MARYLAND DEPARTMENT OF THE ENVIRONMENT

Lead Poisoning Prevention Division

Childhood Blood Lead Surveillance in Maryland

1998 Annual Report

January, 2000

MARYLAND CHILDHOOD LEAD REGISTRY

1998 ANNUAL REPORT

EXECUTIVE SUMMARY

The Maryland Department of the Environment's statewide Childhood Lead Registry (CLR) performs childhood blood lead surveillance for Maryland. The CLR receives the reports of all blood lead tests done on Maryland children 0 - 18 years of age, and provides blood lead test results to local health departments as needed for case management and planning.

Since 1995, the registry has released a comprehensive annual report on statewide childhood blood lead testing. This current report presents the childhood blood lead test results for 1998. All numbers are based on blood lead testing on children 0 - 6 years. The CLR does not receive any reports on lead screening based on the risk questionnaire.

Summary for 1998:

- Basic trends from 1995-1997 continue. General population blood lead levels are coming down as shown by a decline in the percentage of children with Elevated Blood Lead levels and the decrease in average blood lead levels. This may be from a combination of reductions in lead exposure and increased blood lead testing in lower risk areas.

- Fewer children were identified with blood lead levels above 10 micrograms per deciliter (µg/dL), the Center for Disease Control's (CDC) level of concern, and above 20 µg/dL, the level at which environmental investigation begins.

- Blood lead testing dropped 12.7% statewide, from 67,118 children in 1997 to 58,585 in 1998. The 1998 testing levels are similar to testing levels in 1996, before the passage of the 1997 statute requiring lead screening by blood test or questionnaire prior to day care entry.

- Performance of blood lead testing continues to be much higher in higher risk areas than lower risk areas. However the reduction in blood lead testing from 1997 to 1998 was greater in higher risk areas than in lower risk areas.

MARYLAND CHILDHOOD LEAD REGISTRY

OVERVIEW

LEAD POISONING IN MARYLAND

- Lead is throughout our environment.
- Sustained exposure to lead can cause long-lasting neurological damage.
- Children are at greatest risk from birth to age six, a period of significant neurological development period.
- Effects include learning disabilities, shortened attention span, irritability, and lowered IQ.
- Lead paint dust is the most significant exposure source, especially through children's normal hand-to-mouth activity.
- There are about 529,000 residential houses built before 1950 (95% likely to contain lead paint) and 976,000 houses built between 1950-1978 (75% likely to contain lead paint).

SCREENING FOR LEAD IN CHILDREN

- Screening is best accomplished with a blood lead test.
- Private health care providers perform screening for exposure to lead.
- Blood lead screening is mandatory for children receiving health care in the EPSDT program through Medicaid.
- Documentation of lead screening, either by blood test or risk assessment questionnaire, for newly enrolled day care children up to age 6 years is required by the Childhood Lead Screening Program Law, effective May, 1997.
- The CLR receives reports of blood lead testing only, and there is no estimate of the number of children whose lead exposure may have been evaluated by the health care providers with the use of the risk assessment questionnaire.

PUBLIC HEALTH CASE MANAGEMENT

- A "childhood lead poisoning case" is defined as a child under 72 months with a confirmed venous BLL of $\geq$20 µg/dL. At this level, local health departments provide nursing case management, and sanitarians perform environmental investigation for sources of lead exposure.
- Most cases of childhood lead poisoning are related to deteriorated or damaged residential lead paint, most commonly in old windows and porches. Parents' occupations and hobbies occasionally provide exposure to lead dust. Water, air, and soil may provide low-level, "background" exposure and are rarely the cause of childhood lead poisoning.
- The most effective prevention of childhood lead poisoning is to reduce or eliminate exposure.

TERMS AND DEFINITIONS

BLL: Blood lead level

Elevated blood lead (EBL): any blood lead level greater than or equal to 10 µg/dL.

Lead poisoning: a venous blood lead level greater than or equal to 20 µg/dL.

Incidence of EBL: "New" cases, or children with blood lead level (BLL) ≥10 µg/dL in 1998 whose names and dates of birth were not found in the 1997 list of children with BLL ≥10 µg/dL.

Prevalence of EBL: Both old and new cases, or all children with EBL in 1998.

Population estimates for 1998 are adapted from the US Department of Commerce, Bureau of Census.

Screening: As defined in the Childhood Lead Screening Program Law, Health Article 18-106 (B), screening for lead poisoning is performed with either a blood lead test or a lead risk questionnaire.

