

CHILDHOOD LEAD POISONING IN RHODE ISLAND

THE NUMBERS

2 0 0 8



Contents

2	Eliminating Childhood Lead Poisoning by 2010
3	Understanding Blood Lead Levels
4	Lead Action Levels in Rhode Island
5	Understanding the Lead Data
6	Compliance with Screening Guidelines
7	Incidence of Lead Poisoning in Rhode Island
8	Incidence of Lead Poisoning by Geographic Location
9	2007 Incidence of Lead Poisoning by City and Town
10	2007 Incidence of Lead Poisoning in Rhode Island
11	Incidence of Lead Poisoning by Birth Cohort
12	Prevalence of Lead Poisoning in Rhode Island
13	Services Offered to Lead Poisoned Children
17	Glossary

Eliminating Childhood Lead Poisoning by 2010

- Goal To eliminate childhood lead poisoning in Rhode Island by the end of 2010.
- Milestone To decrease the number of new cases of lead poisoning (blood lead level $\geq 10 \mu\text{g}/\text{dL}$) in children under six years of age in all Rhode Island communities without displacing children, decreasing screening rates, or decreasing access to affordable housing.

In 2004, Rhode Island developed a Plan to Eliminate Childhood Lead Poisoning by 2010. This plan focuses on promoting primary prevention while maintaining secondary prevention efforts in the state. Primary prevention reduces or eliminates lead hazards in the environment before a child is exposed. Secondary prevention includes universal screening of children to identify those with elevated blood lead levels (BLL), and in turn, removing or reducing any further exposure to the child. Additional details about RI CLPPP's elimination plan and how we are measuring our progress toward elimination can be found on the web at www.health.ri.gov/lead.



Understanding Blood Lead Levels

What is a Level of Concern?

A level of concern is the threshold used to define an elevated blood lead level. Children with a blood lead level greater than the level of concern (i.e. children with an elevated blood lead level) should be monitored and re-tested. Primary prevention activities, such as community-wide environmental interventions and nutritional and educational campaigns, should be directed at reducing children's blood lead levels below the level of concern. Currently, CDC has defined the level of concern as $\geq 10 \mu\text{g/dL}$.

Should We Lower the Blood Lead Level of Concern?

In response to questions about whether to change the level of concern, based on recent research that found that blood lead levels lower than $10 \mu\text{g/dL}$ can have harmful effects,^{1,2} CDC has prepared the following statement, which can be found on their website at www.cdc.gov/nceh/lead/faq/changeBLL.htm.

“Recent studies suggest that adverse health effects exist in children at blood lead levels less than $10 \mu\text{g/dL}$. In the past, CDC has lowered the level considered elevated in response to similar reports. However, at this time the reasons not to lower the level of concern are as follows:

- No effective clinical interventions are known to lower the blood lead levels for children with levels less than $10 \mu\text{g/dL}$ or to reduce the risk for adverse developmental effects.
- Children cannot be accurately classified as having blood lead levels above or below a value less than $10 \mu\text{g/dL}$ because of the inaccuracy inherent in laboratory testing.
- Finally, no evidence exists of a threshold below which adverse effects are not experienced. Thus, any decision to establish a new level of concern would be arbitrary and provide uncertain benefits.

These studies support making primary prevention of childhood lead poisoning a high priority for health, housing, and environmental agencies at the state, local, and federal levels.”

What is an Action Level?

An action level is the threshold at which interventions should be implemented based on evidence that the interventions are effective and resources are available. It is impossible to define one action level for all interventions, so various action levels trigger different interventions. According to CDC guidelines, community prevention activities, such as nutritional and educational campaigns, should be implemented at blood lead levels $\geq 10 \mu\text{g/dL}$, and individual prevention activities, such as case management and environmental investigations, should be implemented at blood lead levels $\geq 15 \mu\text{g/dL}$.³ For example, while the overall goal is to reduce children's blood lead levels below $10 \mu\text{g/dL}$, there are reasons for not implementing individual, environmental, and medical interventions for children with blood lead levels between 10 and $14 \mu\text{g/dL}$. Effective environmental and medical interventions for children with blood lead levels in this range have not yet been identified. Given limited resources, the sheer number of children in this range would preclude effective case management and would detract from the individualized follow up required by children with higher blood lead levels.

1 Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below $10 \mu\text{g}$ per Deciliter. *New England Journal of Medicine* 2003; 348:1517-26.

2 Selevan SG, Rice DC, Hogan KA, Euling SY, Pfahles-Hutchens A, Bethel J. Blood Lead Concentration and Delayed Puberty in Girls. *New England Journal of Medicine* 2003; 348:1527-36.

3 CDC Preventing Lead Poisoning in Young Children. Atlanta: U.S. Department of Health and Human Services, 1991.

Lead Action Levels in Rhode Island

The guidelines issued by CDC were used to define various action levels in Rhode Island. The different action levels are detailed in the table below.

Category	Action Level	Action
Elevated Blood Lead Level	One BLL between 10-14 µg/dL	<p>Capillary Letter sent to Primary Care Provider recommending venous test to confirm the BLL *</p> <p>Venous Letter sent to family inviting them to call the HEALTH Information Line 800.942.7434 or visit the website for additional information www.health.ri.gov/lead</p>
	One BLL between 15-19 µg/dL	<p>Capillary Letter sent to Primary Care Provider recommending venous test to confirm the BLL</p> <p>Venous Family is referred to a lead center** for an in-home lead education visit and some environmental intervention (i.e. temporary lead hazard control measures, window replacement)</p>
Significant Lead Poisoning	One Venous BLL ≥ 20 µg/dL or Two Venous BLLs 15-19 µg/dL done 90-365 days apart***	Family is referred to a lead center for an in-home lead education visit and is offered an environmental inspection.

