Surveillance for Elevated Blood Lead Levels Among Children --- United States, 1997--2001

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Abstract

Problem/Condition: Lead is neurotoxic and particularly harmful to the developing nervous systems of fetuses and young children. Extremely high blood lead levels (BLLs) (i.e., ≥70 µg/dL) can cause severe neurologic problems (e.g., seizure, coma, and death). However, no threshold has been determined regarding lead's harmful effects on children's learning and behavior. In 1990, the U.S. Department of Health and Human Services established a national goal to eliminate BLLs >25 µg/dL by 2000; a new goal targets elimination of BLLs ≥10 µg/dL in children aged <6 years by 2010.

Reporting Period: Information regarding children's BLLs comes from 1) National Health and Nutrition Examination Surveys (NHANES) conducted during 1976--1980, 1988--1991, 1991--1994, and 1999--2000; and 2) state child blood lead surveillance data for test results collected during 1997--2001.

Description of System: CDC tracks children's BLLs in the United States by using both NHANES and state and local surveillance data. NHANES reports data regarding children aged 1--5 years; state and local surveillance systems report data regarding children aged <72 months. Because lead exposure in children varies among populations and communities, both surveys are needed to determine the burden of elevated BLLs among young children throughout the United States. NHANES uses highly standardized data-collection procedures and probability samples to gather information regarding the health and nutritional status of the civilian, noninstitutionalized U.S. population. State and local childhood lead surveillance systems are based on reports of blood lead tests from laboratories. State and local programs submit data to CDC annually. In this report, confirmed elevated BLLs are defined as one venous blood specimen ≥10 µg/dL or two capillary blood specimens ≥10 µg/dL drawn within 12 weeks of each other.

Results: The NHANES 1999--2000 survey estimated that 434,000 children (95% confidence interval = 189,000--846,000) or 2.2% of children aged 1--5 years had BLLs ≥10 µg/dL. For 2001, a total of 44 states, the District of Columbia (DC), and New York City (NYC) submitted child blood lead surveillance data to CDC. These jurisdictions represent 95% of the U.S. population of children aged <72 months and 97% of the nation's pre-1950 housing. The number of children tested and reported to CDC increased from 1,703,356 in 1997 (37 states, DC, and NYC reporting), to 2,422,298 in 2001 (44 states, DC, and NYC reporting). During that time, the number of children reported with confirmed elevated BLLs ≥10 µg/dL steadily decreased from 130,512 in 1997 to 74,887 in 2001. In 2000, the year targeted for national elimination of BLLs >25 µg/dL, a total of 8,723 children had BLLs ≥25 µg/dL.

Interpretation: Both national surveys and state surveillance data indicate children's BLLs continue to decline throughout the United States. However, thousands of children continue to be identified with elevated BLLs. The 2000 goal of eliminating BLLs >25 µg/dL was not met. Attaining the 2010 goal of eliminating BLLs ≥10 µg/dL will require intensified efforts to target areas at highest risk, evaluate preventive measures, and improve the quality of surveillance data.

Public Health Actions: States will continue to use surveillance data to 1) promote legislation supporting lead poisoning prevention activities, 2) obtain funding, 3) identify risk groups, 4) target and evaluate prevention activities, and 5) monitor and describe progress toward elimination of BLLs ≥10 µg/dL. CDC will work with state and local programs to improve tracking systems and the collection, timeliness, and quality of surveillance data.

Introduction

Exposure to lead can damage the nervous, hematopoietic, and renal systems (*1*,*2*) and is particularly harmful to the developing nervous systems of fetuses and children aged <72 months. Extremely elevated blood lead levels (BLLs) ≥70 µg/dL can cause severe neurologic problems (e.g., seizure, coma, and death) (*3*). Although severe cases are rare today (*4*), the threshold for harmful effects of lead remains unknown. Since 1975, as new data became available, CDC has revised its recommendations regarding the threshold of BLLs that should raise concern and trigger interventions (*5*--*7*). By 1991, CDC had lowered the BLL threshold 66.6% to 10 µg/dL, from 30 µg/dL in 1975 (*5*,*7*), in response to studies in the late 1980s that linked BLLs as low as 10 µg/dL with decreased intelligence and other adverse neurodevelopmental effects (*8*--*11*). Ongoing research conducted since 1991 provides evidence of adverse effects at even lower levels, <10 µg/dL, among children aged <72 months (*12*--*16*).

The principal sources of lead exposure for children in the United States are house dust contaminated by leaded paint and soil contaminated by both leaded paint and decades of industrial and motor vehicle emissions (*1*). Lead was widely used in paint through the 1940s. Although lead use declined during the 1950s and 1960s (*17*), and lead was banned from residential use in 1978*, lead remains a hazard in homes built before the ban, especially in pre-1950 housing. During 1991--1994, CDC's National Health and Nutrition Examination Survey (NHANES) determined the prevalence of BLLs ≥10 µg/dL was highest among children living in pre-1946 homes (8.6%), compared with children living in homes built during 1946--1973 (4.6%), and after 1973 (1.6%). Among children living in pre-1946 housing, prevalence of BLLs ≥10 µg/dL differed substantially by family income. Prevalence among children from low-income families was 16.4%, compared with 4.1% and 0.9% among children from middle- and high-income families (*18*).

National Elimination Goals

The U.S. Department of Health and Human Services (DHHS) established a national goal to eliminate BLLs >25 µg/dL in children aged 6 months--5 years by 2000. This goal was announced in September 1990 in *Healthy People 2000* (*19*). The next year, the U.S. Public Health Service released its Strategic Plan for the Elimination of Childhood Lead Poisoning (*20*). The plan called for a societywide effort to eliminate lead poisoning as a public health problem by 2011. Lead poisoning was defined as BLLs ≥25 µg/dL, but the plan noted CDC was considering lowering that level. The plan called for 1) more childhood lead poisoning prevention programs and activities; 2) effective abatement of leaded paint and leaded paint-contaminated dust in housing; 3) continued reduction of children's exposure to lead in the environment; and 4) establishment of nationwide surveillance for children with elevated BLLs.

By the end of the 1990s, a new *Healthy People 2010* target had been established to eliminate BLLs ≥10 µg/dL among children aged 1--5 years by 2010 (*21*). The baseline data used to monitor progress toward this target are provided by NHANES, which provides nationally representative and comparable estimates for monitoring trends but cannot determine local variations in the risk for elevated BLLs (*22*,*23*). Therefore, state and local data are necessary to develop effective prevention measures and monitor their progress toward elimination of elevated BLLs.

Prevention Programs Established

CDC funds state and local programs to develop childhood lead poisoning prevention programs and surveillance activities. The objectives of these childhood lead poisoning prevention programs (CLPPPs) are to 1) screen infants and children for elevated BLLs; 2) ensure that lead-poisoned infants and children are referred for medical and environmental

intervention; 3) educate the public and health-care providers regarding childhood lead poisoning; and 4) implement prevention measures to reduce children's exposure to lead.

Before child lead screening programs, neurologic findings associated with acute encephalopathy were often the first signs of lead poisoning, and children with these symptoms required immediate hospitalization and treatment (*24*). Because symptoms are rare at BLLs <70 µg/dL, blood lead screening is necessary to identify asymptomatic children with elevated BLLs. Therefore, in 1991, CDC recommended universal screening of children aged 12--72 months. However, a 1994 national survey reported that only one fourth of young children had been screened, including fewer than one third of those at increased risk (e.g., because of poverty or residence in older housing) (*25*). In addition, certain populations of children were determined to be heavily exposed, whereas others were only minimally exposed (*26*), depending on risk factors such as poverty level and housing. Consequently, in 1997, CDC recommended that states use data to develop plans to increase screening and follow-up care for children who most need these services. In the absence of a statewide plan or other formal guidance from health officials, universal screening for all young children was still recommended (*27*).

This report describes national trends in children's BLLs ≥10 µg/dL obtained by using data from NHANES surveys (i.e., 1976--1980, 1988--1991, 1991--1994 and 1999--2000) and state data collected by the state Child Blood Lead Surveillance (CBLS) system during 1997--2001. Also described is the distribution of pre-1950 housing existing in the United States in 2000.

Methods

National Surveys

Since the 1970s, the extent of human lead exposure has been assessed in the United States by using NHANES, a series of cross-sectional, nationally representative examination surveys conducted by CDC's National Center for Health Statistics. NHANES data indicate distribution of BLLs among the national population, not at state or local levels. Each survey is a stratified, multistage, cluster sample of households with a target population of civilian, noninstitutionalized residents of the United States (*28*). The surveys include a household interview and a standardized physical examination conducted in a mobile examination center. This report includes results from the first two years (1999--2000) of the current NHANES, as well as previous results from NHANES II (1976--1980), NHANES III, Phase 1 (1988--1991) and NHANES III, Phase 2 (1991--1994).