Testing: Blood lead testing by capillector (finger stick) or venous blood test measures lead in blood.

0 - 6 years old: Children up to 72 months old.

STATEWIDE BLOOD LEAD TESTING PERFORMANCE

Under 1992 Maryland Screening Guidelines jointly adopted by MDE and the Department of Health and Mental Hygiene, a blood lead test is recommended for all children at 13 months to six years of age who do not have documentation of a previous negative blood lead test.

In 1998, the registry received a total of 73,621 reports on 67,239 children 0-18 years old. Of these, 56,219 reports were from 55,555 children 0 - 6 years. On 3,030 reports, age could not be calculated because of missing or incomplete date of birth information. These reports were counted as children 0 - 6 years with exact age unknown.

Statewide, 13.9% of children 0 - 6 years were blood lead tested for lead poisoning in 1998. The testing varied from 31.2% for Baltimore City to 4.1% for Saint Mary's County . Exhibits One and Two summarize childrens' testing and elevated blood leads per county statewide.

Exhibit One

Blood Lead Testing in Maryland

Children 0 - 6 Years Old by Jurisdiction in 1998

County	Population of children under age 6[1]	Number of children tested	Percent tested	Number of children with EBL[2]	Percent with EBL	Number of children with lead poisoning[3]	Percent with lead poisoning
Allegany	4,512	1,180	26.2	54	4.6	5	0.4
Anne Arundel	38,174	4,496	11.8	104	2.3	2	0.0
Baltimore	53,541	6,645	12.4	211	3.2	11	0.2
Baltimore City	56,967	17,753	31.2	3,949	22.2	669	3.8
Calvert	5,980	385	6.4	6	1.6	1	0.3
Caroline	2,516	363	14.4	39	10.7	4	1.1
Carroll	12,319	630	5.1	30	4.8	3	0.5
Cecil	6,842	379	5.5	23	6.1	0	0.0
Charles	10,866	959	8.8	14	1.5	4	0.4
Dorchester	2,191	319	14.6	46	14.4	10	3.1
Frederick	15,671	956	6.1	25	2.6	2	0.2
Garrett	2,202	241	10.9	4	1.7	0	0.0
Harford	18,929	1,072	5.7	38	3.5	9	0.8
Howard	20,043	977	4.9	18	1.8	6	0.6
Kent	1,302	322	24.7	14	4.3	3	0.9
Montgomery	69,016	8,044	11.7	101	1.3	7	0.1
Pr. George's	66,357	10,176	15.3	131	1.3	12	0.1
Queen Anne's	3,066	265	8.6	18	6.8	1	0.4
Somerset	1,395	313	22.5	41	13.1	7	2.2
St. Mary's	8,495	351	4.1	6	1.7	0	0.0
Talbot	2,240	194	8.7	13	6.7	0	0.0
Washington	9,244	536	5.8	25	4.7	2	0.4
Wicomico	6,293	919	14.6	91	9.9	14	1.5
Worcester	3,036	441	14.5	30	6.8	0	0.0
Co. Unknown		668		37		0	
Maryland	**421,197**	**58,585**	**13.9**	**5,068**	**8.7**	**772**	**1.3**

1. Adapted from Census Bureau population estimate by age and sex for Maryland for 1997.
2. Defined as venous or capillary blood lead level ≥10 µg/dL.
3. Defined as venous blood lead level ≥20 µg/dL.

Compared to 1997, blood lead testing in the population of children 0 - 6 years dropped statewide, from 67,118 children in 1997 to 58,585 in 1998. Four counties, Kent, Montgomery, Washington, and Wicomico had a modest increase in blood lead testing. The total number of children tested statewide in 1998 is similar to the statewide total for 1996. Testing in 1997 may have shown a temporary increase in response to the initiation of a 1997 law requiring evidence of lead screening within 30 days of a child's entry into daycare.

In 1998, blood lead testing among children 0 - 6 years for Baltimore City decreased, continuing a trend since 1995. The decrease is greater than the decrease expected due to population decrease in the 0 – 6 age group. Part of this decline may be due to improved methods beginning with the 1997 Annual Report, in the assignment of children to jurisdictions or to the county in unknown category. Other possible causes include a shift in health care provider practice or family compliance with ordered testing. Other States also report a decrease in testing in recent years.