* In addition to the actions described, a letter is sent to families living in Providence ONLY, informing them that they can contact the city of Providence for a free environmental inspection of their home.

** A lead center is a non-profit agency funded by Medicaid that offers comprehensive case management services to families of children with lead poisoning.

*** Two venous blood lead levels 15-19 µg/dL done between 90 and 365 days apart may also be referred to as "Persistent Lead Poisoning." Prior to January 1, 2006, two blood lead levels, capillary or venous, ≥ 15 µg/dL were used to define persistent lead poisoning.

Understanding the Lead Data

In Rhode Island, healthcare providers are required by law to annually screen their patients between nine months and six years of age for lead poisoning. The screening process involves collecting a sample of blood from the child, either from a capillary (finger stick) or a vein (venous test), and analyzing the blood to determine the amount of lead in the sample. Blood lead levels are measured and reported as micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$ or mcg/dL).

The data presented in this report are based on all blood lead results, both capillary and venous, performed on children from birth to six years of age in the state of Rhode Island.⁴ Although the guidelines recommend that children begin screening at nine months of age, some children may be screened earlier if they are at high risk for lead poisoning. For the incidence and prevalence analyses, each child is represented once per year in which he was screened.

Race and Ethnicity Data

The collection of race and ethnicity data is an important part of public health. These data allow us to monitor disease trends, track health status, and assess progress in improving health among various populations. These data also help us assure non-discriminatory healthcare access and treatment, identify issues surrounding access to care and discrimination, and track the extent to which members of minority groups are beneficiaries of and participants in federally assisted programs.

Despite the mandate to collect this information, race and ethnicity data are often incomplete. Approximately 40-50% of blood lead records collected from laboratories and hospitals report race and ethnicity; therefore lead poisoning information presented in this report is not broken down by race and ethnicity.

In 2004, RI CLPPP conducted a survey to better understand the barriers to collecting race and ethnicity information. The survey findings, which can be found in more detail on the web at www.health.ri.gov/lead indicate that while clients did not object to reporting their race and ethnicity, most laboratory professionals were uncomfortable asking people about their race and ethnicity, and some were not aware that they were required to collect race and ethnicity information. Laboratory professionals were not interested in receiving training, however. In an effort to educate the public about the importance of reporting race and ethnicity information, RI CLPPP plans to send informational posters to all licensed laboratories in the state annually.

Confirmed Tests in 2005-2007

Prior to July 1, 2004, if a child under the age of six had a capillary blood lead level $\geq 20 \mu\text{g}/\text{dL}$, the Rhode Island Department of Health would recommend that the child have a confirmatory venous test within three months. On July 1, 2004, the Rhode Island Department of Health revised the Lead Screening and Referral Guidelines and began recommending a confirmatory venous test for any child under the age of six who had a capillary blood lead level $\geq 10 \mu\text{g}/\text{dL}$ (instead of $\geq 20 \mu\text{g}/\text{dL}$). The Rhode Island Department of Health is also recommending that only venous tests be used for confirmatory purposes. Since these changes went into effect in July 2004, the first full year for which RI CLPPP has confirmed capillary test data is 2005. As a result, 2005-2007 data in this document are based on venous and confirmed capillary tests only. The data presented for previous years are based on all venous and capillary tests.

⁴ The numbers presented here are estimates, given that calculations are based on screening data rather than population data for all children under the age of six.

Compliance with Screening Guidelines

All healthcare providers in Rhode Island are required by law to annually screen their patients between nine months and six years of age for lead poisoning. Compliance with these guidelines is assessed by measuring the proportion of children born in a given year with at least one blood lead test by 18 months of age, and at least two blood lead tests, no less than 12 months apart, by 36 months of age.

Approximately 70% of children born in 2001 through 2004 were screened for lead poisoning at least once by 18 months of age; however, only about 40% of these children were screened at least twice, no less than 12 months apart, by 36 months of age. Although the data have remained consistent over the last four years, efforts are needed to improve screening among children 36 months of age.

The high screening rates among children 18 months of age in Rhode Island may be attributed to pediatricians' access to KIDSNET, Rhode Island's integrated child health information system. KIDSNET allows healthcare providers to monitor lead screening among their patients and generate reports of unscreened patients in their practice at any time. In 2007, 52.4% of KIDSNET practices used this report.

Figure 1: Percent of Children Being Screened for Lead in Compliance with Guidelines, 2001-2004

