Office of Health Care Access
Raymond J. Gorman, Commissioner

Department of Public Health
Stephen A. Harriman, Commissioner

Report on the Status of Lead Poisoning in Connecticut

State of Connecticut

John G. Rowland, Governor

March 1998

State of Connecticut, Office of Health Care Access, March 1998

Acknowledgements

This report is a collaborative effort between the State of Connecticut Office of Health Care Access (OHCA) and the Department of Public Health (DPH). Jointly written and produced by OHCA and DPH staff, the report is intended to provide quantitative and qualitative information as well as analytical insights on lead poisoning, an issue which is important to the State of Connecticut and its citizens. Questions, comments and suggestions are appreciated.

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Sources of Information

Data used in this report is from the Office of Health Care Access (OHCA) Hospital Discharge Database and the Department of Public Health Childhood Lead Poisoning Surveillance System (DPHLSS). The OHCA database contains discharge abstract and Uniform Billing (UB-92) data for all of Connecticut's acute care hospitals. OHCA data is based on hospital fiscal year, which runs from October 1 through September 30 of the following calendar year. OHCA data defines pediatric cases as those hospital discharges under age 18. Lead poisoning cases were defined by Principal Diagnosis codes 984.0 through 984.9.

The Lead Poisoning Surveillance System contains demographic and blood lead test information for children residing in the State who have been tested for lead poisoning. Housing data is based on 1990 U.S. Census data. Blood lead test results are currently not available for children who have not been screened for lead poisoning or for many whose blood lead test results were below 10 micrograms of lead per deciliter (μg/dL). Results below 10 μg/dL are not currently required to be reported by Connecticut statute. However, some laboratories in Connecticut voluntarily report all blood lead test results.

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EXECUTIVE SUMMARY

Although lead poisoning remains one of the most common pediatric health problems today, it is totally preventable. According to the Centers for Disease Control and Prevention, blood lead levels have dramatically declined primarily due to the discontinued use of lead in gasoline. However, lead-based paint and its associated dust remain the major source of lead exposure for children.

Although lead poisoning remains one of the most common pediatric health problems today, it is totally preventable. Prevention of childhood lead poisoning is the goal.

Children most at risk for lead poisoning include those who are poor, non-Hispanic, black and who live in urban areas or older housing. However, these characteristics do not identify all children at risk and the only way to know if a child has been exposed to lead is through blood lead testing. Older housing with deteriorated lead-based paint and contaminated soil and dust pose the greatest threat. Housing built before 1950 generally contains the highest amount of lead-based paint. In Connecticut, the existence of a large segment of housing built prior to 1950, combined with the high proportion of rental housing, ranks this state among the top 15 states with the highest levels of at risk housing.

The health effects of lead are dose-related and many of the symptoms of childhood lead poisoning mimic other serious illnesses. However, in the vast majority of children with lead poisoning, even when the poisoning is severe, children will not exhibit acute symptoms. Thus, the importance of screening children for lead poisoning is emphasized in this report.

Data collection and analysis is the method used to evaluate the effectiveness of lead screening programs aimed at preventing lead poisoning. The Connecticut Department of Public Health is proposing legislation to enhance the data collection process in an effort to allow for a more comprehensive assessment of lead exposure among Connecticut children and to determine the actual screening rate statewide.

Prevention of childhood lead poisoning is Connecticut's goal. Not only are the health effects of lead poisoning devastating to our children and families, but hospital charges incurred in 1996 represented over a half million dollars. Improved screening and prevention can reduce these costs.

As part of a continuing effort to enhance education and raise awareness in different areas of interest regarding the status of health care in Connecticut, the Office of Health Care Access (OHCA) and the Department of Public Health present this collaborative Report. It is hoped that this is only the first in a series of many collaborative projects among state agencies to provide information to the public on issues surrounding health care costs and access.

HEALTH EFFECTS OF LEAD

Lead is a poison and serves no purpose in the human body. Lead affects virtually every system in the body and is especially harmful to the developing brains of fetuses and young children. The health effects of lead are dose-related and many of the symptoms of childhood lead poisoning mimic other less serious illnesses. However, in the vast majority of children with lead poisoning, even when the poisoning is severe, children will demonstrate no acute symptoms. Symptoms may include stomach ache, constipation or vomiting. Blood lead levels (BLLs) as low as 10 micrograms per deciliter (μg/dL) are associated with decreased intelligence, reduction in attention span, reading and learning disabilities, and behavioral problems. Children with high lead levels may develop anemia, and at extreme levels seizures, coma and death. Generally, children are not hospitalized for lead poisoning until they have blood lead levels of 45 μg/dL and above. Blood lead levels reaching 70 μg/dL are considered a medical emergency and require immediate hospitalization.