As part of the NHANES physical examination, a 1 mL sample of ethylenediaminetetraacetic acid-anticoagulated whole blood was obtained by venipuncture from children aged 1--5 years. Blood specimens were frozen and shipped for analysis from the survey sites to the NHANES Laboratory, Division of Environmental Health Laboratory Sciences, National Center for Environmental Health, CDC, Alanta, Georgia. All analyses of BLLs were performed at CDC's NHANES Laboratory. The laboratory methods, including quality control and assurance procedures, have been described previously (*29*,*30*). Comparability has also been established for the method used in NHANES II (i.e., modified Delves cup) and that used in NHANES III and the current NHANES (i.e., graphite furnace atomic absorption spectrophotometry). In all surveys, blood lead measurements were calibrated by using standards obtained from the National Institute of Standards and Technology, Gaithersburg, Maryland.

State and Local Surveillance

State and local childhood blood lead surveillance systems are based on the results of blood lead tests of children aged <72 months reported to state health departments by private and state and local government laboratories. Reporting criteria, such as the level that should be reported and who should report, are set by each state and vary across jurisdictions. In addition to funding multiple state programs, CDC also funds certain city and county programs that forward surveillance data to state health departments. Test results, which are compiled and analyzed by state health departments and submitted annually to CDC, comprise the CBLS database.

In conjunction with staff from participating states, CDC staff developed core data variables to be collected for every child tested. These variables include identification and demographic information (e.g., date of birth, race, or ethnicity), laboratory information (e.g., venous or capillary blood specimen), date of specimen collection, and test result. Individual identifiers are stripped from the records, but each child is assigned a unique identifier that is sent to CDC along with the

data. To assist CLPPPs with tracking the care of children with elevated BLLs, CDC developed a computer software program, Systematic Tracking of Elevated Lead Levels and Remediation (STELLAR). Certain states use STELLAR; others have developed their own programs.

CDC checks each state-submitted record for correct formatting and coding and inconsistent values. Records not meeting CDC criteria are summarized in error reports that are sent to states for correction. Certain errors, if not corrected, prevent the record from being entered in CDC's CBLS database. A common error is an illogical sequence of dates on a laboratory record (i.e., date of test analysis is earlier than date blood was drawn).

Analysis

In this report, state surveillance data are presented for children aged <72 months who were tested for lead at least once during 1997--2001. The following surveillance definitions are used for all states:

Test: Any BLL sample (i.e., capillary, venous, or unknown type) that produces a quantifiable result and is analyzed by a Clinical Laboratory Improvement Amendments (CLIA)-certified facility or an approved portable device. Blood for a lead test can be collected for screening, confirmation, or follow-up.

Screening test: A blood lead test for a child aged <72 months who has not had a previously confirmed elevated BLL. A child screened in multiple years or even multiple times within a given year is counted only once for each year.

Confirmed elevated BLL: A child with one venous blood specimen ≥10 µg/dL or two capillary blood specimens ≥10 µg/dL drawn within 12 weeks of each other (*31*,*32*).

CLPPPs check for duplicate laboratory reports for children and assign a unique identifier for each child before sending the data to CDC. Children with confirmed elevated BLLs who subsequently have another elevated test result, regardless of test type, are included in the tables only once for each year they had an elevated BLL test result. In subsequent years, children with previously confirmed elevated BLLs but no follow-up tests, or only follow-up tests with BLLs <10 µg/dL, are not counted for those subsequent years.

We assign children with confirmed elevated BLLs into six BLL groups with program relevance (i.e., ≥10 µg/dL to <15, ≥15 to <20, ≥20 to <25, ≥25 to <45, ≥45 to <70, and ≥70). The majority of states initiate follow-up testing at BLLs ≥10 µg/dL and environmental investigations at either ≥20 µg/dL or persistent BLLs 15--19 µg/dL; chelation is recommended for children with BLLs ≥45 µg/dL; and BLLs ≥70 µg/dL represent a medical emergency. These analyses are also categorized by state, race or ethnicity, sex, and age group.

To assess the extent of testing among children using Medicaid services, a low-income group at high risk for elevated BLLs (*33*), state and local health departments collaborate with their Medicaid agencies to link blood lead surveillance data with Medicaid data. This report presents data regarding which state and local CLPPPs link surveillance and Medicaid data.

Population data in this report were obtained from the U.S. Bureau of the Census. For each year, population data are only included for states with reported surveillance data. Population data used include intercensal population estimates for 1997--1999, the 2000 census, and postcensal estimates for 2001.

Statistical analyses for NHANES were performed with SAS software (*34*) and SUDAAN® (*35*), a software package that incorporates sample weights and adjusts analyses for the complex sample design of the survey. Survey sample weights were used in all analyses to produce estimates representative of the noninstitutionalized, civilian U.S. population. Analyses of the state surveillance data used SAS.

Results

National Surveys

The prevalence of BLLs ≥10 µg/dL in children aged 1--5 years living in the United States has continued to decline from an estimated 88.2% during the 1976--1980 NHANES II survey (Figure 1). In 1999--2000, the prevalence estimate was 2.2% (95% confidence interval [CI] = 1.0%--4.3%) (Table 1). By applying that prevalence to the U.S. population of

children in this age group, we estimated that 434,000 (95% CI = 189,000--846,000) children aged 1--5 years had elevated BLLs. However, because of low prevalence of elevated BLLs and a limited sample size, the NHANES 1999--2000 estimates are highly variable.

State and Local Surveillance

By 2001, 44 states, the District of Columbia (DC), and New York City (NYC) were submitting child blood lead surveillance data to CDC. These sites represent 95% of the U.S. population of children aged <72 months and 97% of pre-1950 housing. By the end of 2001, all states with CDC-associated CLPPPs were requiring laboratories to report results of blood lead tests; however, states varied regarding the BLL level at which results had to be reported (Table 2). In 2001, 29 (64.4%) of the participating jurisdictions required all BLLs to be reported; 12 (26.7%) required reporting only for BLLs ≥10 µg/dL; one (2.2%) required reporting only for BLLs ≥15 µg/dL; one (2.2%) required reporting only for BLLs ≥20 µg/dL; and two (4.4%) required reporting only for BLLs ≥25 µg/dL.

Children Tested

The number of BLL-tested children reported to CDC increased from 1,703,356 in 1997 (37 states, DC, and NYC) to 2,422,298 in 2001 (44 states, DC, and NYC). For all years, the largest group of children tested were aged 12--23 months, followed by those aged 24--35 months (Table 3). Race or ethnicity information was not collected (i.e., was unknown) for approximately half of the children tested. For all years, among the tested children for whom race or ethnicity was reported (range: 57% in 1997 to 40.2% in 2001), approximately 43% were non-Hispanic whites, 35% were non-Hispanic blacks, 15% were Hispanic, and 7% were of other races or ethnicities (Table 4). For all years, slightly more boys than girls were tested (Table 5). More than half of all tests were conducted by six states and NYC (NYC 11.3%, Massachusetts 10.1%, Illinois 7.7%, Texas 7.1%, New York 6.6%, New Jersey 6%, and North Carolina 5%) (Table 6).

During 1997--2001, 28 states reported matching surveillance and Medicaid data to assess the percentage of children eligible for or receiving Medicaid services who had received a blood lead test (Figure 2). However, these states used different methods to assess lead testing among Medicaid-eligible or Medicaid-enrolled children, making findings difficult to compare. For example, certain states that link surveillance and Medicaid data might also link these with birth records. Also, states used different definitions for Medicaid-eligible and Medicaid-enrolled and different age cutoffs for analysis. Eight states that matched Medicaid data with surveillance data reported that 17.2%--52.9% of Medicaid enrollees aged ≤72 months had been tested for lead.

Confirmed Elevated BLLs

The number of children reported with confirmed elevated BLLs steadily decreased from 130,512 in 1997 to 74,887 in 2001. Among children with elevated BLLs and known race or ethnicity (range: 74.3% in 1997 to 63.6% in 2001), approximately 17% were non-Hispanic whites, 60% were non-Hispanic blacks, 16% were Hispanic, and 7% were of other races or ethnicities (Table 4). In each racial or ethnic group, the number of children with elevated BLLs declined steadily from 1997 to 2001. Each year, more boys than girls had elevated BLLs (Table 5). Five states and NYC reported 54% of the confirmed elevated BLLs in 2001 (Illinois, 20.5%; Ohio, 8.7%; Michigan, 6.8%; NYC, 6.6%; New York, 6.4%; and Pennsylvania, 5.7%) (Table 6).

In 2001, 59.7% of children with elevated BLLs had levels of 10--14 µg/dL; 21.3% had levels of 15--19 µg/dL; 9.2% had levels of 20--24 µg/dL; 8.6% had levels of 25--44 µg/dL; 1% had levels of 45--69 µg/dL; and 0.2% had levels ≥70 µg/dL (Figure 3). In 2000, a total of 8,723 children (0.4% of those tested) were reported with BLLs ≥25 µg/dL, the target for elimination by 2000. In 2001, the number of children reported with BLLs ≥25 µg/dL decreased to 7,342 (0.3% of those tested). Among those with confirmed elevated BLLs and reported race or ethnicity, the majority were non-Hispanic blacks (Figure 4). Also, the largest numbers of children with confirmed elevated BLLs were located in northeastern and Midwestern states (Figure 5).

Pre-1950 Housing

The number of existing U.S. housing units built before 1950, when paint had high lead content, decreased from 27.5

million in 1990 to 25.8 million in 2000; however, pre-1950 housing units are located in all states (range: 12,472 in Alaska to 3,309,770 in New York). In 2000, approximately 80% of the 25.8 million pre-1950 housing units in the United States were located in 21 states, and approximately 50% were located in seven states (California, Illinois, Massachusetts, Michigan, New York, Ohio, and Pennsylvania) (Figure 6).