TESTING BY AGE AND GENDER

One-year-old children had the highest rate of testing (23.4%), and five years old the lowest (7.0%) similar to 1996 and 1997. (Exhibit Three)

Boys were tested slightly more than girls. The proportion of EBL was 9.2% for boys and 8.1% for girls. Information is not available on blood lead testing by racial or ethnic background, as this is rarely provided by physician offices or reporting labs.

One and two year old children are at the highest risk of lead exposure. Therefore, screening recommendations focus on this age group. As Exhibit Three shows, on the average 24% of one year old children are being tested for lead exposure every year.

In 1998, the registry received a total of 9,883 blood lead reports on 8,654 children six years of age and older. Exhibit Four shows the distribution and the proportion of lead exposure and lead poisoning by age among these children. In general, as children get older, the blood lead levels decrease and elevated blood lead levels occur less often.

Exhibit Four
Blood Lead Testing Among Children 6-17 Years of Age
(As reported to Childhood Lead Registry for 01/01/1998-12/31/1998)

Age (Year)	No. of Children	Elevated blood lead level		Lead Poisoning**	
		Number	Percent	Number	Percent
6	2,783	328	11.7	31	1.1
7	1,595	190	11.9	22	1.2
8	1,117	79	7.1	4	0.4
9	834	55	6.6	3	0.4
≥10	2,325	69	3.0	10	0.4
Total	8,654	721	8.3	70	0.8

* Blood lead level ≥10 µg/dL
** Venous blood lead level ≥20 µg/dL

COMPARISON OF BLOOD LEAD LEVELS WITH PREVIOUS YEARS

The number of tested children who have elevated blood lead levels has declined over recent years. The proportion of tested children with elevated blood lead level (blood lead levels ≥10 µg/dL) declined from 18.0% in 1995 to 8.6% in 1998. (Exhibit Five, with additional detail in Exhibit Seven)

Exhibit Five
Summary Findings of Childhood Blood Lead Testing: 1995-1998

Calendar Year	Population[1]	Blood Lead Testing		BLL[2] ³10 µg/dL		Lead Poisoning[3]		Average Blood Lead Level[4]		
		Children	%	Children	%	Children	%	All	≥10	≥20
1995	449,168	64,394	14.3	11,585	18.0	1,832	2.8	4.1	14.6	25.5
1996	444,265	59,746	13.4	9,884	16.5	1,830	3.1	5.1	14.7	25.4
1997	431,156	67,118	15.6	7,763	11.6	1,233	1.8	4.3	14.8	25.4
1998	421,197	58,585	13.9	5,065	8.6	772	1.3	3.9	14.2	25.1

1. Adapted from US Bureau of Census Population Estimate by age and sex by calendar year, age 0 – 6 years.
2. Blood Lead Level.
3. Venous blood lead level ≥20 µg/dL.
4. Geometric mean in µg/dL.

Much of the decline in blood lead levels or case identification may be the result of several years of lead poisoning prevention efforts. Increased awareness by parents and property owners of the hazards of lead poisoning, improved maintenance and prevention of lead exposure, moving away from older, inner city housing into more recently built city or suburban housing may all contribute to fewer lead poisoning cases.

Another possible contributor to the decrease in case identification is the relative increase in testing in low risk areas, and decreased testing in higher risk areas. To further explore this issue, the trend of blood lead testing in areas defined as high risk was compared with those from low risk areas at the zip code level. For the purpose of this analysis, “high risk” is based on criteria suggested by CDC in "Screening Young Children for Lead Poisoning: Guidance for State

and Local Public Health Officials," released November, 1997. Any zip code in which the proportion of tested children aged 0 - 6 years with blood lead level ≥10 µg/dL from 1995-1998 was ≥12%, was defined high risk. Of 363 residential zip codes with enough testing results to determine the risk status, 64 were found to be high risk and 299 low risk areas. Exhibit Seven summarizes findings of blood lead testing in these areas for 1995-1998.

Actual population counts for these zip codes are not available. Population estimates for this analysis were based on annual census projections, using Baltimore City's overall rate of population change. Actual population counts for some zip codes may differ, based on local migration patterns. This may be especially true in highest risk zip codes.