In the vast majority of children with lead poisoning, even when the poisoning is severe, children will exhibit no acute symptoms.

Prevention of childhood lead poisoning is the goal. Utilization of both primary and secondary prevention strategies is necessary to achieve this goal. Primary prevention can be achieved (preventing lead exposure, thus preventing lead poisoning before it occurs) through education and community-wide environmental interventions such as lead abatement. Secondary prevention includes interventions that are implemented after exposure to lead has taken place. Primary and secondary prevention activities and treatment depend on the blood lead level of the child.

Blood lead levels of 10 to 19 μg/dL require the monitoring of the child by further testing and family education to prevent further exposure. Educational activities should focus both on methods to decrease exposure and nutritional interventions.

Blood lead levels of 20 to 44 μg/dL require the above measures, but in addition, these children require a full medical evaluation including a detailed behavioral and environmental history, physical examination and tests for iron deficiency. These children also need to have a complete environmental investigation according to Connecticut General Statute (C.G.S. 19a-111) so that lead hazards can be reduced.

Children with blood lead levels of 45 μg/dL and greater require urgent medical follow-up and treatment with a pharmacologic agent to reduce their blood levels. Some children with lower levels also will need treatment with pharmacologic agents. Blood lead levels of 70 μg/dL and over may result in acute lead encephalopathy (any dysfunction of the brain). These levels are a medical emergency and require immediate treatment.

LEAD POISONING AND ITS SOURCES

The blood lead level of the child is the primary means of determining if a child has lead poisoning. In the vast majority of lead poisoning cases, even when the poisoning is severe, children will demonstrate no acute symptoms. Epidemiologic studies have identified harmful effects of lead in children at blood lead levels at least as low as 10 μg/dL. Therefore, the goal is to prevent exposures that will result in blood lead levels of 10 μg/dL or greater and for children already affected to reduce their blood lead levels below this level. Children below 10 μg/dL are considered not to be lead poisoned, but to be "at risk" for lead poisoning.

Recent data from the Third National Health and Nutrition Examination Survey (NHANES III) indicate a dramatic decline in blood lead levels among children, primarily due to the discontinued use of leaded gasoline. However, two major sources of lead exposure remain a significant health threat to children: 1) deterioration of interior and exterior lead-based paint in older housing; and 2) soil and dust that has been contaminated by previous use of leaded gasoline and/or exterior lead-based paint deterioration.

Other sources and pathways of lead exposure can include lead-contaminated water; lead-containing materials used in parental occupations or hobbies; lead-containing ceramic ware and traditional folk remedies. However, lead-based paint, lead-contaminated soil, and associated lead dust are the primary sources of lead poisoning.

LEAD-BASED PAINT IN CONNECTICUT HOUSING

Housing built before 1950 poses the greatest risk of exposure to lead-based paint. Prior to 1950, lead was a major ingredient in most interior and exterior oil house paints. During this time, some paints contained as much as 50% lead by dry weight. As lead-based paint ages it can peel, chip or chalk and form lead dust. Ingestion of this lead is a primary source of lead poisoning in children under six years of age.

In Connecticut, the existence of a large segment of housing built prior to 1950, combined with the high proportion of rental housing, ranks it among the top 15 states with the highest levels of at-risk housing. According to the 1990 U.S. Census, 35% of Connecticut's housing stock was built before 1950, compared to the United States with 26.9%. The following table **(Table 1)** shows the top three towns in each county with the highest percentages of pre-1950 housing. However, every town in Connecticut has some pre-1950 housing.

As lead-based paint ages, it can peel, chip or chalk and form lead dust. Ingestion of this lead dust is a primary source of lead poisoning in children under six years of age.

Table 1: Connecticut Towns With the Highest Percentages of Pre-1950 Housing Within Each County

County	Town	Percent Pre-1950 Housing
Fairfield	Bridgeport	53.5%
	Darien	49.9%
	Greenwich	46.4%
Hartford	Hartford	51.5%
	New Britain	49.0%
	West Hartford	47.6%
Litchfield	North Canaan	54.6%
	Cornwall	51.9%
	Norfolk	63.7%
Middlesex	Chester	51.0%
	Deep River	44.6%
	Portland	41.8%
New Haven	New Haven	57.1%
	Ansonia	51.8%
	Waterbury	45.7%
New London	New London	61.0%
	Sprague	58.0%
	Norwich	55.4%
Tolland	Stafford	44.8%
	Union	39.9%
	Coventry	34.9%
Windham	Putnam	49.3%
	Windham	44.2%
	Killingly	42.5%
Connecticut		**35.0%**
United States		**26.9 %**

Source: U.S. Census

SCREENING

One prevention effort is the screening of children at one and two years of age in an effort to identify them early and at lower blood lead levels. This would help to prevent additional exposure which would put the child at risk for more serious and permanent health consequences.