Discussion

National surveys and state and local surveillance data both indicate children's BLLs continue to decline throughout the United States. This decline reflects changes in national policies and laws implemented since the 1970s that have limited the use of lead, including removal of lead from 1) gasoline, 2) food and soft-drink cans, 3) paint for residential use, and 4) solder in household plumbing (*36*). The greatest reduction in children's BLLs was observed between NHANES II (1976--1980) and NHANES III, Phase I (1988--1991), suggesting that past policies to reduce children's exposure to lead have succeeded. However, the *Healthy People 2000* national goal to eliminate BLLs >25 µg/dL among young children by 2000 was not achieved, and tens of thousands of children remain exposed to lead.

State and local surveillance data and previous NHANES analyses indicate children who are non-Hispanic blacks or Hispanic are more likely to have elevated BLLs than those who are non-Hispanic whites (*37*). Although race or ethnicity classification is missing for approximately half of those children with elevated BLLs identified and reported in the state and local surveillance data, these data suggest the number of children with elevated BLLs has steadily declined in each of these groups, which represent the three largest racial or ethnic populations.

Another group previously determined to be at risk for elevated BLLs is children from low-income families (*4*,*38*). In a previous finding, Medicaid-eligible children represented 60% of children with BLLs ≥10 µg/dL and 83% of those with BLLs ≥20 µg/dL (*39*). However, despite their high risk for elevated BLLs, only 19% of Medicaid-eligible children aged 1--5 years had been tested for lead (*40*). CDC recommends that health-care providers and health plans provide blood lead screening and diagnostic and treatment services for children enrolled in Medicaid (*40*), which routinely reimburses for such services. State and local surveillance systems do not routinely include Medicaid information because health-care providers rarely note Medicaid status on test records. To better determine how many Medicaid-eligible or Medicaid-enrolled children have been tested for lead, states need to link their laboratory surveillance data with Medicaid data. The majority of CLPPPs have already made this link; however, different methodologies limit comparisons among states. CDC will work with these programs to standardize linking and analysis and improve comparability among states.

Limitations

Findings from NHANES and state surveillance systems should be viewed as complementary but not directly comparable; substantial differences in methodology exist. Because NHANES is based on a nationally representative sample, estimates are only generalizable to the U.S. population. The sample is not designed to provide estimates for smaller geographic areas or specific populations where the risk of elevated BLLs is high. Conversely, the CLPPPs provide data at state and local levels that can be used to target screening and other interventions to children at highest risk. However, not all children at risk are tested. NHANES and CLPPPs also differ in methods used to collect blood samples. For NHANES, all blood lead tests are collected by venous sampling, a more accurate method. In contrast, certain blood lead tests reported to state health departments are collected by capillary sampling, which can be contaminated if correct blood collection procedures are not followed. Because of the risk for contamination (*41*), elevated capillary tests should be confirmed by a venous test or a second capillary test within 12 weeks. However, because confirmatory testing does not always occur within 12 weeks, state data might underestimate children with elevated BLLs, especially at levels of 10--14 µg/dL, among states that do not recommend confirmatory testing at that BLL (*42*). Also, for NHANES surveys, all samples are analyzed by the CDC laboratory, which reports all test results. In contrast, multiple laboratories analyze and report blood lead test results to CLPPPs.

State-to-state comparisons of the numbers of children tested and confirmed with elevated BLLs should be made cautiously, with special attention given to varying state practices (Table 2). State practices and policies that can affect assessment of the lead problem include BLLs reported and the time recommended for follow-up testing to confirm elevated BLLs. Certain states are changing policies to improve their ability to develop and assess prevention strategies; since 2001, two more states have made all BLLs reportable for children. Because the majority of children with elevated BLLs are asymptomatic, all children at high risk should be tested; however, state testing practices vary. Children in

certain racial or ethnic groups (i.e., non-Hispanic blacks and Hispanics) are at increased risk for elevated BLLs (*18*,*33*,*37*). CDC encourages collecting racial and ethnic data; however, a high proportion of missing racial data precludes the majority of states from knowing whether they are adequately testing children at increased risk.

Conclusion

Successful surveillance requires states to track the test results of substantial numbers of children. This has strained old computer systems and created barriers to successful submission of complete data to CDC. Also, BLL tracking systems need to integrate data across programs. To improve integration of data, increase states' abilities to submit complete data, and facilitate exchange of information for case management (e.g., environmental inspection), CDC is developing a tracking module that will become part of CDC's Internet-based tracking and reporting system, the National Electronic Disease Surveillance System (NEDSS) (*43*).

Reports published by states can differ from this report in the numbers of children tested and identified with elevated BLLs. CDC's criteria for consistent dates and other data can preclude certain records from being entered into the CDC database. Also, certain states might publish data for older children (i.e., aged ≥72 months) or use different definitions in their analyses. Better comparability among states requires increased use of a uniform national surveillance case definition (*44*) by public health officials and researchers. Comparability is critical to accurately assess the number of children with elevated BLLs and to monitor trends, including progress toward the *Healthy People 2010* goal of eliminating BLLs ≥10 µg/dL among young children.

Reducing BLLs can be a difficult and protracted process for children with long-term exposure because lead accumulates in bones and is released slowly over time. Chelation, the only available medical therapy, has side effects and risks, might not reverse harmful effects, and does not effectively reduce BLLs in children with moderate exposure (*45*). CDC and others recommend screening the environment for lead to prevent exposure to children (*46*--*50*). Identifying sources of lead exposure can be challenging, especially for children who move or spend time in multiple locations. Effective identification of pre-1950 housing where young children live or are likely to live requires assessment of data from multiple sources (e.g., tax assessor, census, Medicaid, and child blood lead surveillance) and improved partnerships with other programs (e.g., prenatal care; home visits for newborns; the Women, Infants, and Children nutritional program; immunizations; and housing subsidies).

Elevated BLLs among young children can be eliminated by state and local prevention activities. Beginning in 2003, state and local health departments funded by CDC for childhood lead poisoning prevention programs are required to develop formal elimination plans. Certain jurisdictions (i.e., Minnesota, Boston, Chicago, and Cleveland) already have convened lead elimination workgroups involving key representatives from health, housing, banking, and other areas involved in children's health and welfare. A critical factor in any elimination plan is use of local data to define and address local problems. Key elements for effective targeting strategies include 1) enacting state laws requiring reporting of all BLLs, 2) linking state-level environmental and Medicaid enrollment data, 3) improving overall data quality, and 4) streamlining reporting through NEDSS.

CDC will continue to urge CLPPPs to direct interventions at areas with the greatest demonstrated problems, and at populations with the highest risks. State and local data, in combination with NHANES, will enable us to continue monitoring progress toward elimination of elevated BLLs among all young children.

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* 16 CFR § 1303.

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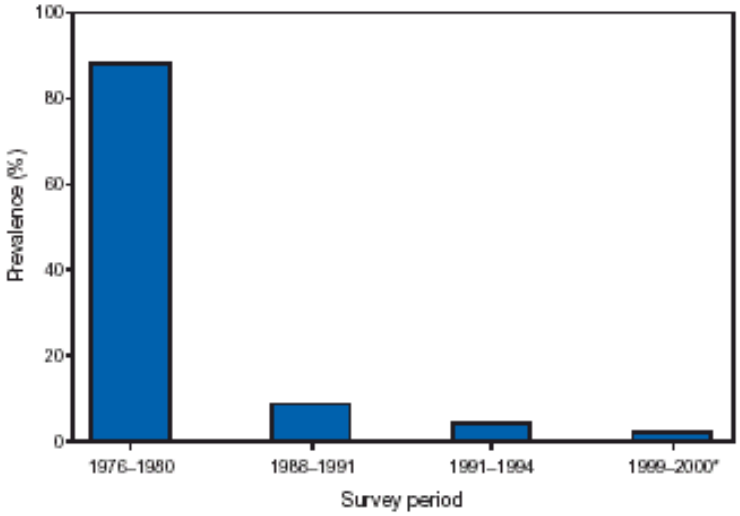
* Program manager.
† Surveillance coordinator.

Figure 1

FIGURE 1. Blood lead levels ≥10 µg/dL among children aged 1–5 years — United States, 1976–1980, 1988–1991, 1991–1994, and 1999–2000*



Source: National Health and Nutrition Examination Surveys (NHANES).
Note: In 1991, NHANES III Phase 1 was completed and Phase 2 was begun.
* Data for 1999–2000 are highly variable (relative standard error >30%).