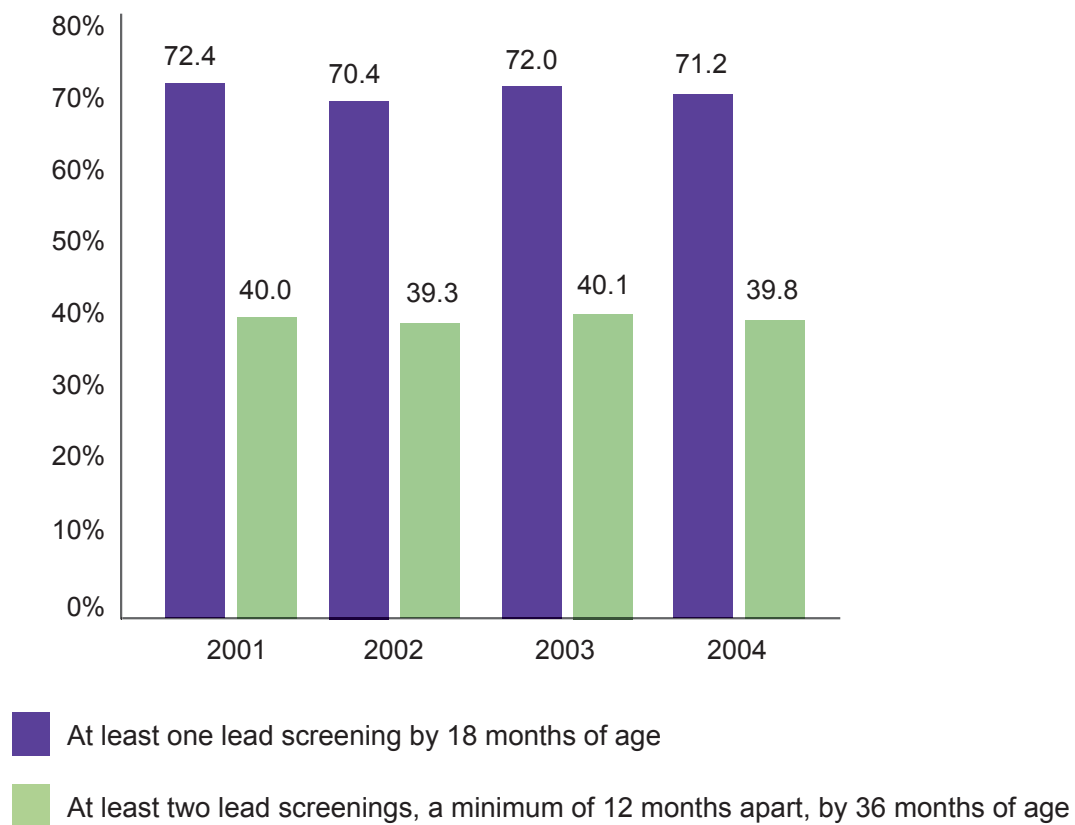


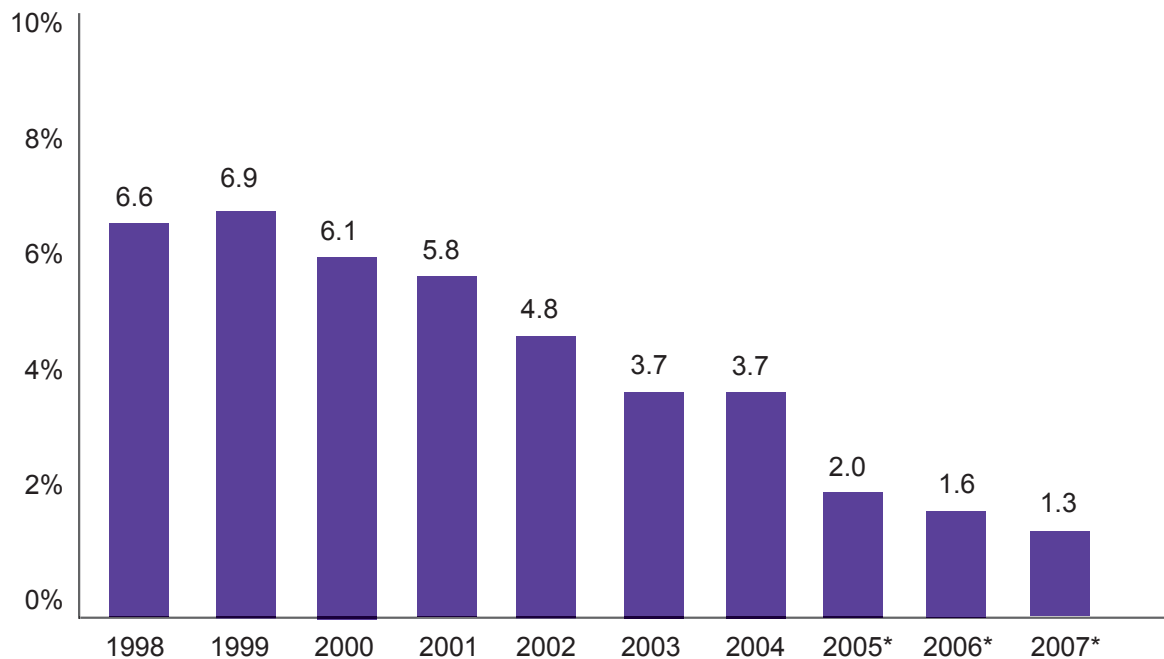
Chart Note Birth cohorts beyond 2004 are not included here because those children had not yet turned 36 months of age by the time this report was prepared.

Incidence of Lead Poisoning in Rhode Island

The Rhode Island Childhood Lead Poisoning Prevention Program tracks and reports the number of new cases of lead poisoning (BLL \geq 10 $\mu\text{g}/\text{dL}$) among children less than six years of age who have never been previously poisoned. This statistic is known as the incidence of lead poisoning.

The proportion of new cases among children screened for lead poisoning has declined dramatically from 6.6% in 1998 to 1.3% in 2007. Although an incidence of 1.3% appears to be low, 388 children were poisoned for the first time in 2007. Rhode Island must continue to focus on primary prevention and lead-safe housing to protect children from becoming lead poisoning in the future.

