							
	Age 6 to <21							
	Local Total age <21							
<b>Kern</b>	Age <6	21,147	98.67%	239	1.12%	45	0.21%	21,431
	Age 6 to <21	1,166	98.81%	14	1.19%	0	0.00%	1,180
	Local Total age <21	22,313	98.68%	253	1.12%	45	0.20%	22,611
<b>Kings</b>	Age <6	2,175	97.27%	50	2.24%	11	0.49%	2,236
	Age 6 to <21	81	94.19%	5	5.81%	0	0.00%	86
	Local Total age <21	2,256	97.16%	55	2.37%	11	0.47%	2,322
<b>Lake</b>	Age <6							413
	Age 6 to <21							32
	Local Total age <21	434	97.53%					445
<b>Lassen</b>	Age <6	139	86.34%					161
	Age 6 to <21							
	Local Total age <21							

<b>Long Beach</b>	<b>Age &lt;6</b>	6,721	98.71%	81	1.19%	7	0.10%	6,809
	<b>Age 6 to &lt;21</b>	527	99.06%	3	0.56%	2	0.38%	532
	<b>Local Total age &lt;21</b>	7,248	98.73%	84	1.14%	9	0.12%	7,341
<b>Los Angeles</b>	<b>Age &lt;6</b>	148,884	98.31%	2,046	1.35%	516	0.34%	151,446
	<b>Age 6 to &lt;21</b>	18,464	98.80%	175	0.94%	49	0.26%	18,688
	<b>Local Total age &lt;21</b>	167,348	98.36%	2,221	1.31%	565	0.33%	170,134
<b>Madera</b>	<b>Age &lt;6</b>	3,591	98.38%	50	1.37%	9	0.25%	3,650
	<b>Age 6 to &lt;21</b>	164	99.39%	1	0.61%	0	0.00%	165
	<b>Local Total age &lt;21</b>	3,755	98.43%	51	1.34%	9	0.24%	3,815
<b>Marin</b>	<b>Age &lt;6</b>	1,737	98.53%	22	1.25%	4	0.23%	1,763
	<b>Age 6 to &lt;21</b>	123	98.40%	2	1.60%	0	0.00%	125
	<b>Local Total age &lt;21</b>	1,860	98.52%	24	1.27%	4	0.21%	1,888
<b>Mariposa</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							
<b>Mendocino</b>	<b>Age &lt;6</b>	746	95.27%					783
	<b>Age 6 to &lt;21</b>	43	100.00%					43
	<b>Local Total age &lt;21</b>	789	95.52%					826
<b>Merced</b>	<b>Age &lt;6</b>	4,104	98.65%	42	1.01%	14	0.34%	4,160
	<b>Age 6 to &lt;21</b>	170	98.27%	3	1.73%	0	0.00%	173
	<b>Local Total age &lt;21</b>	4,274	98.64%	45	1.04%	14	0.32%	4,333
<b>Modoc</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							
<b>Mono</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							122
<b>Monterey</b>	<b>Age &lt;6</b>	7,901	98.14%	118	1.47%	32	0.40%	8,051
	<b>Age 6 to &lt;21</b>	821	96.14%	20	2.34%	13	1.52%	854
	<b>Local Total age &lt;21</b>	8,722	97.94%	138	1.55%	45	0.51%	8,905
<b>Napa</b>	<b>Age &lt;6</b>	1,307	99.02%	9	0.68%	4	0.30%	1,320
	<b>Age 6 to &lt;21</b>	46	97.87%	0	0.00%	1	2.13%	47
	<b>Local Total age &lt;21</b>	1,353	98.98%	9	0.66%	5	0.37%	1,367

<b>Nevada</b>	<b>Age &lt;6</b>	<b>678</b>	<b>96.31%</b>					<b>704</b>
	<b>Age 6 to &lt;21</b>							34
	<b>Local Total age &lt;21</b>							738
<b>Orange</b>	<b>Age &lt;6</b>	37,995	98.59%	467	1.21%	75	0.19%	38,537
	<b>Age 6 to &lt;21</b>	4,377	97.42%	96	2.14%	20	0.45%	4,493
	<b>Local Total age &lt;21</b>	42,372	98.47%	563	1.31%	95	0.22%	43,030
<b>Pasadena</b>	<b>Age &lt;6</b>	1,678	98.24%	24	1.41%	6	0.35%	1,708
	<b>Age 6 to &lt;21</b>	190	97.44%	5	2.56%	0	0.00%	195
	<b>Local Total age &lt;21</b>	1,868	98.16%	29	1.52%	6	0.32%	1,903
<b>Placer</b>	<b>Age &lt;6</b>	1,013	97.40%	19	1.83%	8	0.77%	1,040
	<b>Age 6 to &lt;21</b>	127	94.78%	4	2.99%	3	2.24%	134
	<b>Local Total age &lt;21</b>	1,140	97.10%	23	1.96%	11	0.94%	1,174
<b>Plumas</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							
<b>Riverside</b>	<b>Age &lt;6</b>	37,690	99.30%	223	0.59%	44	0.12%	37,957
	<b>Age 6 to &lt;21</b>	2,159	98.67%	21	0.96%	8	0.37%	2,188
	<b>Local Total age &lt;21</b>	39,849	99.26%	244	0.61%	52	0.13%	40,145
<b>Sacramento</b>	<b>Age &lt;6</b>	16,461	97.23%	372	2.20%	97	0.57%	16,930
	<b>Age 6 to &lt;21</b>	1,541	89.54%	169	9.82%	11	0.64%	1,721
	<b>Local Total age &lt;21</b>	18,002	96.52%	541	2.90%	108	0.58%	18,651
<b>San Benito</b>	<b>Age &lt;6</b>	713	97.94%					728
	<b>Age 6 to &lt;21</b>							74
	<b>Local Total age &lt;21</b>							802
<b>San Bernardino</b>	<b>Age &lt;6</b>	38,114	98.95%	336	0.87%	69	0.18%	38,519
	<b>Age 6 to &lt;21</b>	3,098	98.57%	34	1.08%	11	0.35%	3,143
	<b>Local Total age &lt;21</b>	41,212	98.92%	370	0.89%	80	0.19%	41,662
<b>San Diego</b>	<b>Age &lt;6</b>	41,766	97.98%	753	1.77%	108	0.25%	42,627
	<b>Age 6 to &lt;21</b>	2,216	94.90%	105	4.50%	14	0.60%	2,335
	<b>Local Total age &lt;21</b>	43,982	97.82%	858	1.91%	122	0.27%	44,962
<b>San Francisco</b>	<b>Age &lt;6</b>	9,181	98.35%	134	1.44%	20	0.21%	9,335
	<b>Age 6 to &lt;21</b>	773	98.47%	9	1.15%	3	0.38%	785
	<b>Local Total age &lt;21</b>	9,954	98.36%	143	1.41%	23	0.23%	10,120

<b>San Joaquin</b>	<b>Age &lt;6</b>	10,339	98.44%	124	1.18%	40	0.38%	10,503
	<b>Age 6 to &lt;21</b>	721	97.83%	13	1.76%	3	0.41%	737
	<b>Local Total age &lt;21</b>	11,060	98.40%	137	1.22%	43	0.38%	11,240
<b>San Luis Obispo</b>	<b>Age &lt;6</b>	1,414	98.74%	16	1.12%	2	0.14%	1,432
	<b>Age 6 to &lt;21</b>	75	96.15%	3	3.85%	0	0.00%	78
	<b>Local Total age &lt;21</b>	1,489	98.61%	19	1.26%	2	0.13%	1,510
<b>San Mateo</b>	<b>Age &lt;6</b>	6,414	98.56%	85	1.31%	9	0.14%	6,508
	<b>Age 6 to &lt;21</b>	501	98.24%	4	0.78%	5	0.98%	510
	<b>Local Total age &lt;21</b>	6,915	98.53%	89	1.27%	14	0.20%	7,018
<b>Santa Barbara</b>	<b>Age &lt;6</b>	5,359	98.17%	82	1.50%	18	0.33%	5,459
	<b>Age 6 to &lt;21</b>	242	96.41%	6	2.39%	3	1.20%	251
	<b>Local Total age &lt;21</b>	5,601	98.09%	88	1.54%	21	0.37%	5,710
<b>Santa Clara</b>	<b>Age &lt;6</b>	19,605	98.60%	222	1.12%	57	0.29%	19,884
	<b>Age 6 to &lt;21</b>	2,390	97.47%	45	1.84%	17	0.69%	2,452
	<b>Local Total age &lt;21</b>	21,995	98.47%	267	1.20%	74	0.33%	22,336
<b>Santa Cruz</b>	<b>Age &lt;6</b>	2,917	98.25%	40	1.35%	12	0.40%	2,969
	<b>Age 6 to &lt;21</b>	285	95.64%	11	3.69%	2	0.67%	298
	<b>Local Total age &lt;21</b>	3,202	98.01%	51	1.56%	14	0.43%	3,267
<b>Shasta</b>	<b>Age &lt;6</b>	722	98.37%	12	1.63%	0	0.00%	734
	<b>Age 6 to &lt;21</b>	55	100.00%	0	0.00%	0	0.00%	55
	<b>Local Total age &lt;21</b>	777	98.48%	12	1.52%	0	0.00%	789
<b>Sierra</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							
<b>Siskiyou</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							110
<b>Solano</b>	<b>Age &lt;6</b>	4,948	97.92%	91	1.80%	14	0.28%	5,053
	<b>Age 6 to &lt;21</b>	236	97.12%	5	2.06%	2	0.82%	243
	<b>Local Total age &lt;21</b>	5,184	97.89%	96	1.81%	16	0.30%	5,296
<b>Sonoma</b>	<b>Age &lt;6</b>	<b>3,738</b>	<b>99.07%</b>	<b>28</b>	<b>0.74%</b>	<b>7</b>	<b>0.19%</b>	<b>3,773</b>
	<b>Age 6 to &lt;21</b>	370	98.67%	3	0.80%	2	0.53%	375
	<b>Local Total age &lt;21</b>	4,108	99.04%	31	0.75%	9	0.22%	4,148



<b>Stanislaus</b>	<b>Age &lt;6</b>	7,154	97.63%	152	2.07%	22	0.30%	7,328
	<b>Age 6 to &lt;21</b>	495	92.52%	37	6.92%	3	0.56%	535
	<b>Local Total age &lt;21</b>	7,649	97.28%	189	2.40%	25	0.32%	7,863
<b>Sutter</b>	<b>Age &lt;6</b>	1,507	98.50%					1,530
	<b>Age 6 to &lt;21</b>							43
	<b>Local Total age &lt;21</b>							1,573
<b>Tehama</b>	<b>Age &lt;6</b>	1,406	97.10%					1,448
	<b>Age 6 to &lt;21</b>	74	100.00%					74
	<b>Local Total age &lt;21</b>	1,480	97.24%					1,522
<b>Trinity</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							113
<b>Tulare</b>	<b>Age &lt;6</b>	7,108	98.39%	94	1.30%	22	0.30%	7,224
	<b>Age 6 to &lt;21</b>	498	98.61%	2	0.40%	5	0.99%	505
	<b>Local Total age &lt;21</b>	7,606	98.41%	96	1.24%	27	0.35%	7,729
<b>Tuolumne</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total age &lt;21</b>							144
<b>Ventura</b>	<b>Age &lt;6</b>	7,694	98.41%	110	1.41%	14	0.18%	7,818
	<b>Age 6 to &lt;21</b>	417	98.35%	7	1.65%	0	0.00%	424
	<b>Local Total age &lt;21</b>	8,111	98.41%	117	1.42%	14	0.17%	8,242
<b>Yolo</b>	<b>Age &lt;6</b>	1,895	97.38%	43	2.21%	8	0.41%	1,946
	<b>Age 6 to &lt;21</b>	72	93.51%	5	6.49%	0	0.00%	77
	<b>Local Total age &lt;21</b>	1,967	97.23%	48	2.37%	8	0.40%	2,023
<b>Yuba</b>	<b>Age &lt;6</b>	994	98.32%					1,011
	<b>Age 6 to &lt;21</b>							58
	<b>Local Total age &lt;21</b>							1,069
<b>CLPPB</b> (includes tests with unknown jurisdictions)	<b>Age &lt;6</b>	29	100.00%	0	0.00%	0	0.00%	29
	<b>Age 6 to &lt;21</b>	27	100.00%	0	0.00%	0	0.00%	27
	<b>Local Total age &lt;21</b>	56	100.00%	0	0.00%	0	0.00%	56

<b>California Totals</b>	<b>Age &lt;6</b>	<b>523,121</b>	<b>98.28%</b>	<b>7,576</b>	<b>1.42%</b>	<b>1,567</b>	<b>0.29%</b>	<b>532,264</b>
	<b>Age 6 to &lt;21</b>	46,853	97.64%	931	1.94%	201	0.42%	47,985
	<b>Total age &lt;21</b>	<b>569,974</b>	<b>98.23%</b>	<b>8,507</b>	<b>1.47%</b>	<b>1,768</b>	<b>0.30%</b>	<b>580,249</b>

- Data are from the RASSCLE surveillance database archive of 1/3/2019.
- Each individual is counted only once, using their highest BLL during 2016.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “<5 mcg/dL” are included in the category “BLL <4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2016 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions.