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Figure 2

FIGURE 2. State programs linking childhood blood lead and Medicaid data — United States, 1995–2001

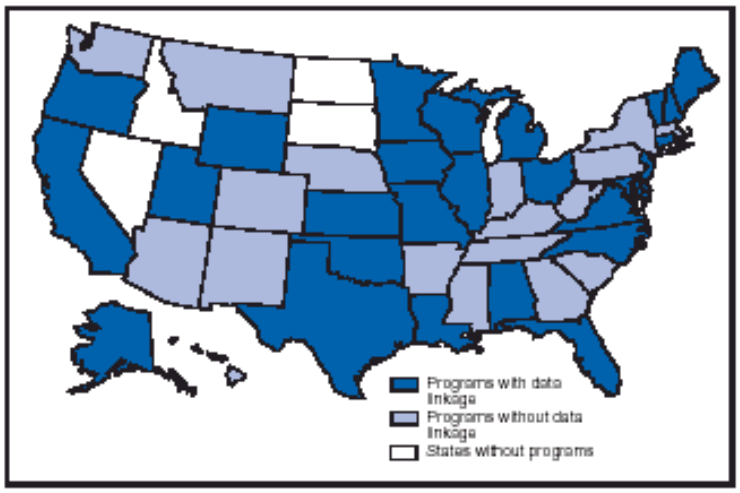

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Figure 3

FIGURE 3. Number of children with confirmed blood lead levels (BLLs) ≥10 µg/dL by program-relevant age group and BLL group — selected U.S. states, 2001

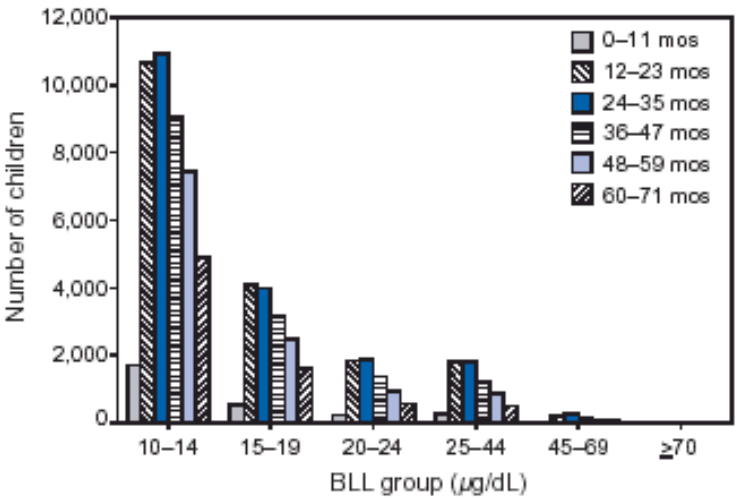

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Figure 4

FIGURE 4. Number of children with confirmed blood lead levels (BLLs) ≥10 µg/dL by racial or ethnic group and program-relevant BLL group — selected U.S. states, 2001

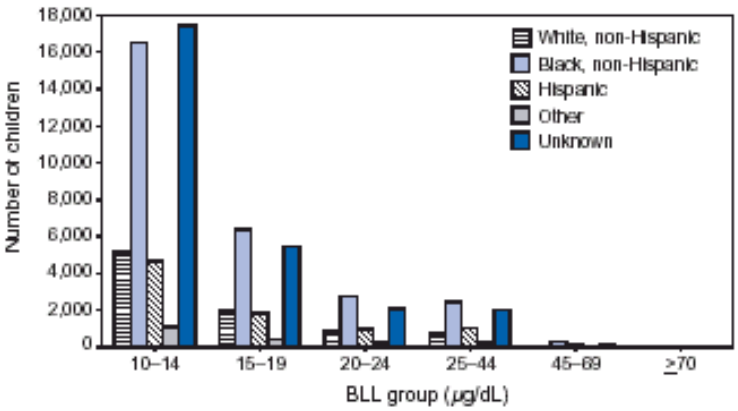

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Figure 5

FIGURE 5. Number of children with confirmed blood lead levels ≥10 µg/dL — United States, 2001

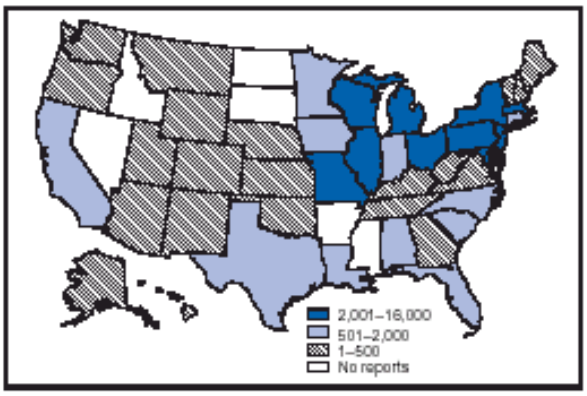

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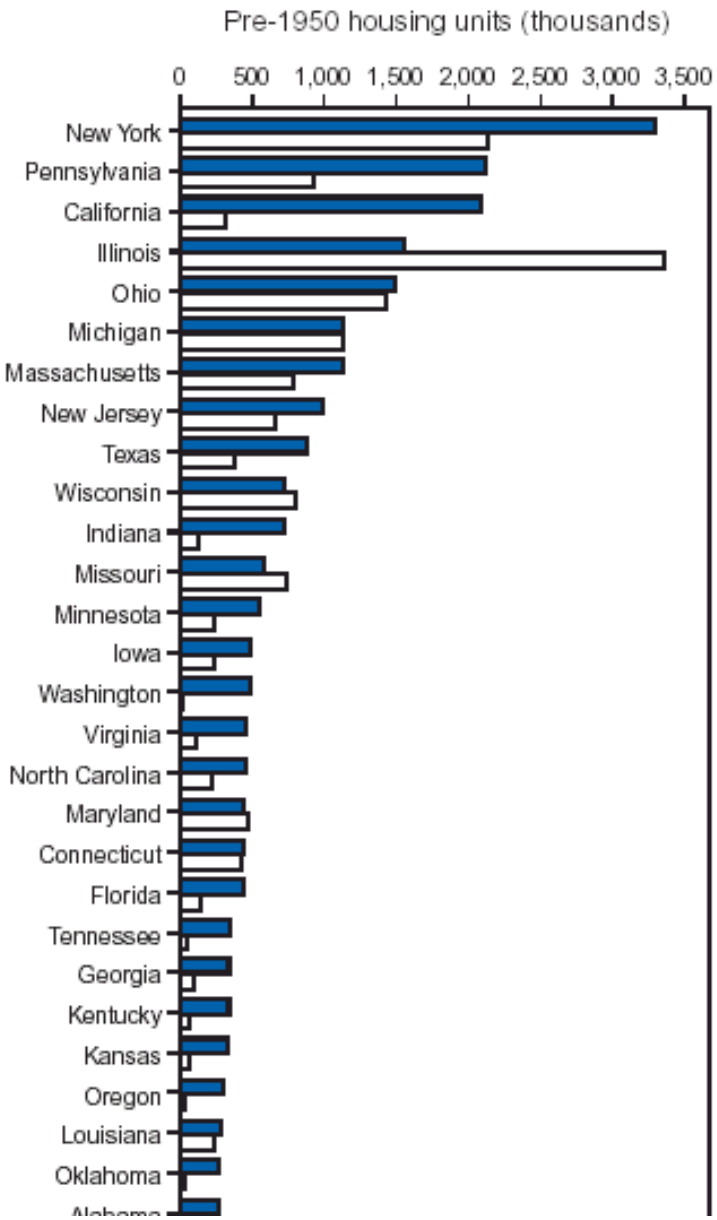
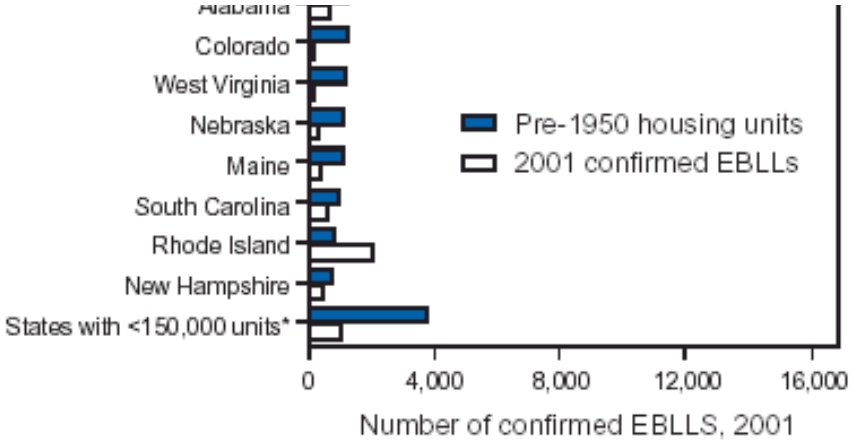
Figure 6

FIGURE 6. Number of pre-1950 housing units and children with confirmed elevated blood lead levels (EBLLs) ≥10 µg/dL — selected U.S. sites, 2001





* Arkansas, Arizona, Delaware, District of Columbia, Hawaii, Montana, New Mexico, New York City, Utah, Vermont, and Wyoming.