Virtually all children are considered at-risk for lead poisoning and may not have obvious symptoms that would prompt medical intervention. As a result, the Centers for Disease Control and Prevention recommended in 1991 that all children be screened for lead poisoning unless it could be demonstrated that a community in which a child resides did not have a childhood lead poisoning problem.

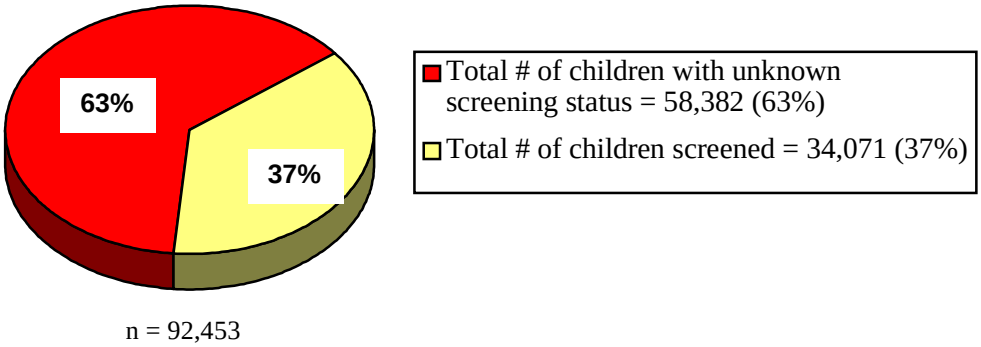
A 1994 national survey showed that only about one-quarter of young children had been screened and only about one-third of poor children, who are at higher risk of lead exposure than other children, had been screened.

According to the 1991 guidelines, health care providers were recommended to screen children based on their risk of exposure to lead. Children on Medicaid are required to be screened at one and two years of age and from age three to six years, a risk assessment is required. However, according to the CDC, a 1994 national survey showed that only about one-quarter of young children had been screened and only about one-third of poor children, who are at higher risk of lead exposure than other children, had been screened.

The 1997 CDC guidelines recommend that state health officials develop a statewide plan for childhood lead screening. The statewide plan should use available screening and housing data to identify the highest risk areas. This plan needs to utilize the results of all tests, regardless of the blood lead level, so that calculation of rates of elevated blood lead levels among screened children can take place. Until DPH and local health departments have access to all the data (including BLL <10 µg/dL) a comprehensive statewide plan that will target scarce resources can not be developed. The CDC also recommended that children at greatest risk for high-dose lead exposure be screened more frequently and screening should begin at one and two years of age.

Currently, the Department of Public Health is unable to ascertain the extent of lead screening in Connecticut because blood lead test results under 10 µg/dL are not required to be reported by statute to the Department. Some efforts to obtain data for blood lead levels below 10 µg/dL have been successful, primarily with the Department's laboratory and the state's two regional lead treatment centers. In calendar year 1995, the reported data showed that 36.9% of the state's one and two year olds were screened for lead poisoning. The blood lead screening status of the remaining 63.1% of children is unknown due to any one of the following: (1) the children were not screened by a health care provider; or (2) they were screened and the test result was less than 10 µg/dL, which is not required to be reported to the Department of Public Health; or (3) they were screened during another calendar year; or (4) a screening test indicated an elevated result which was not subsequently confirmed with a diagnostic test **(Figure 1)**. Lead screening information for all children is critical to the development, implementation, and evaluation of lead poisoning programs.