### Number of Individual Children Screened for Lead, by California Local Health Jurisdiction and Highest Level, 2017

Local Health Jurisdiction	Age Group (Years)	Blood Lead Level (BLL) <4.5 n	BLL <4.5 % (row)	BLL ≥4.5 to <9.5 n	BLL ≥4.5 to <9.5 % (row)	BLL ≥9.5 n	BLL ≥9.5 % (row)	Totals
Alameda	Age <6	17,071	97.99%	270	1.55%	81	0.46%	17,422
	Age 6 to <21	2,228	97.04%	55	2.40%	13	0.57%	2,296
	Local Total Age <21	19,299	97.88%	325	1.65%	94	0.48%	19,718
Alpine	Age <6							
	Age 6 to <21							
	Local Total Age <21							
Amador	Age <6							
	Age 6 to <21							
	Local Total Age <21							443
Berkeley	Age <6	714	97.94%	11	1.51%	4	0.55%	729
	Age 6 to <21	78	98.73%	1	1.27%	0	0.00%	79
	Local Total Age <21	792	98.02%	12	1.49%	4	0.50%	808
Butte	Age <6	2,108	98.92%	21	0.99%	2	0.09%	2,131
	Age 6 to <21	49	96.08%	2	3.92%	0	0.00%	51
	Local Total Age <21	2,157	98.85%	23	1.05%	2	0.09%	2,182
Calaveras	Age <6							
	Age 6 to <21							
	Local Total Age <21							268
Colusa	Age <6							
	Age 6 to <21							
	Local Total Age <21							359
Contra Costa	Age <6	8,203	98.93%	71	0.86%	18	0.22%	8,292
	Age 6 to <21	723	97.57%	13	1.75%	5	0.67%	741
	Local Total Age <21	8,926	98.82%	84	0.93%	23	0.25%	9,033
Del Norte	Age <6							
	Age 6 to <21							
	Local Total Age <21							365

<b>El Dorado</b>	<b>Age &lt;6</b>	548	95.64%	22	3.84%	3	0.52%	573
	<b>Age 6 to &lt;21</b>	63	98.44%	1	1.56%	0	0.00%	64
	<b>Local Total Age &lt;21</b>	611	95.92%	23	3.61%	3	0.47%	637
<b>Fresno</b>	<b>Age &lt;6</b>	15,981	97.43%	356	2.17%	66	0.40%	16,403
	<b>Age 6 to &lt;21</b>	785	96.44%	25	3.07%	4	0.49%	814
	<b>Local Total Age &lt;21</b>	16,766	97.38%	381	2.21%	70	0.41%	17,217
<b>Glenn</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							419
<b>Humboldt</b>	<b>Age &lt;6</b>	2,168	93.05%	142	6.09%	20	0.86%	2,330
	<b>Age 6 to &lt;21</b>	115	95.83%	4	3.33%	1	0.83%	120
	<b>Local Total Age &lt;21</b>	2,283	93.18%	146	5.96%	21	0.86%	2,450
<b>Imperial</b>	<b>Age &lt;6</b>	4,753	97.80%	95	1.95%	12	0.25%	4,860
	<b>Age 6 to &lt;21</b>	276	97.53%	7	2.47%	0	0.00%	283
	<b>Local Total Age &lt;21</b>	5,029	97.78%	102	1.98%	12	0.23%	5,143
<b>Inyo</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							
<b>Kern</b>	<b>Age &lt;6</b>	18,961	98.56%	229	1.19%	48	0.25%	19,238
	<b>Age 6 to &lt;21</b>	1,073	97.63%	23	2.09%	3	0.27%	1,099
	<b>Local Total Age &lt;21</b>	20,034	98.51%	252	1.24%	51	0.25%	20,337
<b>Kings</b>	<b>Age &lt;6</b>	1,703	97.31%	37	2.11%	10	0.57%	1,750
	<b>Age 6 to &lt;21</b>	35	94.59%	2	5.41%	0	0.00%	37
	<b>Local Total Age &lt;21</b>	1,738	97.26%	39	2.18%	10	0.56%	1,787
<b>Lake</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							563
<b>Lassen</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							147
<b>Long Beach</b>	<b>Age &lt;6</b>	6,421	99.06%	53	0.82%	8	0.12%	6,482
	<b>Age 6 to &lt;21</b>	495	99.20%	3	0.60%	1	0.20%	499
	<b>Local Total Age &lt;21</b>	6,916	99.07%	56	0.80%	9	0.13%	6,981



<b>Orange</b>	<b>Age &lt;6</b>	36,146	98.62%	408	1.11%	98	0.27%	36,652
	<b>Age 6 to &lt;21</b>	4,639	98.45%	62	1.32%	11	0.23%	4,712
	<b>Local Total Age &lt;21</b>	40,785	98.60%	470	1.14%	109	0.26%	41,364
<b>Pasadena</b>	<b>Age &lt;6</b>	1,621	98.30%	24	1.46%	4	0.24%	1,649
	<b>Age 6 to &lt;21</b>	166	99.40%	1	0.60%	0	0.00%	167
	<b>Local Total Age &lt;21</b>	1,787	98.40%	25	1.38%	4	0.22%	1,816
<b>Placer</b>	<b>Age &lt;6</b>	1,134	97.84%	22	1.90%	3	0.26%	1,159
	<b>Age 6 to &lt;21</b>	106	98.15%	2	1.85%	0	0.00%	108
	<b>Local Total Age &lt;21</b>	1,240	97.87%	24	1.89%	3	0.24%	1,267
<b>Plumas</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							124
<b>Riverside</b>	<b>Age &lt;6</b>	35,635	99.26%	213	0.59%	54	0.15%	35,902
	<b>Age 6 to &lt;21</b>	2,209	98.53%	24	1.07%	9	0.40%	2,242
	<b>Local Total Age &lt;21</b>	37,844	99.21%	237	0.62%	63	0.17%	38,144
<b>Sacramento</b>	<b>Age &lt;6</b>	16,448	95.40%	571	3.31%	222	1.29%	17,241
	<b>Age 6 to &lt;21</b>	1,892	80.79%	392	16.74%	58	2.48%	2,342
	<b>Local Total Age &lt;21</b>	18,340	93.65%	963	4.92%	280	1.43%	19,583
<b>San Benito</b>	<b>Age &lt;6</b>	813	98.55%					825
	<b>Age 6 to &lt;21</b>							42
	<b>Local Total Age &lt;21</b>							867
<b>San Bernardino</b>	<b>Age &lt;6</b>	36,478	99.14%	259	0.70%	59	0.16%	36,796
	<b>Age 6 to &lt;21</b>	3,046	99.15%	16	0.52%	10	0.33%	3,072
	<b>Local Total Age &lt;21</b>	39,524	99.14%	275	0.69%	69	0.17%	39,868
<b>San Diego</b>	<b>Age &lt;6</b>	41,628	98.54%	487	1.15%	131	0.31%	42,246
	<b>Age 6 to &lt;21</b>	2,396	96.57%	78	3.14%	7	0.28%	2,481
	<b>Local Total Age &lt;21</b>	44,024	98.43%	565	1.26%	138	0.31%	44,727
<b>San Francisco</b>	<b>Age &lt;6</b>	9,072	98.32%	131	1.42%	24	0.26%	9,227
	<b>Age 6 to &lt;21</b>	1,076	98.44%	16	1.46%	1	0.09%	1,093
	<b>Local Total Age &lt;21</b>	10,148	98.33%	147	1.42%	25	0.24%	10,320
<b>San Joaquin</b>	<b>Age &lt;6</b>	10,786	98.50%	135	1.23%	29	0.26%	10,950
	<b>Age 6 to &lt;21</b>	711	97.80%	15	2.06%	1	0.14%	727
	<b>Local Total Age &lt;21</b>	11,497	98.46%	150	1.28%	30	0.26%	11,677

<b>San Luis Obispo</b>	<b>Age &lt;6</b>	1,378	99.35%	7	0.50%	2	0.14%	1,387
	<b>Age 6 to &lt;21</b>	40	93.02%	3	6.98%	0	0.00%	43
	<b>Local Total Age &lt;21</b>	1,418	99.16%	10	0.70%	2	0.14%	1,430
<b>San Mateo</b>	<b>Age &lt;6</b>	6,397	98.61%	76	1.17%	14	0.22%	6,487
	<b>Age 6 to &lt;21</b>	490	98.99%	3	0.61%	2	0.40%	495
	<b>Local Total Age &lt;21</b>	6,887	98.64%	79	1.13%	16	0.23%	6,982
<b>Santa Barbara</b>	<b>Age &lt;6</b>	5,148	98.75%	49	0.94%	16	0.31%	5,213
	<b>Age 6 to &lt;21</b>	197	93.81%	12	5.71%	1	0.48%	210
	<b>Local Total Age &lt;21</b>	5,345	98.56%	61	1.12%	17	0.31%	5,423
<b>Santa Clara</b>	<b>Age &lt;6</b>	19,513	98.34%	273	1.38%	57	0.29%	19,843
	<b>Age 6 to &lt;21</b>	2,430	96.81%	59	2.35%	21	0.84%	2,510
	<b>Local Total Age &lt;21</b>	21,943	98.17%	332	1.49%	78	0.35%	22,353
<b>Santa Cruz</b>	<b>Age &lt;6</b>	2,730	97.88%	44	1.58%	15	0.54%	2,789
	<b>Age 6 to &lt;21</b>	288	96.64%	7	2.35%	3	1.01%	298
	<b>Local Total Age &lt;21</b>	3,018	97.76%	51	1.65%	18	0.58%	3,087
<b>Shasta</b>	<b>Age &lt;6</b>	629	98.28%	11	1.72%	0	0.00%	640
	<b>Age 6 to &lt;21</b>	45	100.00%	0	0.00%	0	0.00%	45
	<b>Local Total Age &lt;21</b>	674	98.39%	11	1.61%	0	0.00%	685
<b>Sierra</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							
<b>Siskiyou</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							114
<b>Solano</b>	<b>Age &lt;6</b>	4,694	97.47%	101	2.10%	21	0.44%	4,816
	<b>Age 6 to &lt;21</b>	312	98.73%	3	0.95%	1	0.32%	316
	<b>Local Total Age &lt;21</b>	5,006	97.54%	104	2.03%	22	0.43%	5,132
<b>Sonoma</b>	<b>Age &lt;6</b>	3,558	99.08%	32	0.89%	1	0.03%	3,591
	<b>Age 6 to &lt;21</b>	361	99.18%	2	0.55%	1	0.27%	364
	<b>Local Total Age &lt;21</b>	3,919	99.09%	34	0.86%	2	0.05%	3,955
<b>Stanislaus</b>	<b>Age &lt;6</b>	7,118	97.65%	129	1.77%	42	0.58%	7,289
	<b>Age 6 to &lt;21</b>	631	92.79%	41	6.03%	8	1.18%	680
	<b>Local Total Age &lt;21</b>	7,749	97.24%	170	2.13%	50	0.63%	7,969