Figure 2: Incidence of Lead Poisoning Statewide, 1998-2007



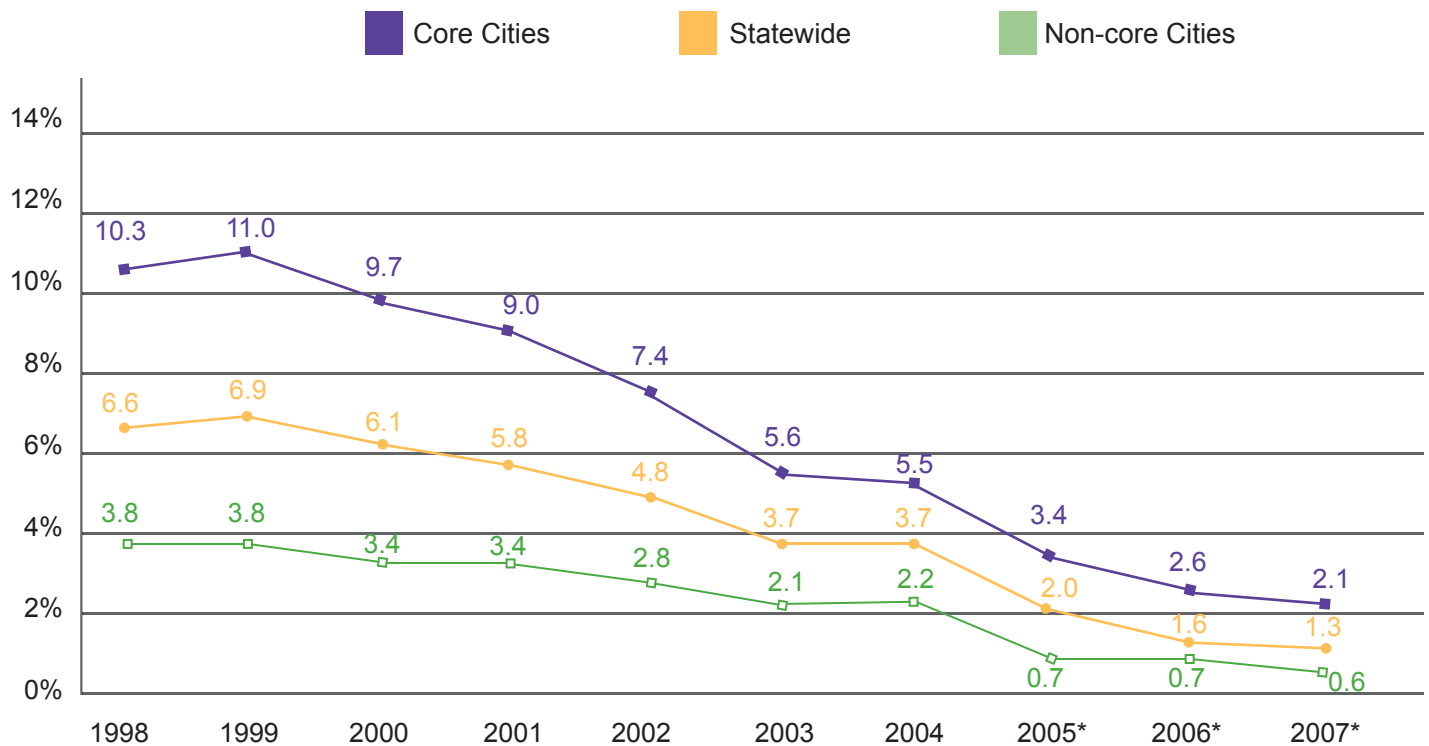
*Data are based on venous tests and confirmed capillary tests only.

Incidence of Lead Poisoning by Geographic Location

According to the 2000 census, cities where the child poverty level is greater than 15% are designated as core cities. Rhode Island currently has six core cities: Central Falls, Newport, Pawtucket, Providence, Woonsocket, and West Warwick.

Although all Rhode Island cities and towns have experienced a dramatic decline in incidence over the last ten years, cases of lead poisoning continue to be concentrated in the core cities. In 2007, the incidence of lead poisoning in the core cities was 2.1%, compared to less than 1% in the remaining cities and towns. Rhode Island must continue to focus its efforts on increasing the availability of lead-safe housing, particularly in the core cities, in order to reach elimination.

Figure 3: Incidence of Lead Poisoning by Geographic Location 1998 - 2007



*Data are based on venous tests and confirmed capillary tests only.

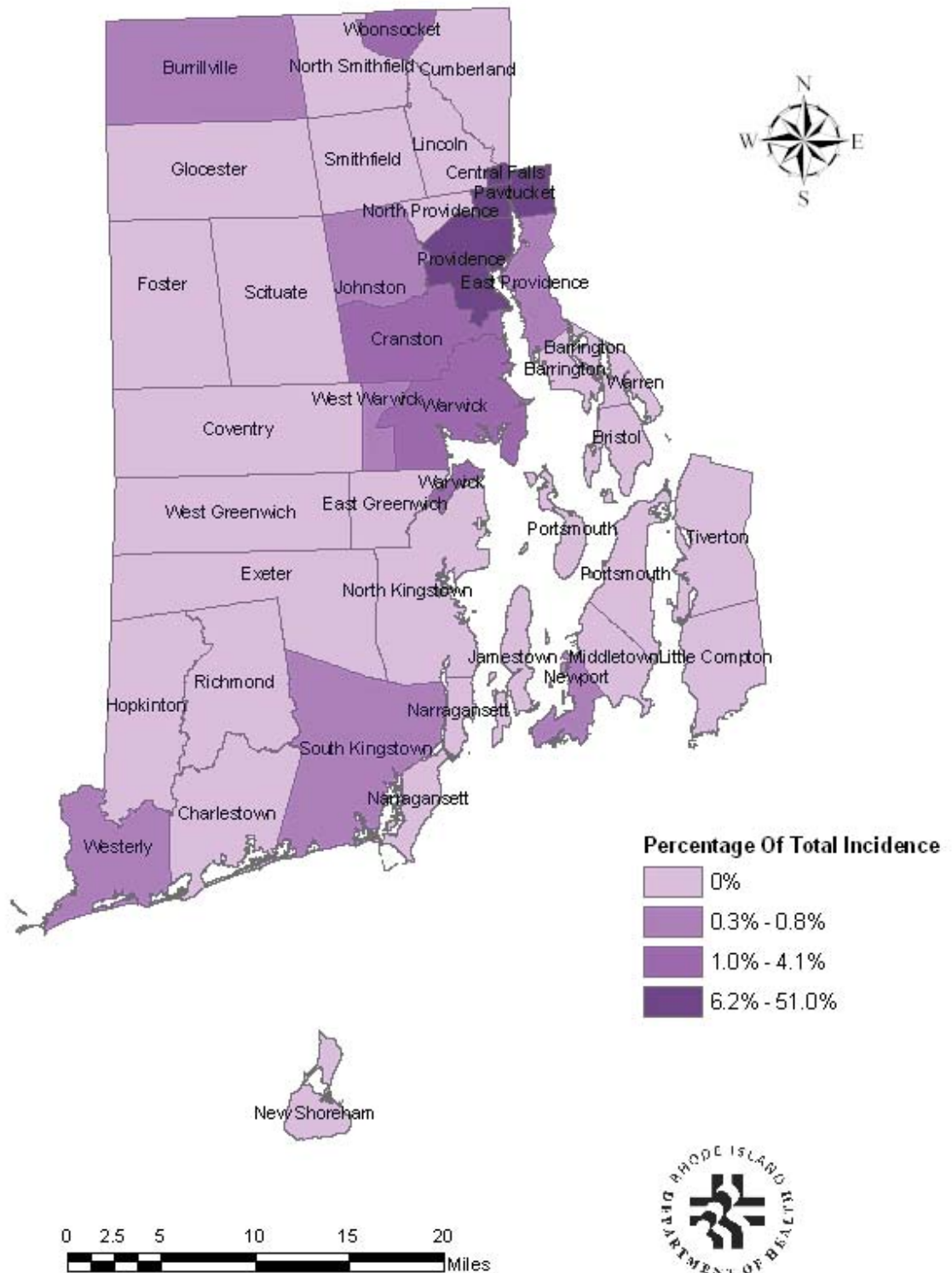
2007 Incidence of Lead Poisoning by City and Town