Figure 1: CT: Number of Children Aged 1-2 Years With a Reported Blood Lead Screening Test, CY 1995

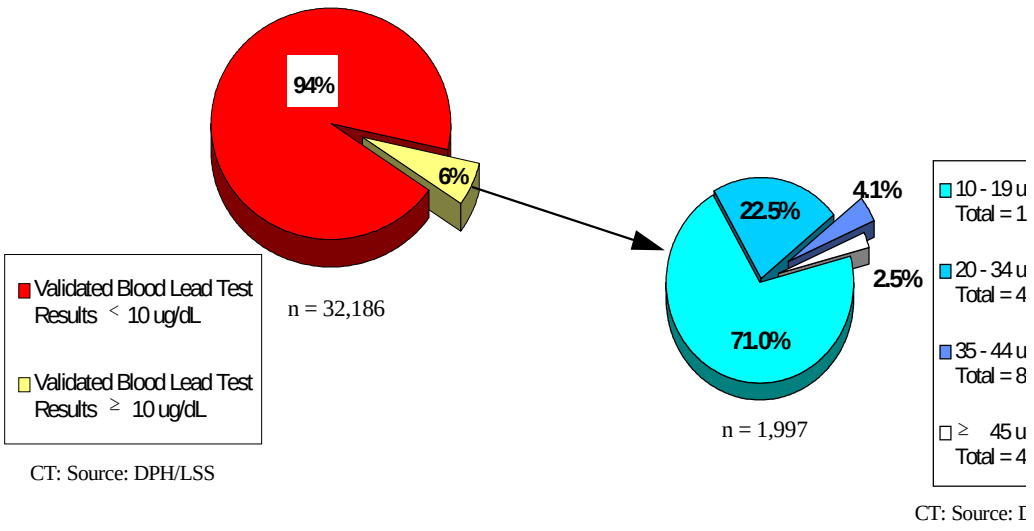


n = 92,453

CT: Source: DPH/LSS

Blood lead level data collected at the national level has shown that the average blood lead level in the United States has dramatically declined since the 1970s. However, some populations of children continue to be disproportionately exposed to lead. The segment of the population identified by the NHANES III survey to be at highest risk of elevated blood lead levels includes children that are poor, non-Hispanic black, living in urban areas, or living in older housing. In 1995 in Connecticut, there were 1,997 children (6.2% of all those screened) aged 1-2 years reported to the Department of Public Health with a confirmed elevated blood lead level of 10 mg/dL or greater **(Figure 2)**. This appears to be higher than the national estimate of 5.9% for children 1-2 years old. However, due to incomplete reporting this cannot be adequately assessed. The following figure provides a break-down of the reported blood lead test results for one and two year olds in calendar year 1995.

Figure 2: CT: Validated Blood Lead Test Results For Children Aged 1-2 Years, CY 1995



CASE STUDY: "JOHNNY"

Johnny is a two-year old male living in an urban area in Connecticut. In Fiscal Year 1996, he was admitted five times to a Connecticut hospital for the toxic effect of inorganic lead caused by accidental lead paint poisoning.

Johnny was admitted to the hospital four times through physician referral and once through the emergency room. His average length of stay in the hospital was 5.2 days and his total length of stay for five admissions was 31 days, at an average charge of $1,524 per day. Because Johnny was on public assistance, the average direct charge of this one case of lead poisoning to the state was $47,244. This does not include the current and future indirect costs due to permanent damage Johnny may develop as a result of his poisoning. Johnny is just one of 71 pediatric patients discharged from a Connecticut hospital last year for lead poisoning.

The effects of lead poisoning on Johnny's neurological status cannot be described due to his anonymity, and the lack of detailed information on Johnny's actual blood lead level. However, admission to a hospital for lead poisoning can begin at a blood lead level of 45 micrograms per deciliter, depending on the child's symptoms and blood lead levels of 70 micrograms per deciliter and greater are considered a medical emergency, requiring immediate hospitalization. Source: Connecticut Office of Health Care Access inpatient database

The Connecticut specific data in this section are from the Office of Health Care Access Inpatient Discharge database, unless otherwise cited. The database contains discharge abstract and Uniform Billing (UB-92) data for all of Connecticut's acute care hospitals. Data is based on hospital fiscal year, which runs from October 1 through September 30 of the following calendar year. Analyses do not include Connecticut residents who may have received treatment in out-of-state hospitals.

It should also be noted that outpatient encounter-level data, which would allow a more comprehensive analysis of the occurrence of lead poisoning in Connecticut, are currently not collected by the Office of Health Care Access.

LEAD-RELATED HOSPITALIZATIONS

OHCA data represents the most extreme cases of lead poisoning, those that require hospitalization. Connecticut data reflects the national trends of those populations at highest risk for elevated blood lead levels. The majority of discharges are those children between the ages of one and two, non-Hispanic black children **(Table 2)**, and children who are poor (as evidenced by the Medicaid insurance status) **(Figure 3)**.