<b>Sutter</b>	<b>Age &lt;6</b>	1,362	98.55%					1,382
	<b>Age 6 to &lt;21</b>							82
	<b>Local Total Age &lt;21</b>							1,464
<b>Tehama</b>	<b>Age &lt;6</b>	1,441	98.36%					1,465
	<b>Age 6 to &lt;21</b>	88	100.00%					88
	<b>Local Total Age &lt;21</b>	1,529	98.45%					1,553
<b>Trinity</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							
<b>Tulare</b>	<b>Age &lt;6</b>	5,603	98.44%	61	1.07%	28	0.49%	5,692
	<b>Age 6 to &lt;21</b>	500	98.04%	7	1.37%	3	0.59%	510
	<b>Local Total Age &lt;21</b>	6,103	98.40%	68	1.10%	31	0.50%	6,202
<b>Tuolumne</b>	<b>Age &lt;6</b>							
	<b>Age 6 to &lt;21</b>							
	<b>Local Total Age &lt;21</b>							143
<b>Ventura</b>	<b>Age &lt;6</b>	7,648	99.44%	38	0.49%	5	0.07%	7,691
	<b>Age 6 to &lt;21</b>	461	98.93%	3	0.64%	2	0.43%	466
	<b>Local Total Age &lt;21</b>	8,109	99.41%	41	0.50%	7	0.09%	8,157
<b>Yolo</b>	<b>Age &lt;6</b>	2,013	97.25%	43	2.08%	14	0.68%	2,070
	<b>Age 6 to &lt;21</b>	87	97.75%	2	2.25%	0	0.00%	89
	<b>Local Total Age &lt;21</b>	2,100	97.27%	45	2.08%	14	0.65%	2,159
<b>Yuba</b>	<b>Age &lt;6</b>	965	98.37%					981
	<b>Age 6 to &lt;21</b>							110
	<b>Local Total Age &lt;21</b>							1,091
<b>CLPPB</b>	<b>Age &lt;6</b>	75	100.00%	0	0.00%	0	0.00%	75
(includes tests with unknown jurisdictions)	<b>Age 6 to &lt;21</b>	13	100.00%	0	0.00%	0	0.00%	13
	<b>Local Total Age &lt;21</b>	88	100.00%	0	0.00%	0	0.00%	88
<b>California Totals</b>	<b>Age &lt;6</b>	505,695	98.40%	6,609	1.29%	1,625	0.32%	513,929
	<b>Age 6 to &lt;21</b>	48,858	97.26%	1,134	2.26%	243	0.48%	50,235
	<b>Local Total Age &lt;21</b>	554,553	98.30%	7,743	1.37%	1,868	0.33%	564,164



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- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as "< 5 mcg/dL" are included in the category "BLL <4.5 mcg/dL."
- If an individual moved between two jurisdictions, then the child's residence at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by spatially joining the XY coordinates from the patient's geocoded address for their highest BLL to a jurisdiction boundary layer.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2017 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions.

## Number of Individual Children Screened for Lead, by California Local Health Jurisdiction and Highest Level, 2018

Local Health Jurisdiction	Age Group (Years)	Blood Lead Level (BLL) <4.5 n	BLL <4.5 % (row)	BLL ≥4.5 to <9.5 n	BLL ≥4.5 to <9.5 % (row)	BLL ≥9.5 n	BLL ≥9.5 % (row)	Totals
Alameda	Age < 6	15,945	97.78%	300	1.84%	62	0.38%	16,307
	Age 6 to < 21	2,316	97.03%	56	2.35%	15	0.63%	2,387
	Local Total Age < 21	18,261	97.68%	356	1.90%	77	0.41%	18,694
Alpine	Age < 6							
	Age 6 to < 21							
	Local Total Age < 21							
Amador	Age < 6							
	Age 6 to < 21							
	Local Total Age < 21							442
Berkeley	Age < 6	616	98.25%	10	1.59%	1	0.16%	627
	Age 6 to < 21	57	100.00%	0	0.00%	0	0.00%	57
	Local Total Age < 21	673	98.39%	10	1.46%	1	0.15%	684
Butte	Age < 6	1,817	99.07%	15	0.82%	2	0.11%	1,834
	Age 6 to < 21	48	97.96%	1	2.04%	0	0.00%	49
	Local Total Age < 21	1,865	99.04%	16	0.85%	2	0.11%	1,883
Calaveras	Age < 6							
	Age 6 to < 21							
	Local Total Age < 21							339
Colusa	Age < 6							
	Age 6 to < 21							
	Local Total Age < 21							376
Contra Costa	Age < 6	7,062	98.48%	85	1.19%	24	0.33%	7,171
	Age 6 to < 21	684	96.07%	23	3.23%	5	0.70%	712
	Local Total Age < 21	7,746	98.26%	108	1.37%	29	0.37%	7,883
Del Norte	Age < 6							
	Age 6 to < 21							
	Local Total Age < 21							219

<b>El Dorado</b>	<b>Age &lt; 6</b>	521	96.13%	18	3.32%	3	0.55%	542
	<b>Age 6 to &lt; 21</b>	80	98.77%	1	1.23%	0	0.00%	81
	<b>Local Total Age &lt; 21</b>	601	96.47%	19	3.05%	3	0.48%	623
<b>Fresno</b>	<b>Age &lt; 6</b>	15,221	97.53%	320	2.05%	66	0.42%	15,607
	<b>Age 6 to &lt; 21</b>	1,928	98.52%	25	1.28%	4	0.20%	1,957
	<b>Local Total Age &lt; 21</b>	17,149	97.64%	345	1.96%	70	0.40%	17,564
<b>Glenn</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							393
<b>Humboldt</b>	<b>Age &lt; 6</b>	1,686	92.33%	122	6.68%	18	0.99%	1,826
	<b>Age 6 to &lt; 21</b>	78	93.98%	5	6.02%	0	0.00%	83
	<b>Local Total Age &lt; 21</b>	1,764	92.40%	127	6.65%	18	0.94%	1,909
<b>Imperial</b>	<b>Age &lt; 6</b>	4,447	98.28%	68	1.50%	10	0.22%	4,525
	<b>Age 6 to &lt; 21</b>	477	98.96%	5	1.04%	0	0.00%	482
	<b>Local Total Age &lt; 21</b>	4,924	98.34%	73	1.46%	10	0.20%	5,007
<b>Inyo</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							
<b>Kern</b>	<b>Age &lt; 6</b>	16,998	98.20%	256	1.48%	56	0.32%	17,310
	<b>Age 6 to &lt; 21</b>	1,323	98.07%	22	1.63%	4	0.30%	1,349
	<b>Local Total Age &lt; 21</b>	18,321	98.19%	278	1.49%	60	0.32%	18,659
<b>Kings</b>	<b>Age &lt; 6</b>	2,194	97.29%	54	2.39%	7	0.31%	2,255
	<b>Age 6 to &lt; 21</b>	69	97.18%	1	1.41%	1	1.41%	71
	<b>Local Total Age &lt; 21</b>	2,263	97.29%	55	2.36%	8	0.34%	2,326
<b>Lake</b>	<b>Age &lt; 6</b>							553
	<b>Age 6 to &lt; 21</b>							27
	<b>Local Total Age &lt; 21</b>							580
<b>Lassen</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							67
<b>Long Beach</b>	<b>Age &lt; 6</b>	5,689	99.18%	37	0.65%	10	0.17%	5,736
	<b>Age 6 to &lt; 21</b>	442	99.33%	2	0.45%	1	0.22%	445
	<b>Local Total Age &lt; 21</b>	6,131	99.19%	39	0.63%	11	0.18%	6,181



<b>Orange</b>	<b>Age &lt; 6</b>	32,094	98.98%	271	0.84%	61	0.19%	32,426
	<b>Age 6 to &lt; 21</b>	3,570	99.22%	23	0.64%	5	0.14%	3,598
	<b>Local Total Age &lt; 21</b>	35,664	99.00%	294	0.82%	66	0.18%	36,024
<b>Pasadena</b>	<b>Age &lt; 6</b>	1,346	97.89%	25	1.82%	4	0.29%	1,375
	<b>Age 6 to &lt; 21</b>	132	100.00%	0	0.00%	0	0.00%	132
	<b>Local Total Age &lt; 21</b>	1,478	98.08%	25	1.66%	4	0.27%	1,507
<b>Placer</b>	<b>Age &lt; 6</b>	987	99.00%	8	0.80%	2	0.20%	997
	<b>Age 6 to &lt; 21</b>	106	96.36%	3	2.73%	1	0.91%	110
	<b>Local Total Age &lt; 21</b>	1,093	98.74%	11	0.99%	3	0.27%	1,107
<b>Plumas</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							
<b>Riverside</b>	<b>Age &lt; 6</b>	33,866	99.47%	154	0.45%	26	0.08%	34,046
	<b>Age 6 to &lt; 21</b>	1,864	99.04%	13	0.69%	5	0.27%	1,882
	<b>Local Total Age &lt; 21</b>	35,730	99.45%	167	0.46%	31	0.09%	35,928
<b>Sacramento</b>	<b>Age &lt; 6</b>	14,490	96.27%	431	2.86%	130	0.86%	15,051
	<b>Age 6 to &lt; 21</b>	1,401	81.08%	279	16.15%	48	2.78%	1,728
	<b>Local Total Age &lt; 21</b>	15,891	94.71%	710	4.23%	178	1.06%	16,779
<b>San Benito</b>	<b>Age &lt; 6</b>							706
	<b>Age 6 to &lt; 21</b>							35
	<b>Local Total Age &lt; 21</b>							741
<b>San Bernardino</b>	<b>Age &lt; 6</b>	32,832	99.24%	209	0.63%	42	0.13%	33,083
	<b>Age 6 to &lt; 21</b>	2,780	99.29%	15	0.54%	5	0.18%	2,800
	<b>Local Total Age &lt; 21</b>	35,612	99.24%	224	0.62%	47	0.13%	35,883
<b>San Diego</b>	<b>Age &lt; 6</b>	38,639	98.63%	435	1.11%	102	0.26%	39,176
	<b>Age 6 to &lt; 21</b>	1,819	95.34%	71	3.72%	18	0.94%	1,908
	<b>Local Total Age &lt; 21</b>	40,458	98.48%	506	1.23%	120	0.29%	41,084
<b>San Francisco</b>	<b>Age &lt; 6</b>	8,073	98.28%	109	1.33%	32	0.39%	8,214
	<b>Age 6 to &lt; 21</b>	892	99.22%	6	0.67%	1	0.11%	899
	<b>Local Total Age &lt; 21</b>	8,965	98.38%	115	1.26%	33	0.36%	9,113
<b>San Joaquin</b>	<b>Age &lt; 6</b>	10,426	98.56%	121	1.14%	31	0.29%	10,578
	<b>Age 6 to &lt; 21</b>	603	97.57%	13	2.10%	2	0.32%	618
	<b>Local Total Age &lt; 21</b>	11,029	98.51%	134	1.20%	33	0.29%	11,196