City/Town	# Children with BLL \geq 10 $\mu\text{g}/\text{dL}$ for the First Time	Total # Children Screened with No Previous Confirmed Elevated BLL	Incidence
Barrington	0	712	0.0%
Bristol	0	633	0.0%
Burrville	4	383	1.0%
Central Falls	24	1,039	2.3%
Charlestown	1	166	0.6%
Coventry	3	749	0.4%
Cranston	16	1,886	0.8%
Cumberland	2	855	0.2%
East Greenwich	0	305	0.0%
East Providence	10	1,558	0.6%
Exeter	1	115	0.9%
Foster	0	109	0.0%
Glocester	3	168	1.8%
Hopkinton	0	190	0.0%
Jamestown	1	88	1.1%
Johnston	5	599	0.8%
Lincoln	2	461	0.4%
Little Compton	0	112	0.0%
Middletown	1	565	0.2%
Narragansett	1	207	0.5%
New Shoreham	0	15	0.0%
Newport	6	816	0.7%
North Kingstown	2	691	0.3%
North Providence	3	644	0.5%
North Smithfield	3	202	1.5%
Pawtucket	48	2,780	1.7%
Portsmouth	1	505	0.2%
Providence	198	7,357	2.7%
Richmond	0	154	0.0%
Scituate	1	235	0.4%
Smithfield	3	362	0.8%
South Kingstown	4	649	0.6%
Tiverton	1	459	0.2%
Warren	3	338	0.9%
Warwick	15	1,812	0.8%
West Greenwich	0	113	0.0%
West Warwick	6	812	0.7%
Westerly	5	549	0.9%
Woonsocket	15	1,588	0.9%
Unknown RI City/Town	0	8	0.0%
STATEWIDE	388	30,981	1.3%

City specific incidence for previous years can be found on the web at www.health.ri.gov/lead.

2007 Incidence of Lead Poisoning in Rhode Island

The following map depicts the distribution of children found to have a blood lead level $\geq 10 \mu\text{g}/\text{dL}$ for the first time in 2007. Providence is home to the majority of lead poisoned children, as indicated by the dark color, followed by Central Falls and Pawtucket.



Incidence of Lead Poisoning by Birth Cohort

The incidence of lead poisoning by birth cohort is defined as the proportion of children born in a given year who became lead poisoned (BLL \geq 10 $\mu\text{g}/\text{dL}$) before the age of six.

The risk of a child becoming lead poisoned in Rhode Island has decreased over time. Approximately one in four children (29.6%) born in 1992 were lead poisoned before the age of six, compared to one in seventeen children (5.9%) born in 2001. In order to further decrease the rate of lead poisoning, Rhode Island must continue to make lead-safe housing a priority.