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Table 1

TABLE 1. Estimated prevalence* of children aged 1–5 years with blood lead levels (BLLs) ≥10 µg/dL† — United States, 1976–1980, 1988–1991, 1991–1994, and 1999–2000

	Prevalence of BLLs ≥10 µg/dL		Children with BLLs ≥10 µg/dL	
Survey	(%)	(95% CI§)	No.	(95% CI)
1976–1980	88.2	(83.8–92.6)	13,500,000	(12,800,000–14,100,000)
1988–1991	8.6¶	(4.8–12.4)	1,700,000	(960,000–2,477,000)
1991–1994	4.4	(2.9–6.6)	890,000	(590,000–1,330,000)
1999–2000	2.2**	(1.0–4.3)	434,000**	(189,000–846,000)

Source: National Health and Nutrition Examination Surveys (NHANES).
Note: In 1991, NHANES III Phase 1 was completed and Phase 2 was begun.
* Estimated number of children aged 1–5 years with BLLs ≥10 µg/dL divided by estimated population of children aged 1–5 years.
† CDC has determined BLL ≥10 µg/dL is a level of concern.
§ Confidence interval.
¶ Estimate differs slightly from that published previously because of updates in coding and weighting of survey data.
** Data for 1999–2000 are highly variable (relative standard error >30%).

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Table 2

TABLE 2. Selected state policies that affect interpretation of blood lead level (BLL) data collected and reported by childhood lead poisoning prevention programs — United States sites, 1997–2001

State	When screening is required or recommended	Confirmatory testing: Minimum BLL that should have follow-up for confirmation (µg/dL)	Confirmatory testing: Time recommended to obtain confirmatory test	Surveillance: Reportable BLL (µg/dL)	Surveillance: Who reports
Alabama	r, hr, u, E*	10	3 mos	≥10	p, l†
Alaska	r, hr	10	3 mos	≥10	p, l
Arizona	p, u, E	10	30 days	all	p, l
California	p, hrp, E	10	3 mos	≥25	p, l
Colorado	r, hr, E	10	1–3 mos	≥10	p, l
Connecticut	r, hr, E	10	3 mos	all§	p, l
District of Columbia	r, dc, u, s, hr	15	1 wk	≥10	p, l
Delaware	r, dc, s, hr, p, u	10	3 mos	all	l
Florida	E, hr, p, r	10	3 mos	≥10	p, l
Georgia	r, p, E	10	3 mos	≥10	p, l, o[2,3]
Hawaii	p, E	10	3 mos	all	p, l
Illinois	dc, hr, s, E, M	10	3 mos	all	p, l
Indiana	E	10	3–4 mos	all	l
Iowa	E	10	3–4 mos	all	p, l
Kansas	r, hr, p, u, E	10	3 mos	≥10	p, l, o[2,3]
Kentucky	u, E	20	1–4 wks	≥25	p, l, o[2]
Louisiana	r, p, u, E	10	3 mos	all	p, l, o[2,3]
Maine	r, hr, E, M	10¶	1 month	≥20	l
Maryland	r, p, dc, hr, E	10	3 mos	all	l
Massachusetts	hr, dc, s, p, u, E	10	90 days	≥15	l
Michigan	r, hr, E	10	3–4 mos	all	l
Minnesota	r, hr, E	10	3 mos	all	l
Missouri	p, u, r, hr, dc, E	10	2–3 mos	all	p, l, o[3]
Montana	r, hr	10	1 mos	>10	p, l
Nebraska	r, p, hr, E	10	3–4 mos	all	p, l
New Hampshire	r, hr, E	10	6 mos	all	p, l
New Jersey	p, u, E	10	3 mos	all	l
New Mexico	r, p, hr, E	10	3 mos	all	p, l, o[1]
New York	u	10	3–4 mos	all	p, l, o[2,3]
North Carolina	hr, E	10	6 mos	all	l
Ohio	r, hr, E	10	3 mos	all	l
Oklahoma	hr, p, E	10	3 mos	≥10	p, l
Oregon	r, hr, E	10	3 mos	all	p, l
Pennsylvania	p, hr, u, E	10	3 mos	all	l
Rhode Island	u	10	3 mos	all	p, l
South Carolina	u	10	3 mos	all	p, l, o[3]
Tennessee	r, hr, E	10	3 mos	all	p, l
Texas	p, E	10	3–4 mos	≥10	p, l
Utah	r, hr, p, E	10	3 mos	≥10	p, l, o[2,3]
Vermont	u	15**	3 mos	all	p, l
Virginia	hr, E	10	3 mos	≥10	p, l
Washington	r	10	6 mos	all	l
West Virginia	u, E	10	3 mos	all	p, l
Wisconsin	E, p, r, hr	10	3 mos	all	p, l
Wyoming	r, hr, p, u, E	10	3–4 mos	all	l

Source: Adapted from National Conference of State Legislatures. State activities in lead poisoning prevention, 2002.

* dc before entering day care
E Early and Periodic Screening, Diagnosis, and Treatment program regulations (requires blood lead test of all Medicaid eligible children)
hr lives in high-risk area
hrp high-risk population
M targeted screen of Medicaid children
p pediatricians screen
r upon request
s before entering school
u universal screening of all children

† l laboratories
o other
[1] child, adult
[2] health-care provider
[3] local health agencies and industries
[4] all children <6 years old have blood lead samples analyzed only at state public health lab
p pediatricians or other physicians

§ Before October 1998 only BLLs ≥10 µg/dL were reportable.
¶ Confirmatory testing only for BLLs ≥15 µg/dL during January 1997–June 1998.
** Medicaid confirms tests at BLLs ≥10 µg/dL.

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Table 3

TABLE 3. Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by year, age group, and BLL group — selected U.S. sites, 1997–2001

Year	Age group (mos)	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
1997	0–11	3,234,558	210,953	4,534	2.15	2,789	922	427	361	30	5
	12–23	3,208,065	426,891	26,801	6.28	14,124	6,002	3,197	3,057	375	46
	24–35	3,257,559	307,957	29,483	9.57	15,765	6,667	3,369	3,214	386	82
	36–47	3,301,714	279,412	27,707	9.92	15,363	6,506	3,028	2,557	213	40
	48–59	3,401,339	288,863	25,303	8.76	14,820	5,757	2,535	2,014	157	20
	60–71	3,469,679	189,280	16,684	8.81	9,955	3,830	1,649	1,148	86	16
	Total	19,872,914	1,703,356	130,512	7.66	72,816	29,684	14,205	12,351	1,247	209
1998	0–11	3,446,646	220,652	4,151	1.88	2,625	852	341	314	17	2
	12–23	3,410,464	462,849	25,685	5.55	14,087	5,779	2,834	2,614	316	55
	24–35	3,415,630	310,760	26,280	8.46	14,365	5,973	2,823	2,743	319	57
	36–47	3,461,075	278,701	24,031	8.62	13,930	5,422	2,426	2,008	218	27
	48–59	3,554,842	283,857	21,863	7.70	13,473	4,765	1,985	1,501	129	10
	60–71	3,604,969	180,089	14,522	8.06	8,966	3,236	1,302	927	85	6
	Total	20,893,626	1,736,908	116,532	6.71	67,446	26,027	11,711	10,107	1,084	157
1999	0–11	3,549,859	231,121	3,274	1.42	1,980	674	273	308	33	6
	12–23	3,490,917	519,475	21,374	4.11	12,001	4,719	2,263	2,122	241	28
	24–35	3,493,098	331,060	21,626	6.53	12,007	4,914	2,304	2,102	267	32
	36–47	3,492,478	274,480	18,928	6.90	11,322	4,113	1,832	1,501	137	23
	48–59	3,584,866	277,676	16,677	6.01	10,328	3,612	1,441	1,190	99	7
	60–71	3,626,499	175,729	11,356	6.46	7,101	2,514	989	691	49	12
	Total	21,237,717	1,809,541	93,235	5.15	54,739	20,546	9,102	7,914	826	108
2000	0–11	3,586,594	270,824	3,252	1.20	2,014	643	269	291	32	3
	12–23	3,600,669	645,586	20,825	3.23	11,827	4,454	2,215	2,063	224	42
	24–35	3,573,765	412,905	21,576	5.23	12,198	4,641	2,223	2,212	247	55
	36–47	3,615,334	314,052	17,523	5.58	10,528	3,753	1,616	1,438	163	25
	48–59	3,704,678	302,453	14,575	4.82	9,040	3,094	1,253	1,067	107	14
	60–71	3,743,359	190,112	9,806	5.16	6,115	2,108	843	678	52	10
	Total	21,824,399	2,135,932	87,557	4.10	51,722	18,693	8,419	7,749	825	149
2001	0–11	3,674,701	321,267	2,774	0.86	1,697	558	232	262	22	3
	12–23	3,689,097	738,122	18,681	2.53	10,700	4,124	1,843	1,784	196	34
	24–35	3,660,883	476,408	18,905	3.97	10,934	3,978	1,875	1,814	260	44
	36–47	3,702,419	355,764	14,998	4.22	9,043	3,201	1,385	1,208	135	26
	48–59	3,793,982	329,250	11,853	3.60	7,440	2,481	954	872	100	6
	60–71	3,833,419	201,487	7,676	3.81	4,916	1,601	583	524	47	5
	Total	22,354,501§	2,422,298	74,887	3.09	44,730	15,943	6,872	6,464	760	118

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.
† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).
§ Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

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Table 4

TABLE 4. Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by year, racial or ethnic group, and BLL group — selected U.S. sites, 1997–2001