<b>San Luis Obispo</b>	<b>Age &lt; 6</b>	1,279	99.07%	9	0.70%	3	0.23%	1,291
	<b>Age 6 to &lt; 21</b>	41	95.35%	2	4.65%	0	0.00%	43
	<b>Local Total Age &lt; 21</b>	1,320	98.95%	11	0.82%	3	0.22%	1,334
<b>San Mateo</b>	<b>Age &lt; 6</b>	5,938	98.04%	100	1.65%	19	0.31%	6,057
	<b>Age 6 to &lt; 21</b>	460	99.14%	3	0.65%	1	0.22%	464
	<b>Local Total Age &lt; 21</b>	6,398	98.11%	103	1.58%	20	0.31%	6,521
<b>Santa Barbara</b>	<b>Age &lt; 6</b>	4,499	98.60%	53	1.16%	11	0.24%	4,563
	<b>Age 6 to &lt; 21</b>	217	97.75%	5	2.25%	0	0.00%	222
	<b>Local Total Age &lt; 21</b>	4,716	98.56%	58	1.21%	11	0.23%	4,785
<b>Santa Clara</b>	<b>Age &lt; 6</b>	18,542	98.53%	208	1.11%	69	0.37%	18,819
	<b>Age 6 to &lt; 21</b>	2,225	96.87%	46	2.00%	26	1.13%	2,297
	<b>Local Total Age &lt; 21</b>	20,767	98.35%	254	1.20%	95	0.45%	21,116
<b>Santa Cruz</b>	<b>Age &lt; 6</b>	2,214	97.96%	38	1.68%	8	0.35%	2,260
	<b>Age 6 to &lt; 21</b>	276	96.17%	10	3.48%	1	0.35%	287
	<b>Local Total Age &lt; 21</b>	2,490	97.76%	48	1.88%	9	0.35%	2,547
<b>Shasta</b>	<b>Age &lt; 6</b>	534	97.98%	8	1.47%	3	0.55%	545
	<b>Age 6 to &lt; 21</b>	35	97.22%	1	2.78%	0	0.00%	36
	<b>Local Total Age &lt; 21</b>	569	97.93%	9	1.55%	3	0.52%	581
<b>Sierra</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							
<b>Siskiyou</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							144
<b>Solano</b>	<b>Age &lt; 6</b>	4,470	97.05%	115	2.50%	21	0.46%	4,606
	<b>Age 6 to &lt; 21</b>	233	95.88%	9	3.70%	1	0.41%	243
	<b>Local Total Age &lt; 21</b>	4,703	96.99%	124	2.56%	22	0.45%	4,849
<b>Sonoma</b>	<b>Age &lt; 6</b>	2,782	98.90%	25	0.89%	6	0.21%	2,813
	<b>Age 6 to &lt; 21</b>	263	98.50%	4	1.50%	0	0.00%	267
	<b>Local Total Age &lt; 21</b>	3,045	98.86%	29	0.94%	6	0.19%	3,080
<b>Stanislaus</b>	<b>Age &lt; 6</b>	7,448	98.22%	109	1.44%	26	0.34%	7,583
	<b>Age 6 to &lt; 21</b>	583	91.96%	41	6.47%	10	1.58%	634
	<b>Local Total Age &lt; 21</b>	8,031	97.74%	150	1.83%	36	0.44%	8,217

<b>Sutter</b>	<b>Age &lt; 6</b>	1,188	98.34%					1,208
	<b>Age 6 to &lt; 21</b>							62
	<b>Local Total Age &lt; 21</b>							1,270
<b>Tehama</b>	<b>Age &lt; 6</b>	1,550	98.92%					1,567
	<b>Age 6 to &lt; 21</b>							88
	<b>Local Total Age &lt; 21</b>							1,655
<b>Trinity</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							
<b>Tulare</b>	<b>Age &lt; 6</b>	5,711	98.04%	98	1.68%	16	0.27%	5,825
	<b>Age 6 to &lt; 21</b>	399	98.28%	5	1.23%	2	0.49%	406
	<b>Local Total Age &lt; 21</b>	6,110	98.06%	103	1.65%	18	0.29%	6,231
<b>Tuolumne</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>							351
<b>Ventura</b>	<b>Age &lt; 6</b>	7,009	99.31%	39	0.55%	10	0.14%	7,058
	<b>Age 6 to &lt; 21</b>	486	98.78%	5	1.02%	1	0.20%	492
	<b>Local Total Age &lt; 21</b>	7,495	99.27%	44	0.58%	11	0.15%	7,550
<b>Yolo</b>	<b>Age &lt; 6</b>	2,221	97.28%	51	2.23%	11	0.48%	2,283
	<b>Age 6 to &lt; 21</b>	77	97.47%	2	2.53%	0	0.00%	79
	<b>Local Total Age &lt; 21</b>	2,298	97.29%	53	2.24%	11	0.47%	2,362
<b>Yuba</b>	<b>Age &lt; 6</b>							
	<b>Age 6 to &lt; 21</b>							
	<b>Local Total Age &lt; 21</b>	887	98.56%					900
<b>CLPPB</b>	<b>Age &lt; 6</b>	21	100.00%	0	0.00%	0	0.00%	21
(Includes Tests with unknown Jurisdictions)	<b>Age 6 to &lt; 21</b>	3	100.00%	0	0.00%	0	0.00%	3
	<b>Local Total Age &lt; 21</b>	24	100.00%	0	0.00%	0	0.00%	24
<b>California Totals</b>	<b>Age &lt; 6</b>	473,813	98.52%	5,850	1.22%	1,291	0.27%	480,954
	<b>Age 6 to &lt; 21</b>	46,643	97.46%	984	2.06%	232	0.48%	47,859
	<b>Local Total Age &lt; 21</b>	520,456	98.42%	6,834	1.29%	1,523	0.29%	528,813

- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest BLL during 2018.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary, and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “<5 mcg/dL” are included in the category “BLL <4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by geocoding the address associated with the child's highest BLL and spatially joining it to a jurisdiction boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. However, the California Totals include the data from suppressed jurisdictions.



## APPENDIX E: DATA SUPPRESSION TO PROTECT CHILDREN'S PRIVACY

California requires that laboratories report certain information to CDPH so that CDPH can ensure that lead-poisoned children are identified and receive appropriate follow up and case management. By law, CDPH is also required to prevent disclosure of children's identifiable medical information.

To assist public agencies in balancing these interests, the California Health and Human Services (CHHS) Agency implemented Data De-Identification Guidelines (DDGs) in 2016. The DDGs provide specific steps that must be taken to determine whether disclosure of information about a group of individuals would put individuals in the group at risk of re-identification. If there are not enough individuals in a given group, CDPH must "suppress" information about that group when disseminating information about the health condition. This information can still be used within state and local health departments for public health surveillance and policy making, but detailed information that could put children at risk for re-identification cannot be publicly disseminated.

## APPENDIX F: MEDI-CAL COHORT REPORT

**Title:** Blood Lead Screening Rates for a Cohort of California Children Served by Medi-Cal: A Joint Report from the California Department of Public Health-Department of Health Care Services

### Abstract

Federal guidelines require that children served by Medicaid be screened for lead poisoning with a blood lead level (BLL) test at ages 12 and 24 months, and up to age 6 years if not previously tested. The California Department of Public Health (CDPH) and the Department of Health Care Services (DHCS) undertook a collaboration to assess BLL screening rates in the group (cohort) of children served by California's Medicaid program, Medi-Cal, who turned 3 years old in Federal Fiscal Year (FFY) 2016.

Data relevant to assessing BLL screening rates among children on Medi-Cal are available in data repositories managed by CDPH and DHCS. The data repositories are intended for different purposes, and analyses of data contained in each separate system offer an incomplete picture of screening rates. A more accurate picture of screening rates is obtained by combining data from the two systems and identifying clients found in both data sets (deterministic matching). In this approach, the analysis searches for children who are found in both data sets, indicating that a specific child has been reported both to CDPH as having received a blood lead test, and to DHCS as having been served by Medi-Cal. Using this approach, we found that of 309,574 children who turned 3 in FFY 2016 (October 1, 2015, to September 30, 2016) and had been enrolled in Medi-Cal at any time (including both children enrolled continuously and enrolled intermittently) before their third birthday, 201,263 (65.0 %) had at least one blood lead test at some point between the ages of 6 and 35 months. When the analysis was restricted to the subset of 197,847 children who turned 3 in FFY 2016 and had been enrolled in Medi-Cal since they were 6 months old (i.e., continuously), the percentage of children screened increased to 72.6 % (143,714). This number likely still underestimates the number of Medi-Cal children who received a blood lead test during the time period studied because limitations of the matching approach preclude identifying every child who is truly in both data sets.

### Introduction

Pediatric lead exposure at very low levels can adversely affect the normal development of children and may have lifelong impacts.<sup>1</sup> State and federal laws support careful monitoring of pediatric lead exposures and intensive response to positive screening results. CDPH and DHCS administer programs responsible for monitoring the

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<sup>1</sup> AAP COUNCIL ON ENVIRONMENTAL HEALTH. Prevention of Childhood Lead Toxicity. *Pediatrics*. 2016; 138(1):e20161493. CDC's BLL in Children fact sheet can be found at: <https://www.cdc.gov/nceh/lead/about/program.htm>.

population for childhood lead exposure, investigating suspected cases of lead poisoning, treating children for EBLLs, publicly reporting screening rates, and performing other associated activities. In 2018, CDPH and DHCS undertook a cohort analysis to better understand BLL screening rates and data quality considerations.

## Background

All blood lead tests drawn in California are to be reported to CDPH<sup>2</sup> and are recorded in the CDPH Response and Surveillance System for Childhood Lead Exposures (RASSCLE) system. California children who are beneficiaries of Medi-Cal, California's Medicaid program, are to be screened for lead poisoning with a blood test at ages 12 and 24 months and up to age 6 years if not previously tested.<sup>3</sup> Medi-Cal beneficiaries receive their health care services either through Medi-Cal Fee-For-Service (FFS) or through a Medi-Cal managed care plan (MCP). FFS Medi-Cal providers are required to submit their claims to DHCS for services paid for by Medi-Cal. MCPs are required to submit their encounter data to DHCS for services provided to Medi-Cal beneficiaries. Public reporting of children receiving BLL screening has been based on data reported to CDPH or claims and encounter data reported to DHCS. In 2018, the CDPH Childhood Lead Poisoning Prevention Branch and DHCS partnered to demonstrate the benefit of combining data from CDPH and DHCS to obtain a more accurate estimate of BLL screening rates among children under the age of 6 receiving Medi-Cal services.

An initial analysis combining data from CDPH and DHCS was performed and shared with the Legislature in June 2018 (Appendix C-1). Information shared at that time was the result of a "point in time" analysis and would have missed some children who had actually received lead screening. The analysis examined the number of children ages 12 through 35 months who were enrolled 12 months continuously in Medi-Cal who had a blood lead test during FFY 2015. That initial analysis demonstrated that there are gaps in data completeness in both the CDPH and DHCS data sets. Additionally, BLL data collected by DHCS and CDPH are very different. Medi-Cal data is based on the submittal of a claim or encounter that includes specific procedure and diagnosis codes indicating that a BLL screening has been performed. DHCS receives administrative data in the forms of claims (for FFS beneficiaries) or encounter data (for MCP beneficiaries). DHCS' data does not indicate the completion of a BLL test if a primary care provider performed the test but only documented an office visit. In contrast, CDPH receives data on BLL tests performed by laboratories, including those in a physician's office. CDPH has limited data to indicate whether a child is a Medi-Cal beneficiary.

Given these differences in collection processes, the most accurate estimate of the number of Medi-Cal beneficiaries who received a BLL test can only be obtained by combining data from CDPH and DHCS data repositories and matching client-level information. Client-level data, i.e., data which includes personally identifiable information such as a Social Security number, name, date of birth, etc., is needed because there is

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<sup>2</sup> California Health and Safety Code Section 124130

<sup>3</sup> Title 17, California Code of Regulations Section 37100 (b)(2)

no unique identifier that is shared between all children in both data repositories (e.g., Medi-Cal numbers and Social Security numbers are rarely included with laboratory results).

This study was undertaken to determine an improved estimate of the number of young Medi-Cal beneficiaries who had received at least a single blood lead test before their third birthday. A similar measure is the Lead Screening in Children (LSC) Healthcare Effectiveness Data and Information Set (HEDIS) measure which assesses the percentage of children two years of age who had one or more capillary or venous blood lead tests for lead poisoning by their second birthday.<sup>4</sup> Medicaid Health Management Organizations reporting to the National Committee for Quality Assurance (NCQA) have reported that approximately 65 % of children two years of age had one or more capillary or venous blood lead tests for lead poisoning by their second birthday.