Figure 4: Incidence of Lead Poisoning by Birth Cohort, 1992-2001

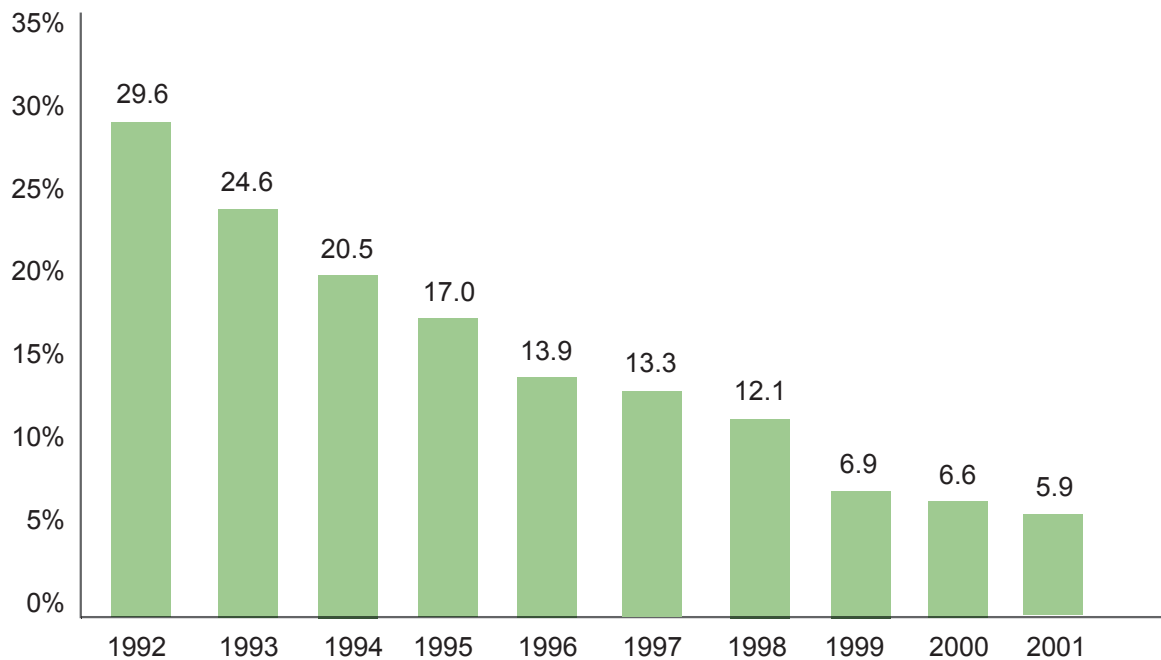


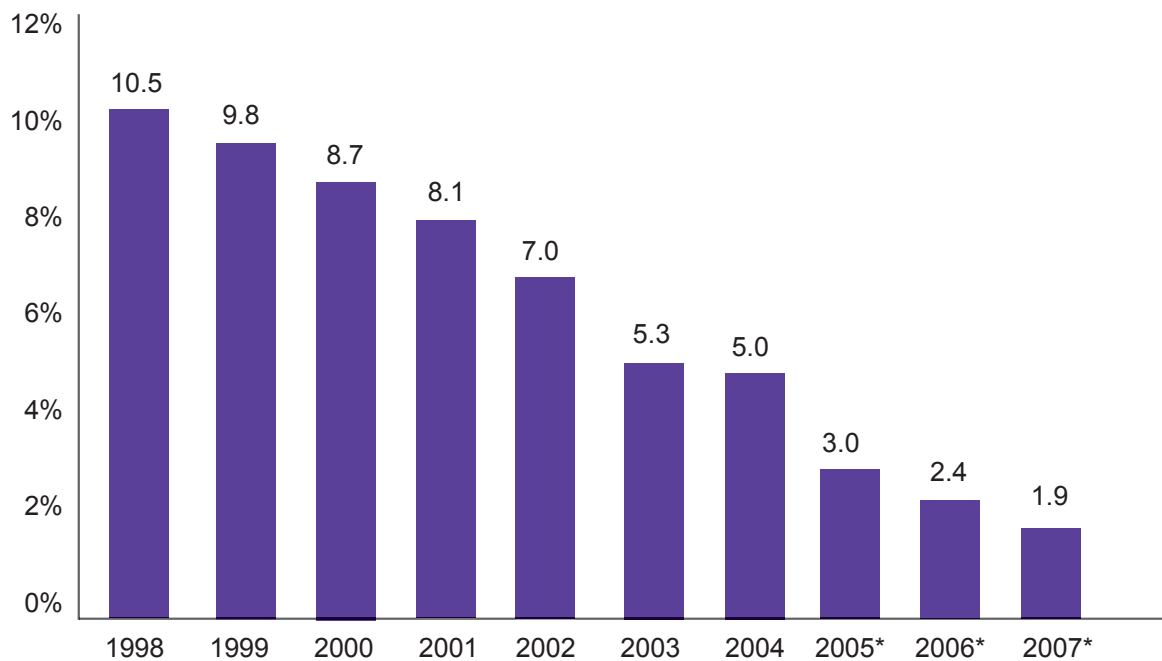
Chart Notes:

- 1) Birth cohorts beyond 2001 are not included here because those children had not yet turned six years of age by the time this report was prepared.
- 2) Data for birth cohorts 1992-1998 are based on all venous and capillary blood lead tests that a child had.
- 3) Data for the 1999-2001 birth cohorts are based on venous tests and confirmed capillary tests only.
- 4) The percent of lead poisoned children in the 1999 and 2001 birth cohorts may be underestimated because the policies recommending a confirmatory venous follow up for a capillary screening test \geq 10 $\mu\text{g}/\text{dL}$ were not in place until July 1, 2004.

Prevalence of Lead Poisoning in Rhode Island

Reporting prevalence of lead poisoning allows one to look at the number of children under the age of six who are lead poisoned at a given point in time. The data show a steady decline in the prevalence of lead poisoning over the last ten years, from 10.5% in 1998 to 1.9% in 2007. Although the prevalence of lead poisoning in Rhode Island has been steadily declining, a total of 614 children were lead poisoned in 2007. In order to decrease the number of prevalent cases in the future, we must continue to work on promoting policies to increase lead-safe affordable housing.

Figure 5: Prevalence of Lead Poisoning in Rhode Island, 1998-2007



*Data are based on venous tests and confirmed capillary tests only.

Services Offered to Lead Poisoned Children

Children with Elevated Blood Lead Levels

An elevated blood lead level is defined as a first-time blood lead level (venous or capillary) between 10 and 19 $\mu\text{g}/\text{dL}$. Children with elevated blood lead levels in the 10-14 $\mu\text{g}/\text{dL}$ range receive one set of services, and children in the 15-19 $\mu\text{g}/\text{dL}$ range receive a different set of services.

Blood Lead Levels 10-14 $\mu\text{g}/\text{dL}$

In 2007, 519 children had first-time elevated blood lead levels between 10-14 $\mu\text{g}/\text{dL}$. Throughout the year, families of these children were sent educational materials. Until September of 2007, families also received a letter encouraging them to contact the Family Outreach Program for a free home-based lead education visit where they review general information about lead, lead poisoning, and cleaning techniques to minimize lead hazards in the home.