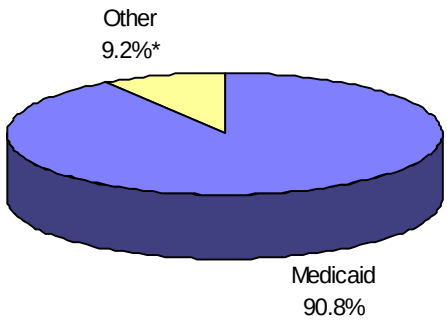
Table 2: Pediatric Lead Poisoning Discharges By Race and Ethnicity, FY 1996

Race/Ethnicity	Number
White Non-Hispanic	14
Black Non-Hispanic	43
Hispanic	28
Other Non-White	<6
Totals	87*

Source: Connecticut Office of Health Care Access inpatient database

***Total includes those pediatric patients who were discharged from a hospital more than once for lead poisoning.**

Figure 3: Pediatric Lead Poisoning Discharges by Payer, FY 1996



Source: Connecticut Office of Health Care Access Inpatient Database

The data that are available indicate that 70%* of these hospitalizations resulted from exposure to lead paint in the environment. The following table outlines the number of pediatric lead poisoning hospital discharges by the town in which the child resided in 1996.

Table 3: Pediatric Lead Poisoning Discharges by Town of Residence, FY 1996

Town of Residence	Number of Discharges
New Haven	33
Hartford	14
Waterbury	10
Bridgeport	8
Norwich	<6
Danbury	<6
Griswold/Lisbon	<6
Meriden	<6
Clinton	<6
East Hartford	<6
Hamden	<6
Naugatuck	<6
New Britain	<6
Norwalk	<6
Stamford	<6
West Haven	<6
Total	87

Source: Connecticut Office of Health Care Access inpatient database

*****Discharges under Principal Diagnosis Codes 984.0 (Toxic Effect of Inorganic Lead Compounds) and Initial Secondary Diagnosis Code E8615 (Accidental Lead Poisoning by Lead Paints)

A significant goal of early identification of children with elevated blood lead levels is to reduce the number of children who require costly inpatient hospitalization. According to OHCA, if extreme cases of lead poisoning were prevented, the potential charges saved in 1996 would have exceeded a half million dollars. The average length of stay per lead poisoning discharge was 5.63 days and the average charge per stay was $6,055 **(Table 4)**. Many of these children are Medicaid recipients as shown in Figure 3, therefore, if early intervention had prevented these hospitalizations, direct costs to the state may have been avoided or greatly reduced.

Table 4: Average Length of Stay and Charges for Pediatric Lead Poisoning Discharges

Year	Total Discharges	Average length of stay	Total charges	Average charge
1991	82	5.12	$336,451	$4,103
1992	113	5.19	$522,910	$4,623
1993	159	5.50	$792,730	$4,986
1994	126	6.75	$787,060	$6,247
1995	118	5.63	$641,030	$5,432
1996	87	5.63	$528,133	$6,050

Source: Connecticut Office of Health Care Access hospital inpatient database

A significant goal of early identification of children with elevated blood lead levels is to reduce the number of children who require costly inpatient hospitalization.

PROPOSED LEGISLATION

The Connecticut Department of Public Health (DPH) is proposing *An Act Concerning Efforts to Increase the Reporting of Information Regarding Childhood Lead Poisoning* to expand required reporting to include blood lead levels below 10 micrograms per deciliter (mg/dL) of blood. The passage of this legislation will expand and enhance the Department of Public Health's lead surveillance system. Collection of all blood tests regardless of blood lead levels will help programs follow sequential test results on children who have elevated blood lead levels. It will also provide denominator data that will allow calculation of screening penetration rates and prevalence of elevated lead levels of children tested. This will help the local health departments and DPH to (1) determine the actual screening rate, (2) identify geographic areas where screening is not being done, (3) identify geographic areas where children are most at risk for lead exposure and thereby help target limited resources and (4) obtain unbiased estimates of the prevalence of elevated blood lead levels by geographic area.

In November 1997, the Centers for Disease Control and Prevention released their document "Screening Children for Lead Poisoning: Guidance for State and Local Public Health Officials," which recommends that blood lead data be available on all children in order to assess the screening needs of the State. Current statutory authority allows the Department of Public Health and local health departments to obtain information only on children identified with blood lead levels of 10 µg/dL or greater. Although some efforts have been successful in obtaining blood lead test results below 10 µg/dL, the current statute limits the complete accounting of children screened statewide. Subsequent to this expanded data collection, the state and local health departments would then be able to design and implement relevant and appropriate prevention activities with health care providers.

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2. Centers for Disease Control & Prevention
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