### **Methodology**

This report describes a cohort analysis, in contrast to the point-in-time analysis previously reported. CDPH reports,<sup>5</sup> by calendar year, the number of individual children screened for lead, by highest level, by age group, and by local health jurisdiction. DHCS reports annually to the Centers for Medicare and Medicaid Services (CMS) on the CMS-416: Annual Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) Participation Report.<sup>6</sup> Each of these reports reflects a point-in-time analysis based on the number of tests performed in a given year and the age of the child receiving the test in that year.

Point-in-time analyses can be limited based on the way measurement criteria are set. In contrast, cohort analyses follow a group of individuals over time, and can provide a better picture of the true experience of individuals in the group. The cohort analysis in this report was undertaken in order to have a better understanding of prevalence of BLL screening for young children enrolled in Medi-Cal. The time period of interest for BLL screening for these children is 12 and 24 months of age. Health care providers may order the mandated screening at visits that occur exactly on the child's 12 month and 24 month birthdays. However, they may also order the mandated test on a visit that occurs somewhat before or after those dates. To get a complete picture of screening rates, this analysis reviewed the cohort of Medi-Cal-enrolled children who turned 3 in FFY 2016 (October 1, 2015, to September 30, 2016) and who had a BLL screening test that occurred from 6 through 35 months of age.

The most complete and accurate estimate of the proportion of Medi-Cal beneficiaries who have received a BLL test can only be obtained by combining and matching individual children from CDPH and DHCS data repositories. To identify children appearing in both data repositories, a deterministic match was performed using several

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<sup>4</sup> <https://www.ncqa.org/hedis/measures/lead-screening-in-children/>

<sup>5</sup> <https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/CLPPB/Pages/data.aspx>

<sup>6</sup> <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>

variables or combinations of variables since there is no unique identifier that is shared between all children in both data repositories. Matching variables included Social Security number, Medi-Cal number (although a small proportion of the blood lead records contained neither of these data elements), a combination of first name, last name, date of birth, and zip code, or a combination of first name, last name, and seven-digit phone number.

Children with gaps in Medi-Cal enrollment may have different rates of BLL screening from children with continuous enrollment. Therefore, analyses were initially performed to determine BLL screening rates among children who were enrolled at any time prior to their third birthday. Then the analysis was repeated on the subset of these children who had been continuously enrolled prior to age 3. Children were counted as having received a BLL test if there was at least one Medi-Cal claim (fee-for-service) or encounter (managed care) for a blood lead test (CPT code 83655) or a report of a BLL test in the CDPH RASSCLE data system.

Claims that were denied were not included in this analysis. Claims may be denied due to incorrect codes, lack of eligibility of patients, lack of eligibility of providers, and other reasons. MCPs are required to submit encounter data to DHCS as part of their contractual requirements; however, submission of an individual encounter record does not equate with a provider reimbursement. Encounter data indicates that the service was provided.

### Findings

Table 1 illustrates the cohort analysis including all Medi-Cal beneficiaries who turned age 3 in FFY 2016 and were enrolled in Medi-Cal at any point during the previous three years. Of the 309,574 children who turned 3 in FFY 2016, 169,234 had a BLL test between 6 and 35 months of age based on data from DHCS (Table 1). After examining the data from the CDPH RASSCLE data system, an additional 32,029 children were found to have received a BLL test. When BLL tests from both CDPH and DHCS data repositories were included, 65.0 % of Medi-Cal beneficiaries (defined as having been enrolled in Medi-Cal at any point before their third birthday) were found to have been screened at least once for lead poisoning based on these matches.

<b>Table 1. BLL Screening Rates Among Children Who Turned 3 in FFY 2016 and Were Enrolled in Medi-Cal at Any Point Before They Turned 3</b>			
<b>Cohort Characteristics</b>	<b>Medi-Cal Beneficiaries Screened</b>	<b>Total Number of Medi-Cal Beneficiaries</b>	<b>Percentage of Medi-Cal Beneficiaries Screened</b>
Turned 3 in FFY 2016: Enrolled any time during 3 years with screening at 6 through 35 months of age (DHCS data only)	169,234	309,574	54.7%

Additional Children Found in CDPH Data	32,029		
Total with Additional Children Found in CDPH Data	201,263	309,574	65.0%

Children who are not enrolled continuously in Medi-Cal may receive services outside of Medi-Cal. Table 2 illustrates the results of analysis of children who turned 3 in FFY 2016 and were continuously enrolled in Medi-Cal. Of the 197,847 children who turned 3 in FFY 2016 and were continuously enrolled in Medi-Cal, 126,045 had a blood lead test based on data from DHCS alone. After examining the data from CDPH, an additional 17,669 children were found to have been tested for lead. Among children continuously enrolled in Medi-Cal, 72.6 % were found to have been screened at least once for lead poisoning based on these matches.

**Table 2. BLL Screening Rates Among Children Who Turned 3 in FFY 2016 and Were Continuously Enrolled in Medi-Cal Before They Turned 3**

Cohort Characteristics	Medi-Cal Beneficiaries Screened	Total Number of Medi-Cal Beneficiaries	Percentage of Medi-Cal Beneficiaries Screened
Turned 3 in FFY 2016: Enrolled continuously during 3 years with screening at 6 through 35 months of age	126,045	197,847	63.7%
Additional Children Found in CDPH Data	17,669		
Total with Additional Children Found in CDPH Data	143,714	197,847	72.6%

### Assessment of completeness of matching

This analysis may have failed to identify some Medi-Cal children who received BLL tests, due to limitations in the matching process resulting from missing data or inconsistent information across the two datasets. To determine whether additional children had actually received BLL testing, a random sample of 100 Medi-Cal children who had not matched with CDPH data were identified. Individual searches were then performed to try to locate a BLL test reported to CDPH. Among the 100 children, 14 children were found to have had a test reported to CDPH RASSCLE sometime between the ages of 6 and 35 months. An additional 23 children had a reported test outside that age range (all occurred when the child was age 3 or 4 years). For the remaining 63

children, no BLL test was found in RASSCLE. This indicates that the true rates of BLL screening among children enrolled in Medi-Cal are likely even higher than the estimates shown in Table 2.

## Discussion

Depending on whether we included in our analysis all children enrolled at any point in Medi-Cal, or restricted our analysis to only those enrolled continuously, we found that 65 % to 72.6 % of Medi-Cal beneficiaries who turned 3 in FFY 2016 had received a BLL test at least once between 6 and 35 months of age. This analysis likely underestimates the true rate of BLL testing in the population, due to limitations inherent in the matching methodology. Because there is no common unique identifier in the CDPH and DHCS data repositories, data matching was performed using a combination of other data elements, including names, dates of birth, ZIP codes, and telephone numbers, when Social Security or Medi-Cal numbers were not available. This likely underestimates the number of Medi-Cal children with a blood lead test in the CDPH data. Furthermore, there are a fair number of laboratory reports that do not contain address, phone number, or any other linking variables (e.g., Medi-Cal number, social security number) beyond name and birth date. This further reduces the likelihood of a match, even if the individual child was truly present in both data repositories. The initial match did not include provider information on the claim and encounter data. Provider information could be included in future analyses to help improve matching.

This cohort analysis included two definitions of Medi-Cal participation: eligibility at any point during the three-year time period and continuous eligibility throughout the three-year period. Using these two definitions, this analysis found estimates of the percentage of Medi-Cal children who received at least one BLL screening test by the age of 3 to be either 54.7 % among children eligible at any point or 63.7 % among children continuously enrolled, based on DHCS data alone, and either 65.0 % or 72.6 % respectively based on CDPH and DHCS combined data. In contrast, the data reported to CMS on the CMS-416 report requires three months of continuous eligibility but is a point-in-time analysis. Using the data reported to CMS<sup>7</sup> for FFY 2017, of the 792,663 children under the age of 3 with three months continuous eligibility in the previous year, 211,836 or 26.7 % had a BLL screening test in that year, based on DHCS data alone. This demonstrates the substantial difference in estimates of BLL testing rates provided by a cohort analysis as compared to a point-in-time analysis.

There are a number of reasons a BLL screening test may not be found in either the CDPH or DHCS data. Previous testing may be documented in the patient's medical record, as testing may have occurred when the child lived in another state. In this case, the provider may be compliant with federal and state laws, but the data in the CDPH or DHCS systems would not reflect this.

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<sup>7</sup> <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>

Providers may evaluate a patient for risk of lead exposure through an assessment of environmental hazards and decide that the risk of screening is a greater risk to the child's health than the risk of lead poisoning. The Bright Futures Periodicity Schedule includes in the footnote for Lead Screening to “Perform risk assessments or screenings as appropriate, based on universal screening requirements for patients with Medicaid or in high prevalence areas.”<sup>8</sup> It may not be clear that the requirements for Medicaid included BLL screening (testing) in addition to screening performed through interview or questionnaire techniques. Providers who subcontract with managed care service plans who serve both commercial populations and Medi-Cal populations may not be aware during an office visit that a patient they are seeing is on Medi-Cal and that universal BLL screening (testing) is required for Medi-Cal patients.

Providers work with patients and parents or guardians to develop care plans for the children they care for. Providers may have ordered a BLL test, but parents may not have taken the child to a laboratory or draw station to receive the test. This may have been due to time constraints, transportation challenges, misunderstanding, or other reasons. If a test was performed but the specimen was inadequate for laboratory analysis, and the child was not retested, then a BLL screening would not be documented in the CDPH or DHCS data. Lastly, parents may have opted not to have their child tested with a BLL for lead.

While this study determined that the actual number of young Medi-Cal beneficiaries receiving blood lead screening was higher than suggested by previous reports, important questions remain. Future analyses may include:

- Assessing the degree to which Medi-Cal beneficiaries receive appropriate follow-up testing when their blood tests indicated that they have elevated BLLs; and,
- Assessing how many Medi-Cal beneficiaries receive two screenings (at 12 and 24 months), as state and federal regulations require.

CDPH and DHCS are planning future collaborations to answer these questions and ensure that young Medi-Cal beneficiaries receive appropriate services to prevent and address lead exposure.

### Reference Materials

Title 17, California Code of Regulations (CCR) Section 37100 (b) (2) requires screening evaluations to be performed as follows:

- When the child is 12 months of age.
- When the child is 24 months of age.
- Whenever the health care provider performing a Periodic Health Assessment (PHA) becomes aware that the child is 12 months to 24 months of age and a BLL test or risk evaluation was not taken at 12 months of age or thereafter.

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<sup>8</sup> [https://www.aap.org/en-us/Documents/periodicity\\_schedule.pdf](https://www.aap.org/en-us/Documents/periodicity_schedule.pdf)



- Whenever the health care provider performing a PHA becomes aware that the child is 24 months to 72 months of age and a BLL test or risk evaluation was not taken when the child was 24 months of age or thereafter.
- Whenever the health care provider who performs a PHA of a child 12 to 72 months of age becomes aware that, in the professional judgment of the health care provider, a change in circumstance has put the child at risk of lead poisoning.