Year	Racial or ethnic group	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
1997	White, non-Hispanic	12,564,418	419,428	15,713	3.75	9,124	3,516	1,561	1,365	126	21
	Black, non-Hispanic	2,603,363	359,505	63,458	17.65	32,969	15,296	7,785	6,650	642	116
	Native American/ Alaska Native	148,765	5,951	327	5.49	177	70	33	42	4	1
	Asian/Pacific Islander	847,029	19,697	1,562	7.93	832	272	208	202	39	9
	Hispanic	3,709,339	151,833	14,383	9.47	7,748	3,105	1,685	1,624	190	31
	Other/Multiracial		17,861	1,571	8.80	819	383	168	175	24	2
	Unknown		729,081	33,498	4.59	21,147	7,042	2,765	2,293	222	29
	Total	19,872,914	1,703,356	130,512	7.66	72,816	29,684	14,205	12,351	1,247	209
1998	White, non-Hispanic	13,039,219	401,830	13,426	3.34	7,817	2,995	1,305	1,169	123	17
	Black, non-Hispanic	2,930,480	358,241	54,177	15.12	29,358	12,854	6,121	5,238	541	65
	Native American/ Alaska Native	150,921	6,330	286	4.52	152	70	30	29	4	1
	Asian/Pacific Islander	950,638	20,984	1,432	6.82	738	292	185	182	28	7
	Hispanic	3,822,368	135,728	12,132	8.94	6,692	2,481	1,418	1,340	168	33
	Other/Multiracial		16,323	1,160	7.11	689	251	98	106	14	2
	Unknown		797,472	33,919	4.25	22,000	7,084	2,554	2,043	206	32
	Total	20,893,626	1,736,908	116,532	6.71	67,446	26,027	11,711	10,107	1,084	157
1999	White, non-Hispanic	13,138,722	408,672	11,391	2.79	6,546	2,634	1,074	1,041	81	15
	Black, non-Hispanic	2,888,002	339,813	41,471	12.20	23,140	9,627	4,480	3,808	374	42
	Native American/ Alaska Native	178,593	9,745	251	2.58	139	55	20	33	3	1
	Asian/Pacific Islander	977,235	19,874	1,172	5.90	583	247	173	135	31	3
	Hispanic	4,055,165	139,028	10,180	7.32	5,641	2,050	1,154	1,170	145	20
	Other/Multiracial		18,323	1,002	5.47	584	230	84	88	10	6
	Unknown		874,086	27,768	3.18	18,106	5,703	2,117	1,639	182	21
	Total	21,237,717	1,809,541	93,235	5.15	54,739	20,546	9,102	7,914	826	108
2000	White, non-Hispanic	12,666,345	414,833	10,250	2.47	6,037	2,216	982	908	93	14
	Black, non-Hispanic	3,043,966	325,086	34,483	10.61	19,569	7,926	3,562	3,066	303	57
	Native American/ Alaska Native	185,763	13,717	234	1.71	135	58	17	19	4	1
	Asian/Pacific Islander	806,149	21,886	1,084	4.95	562	214	132	152	19	5
	Hispanic	4,339,913	154,962	9,685	6.25	5,275	2,056	1,097	1,107	127	23
	Other/Multiracial	782,263	17,029	869	5.10	507	181	72	93	12	4
	Unknown		1,188,419	30,952	2.60	19,637	6,042	2,557	2,404	267	45
	Total	21,824,399	2,135,932	87,557	4.10	51,722	18,693	8,419	7,749	825	149
2001	White, non-Hispanic	13,030,940	433,317	8,738	2.02	5,134	1,948	849	707	83	17
	Black, non-Hispanic	3,148,325	327,126	28,291	8.65	16,460	6,334	2,731	2,431	300	35
	Native American/ Alaska Native	187,319	15,161	230	1.52	126	54	23	23	4	0
	Asian/Pacific Islander	814,671	20,355	901	4.43	428	186	121	148	16	2
	Hispanic	4,376,784	154,723	8,625	5.57	4,630	1,834	988	1,032	119	22
	Other/Multiracial	796,461	22,073	872	3.95	503	177	88	90	12	2
	Unknown		1,449,543	27,230	1.88	17,449	5,410	2,072	2,033	226	40
	Total	22,354,500§	2,422,298	74,887	3.09	44,730	15,943	6,872	6,464	760	118

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.
† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).
§ Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

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Table 5

TABLE 5. Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by year, sex, and BLL group — selected U.S. sites, 1997–2001

Year	Sex	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
1997	Male	10,164,518	850,881	69,420	8.16	38,344	16,051	7,674	6,586	645	120
	Female	9,708,396	798,763	58,955	7.38	33,096	13,195	6,349	5,637	590	88
	Unknown		53,712	2,137	3.98	1,376	438	182	128	12	1
	Total	19,872,914	1,703,356	130,512	7.66	72,816	29,684	14,205	12,351	1,247	209
1998	Male	10,686,510	879,369	62,466	7.10	35,967	14,059	6,362	5,455	547	76
	Female	10,207,116	805,709	51,938	6.45	30,076	11,501	5,227	4,532	523	79
	Unknown		51,830	2,128	4.11	1,403	467	122	120	14	2
	Total	20,893,626	1,736,908	116,532	6.71	67,446	26,027	11,711	10,107	1,084	157
1999	Male	10,858,067	898,937	49,854	5.55	29,108	11,104	4,914	4,235	437	56
	Female	10,379,650	848,600	41,430	4.88	24,447	8,994	4,036	3,527	378	48
	Unknown		62,004	1,951	3.15	1,184	448	152	152	11	4
	Total	21,237,717	1,809,541	93,235	5.15	54,739	20,546	9,102	7,914	826	108
2000	Male	11,167,766	1,078,922	46,613	4.32	27,412	9,977	4,554	4,147	453	70
	Female	10,656,633	982,792	38,845	3.95	22,952	8,300	3,722	3,442	352	77
	Unknown		74,218	2,099	2.83	1,358	416	143	160	20	2
	Total	21,824,399	2,135,932	87,557	4.10	51,722	18,693	8,419	7,749	825	149
2001	Male	11,439,685	1,225,187	40,067	3.27	23,817	8,570	3,729	3,471	418	62
	Female	10,914,827	1,106,532	33,051	2.99	19,754	7,023	3,026	2,859	335	54
	Unknown		90,579	1,769	1.95	1,159	350	117	134	7	2
	Total	22,354,512§	2,422,298	74,887	3.09	44,730	15,943	6,872	6,464	760	118

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.
† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).
§ Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

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Table 6

TABLE 6. Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
Alabama	1997	357,087	22,880	1,501	6.56	889	411	120	76	5	0
	1998	352,409	17,844	992	5.56	586	253	86	61	6	0
	1999	349,592	17,657	546	3.09	342	114	43	41	6	0
	2000	356,676	13,702	316	2.31	204	64	20	21	7	0
	2001	357,111	12,077	654	5.42	400	131	62	56	5	0
Alaska	1997	60,266	142	2	1.41	1	1	0	0	0	0
	1998	60,271	242	2	0.83	2	0	0	0	0	0
	1999	60,247	103	1	0.97	1	0	0	0	0	0
	2000	57,620	73	1	1.37	0	1	0	0	0	0
	2001	57,773	51	3	5.88	3	0	0	0	0	0
Arizona	1997	—§	—	—	—	—	—	—	—	—	—
	1998	—	—	—	—	—	—	—	—	—	—
	1999	462,341	1,929	168	8.71	93	42	12	18	3	0
	2000	459,141	7,247	181	2.50	105	35	19	20	2	0
	2001	463,085	8,026	170	2.12	109	34	10	17	0	0
California	1997	3,204,502	12,403	2,281	18.39	566	679	544	433	52	7
	1998	3,104,123	11,800	1,848	15.66	491	545	429	341	37	5
	1999	3,029,049	10,070	1,565	15.54	372	474	356	319	37	7
	2000	3,018,386	12,717	1,475	11.60	398	412	307	319	32	7
	2001	3,034,623	15,040	1,402	9.32	325	443	281	321	27	5
Colorado	1997	331,728	5,077	180	3.55	108	36	16	17	2	1
	1998	339,604	4,150	124	2.99	77	24	6	14	3	0
	1999	345,246	3,815	102	2.67	64	20	10	7	1	0
	2000	357,202	6,606	112	1.70	71	21	7	12	1	0
	2001	359,896	8,983	112	1.25	62	20	18	12	0	0
Connecticut	1997	260,336	65,063	3,000	4.61	1,581	709	357	311	41	1
	1998	261,163	52,942	2,384	4.50	1,266	538	291	258	28	3
	1999	263,845	62,163	2,057	3.31	1,196	439	204	188	28	2
	2000	270,187	64,017	2,362	3.69	1,342	521	255	216	26	2
	2001	270,763	66,333	1,977	2.98	1,170	445	187	153	20	2
Delaware	1997	—	—	—	—	—	—	—	—	—	—
	1998	59,695	8,728	226	2.59	115	54	29	26	1	1
	1999	60,211	10,354	210	2.03	108	48	26	26	2	0
	2000	62,122	9,505	159	1.67	86	30	22	19	2	0
	2001	62,380	14,329	150	1.05	82	41	11	15	1	0
District of Columbia	1997	39,660	192	153	79.69	9	33	55	50	6	0
	1998	35,348	8,914	453	5.08	235	105	54	49	9	1
	1999	33,320	14,314	502	3.51	305	92	46	55	4	0
	2000	39,326	15,138	404	2.67	250	85	35	29	4	1
	2001	39,356	16,036	437	2.73	287	74	29	44	3	0
Florida	1997	1,152,887	38,801	2,347	6.05	1,592	486	142	109	13	5
	1998	1,154,343	33,803	2,146	6.35	1,495	396	138	110	7	0
	1999	1,149,495	34,389	1,509	4.39	967	347	108	75	10	2
	2000	1,142,293	45,895	723	1.58	467	149	40	58	9	0
	2001	1,149,277	61,788	633	1.02	391	134	56	49	3	0