At the request of the city of Providence Lead Hazard Reduction Program, RI CLPPP sends letters to Providence families with children who had elevated blood lead levels in the 10-14 $\mu\text{g}/\text{dL}$ range. The letter encourages families to contact the City of Providence to request a free comprehensive environmental inspection of their apartment or home. The free lead inspection provides families with the opportunity to identify lead hazards in their apartment or home, and to learn how to minimize lead exposure among their children. In 2007, 265 Providence families received a letter from RI CLPPP, yet only 14 families requested an inspection.



Blood Lead Levels 15-19 $\mu\text{g}/\text{dL}$

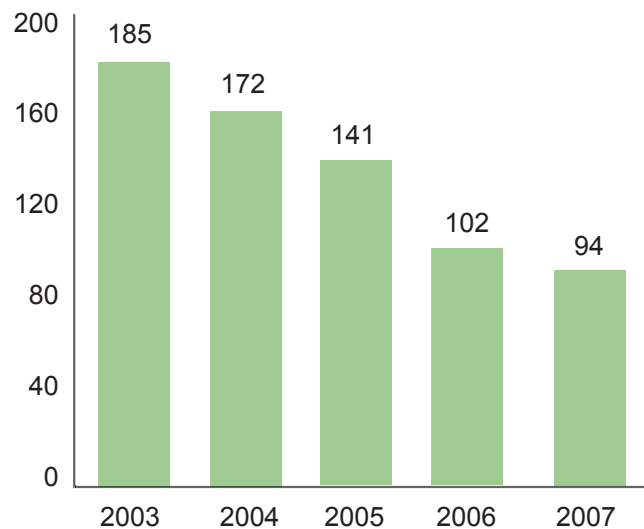
In 2007, 76 children had first-time elevated blood lead levels in the 15-19 $\mu\text{g}/\text{dL}$ range. The families of these children were referred to one of four lead centers. These non-profit agencies funded by Medicaid offer comprehensive case management services to families of children with lead poisoning. The lead centers then offer each family in-home lead education, nutrition advice, and coordination of medical care with the family's primary care provider. Of the 76 cases referred, 64 (84%) accepted services, while 12 (16%) did not. The 12 cases that did not receive services either refused or could not be located by the lead center.

Children with Significant Lead Poisoning

Significant lead poisoning is defined as a venous blood lead level $\geq 20 \mu\text{g/dL}$ or two venous blood lead tests 15-19 $\mu\text{g/dL}$, done between 90 and 365 days apart. The number of children with significant lead poisoning has decreased steadily over the last five years. In 2003, there were 185 significantly lead poisoned children referred to case management, compared to 94 children in 2007. This 49% decrease in the number of significantly lead poisoned children in the last five years reflects the impact of primary prevention activities and various efforts implemented in an effort to eliminate lead poisoning in Rhode Island by 2010.

In addition to medical follow up provided by the pediatrician or Lead Clinic, significantly lead poisoned children are referred to a lead center for comprehensive case management services and are offered an environmental inspection of their home.

Figure 6: Significant Lead Poisoning Cases, 2003-2007



Although the number of significantly lead poisoned children is decreasing over time, several children every year have a blood lead level $\geq 45 \mu\text{g/dL}$. In these severe cases, the Lead Screening Guidelines recommend that a capillary test $\geq 45 \mu\text{g/dL}$ would be followed up with a venous test within 48 hours. A venous test $\geq 45 \mu\text{g/dL}$ should be followed up with another venous test immediately.

If the follow up test result is $\geq 45 \mu\text{g/dL}$, hospitalization is considered and an assessment of the child's home environment is conducted. In cases where lead hazards are identified in the home and no alternative housing (i.e. relative's house) is available, the pediatrician usually recommends that the child be hospitalized to prevent continued exposure. The child typically remains hospitalized until a suitable home environment is found. Only a small number of children need hospitalization for severe lead poisoning each year.

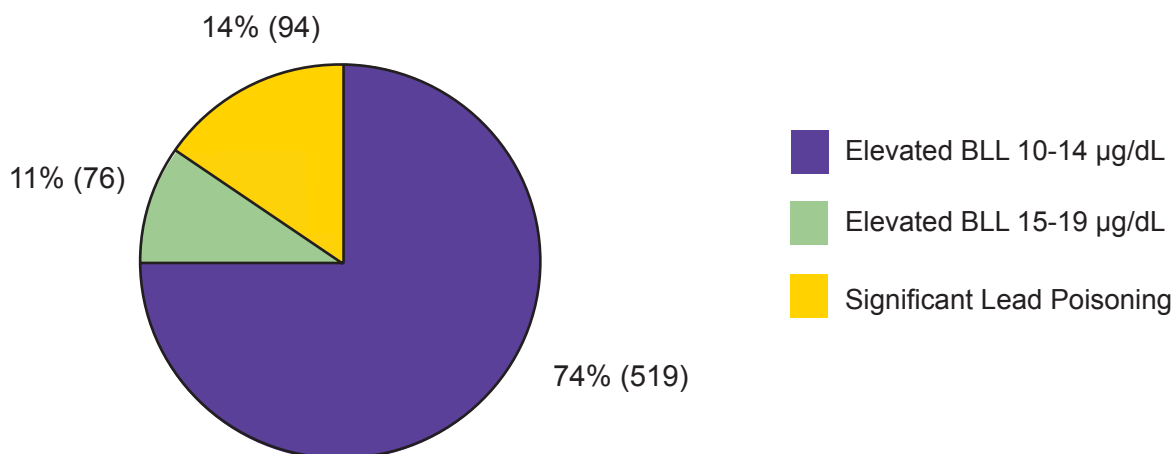
Number of Children with Severe Lead Poisoning 2003-2007	
Year	Venous Results $\geq 45 \mu\text{g/dL}$
2003	6
2004	11
2005	6
2006	4
2007	7

Non-medical Case Management

Of the 94 significantly lead poisoned children referred to lead centers in 2007, 83 (88%) accepted services. The remaining 11 (12%) did not receive services from lead centers because either the family refused services or could not be located after several attempts to contact them. In 2007, 65 cases were closed by lead centers after receiving full services or the after blood lead levels dropped below 15 µg/dL. These cases were open an average of ten months.