## APPENDIX F-1: MEDI-CAL INFORMATION: JUNE 2018

Children 12-23 Months Old Enrolled 12 Months Continuously in Medi-Cal with a Blood Lead Test During Federal Fiscal Year 2015						
Type of service	Number of children with DHCS claims data for a blood lead test (CPT code 83655)	Additional blood lead tests in CDPH database <sup>1</sup>	Revised number of children with a blood lead test (DHCS data + CDPH data)	Number of children 12-23 months old enrolled 12 months continuously in Medi-Cal (DHCS)	Percentage of children 12-23 months old enrolled 12 months continuously in Medi-Cal with a blood lead test based on DHCS data only	Percentage of children 12-23 months old enrolled 12 months continuously in Medi-Cal with a blood lead test based on DHCS and CDPH data
Managed Care	59,132	13,289	72,421	132,143	44.7%	54.8%
Fee-for-Service	42,099	9,941	52,040	122,693	34.3%	42.4%
Total	101,231	23,230	124,461	254,836	39.7%	48.8%

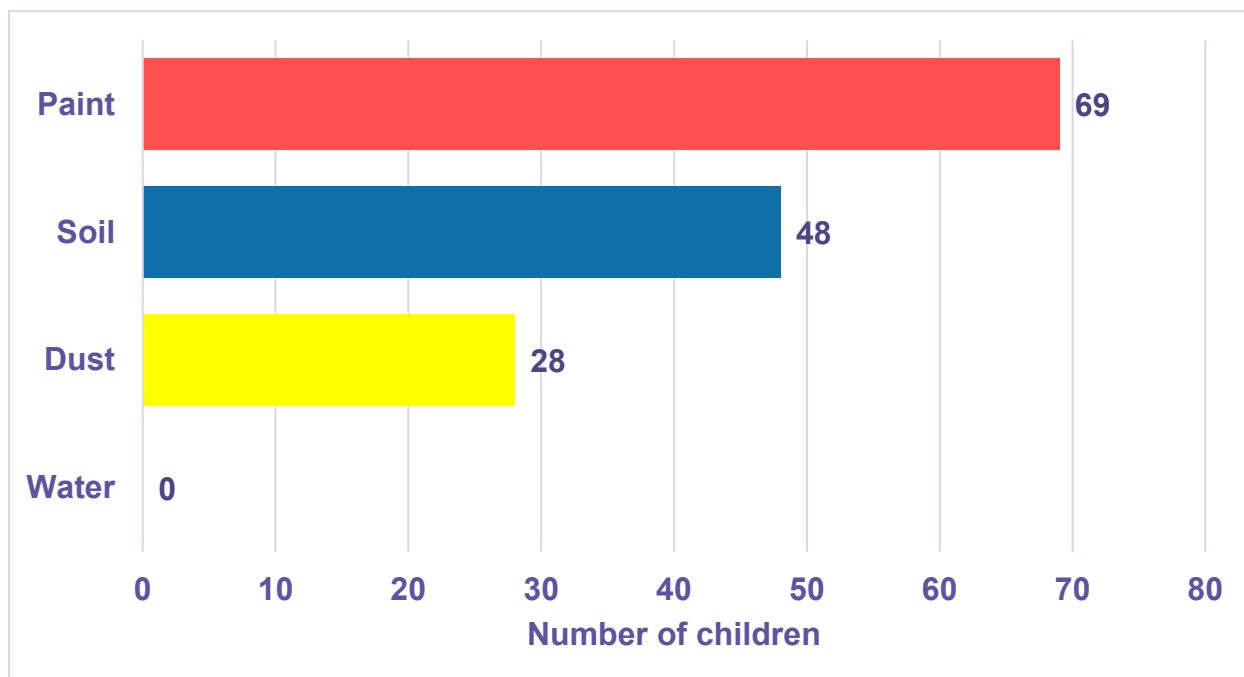
Children 24-35 Months Old Enrolled 12 Months Continuously in Medi-Cal with a Blood Lead Test During Federal Fiscal Year 2015						
Type of service	Number of children with DHCS claims data for a blood lead test (CPT code 83655)	Additional blood lead tests in CDPH database <sup>1</sup>	Revised number of children with a blood lead test (DHCS data + CDPH data)	Number of children 24-35 months old enrolled 12 months continuously in Medi-Cal (DHCS)	Percentage of children 24-35 months old enrolled 12 months continuously in Medi-Cal with a blood lead test based on DHCS data only	Percentage of children 24-35 months old enrolled 12 months continuously in Medi-Cal with a blood lead test based on DHCS and CDPH data
Managed Care	66,394	14,329	80,723	190,949	34.8%	42.3%
Fee-for-Service	16,880	4,597	21,477	61,189	27.6%	35.1%
Total	83,274	18,926	102,200	252,138	33.0%	40.5%

<sup>1</sup>Children identified as tested in the CDPH lead surveillance database but not identified as tested in DHCS Medi-Cal claims data. There is no unique identifier that is shared between all children in both data repositories. Relatively few of the blood lead reports contained Social Security or Medi-Cal numbers. Instead, matches were performed using combinations of variables including names, dates of birth, ZIP codes, and telephone numbers when Social Security or Medi-Cal numbers were not available. Completeness of matching, and therefore, the number of children identified as having had a lead test, was limited by missing or inconsistent information across the two datasets.

## APPENDIX G: SOURCES OF LEAD EXPOSURE

Definition of Environmental Lead Hazards	
Type of environmental hazard	Definition
Paint	<p>Deteriorated lead-based paint tested at the state regulatory level of greater than or equal to 1.0 milligram of lead per square centimeter of surface area (<math>\geq 1.0 \text{ mg/cm}^2</math>). In addition, full cases were attributed to paint hazards at local regulatory levels: Los Angeles at <math>\geq 0.7 \text{ mg/cm}^2</math>. (17 CCR Sections 35022, 35033, 35037; Los Angeles County Code Section 11.28.010)</p> <p>In situations where paint was below the regulatory level but found to be nuisances that may result in persistent and quantifiable lead exposure (17 CCR Section 35037), paint was considered a hazard.</p>
Dust	<p>Lead-contaminated at greater than or equal to 40 micrograms of lead per square foot of surface area (<math>\geq 40 \text{ mcg/ft}^2</math>) for interior floor surfaces, <math>\geq 250 \text{ mcg/ft}^2</math> for interior horizontal surfaces, and <math>\geq 400 \text{ mcg/ft}^2</math> for exterior floor and exterior horizontal surfaces. (17 CCR Sections 35035, 35037)</p>
Soil	<p>Lead-contaminated at greater than or equal to 400 parts per million (<math>\geq 400 \text{ ppm}</math>) in children's play areas.</p> <p>In situations where soil was below the regulatory level but found to be nuisances that may result in persistent and quantifiable lead exposure (17 CCR Section 35037), soil was considered a hazard.</p>
Water	<p>Categorized by an action level; according to the US EPA, greater than or equal to 0.015 milligrams of lead per liter of water (<math>\geq 0.015 \text{ mg/L}</math>) is above the action level. (40 CFR Section 141.80)</p>

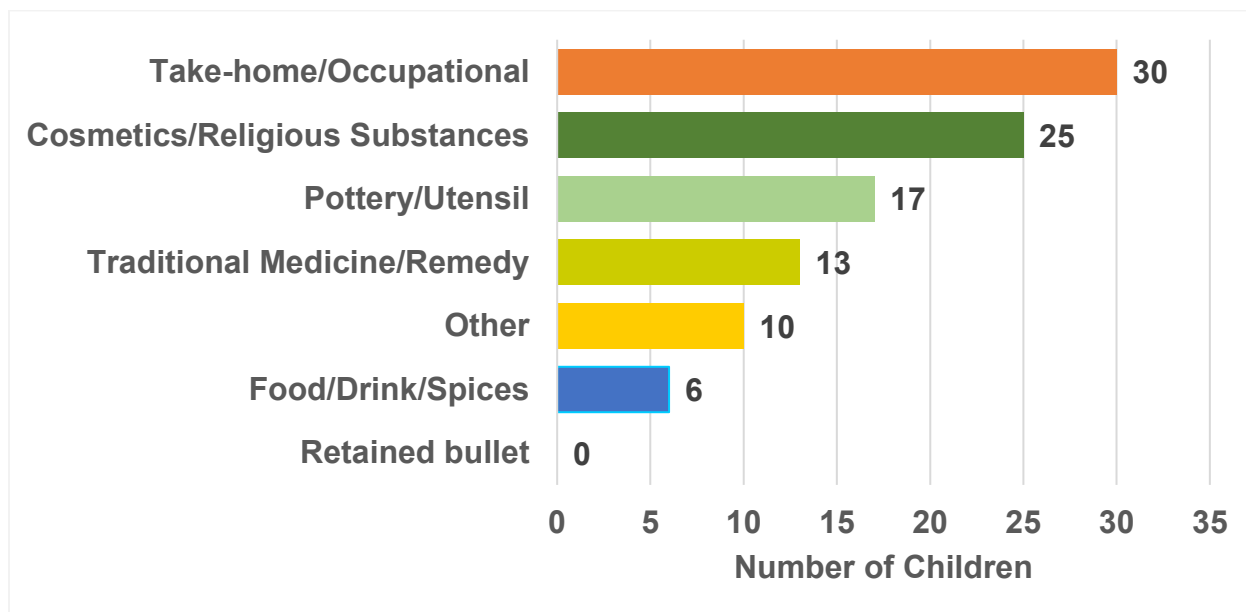
### Total Occurrences<sup>1</sup> of Environmental Lead Hazards<sup>2</sup> at Current Regulatory Levels Identified Among Full Cases, Fiscal Year 2015-16



<sup>1</sup>A child may have more than one type of environmental lead hazard and therefore, the total occurrences of environmental lead hazards will be greater than the number of children identified with a lead hazard.

<sup>2</sup>Environmental lead hazards include:

- A paint hazard signifies the presence of deteriorated lead-based paint, tested at the state regulatory level of  $\geq 1.0$  mg/cm<sup>2</sup>. In addition, full cases were attributed to paint hazards at local regulatory levels: Los Angeles at  $\geq 0.7$  mg/cm<sup>2</sup> and San Francisco at  $\geq 0.8$  mg/cm<sup>2</sup>. (17 CCR Sections 35022, 35033, 35037; Los Angeles County Code Section 11.28.010; San Francisco Health Code Section 581(b)(10))
- Dust is considered a hazard when it is lead-contaminated at  $\geq 40$  mcg/ft<sup>2</sup> for interior floor surfaces,  $\geq 250$  mcg/ft<sup>2</sup> for interior horizontal surfaces, and  $\geq 400$  mcg/ft<sup>2</sup> for exterior floor and exterior horizontal surfaces. (17 CCR Sections 35035, 35037)
- Soil is considered a hazard when it is lead-contaminated at  $\geq 400$  ppm in children's play areas.
- Water levels are categorized by an action level; according to the US EPA,  $\geq 0.015$  mg/L is above the action level (40 CFR Section 141.80). One water sample was above the action level due to a sampling error. The water had been standing in household pipes for weeks prior to sampling while the family was living elsewhere. Subsequent testing under normal conditions, of water standing for  $> 6$  hours, measured non-detect lead levels.

**Total Occurrences<sup>1</sup> of Non-Housing Exposures Identified, Fiscal Year 2015-16**

<sup>1</sup>A child may have more than one type of non-housing exposure and therefore the total occurrences of non-housing exposures hazards will be greater than the number of children identified with a non-housing hazard (n = 95).

## APPENDIX H: LOWER ACTIONABLE LEVELS

### Lower Actionable Levels Considered for Exposure Sources from Paint, Dust, Soil and Water for the 188 Full Cases in Fiscal Year 2015-16 (with Environmental Lead Hazards, Defined In Appendix G, at the Current Actionable Levels)

Type of environmental hazard	Definition
Paint	Paint with lead $\geq 600$ ppm was used. In 1978 the federal Consumer Product Safety Commission (CPSC) restricted lead in newly manufactured paint to 600 ppm. Additionally, 600 ppm is the level petitioners to the US EPA have been seeking to lower the federal definition of lead-based paint. Since there is incongruence of unit equivalency between ppm and $\text{mg}/\text{cm}^2$ , the level chosen for XRF instruments was $0.1 \text{ mg}/\text{cm}^2$ , which is the lowest level detectable to the tenths place in order to be most health protective.
Dust	Lead levels $\geq 10 \text{ mcg}/\text{ft}^2$ for interior floor surfaces, and $\geq 100 \text{ mcg}/\text{ft}^2$ for interior horizontal surfaces were selected in order to match changes in federal dust standards taking effect in 2020.
Soil	Bare soil with $\geq 80$ ppm was used in order to match California Human Health Screening Levels (CHHSLs) proposed by the California Office of Environmental Health Hazard Assessment (OEHHA). The current CHHSL for lead in soil for residential property is 80 ppm.
Water	Drinking water $\geq 0.005 \text{ mg}/\text{L}$ was selected since it is the required reporting limit for laboratories conforming with the federal Lead and Copper Rule for drinking water. Results below this level would not be available from laboratory reports used in the sample of cases selected.