Note: State data and analysis may vary from CDC data because of strict CDC guidelines and criteria.
* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.
† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).
§ Data unavailable for analysis or state surveillance system not in place.
¶ Statewide surveillance start-up year.
** CDC does not have complete dataset.
†† Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

TABLE 6. (*Continued*) Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
Georgia	1997	—	—	—	—	—	—	—	—	—	—
	1998	685,213	22,492	445	1.98	247	121	41	36	0	0
	1999	694,317	20,419	508	2.49	279	130	42	50	7	0
	2000	714,090	27,392	466	1.70	275	107	37	43	3	1
	2001	718,870	32,955	423	1.28	269	89	26	38	0	1
Hawaii	1997	—	—	—	—	—	—	—	—	—	—
	1998	101,124	3,724	99	2.66	58	28	11	2	0	0
	1999	97,480	4,898	105	2.14	71	20	6	8	0	0
	2000	94,446	7,349	84	1.14	47	20	7	6	4	0
	2001	94,748	9,174	42	0.46	26	7	5	3	1	0
Illinois	1997	1,089,142	179,462	32,061	17.87	17,787	7,784	3,082	3,030	319	59
	1998	1,071,765	174,112	25,721	14.77	15,471	5,429	2,368	2,154	250	49
	1999	1,061,071	168,874	20,733	12.28	12,708	4,307	1,774	1,736	178	30
	2000	1,059,514	176,712	18,189	10.29	11,102	3,745	1,668	1,473	162	39
	2001	1,061,668	187,385	15,323	8.18	9,308	3,264	1,323	1,249	155	24
Indiana	1997	494,918	32,011	910	2.84	543	185	88	75	16	3
	1998	495,192	28,603	727	2.54	385	180	84	69	9	0
	1999	497,865	27,280	751	2.75	430	179	72	68	1	1
	2000	508,845	28,143	624	2.22	375	131	66	45	6	1
	2001	509,812	26,903	611	2.27	350	148	67	42	4	0
Iowa	1997	220,872	25,239	1,414	5.60	748	357	157	134	16	2
	1998	220,543	26,174	1,291	4.93	691	288	128	163	16	5
	1999	220,379	27,724	1,049	3.78	548	234	125	128	13	1
	2000	227,062	29,793	1,040	3.49	549	247	121	103	18	2
	2001	227,171	36,841	1,063	2.89	576	238	112	110	24	3
Kansas	1997¶	217,762	36	3	8.33	1	0	0	2	0	0
	1998	219,444	3,482	71	2.04	24	24	7	14	2	0
	1999	220,941	4,009	224	5.59	108	61	26	27	2	0
	2000	226,862	7,224	222	3.07	120	50	16	31	5	0
	2001	227,151	10,706	320	2.99	189	61	33	32	4	1
Kentucky	1997	—	—	—	—	—	—	—	—	—	—
	1998	—	—	—	—	—	—	—	—	—	—
	1999	—	—	—	—	—	—	—	—	—	—
	2000¶	320,380	15,844	142	0.90	65	29	20	25	3	0
	2001	320,916	24,167	317	1.31	157	60	46	47	3	4
Louisiana	1997	—	—	—	—	—	—	—	—	—	—
	1998	379,751	23,168	551	2.38	227	152	82	81	6	3
	1999	378,280	21,587	690	3.20	318	191	94	76	10	1
	2000	381,826	30,804	1,023	3.32	484	270	137	122	8	2
	2001	381,856	44,456	1,060	2.38	563	249	118	124	3	3
Maine	1997	84,280	12,222	514	4.21	330	103	41	34	4	2
	1998	82,130	10,064	396	3.93	262	76	26	31	1	0
	1999	81,394	9,692	340	3.51	194	86	30	28	2	0
	2000	85,915	10,242	333	3.25	209	65	30	20	8	1
	2001	86,075	11,361	332	2.92	209	63	32	24	2	2

Note: State data and analysis may vary from CDC data because of strict CDC guidelines and criteria.

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.

† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).

§ Data unavailable for analysis or state surveillance system not in place.

¶ Statewide surveillance start-up year.

** CDC does not have complete dataset.

†† Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

TABLE 6. (*Continued*) Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
Maryland	1997**	422,725	2,049	1,806	88.14	345	455	568	408	25	5
	1998**	418,567	2,186	1,912	87.47	362	762	470	286	28	4
	1999**	418,912	2,021	1,425	70.51	345	523	327	209	18	3
	2000	427,939	67,516	2,668	3.95	1,698	552	223	178	14	3
	2001	429,749	74,925	2,114	2.82	1,392	427	136	144	12	3
Massachusetts	1997	480,892	241,872	7,810	3.23	5,197	1,531	629	423	27	3
	1998	474,905	240,544	6,453	2.68	4,333	1,301	452	335	31	1
	1999	473,447	254,858	5,458	2.14	3,743	1,007	399	279	28	2
	2000	480,422	251,872	4,395	1.74	3,069	766	280	247	26	7
	2001	481,406	244,173	3,620	1.48	2,498	651	249	205	12	5
Michigan	1997	804,560	23,648	4,028	17.03	2,050	906	546	484	39	3
	1998	793,691	61,975	6,810	10.99	4,105	1,460	611	563	65	6
	1999	792,123	75,648	6,038	7.98	3,566	1,324	613	484	46	5
	2000	814,505	78,164	4,697	6.01	2,933	988	388	353	31	4
	2001	815,894	83,867	5,109	6.09	3,248	1,033	422	348	49	9
Minnesota	1997	383,055	37,413	1,871	5.00	1,098	398	201	151	18	5
	1998	384,854	35,653	1,552	4.35	918	340	138	134	16	6
	1999	387,695	36,727	1,215	3.31	734	258	111	94	15	3
	2000	397,581	41,185	1,019	2.47	584	218	96	106	12	3
	2001	398,895	47,096	1,080	2.29	638	222	104	100	11	5
Missouri	1997	443,042	41,770	5,061	12.12	2,828	1,200	542	441	42	8
	1998	438,960	44,465	5,046	11.35	2,934	1,168	448	434	56	6
	1999	437,313	48,974	4,783	9.77	2,787	1,146	417	384	46	3
	2000	445,566	56,888	4,935	8.67	2,895	1,149	389	458	41	3
	2001	446,404	65,088	3,342	5.13	2,084	707	278	238	33	2
Montana	1997	65,423	858	41	4.78	29	7	4	0	1	0
	1998	64,823	1,133	30	2.65	24	5	1	0	0	0
	1999	64,143	3,402	19	0.56	16	2	0	1	0	0
	2000	66,452	2,394	18	0.75	13	4	1	0	0	0
	2001	66,511	2,208	6	0.27	4	1	1	0	0	0
Nebraska	1997	137,189	5,167	312	6.04	164	61	32	48	6	1
	1998	137,375	8,496	355	4.18	188	78	37	40	10	2
	1999	138,005	11,114	395	3.55	207	84	51	46	6	1
	2000	141,081	13,867	311	2.24	159	61	40	41	6	4
	2001	141,261	14,514	295	2.03	163	65	30	33	4	0
New Hampshire	1997	89,518	15,775	502	3.18	269	118	54	57	4	0
	1998	89,254	15,237	534	3.50	301	123	64	42	4	0
	1999	89,711	14,346	553	3.85	319	137	52	39	4	2
	2000	92,378	13,973	501	3.59	317	117	38	27	1	1
	2001	92,820	13,508	391	2.89	247	84	24	34	2	0
New Jersey	1997**	677,474	12,541	2,938	23.43	851	515	775	705	78	14
	1998**	665,655	11,183	2,350	21.01	685	390	617	585	67	6
	1999**	657,145	8,230	1,712	20.80	494	302	466	385	60	5
	2000	681,609	135,262	3,820	2.82	1,438	667	788	800	105	22
	2001	683,569	146,428	2,998	2.05	1,198	589	525	580	98	8

Note: State data and analysis may vary from CDC data because of strict CDC guidelines and criteria.

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.

† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).

§ Data unavailable for analysis or state surveillance system not in place.

¶ Statewide surveillance start-up year.