Non-medical case management will continue to help children who are already lead poisoned. However, primary prevention measures are needed to protect children from being exposed to lead and to assist Rhode Island in eliminating lead poisoning by 2010.

Figure 7: Children with Elevated Blood Lead Levels, 2007



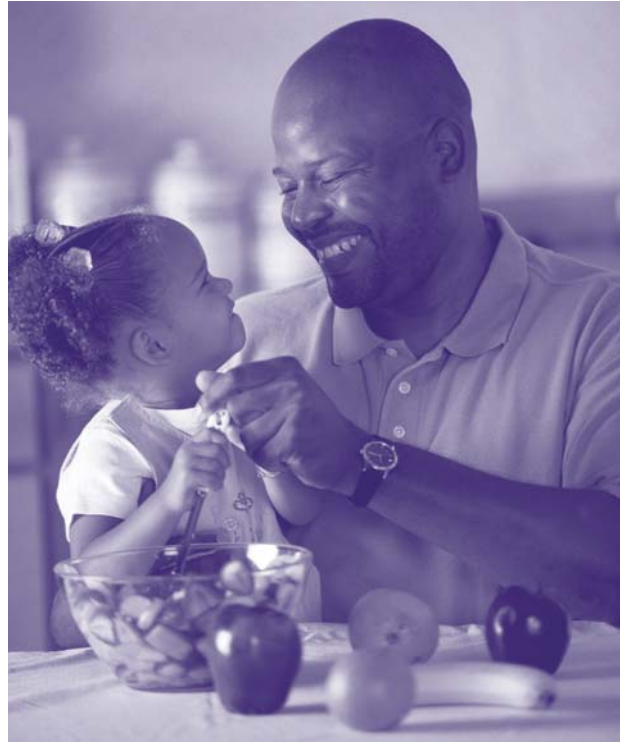
Environmental Inspections

Families of significantly lead poisoned children are offered a comprehensive environmental lead inspection at no cost. The landlord's permission is neither required nor sought for the inspection to occur.

In 2007, 104 environmental inspections were offered to families with significantly lead poisoned children. This includes children who were identified as significantly lead poisoned in 2007, as well as those identified in late 2006. Inspections were performed at 77 of these homes. As of February 8, 2008, one inspection was pending.

Rhode Island's crisis in obtaining affordable housing may contribute to a family's decision to refuse an inspection for fear of eviction. The percentage of families refusing an environmental inspection decreased from 24% (32) in 2006 to 12% (12) in 2007.

In 12 cases in 2007, the family moved before the inspection was offered and/or performed. In these cases, the families were offered an inspection at their new address and a letter was sent to the previous address informing the new occupants that if they have children less than six years of age residing at the address, they can receive a free inspection. No tenants at these previous addresses have requested an inspection.



Environmental Inspections Offered, 2003-2007					
	2003	2004	2005	2006	2007
Inspections Offered	183	168	158	135	104
Child Moved	21	11	19	7	12
No Response To Letters And Calls	16	13	12	7	2
Inspection Refused	27	16	20	32	12
Pending Inspection	0	0	6	4	1
Total Inspections Performed	119	128	101	85	77

Glossary

Abatement

An activity that reduces the risk of human exposure to lead.

BLL

Blood lead level.

Elevated Blood Lead

One blood lead test result between 10-19 $\mu\text{g}/\text{dL}$.

Incidence

The proportion of new cases of a disease that develops during a specified period of time among the population at risk for developing the disease. For example, the incidence of lead poisoning in Rhode Island in 2007 is the proportion of children with a first-time blood lead level $\geq 10 \mu\text{g}/\text{dL}$ among those at risk for developing lead poisoning (i.e. children under age six who have never been lead poisoned in the past).

Lead Center

A non-profit agency funded by Medicaid that offers comprehensive case management services to families of children with lead poisoning.

Prevalence

The proportion of people in a population who have a given disease at a specific point in time. For example, prevalence of lead poisoning in 2007 is the proportion of children who had a BLL $\geq 10 \mu\text{g}/\text{dL}$ in 2007.

RI CLPPP

The Rhode Island Childhood Lead Poisoning Prevention Program.

Screening

Mandatory test that involves collecting a blood sample from a child under the age of six who does not show any signs or symptoms of lead poisoning, either through a finger stick or a venipuncture, and then analyzing the sample to determine the amount of lead in the child's blood.

Significant Lead Poisoning

A venous blood lead level $\geq 20 \mu\text{g}/\text{dL}$ in a child under six years of age, or two venous BLLs 15-19 $\mu\text{g}/\text{dL}$ from a child under six years of age, done between 90 and 365 days apart.

 $\mu\text{g}/\text{dL}$

Micrograms per deciliter of blood. The measurement used to estimate the amount of lead in a sample of blood. This measure is sometimes represented as mcg/dL.



Daniela Quilliam, MPH
Epidemiologist
Childhood Lead Poisoning Prevention Program
Three Capitol Hill
Providence, RI 02908

daniela.quilliam@health.ri.gov
401.222.7730

Previous editions of "Childhood Lead Poisoning in Rhode Island: The Numbers", as well as additional lead poisoning data, can be found at www.health.ri.gov/lead