## APPENDIX I: LEAD RISK TABLE BY JURISDICTION

California Local Health Jurisdictions with the Percent of Children Under 6 Years Old with Blood Lead Level of 4.5 mcg/dL or Greater in 2018, in Descending Order and Estimates of Percentage of Children Living in Pre-1960 housing, Pre-1980 housing, and on Medi-Cal				
Local Health Jurisdiction	% Children Under the Age of 6 with BLLs $\geq 4.5$ in 2018	% Children Under the Age of 6 Living in Pre-1960 housing	% Children Under the Age of 6 Living in Pre-1980 housing	% Children Under the Age of 6 on Medi-Cal
Humboldt	7.67%	33.92	68.37	63.90
Mendocino	3.97%		Cannot estimate	
Nevada	3.91%		Cannot estimate	
El Dorado	3.87%	7.39	38.73	31.04
Sacramento	3.73%	17.24	47.19	47.19
Solano	2.95%	14.79	48.31	43.39
Yolo	2.72%	18.26	41.64	39.65
Kings	2.71%	18.25	42.25	41.17
Fresno	2.47%	20.63	48.99	65.46
Alameda	2.22%	37.14	65.19	30.81
Pasadena	2.11%		Cannot estimate	
Santa Cruz	2.04%	29.86	63.80	50.78
Shasta	2.02%	14.75	50.62	55.27
San Mateo	1.96%	44.57	77.74	23.91
Tulare	1.96%	17.34	45.85	58.22
Merced	1.85%	17.42	45.48	72.29
Monterey	1.80%		Cannot estimate	
Kern	1.80%	19.72	44.82	60.39
Stanislaus	1.78%	17.30	43.99	56.23
Berkeley	1.75%		Cannot estimate	
Imperial	1.72%	10.59	30.89	59.68
San Francisco	1.72%	70.66	81.55	24.60
Sutter	1.66%		Cannot estimate	
Madera	1.62%	16.42	40.05	72.51
Contra Costa	1.52%	24.19	54.30	33.48
California	1.48%	28.10	57.68	46.40
Santa Clara	1.47%	22.10	63.52	28.28
San Joaquin	1.44%	23.14	48.06	54.79
Santa Barbara	1.40%	21.44	63.12	52.81



San Diego	1.37%	17.11	49.65	34.43
Los Angeles	1.33%	47.39	74.24	51.34
Sonoma	1.10%	18.38	53.81	41.28
Tehama	1.08%		Cannot estimate	
Orange	1.02%	21.80	63.58	40.90
Placer	1.00%	8.75	27.12	23.61
San Luis Obispo	0.93%	12.37	47.11	36.68
Butte	0.93%	21.15	52.49	53.81
Napa	0.89%	26.90	60.35	38.93
Marin	0.88%	38.21	78.26	28.23
Long Beach	0.82%		Cannot estimate	
San Bernardino	0.76%	19.99	44.67	55.83
Ventura	0.69%	21.03	65.53	41.74
Riverside	0.53%	10.83	29.21	50.61
CLPPB (includes tests with unknown jurisdictions)	0.00%		Cannot estimate	

Notes for BLL data:

- Data are from the RASSCLE surveillance database archive of 4/3/2019.
- Each individual is counted only once, using their highest BLL during 2018.
- Measures are in mcg/dL of whole blood and include arterial, cord, venous, capillary and unknown samples. Not all elevated capillary samples are confirmed by a follow-up venous sample.
- Results later determined to be false positive and errors have been excluded.
- All results of blood lead analyses are reportable under California law, and the State works to ensure complete reporting. Results that are not submitted to the State, however, would not be included here.
- Those BLLs reported from the analyzing laboratory as “<5 mcg/dL” are included in the category “BLL <4.5 mcg/dL.”
- If an individual moved between two jurisdictions, then the child's jurisdiction at the time of their highest BLL is the one counted.
- Patient jurisdiction is determined by geocoding the address associated with the child's highest BLL and spatially joining it to a jurisdiction boundary layer. This analysis used the Web Mercator Auxiliary Sphere projection.
- Data are suppressed for local health jurisdictions that did not have enough blood lead tests in 2018 to meet the California Health and Human Services Agency's Data De-Identification Guidelines for public release. Therefore, not all jurisdictions are shown in this table.

Notes for estimates of percentage of children Living in pre-1960 housing, pre-1980 housing, and on Medi-Cal:

- The percentages of under 6-year-olds who live in older housing and are on Medicaid were based on the 2013-2017 American Community Survey (ACS; 5-Year Estimates).
- The smallest geographic areas in the available ACS data were Public Use Microdata Areas (PUMAs). Since PUMAs must contain at least 100,000 people, some counties are grouped together in one PUMA. Therefore, we do not have estimates for several individual counties. We did not try to create estimates for the following cities: Berkeley, Long Beach, and Pasadena.
- For some of the smaller geographies, we have less certainty of the percentage. Confidence intervals were calculated but are not shown in the table.
- The Census Bureau classifies all people not living in housing units (house, apartment, mobile home, rented rooms) as living in group quarters. There is no year structure built for group quarters.

## APPENDIX J: DETAILED AGE OF HOUSING DATA BY JURISDICTION

Estimates of Children under 6 Years Old Living in Pre-1960 housing, Pre-1980 housing, and on Medi-Cal from American Community Survey, 2013 - 2017							
California County	% of Children under 6 Living in Housing Units Built Before 1960 With Medicaid/means-tested public coverage	% of Children under 6 Living in Housing Units Built Before 1960 Without Medicaid/means-tested public coverage	% of Children under 6 Living in Housing Units Built Between 1960 and 1979 With Medicaid/means-tested public coverage	% of Children under 6 Living in Housing Units Built Between 1960 and 1979 Without Medicaid/means-tested public coverage	% of Children under 6 Living in Housing Units Built in 1980 or later With Medicaid/means-tested public coverage	% of Children under 6 Living in Housing Units Built in 1980 or later Without Medicaid/means-tested public coverage	Total children under age 6
Alameda	13.04%	24.10%	9.05%	19.00%	8.66%	26.09%	100%
Alpine, Amador, Calaveras, Inyo, Mariposa, Mono & Tuolumne	7.68%	6.35%	15.14%	13.73%	26.60%	30.50%	100%
Butte	12.15%	9.00%	20.07%	11.27%	21.58%	25.92%	100%
Colusa, Glenn, Tehama & Trinity	14.48%	7.92%	20.43%	12.45%	26.03%	18.69%	100%
Contra Costa	9.73%	14.47%	10.39%	19.72%	13.36%	32.32%	100%
Del Norte, Lassen, Modoc, Plumas & Siskiyou	18.62%	10.85%	14.75%	12.74%	22.69%	20.22%	100%
El Dorado	3.10%	4.30%	12.42%	18.91%	15.52%	45.75%	100%
Fresno	15.38%	5.25%	20.34%	8.02%	29.73%	21.28%	100%
Humboldt	21.77%	12.15%	22.03%	12.43%	20.09%	11.53%	100%
Imperial	6.53%	4.06%	16.37%	3.93%	36.78%	32.31%	100%
Kern	15.08%	4.64%	17.40%	7.70%	27.90%	27.28%	100%
Kings	9.47%	8.78%	11.76%	12.23%	19.93%	37.82%	100%

Lake & Mendocino	11.34%	8.18%	26.95%	10.61%	29.82%	12.82%	100%
Los Angeles	24.47%	22.91%	14.13%	12.73%	12.72%	13.02%	100%
Madera	14.63%	1.79%	18.92%	4.71%	38.89%	20.98%	100%
Marin	9.42%	28.79%	13.26%	26.79%	5.55%	16.19%	100%
Merced	13.31%	4.12%	22.33%	5.73%	36.65%	17.87%	100%
Monterey & San Benito	13.53%	9.13%	18.04%	12.45%	26.96%	19.89%	100%
Napa	7.51%	19.39%	14.43%	19.02%	14.84%	22.65%	100%
Nevada & Sierra	5.84%	5.95%	16.48%	22.42%	20.96%	28.35%	100%
Orange	11.93%	9.87%	18.03%	23.74%	10.90%	25.48%	100%
Placer	3.97%	4.78%	5.36%	13.01%	14.16%	58.60%	100%
Riverside	6.96%	3.86%	11.83%	6.56%	31.79%	38.97%	100%
Sacramento	8.21%	9.02%	17.82%	12.14%	21.10%	31.64%	100%
San Bernardino	13.91%	6.08%	15.22%	9.45%	26.64%	28.63%	100%
San Diego	6.71%	10.40%	13.69%	18.85%	14.03%	36.32%	100%
San Francisco	15.28%	55.38%	4.40%	6.49%	4.92%	13.52%	100%
San Joaquin	17.09%	6.05%	15.32%	9.60%	22.33%	29.49%	100%
San Luis Obispo	4.24%	8.13%	14.17%	20.57%	18.27%	34.62%	100%
San Mateo	8.92%	35.64%	8.74%	24.43%	5.96%	15.92%	100%
Santa Barbara	11.01%	10.43%	23.93%	17.75%	17.86%	19.00%	100%
Santa Clara	6.02%	16.08%	12.17%	29.26%	10.00%	26.37%	100%
Santa Cruz	16.60%	13.26%	15.43%	18.51%	18.61%	17.45%	100%
Shasta	7.80%	6.95%	24.72%	11.15%	22.75%	26.63%	100%
Solano	9.27%	5.52%	18.04%	15.48%	16.08%	35.58%	100%
Sonoma	6.44%	11.94%	16.02%	19.40%	18.71%	27.38%	100%
Stanislaus	12.51%	4.79%	17.01%	9.67%	26.61%	29.31%	100%
Sutter & Yuba	10.32%	3.05%	18.93%	12.28%	22.36%	33.06%	100%
Tulare	11.65%	5.69%	18.25%	10.26%	28.32%	25.77%	100%
Ventura	11.56%	9.48%	20.32%	24.17%	9.83%	24.61%	100%
Yolo	9.83%	8.43%	8.92%	14.45%	20.90%	37.47%	100%

• The percentages of under 6-year-olds who live in older housing and are on Medicaid were based on the 2013-2017 American Community Survey (ACS; 5-Year Estimates). ACS defines Medicaid or other means-tested public coverage as coverage through Medicaid, Medical Assistance, or any kind of government-assistance plan for those with low incomes or a disability.

- The smallest geographic areas in the available ACS data were Public Use Microdata Areas (PUMAs). Since PUMAs must contain at least 100,000 people, some counties are grouped together in one PUMA. Therefore, we do not have estimates for several individual counties. We did not try to create estimates for the following cities: Berkeley, Long Beach, and Pasadena.
- For some of the smaller geographies, we have less certainty of the percentage. Confidence intervals were calculated but are not shown in the table.
- The Census Bureau classifies all people not living in housing units (house, apartment, mobile home, rented rooms) as living in group quarters. There is no year structure built for group quarters. An estimated 0.04 % of children under 6 in California live in group quarters and have Medicaid/means-tested public coverage and 0.01 % live in group quarters but do not.