** CDC does not have complete dataset.

†† Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

TABLE 6. (*Continued*) Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
New Mexico	1997	162,814	5,833	71	1.22	43	12	4	10	1	1
	1998	160,514	4,500	24	0.53	9	9	5	1	0	0
	1999	158,269	4,488	29	0.65	17	7	5	0	0	0
	2000	157,439	3,251	23	0.71	18	3	1	1	0	0
	2001	157,696	2,695	39	1.45	24	9	2	4	0	0
New York (excluding New York City)	1997	884,716	212,860	13,120	6.16	7,910	2,963	1,172	1,002	65	8
	1998	846,487	198,030	10,610	5.36	6,463	2,495	891	686	68	7
	1999	821,562	187,282	6,777	3.62	4,233	1,459	554	486	38	7
	2000	861,874	185,016	6,391	3.45	3,976	1,357	546	447	56	9
	2001	863,100	159,997	4,814	3.01	2,973	1,074	381	344	36	6
New York City	1997	670,352	333,488	12,507	3.75	9,246	1,708	773	681	81	18
	1998	658,254	292,282	10,493	3.59	7,266	1,864	662	623	66	12
	1999	648,360	259,865	7,927	3.05	5,575	1,337	502	451	53	9
	2000	639,087	285,343	6,826	2.39	4,826	1,236	364	350	45	5
	2001	639,380	272,947	4,957	1.82	3,369	941	303	303	36	5
North Carolina	1997	629,399	97,167	1,259	1.30	718	313	120	95	11	2
	1998	636,257	96,728	1,067	1.10	641	257	78	83	8	0
	1999	641,514	107,092	1,039	0.97	628	235	100	72	4	0
	2000	647,879	116,930	1,261	1.08	772	287	108	83	8	3
	2001	651,034	121,906	994	0.82	615	215	79	78	5	2
Ohio	1997	907,805	74,456	12,342	16.58	6,764	2,766	1,386	1,255	150	21
	1998	896,793	75,584	11,773	15.58	6,660	2,654	1,312	1,021	111	15
	1999	893,169	103,825	9,254	8.91	5,366	2,101	974	735	70	8
	2000	911,072	94,043	7,274	7.73	4,093	1,682	800	633	58	8
	2001	911,807	101,144	6,549	6.47	3,848	1,438	649	536	67	11
Oklahoma	1997	275,375	9,184	341	3.71	232	57	20	31	1	0
	1998	276,764	7,550	164	2.17	107	28	16	10	3	0
	1999	278,461	8,634	127	1.47	81	20	8	17	1	0
	2000	283,208	9,499	154	1.62	103	36	9	6	0	0
	2001	283,596	11,847	147	1.24	89	33	11	13	1	0
Oregon	1997**	257,876	2,102	80	3.81	51	11	10	7	1	0
	1998**	261,090	2,619	97	3.70	57	23	10	7	0	0
	1999**	263,482	1,366	108	7.91	70	25	9	3	1	0
	2000**	268,083	475	104	21.89	69	19	5	9	0	2
	2001**	269,102	971	94	9.68	56	20	10	7	0	1
Pennsylvania	1997	895,951	39,200	9,644	24.60	4,111	2,840	1,421	1,139	112	21
	1998	877,252	49,570	9,971	20.11	5,119	2,573	1,164	1,019	80	16
	1999	864,659	63,973	6,877	10.75	3,497	1,831	778	699	64	8
	2000	884,030	72,272	7,344	10.16	3,833	1,868	826	750	64	3
	2001	884,426	45,738	4,259	9.31	2,350	989	420	434	63	3
Rhode Island	1997	77,157	33,826	3,119	9.22	1,779	703	331	272	31	3
	1998	75,134	31,866	2,465	7.74	1,522	510	212	200	20	1
	1999	75,194	33,229	2,363	7.11	1,465	488	193	191	23	3
	2000	77,648	31,332	1,987	6.34	1,235	404	159	166	21	2
	2001	77,859	34,765	2,026	5.83	1,267	402	178	166	11	2

Note: State data and analysis may vary from CDC data because of strict CDC guidelines and criteria.
* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.
† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).
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¶ Statewide surveillance start-up year.
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TABLE 6. (*Continued*) Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
South Carolina	1997	309,371	13,310	684	5.14	436	151	57	37	3	0
	1998	305,425	9,305	457	4.91	292	92	46	25	2	0
	1999	304,583	26,429	548	2.07	386	111	31	19	1	0
	2000	318,543	33,527	680	2.03	439	157	38	45	1	0
	2001	319,537	46,018	566	1.23	377	122	37	27	2	1
Tennessee	1997	—	—	—	—	—	—	—	—	—	—
	1998	—	—	—	—	—	—	—	—	—	—
	1999	—	—	—	—	—	—	—	—	—	—
	2000	—	—	—	—	—	—	—	—	—	—
	2001¶	452,712	27,912	258	0.92	156	56	27	15	3	1
Texas	1997**	1,928,518	1,286	50	3.89	36	9	3	0	2	0
	1998**	1,950,129	876	24	2.74	15	5	3	1	0	0
	1999**	1,963,136	937	61	6.51	16	8	18	17	1	1
	2000**	1,948,297	11,883	352	2.96	160	92	45	50	4	1
	2001	1,960,424	172,373	1,740	1.01	1,069	346	158	151	12	4
Utah	1997	235,849	1,794	44	2.45	19	15	4	6	0	0
	1998	243,453	2,492	53	2.13	33	15	3	2	0	0
	1999	249,309	2,609	19	0.73	13	3	2	1	0	0
	2000	248,430	3,581	22	0.61	12	8	1	1	0	0
	2001	249,696	3,433	19	0.55	9	5	2	3	0	0
Vermont	1997	41,322	6,742	306	4.54	186	74	23	22	1	0
	1998	39,917	6,253	239	3.82	143	51	26	14	5	0
	1999	39,042	6,179	170	2.75	94	37	24	15	0	0
	2000	41,709	6,424	178	2.77	105	48	11	13	1	0
	2001	41,780	6,455	144	2.23	74	43	17	8	2	0
Virginia	1997	542,983	12,870	864	6.71	413	225	114	103	6	3
	1998	542,156	23,781	939	3.95	478	239	111	86	24	1
	1999	542,731	24,270	498	2.05	263	143	58	29	5	0
	2000	557,736	25,728	614	2.39	367	141	47	57	2	0
	2001	560,065	39,291	456	1.16	233	110	53	49	11	0
Washington	1997	466,597	3,712	36	0.97	20	4	5	7	0	0
	1998	469,215	3,277	39	1.19	25	7	2	5	0	0
	1999	469,925	3,114	28	0.90	16	3	4	4	1	0
	2000	475,456	3,616	40	1.11	19	4	9	6	1	1
	2001	477,458	3,487	32	0.92	19	4	3	5	1	0
West Virginia	1997	126,536	11,645	267	2.29	172	54	23	15	3	0
	1998	124,234	10,473	237	2.26	150	56	18	12	1	0
	1999	122,311	9,538	169	1.77	113	36	13	6	1	0
	2000	122,919	11,718	173	1.48	115	36	12	9	0	1
	2001	122,793	12,159	147	1.21	89	33	15	9	1	0
Wisconsin	1997	405,409	68,620	7,032	10.25	3,688	1,803	784	679	65	13
	1998	403,252	69,758	5,347	7.67	2,978	1,305	532	481	44	7
	1999	401,769	70,874	4,577	6.46	2,586	1,135	419	397	36	4
	2000	414,337	70,578	3,911	5.54	2,323	811	388	351	28	10
	2001	415,154	79,467	3,658	4.60	2,162	823	341	294	33	5

Note: State data and analysis may vary from CDC data because of strict CDC guidelines and criteria.

* Confirmed by either one elevated venous test or two elevated capillary tests <12 weeks apart.

† BLL group may be underreported. Certain states do not report BLLs 10–24 µg/dL (see Table 2).

§ Data unavailable for analysis or state surveillance system not in place.

¶ Statewide surveillance start-up year.

** CDC does not have complete dataset.

†† Detailed census data were not available. Differences in 2001 total population estimates are due to rounding.

TABLE 6. (*Continued*) Children aged <72 months for whom blood lead surveillance data were reported to CDC and number of children confirmed to have blood lead levels (BLLs) ≥10 µg/dL by state, year and BLL group — selected U.S. sites, 1997–2001

State	Year	No. aged <72 mos for states submitting data	No. tested	Total no. with confirmed* BLLs ≥10 µg/dL	Confirmed BLLs ≥10 µg/dL among tested (%)	No. with confirmed BLLs ≥10 µg/dL by their highest BLL (µg/dL) at or after confirmation					
						10–14†	15–19†	20–24†	25–44	45–69	≥70
Wyoming	1997	37,566	640	11	1.72	6	1	2	2	0	0
	1998	37,098	850	15	1.76	6	4	2	3	0	0
	1999	36,674	1,240	6	0.48	5	0	0	1	0	0
	2000	37,226	1,192	3	0.25	2	0	0	0	0	1
	2001	37,226	1,275	4	0.31	3	0	1	0	0	0
U.S. Total	1997	19,872,914	1,703,356	130,512	7.66	72,816	29,684	14,205	12,351	1,247	209
	1998	20,893,626	1,736,908	116,532	6.71	67,446	26,027	11,711	10,107	1,084	157
	1999	21,237,717	1,809,541	93,235	5.15	54,739	20,546	9,102	7,914	826	108
	2000	21,824,399	2,135,932	87,557	4.10	51,722	18,693	8,419	7,749	825	149
	2001	22,354,501††	2,422,298	74,887	3.09	44,730	15,943	6,872	6,464	760	118

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