## APPENDIX K: ZIP CODES AND GEOSPATIAL INDICATORS OF RISK FOR CHILDHOOD LEAD EXPOSURE

ZIP Codes with at Least One Geospatial Indicator of Risk for Childhood Lead Exposure (n = 1,677)									
90001	91001	92019	92386	93117	93641	94547	95136	95525	95920
90002	91006	92020	92389	93202	93643	94548	95138	95526	95922
90003	91007	92021	92391	93203	93644	94549	95139	95527	95923
90004	91008	92024	92392	93204	93645	94550	95140	95528	95925
90005	91010	92025	92394	93205	93646	94551	95141	95531	95926
90006	91011	92026	92395	93206	93647	94552	95148	95536	95928
90007	91016	92027	92397	93207	93648	94553	95192	95540	95932
90008	91020	92028	92398	93210	93650	94555	95202	95542	95934
90011	91024	92029	92399	93212	93651	94556	95203	95543	95935
90012	91030	92036	92401	93215	93652	94558	95204	95546	95936
90013	91040	92037	92404	93219	93653	94559	95205	95547	95937
90014	91042	92040	92405	93221	93654	94560	95206	95548	95938
90015	91101	92054	92407	93222	93656	94561	95207	95549	95939
90016	91103	92055	92408	93223	93657	94563	95209	95550	95941
90017	91104	92056	92410	93224	93660	94564	95210	95551	95942
90018	91105	92057	92411	93225	93662	94565	95211	95552	95943
90019	91106	92058	92415	93226	93664	94566	95212	95554	95944
90020	91107	92059	92501	93230	93667	94567	95215	95555	95945
90021	91108	92061	92503	93234	93668	94568	95219	95556	95946
90022	91123	92064	92504	93235	93669	94569	95220	95558	95947
90023	91201	92065	92505	93238	93675	94571	95222	95560	95948
90024	91202	92066	92506	93239	93701	94572	95223	95562	95949
90025	91203	92069	92507	93240	93702	94574	95228	95563	95951
90026	91204	92070	92508	93241	93703	94576	95230	95564	95953
90027	91205	92071	92509	93242	93704	94577	95231	95565	95954
90028	91206	92075	92518	93243	93705	94578	95232	95567	95955
90029	91207	92078	92521	93244	93706	94579	95236	95568	95956
90031	91208	92081	92530	93245	93710	94580	95237	95569	95957
90032	91210	92082	92532	93247	93711	94582	95240	95570	95959
90033	91214	92083	92536	93249	93720	94583	95242	95573	95960
90034	91301	92084	92539	93250	93721	94585	95245	95585	95961
90035	91302	92086	92543	93251	93722	94586	95246	95587	95963
90036	91303	92093	92544	93252	93723	94587	95247	95589	95965
90037	91304	92096	92545	93254	93725	94588	95249	95595	95966

90038	91306	92101	92548	93255	93726	94589	95251	95602	95968
90039	91307	92102	92549	93256	93727	94590	95252	95603	95969
90040	91311	92103	92553	93257	93728	94591	95255	95605	95970
90041	91316	92104	92555	93260	93730	94592	95257	95606	95971
90042	91320	92105	92557	93263	93737	94595	95258	95607	95972
90043	91321	92106	92561	93265	93741	94596	95301	95608	95973
90044	91324	92107	92562	93266	93901	94597	95303	95610	95975
90045	91325	92108	92563	93267	93905	94598	95304	95612	95977
90046	91326	92109	92567	93268	93906	94599	95306	95614	95979
90047	91330	92110	92570	93270	93907	94601	95307	95615	95981
90048	91331	92111	92571	93271	93908	94602	95310	95616	95982
90049	91335	92113	92582	93272	93920	94603	95311	95618	95983
90056	91340	92114	92583	93274	93923	94605	95313	95619	95984
90057	91342	92115	92584	93276	93924	94606	95315	95620	95987
90058	91343	92116	92585	93277	93925	94607	95316	95621	95988
90059	91344	92117	92586	93280	93926	94608	95317	95623	95991
90061	91345	92118	92590	93283	93927	94609	95318	95624	95993
90062	91350	92119	92591	93285	93930	94610	95320	95626	96001
90063	91351	92120	92592	93286	93932	94611	95321	95627	96002
90064	91352	92121	92595	93287	93933	94612	95322	95628	96003
90065	91354	92122	92596	93291	93940	94613	95323	95629	96006
90066	91355	92123	92602	93292	93943	94618	95324	95630	96007
90067	91356	92124	92603	93301	93944	94619	95326	95631	96008
90068	91360	92126	92604	93304	93950	94621	95327	95632	96010
90069	91361	92127	92606	93305	93953	94702	95328	95633	96013
90071	91362	92128	92610	93306	93955	94703	95329	95634	96014
90073	91364	92129	92612	93307	93960	94704	95330	95635	96015
90077	91367	92130	92614	93308	93962	94705	95333	95636	96016
90089	91371	92131	92617	93309	94002	94706	95334	95637	96017
90094	91381	92134	92618	93311	94005	94707	95335	95638	96019
90095	91384	92135	92620	93312	94010	94708	95336	95640	96020
90201	91387	92136	92624	93313	94014	94709	95337	95641	96021
90210	91390	92139	92625	93314	94015	94710	95338	95642	96022
90211	91401	92140	92626	93401	94019	94720	95340	95645	96023
90212	91402	92145	92627	93402	94020	94801	95341	95648	96024
90220	91403	92152	92629	93405	94021	94803	95345	95650	96025
90221	91405	92154	92630	93407	94022	94804	95346	95651	96027
90222	91406	92155	92637	93420	94024	94805	95348	95652	96028
90230	91411	92173	92646	93422	94025	94806	95350	95653	96031
90232	91423	92182	92647	93426	94027	94901	95351	95655	96032

90240	91436	92201	92648	93427	94028	94903	95354	95658	96033
90241	91501	92203	92649	93428	94030	94904	95355	95659	96034
90242	91502	92210	92651	93429	94035	94920	95356	95660	96035
90245	91504	92211	92653	93430	94037	94922	95357	95661	96038
90247	91505	92220	92655	93432	94038	94923	95358	95662	96039
90248	91506	92223	92656	93433	94040	94924	95360	95663	96040
90249	91521	92225	92657	93434	94041	94925	95361	95664	96041
90250	91522	92227	92660	93435	94043	94928	95363	95665	96044
90254	91523	92230	92661	93436	94044	94929	95364	95666	96047
90255	91601	92231	92662	93437	94060	94930	95365	95667	96048
90260	91602	92233	92663	93440	94061	94931	95366	95668	96050
90262	91604	92234	92672	93441	94062	94933	95367	95669	96051
90263	91605	92236	92673	93442	94063	94937	95368	95670	96052
90265	91606	92239	92675	93444	94065	94938	95369	95673	96054
90266	91607	92240	92676	93445	94066	94939	95370	95674	96055
90270	91608	92241	92677	93446	94070	94940	95372	95677	96056
90272	91701	92242	92679	93449	94074	94941	95374	95678	96057
90274	91702	92243	92683	93450	94080	94945	95376	95679	96058
90275	91706	92249	92688	93451	94085	94946	95377	95681	96059
90277	91708	92250	92691	93452	94086	94947	95379	95682	96061
90278	91709	92251	92692	93453	94087	94949	95380	95683	96062
90280	91710	92252	92694	93454	94089	94951	95382	95684	96063
90290	91711	92254	92701	93455	94102	94952	95383	95685	96064
90291	91722	92256	92703	93458	94103	94954	95385	95687	96065
90292	91723	92257	92704	93460	94104	94956	95386	95688	96067
90293	91724	92258	92705	93461	94105	94957	95388	95689	96069
90301	91730	92259	92706	93463	94107	94960	95389	95690	96071
90302	91731	92260	92707	93465	94108	94963	95391	95691	96073
90303	91732	92262	92708	93501	94109	94964	95401	95692	96075
90304	91733	92264	92780	93505	94110	94965	95403	95693	96076
90305	91737	92270	92782	93510	94111	94970	95404	95694	96080
90401	91739	92274	92801	93512	94112	94971	95405	95695	96085
90402	91740	92276	92802	93513	94114	94972	95407	95698	96086
90403	91741	92277	92804	93514	94115	94973	95409	95701	96087
90404	91744	92278	92805	93516	94116	95002	95410	95703	96088
90405	91745	92280	92806	93517	94117	95003	95412	95709	96091
90501	91746	92281	92807	93518	94118	95004	95415	95713	96093
90502	91748	92282	92808	93519	94121	95005	95417	95714	96094
90503	91750	92283	92821	93523	94122	95006	95420	95715	96096
90504	91752	92284	92823	93524	94123	95008	95421	95717	96097



90505	91754	92285	92831	93526	94124	95010	95422	95720	96101
90506	91755	92301	92832	93527	94127	95012	95423	95721	96103
90601	91759	92304	92833	93528	94128	95013	95425	95722	96104
90602	91761	92305	92835	93529	94129	95014	95426	95724	96105
90603	91762	92307	92840	93531	94130	95017	95427	95726	96106
90604	91763	92308	92841	93532	94131	95018	95428	95728	96107
90605	91764	92309	92843	93534	94132	95019	95429	95735	96108
90606	91765	92310	92844	93535	94133	95020	95432	95742	96109
90620	91766	92311	92845	93536	94134	95023	95436	95746	96111
90621	91767	92313	92860	93541	94158	95030	95437	95747	96112
90623	91768	92314	92861	93543	94301	95032	95439	95757	96113
90630	91770	92315	92865	93544	94303	95033	95441	95758	96114
90631	91773	92316	92866	93545	94304	95035	95442	95762	96115
90638	91775	92317	92867	93546	94305	95037	95443	95765	96116
90639	91776	92318	92868	93550	94306	95039	95444	95776	96117
90640	91780	92320	92869	93551	94401	95043	95445	95811	96118
90650	91784	92321	92870	93552	94402	95045	95446	95814	96119
90660	91786	92322	92879	93553	94403	95046	95448	95815	96120
90670	91789	92324	92880	93554	94404	95050	95449	95816	96121
90680	91790	92325	92881	93555	94501	95051	95450	95817	96122
90701	91791	92327	92882	93560	94502	95053	95451	95818	96123
90703	91792	92328	92883	93561	94503	95054	95452	95819	96124
90704	91801	92332	92886	93562	94505	95060	95453	95820	96125
90706	91803	92333	92887	93563	94506	95062	95454	95821	96126
90710	91901	92335	93001	93591	94507	95064	95456	95822	96128
90712	91902	92336	93003	93601	94508	95065	95457	95823	96129
90713	91905	92337	93004	93602	94509	95066	95458	95824	96130
90715	91906	92338	93010	93603	94510	95070	95459	95825	96132
90716	91910	92339	93012	93604	94511	95073	95460	95826	96133
90717	91911	92341	93013	93608	94512	95075	95461	95827	96134
90720	91913	92342	93015	93609	94513	95076	95462	95828	96136
90723	91914	92344	93021	93610	94514	95110	95464	95829	96137
90731	91915	92345	93022	93611	94515	95111	95465	95830	96140
90732	91916	92346	93023	93612	94517	95112	95466	95831	96141
90740	91917	92347	93030	93614	94518	95113	95467	95832	96142
90742	91932	92350	93033	93615	94519	95116	95468	95833	96143
90743	91934	92352	93035	93616	94520	95117	95469	95834	96145
90744	91935	92354	93036	93618	94521	95118	95470	95835	96146
90745	91941	92356	93040	93619	94523	95119	95472	95836	96148
90746	91942	92358	93041	93620	94525	95120	95476	95837	96150

90747	91945	92359	93042	93621	94526	95121	95482	95838	96161
90755	91950	92363	93043	93622	94528	95122	95485	95841	96162
90802	91962	92364	93060	93623	94530	95123	95488	95842	
90803	91963	92365	93063	93625	94531	95124	95490	95843	
90804	91977	92368	93065	93626	94533	95125	95492	95864	
90805	91978	92371	93066	93627	94534	95126	95493	95901	
90806	91980	92372	93067	93628	94535	95127	95494	95903	
90807	92003	92373	93101	93630	94536	95128	95497	95910	
90808	92004	92374	93103	93631	94538	95129	95501	95912	
90810	92007	92376	93105	93633	94539	95130	95503	95914	
90813	92008	92377	93106	93635	94541	95131	95511	95915	
90814	92009	92378	93108	93636	94542	95132	95514	95916	
90815	92010	92382	93109	93637	94544	95133	95519	95917	
90822	92011	92384	93110	93638	94545	95134	95521	95918	
90840	92014	92385	93111	93640	94546	95135	95524	95919	

**ZIP Codes with No Geospatial Indicator of Risk for Childhood Lead Exposure  
(n = 12)**

91377	92267	93262
92067	92551	95672
92091	92587	95962
92253	92697	96046