Exhibit Six
Blood Lead Testing in High Risk and Low Risk Zip Codes, Age 0 - 6 years

	High Risk Zip Codes *(n = 64)*			Low Risk Zip Codes *(n = 299)*		
Calendar	Population	Children Tested		Population	Children Tested	
Year	of children	Number	%	of children	Number	%
1995	74,317	17,330	23.3	360,195	25,195	7.0
1996	72,164	23,051	31.9	358,013	32,015	8.9
1997	68,830	22,755	33.1	348,550	41,276	11.8
1998	65,790	12,339	18.8	341,294	24,888	7.3

The low risk areas had more relative increase in blood lead testing from 1995 to 1997. In 1998 both areas had significant decline in blood lead testing. However, compared to 1995, low risk areas still show a slight increase, while higher risk areas had a decline in testing. In the analyses in this report, the population by year is revised according to Census Bureau updates. There are no current data available about migration patterns.

Exhibit Seven
Childhood Blood Lead Surveillance in Maryland: 1992-1998

Calendar Year		Population of Children[1]	Blood Lead Tests		Elevated Blood Lead[2]		Lead Poisoning[3]	
			Number	Percent	Number	Percent	Number	Percent
1992								
	City	70,222	31,142	44.3	11,316	36.3	1,328	4.4
	Counties	376,631	15,889	4.2	1,706	10.7	54	0.3
	Total	446,853	47,031	10.5	13,022	27.7	1,382	2.9
1993								
	City	69,434	38,030	54.8	12,908	33.9	1,850	4.9
	Counties	381,753	22,882	6.0	1,638	7.2	54	0.2
	Total	451,187	60,912	13.5	14,546	23.9	1,904	3.1
1994								
	City	65,255	32,620	50.0	9,168	28.1	1,635	5.0
	Counties	384,720	19,771	5.1	1,209	6.1	156	0.8
	Total	452,975	52,391	11.6	10,377	19.8	1,791	3.4
1995								
	City	65,958	38,794	58.8	10,258	26.4	1,633	4.2
	Counties	383,210	25,600	6.7	1,327	5.2	199	0.8
	Total	449,168	64,394	14.3	11,585	18.0	1,832	2.8
1996								
	City	63,508	29,630	46.7	7,816	26.4	1,646	5.6
	Counties	380,757	27,006	7.1	1,264	4.7	160	0.6
	Unknown[4]		3,110		804		24	
	Total	444,265	59,746	13.4	9,884	16.5	1,830	3.1
1997[5]								
	City	60,099	21,423	35.6	5,983	27.9	1030	4.8
	Counties	371,057	44,546	12.0	1654	3.7	202	0.5
	Unknown		1,149		126		1	
	Total	431,156	67,118	15.6	7,763	11.6	1233	1.8
1998[5]								
	City	56,967	17,753	31.2	3,949	22.2	669	3.8
	Counties	364,230	40,164	11.0	1,082	2.7	103	0.3
	Unknown		668		37		0	
	Total	421,197	58,585	13.9	5,068	8.7	772	1.3

1. Annual population estimate from US Census Bureau age-sex population estimate for state and counties.
2. Defined as a venous or a capillary blood lead level ≥10 µg/dL.
3. Defined as a venous blood lead level ≥20 µg/dL.
4. City/county cannot be assigned because of no information on address.
5. Baltimore City/County assignment was improved for the 1997 analysis, based on zip code) The city/county assignment was based on the US Postal Service Address Information System product.

NEW AND OLD CASES: INCIDENCE AND PREVALENCE OF EBL

After exposure, a child's blood lead level can take several months or even years to sustain a decrease. It is possible for a child to remain a "case" from one year to the next. During this time, many efforts by the family, local health services, health care provider, and rental property owner are required. To better focus prevention efforts and evaluate effectiveness of case interventions, it is important to be able to distinguish between "new" cases and "old" cases.

By definition, any child tested in 1998 with blood lead level ≥ 10 µg/dL whose name and date of birth failed to match the list of children with BLL ≥10 µg/dL in 1997 was considered a new (incidence) case for 1998. Matched children were counted as old cases. Prevalence was the sum of new and old cases. Based on these criteria, the incidence and prevalence of EBL among tested children in 1998 were 6.3% and 8.7% respectively.

Exhibits Nine and Ten present age-specific incidence and prevalence of EBL in 1998. The incidence of EBL increases after age one. Children's increasing hand-mouth activity after age one increases their exposure to lead, and therefore, an increase in new cases (incidence) of EBL. After age one, the incidence of EBL remains stable. The prevalence however, continues to increase until age 3. This may be because those children who were exposed to lead at early ages continue to be exposed or respond slowly to treatment, and therefore maintain their EBL status over the years.

Exhibit Eight

1998 Age-Specific Incidence and Prevalence of EBL*

Age	Number of Children Tested	Total Number of EBL	New Cases of EBL	Incidence %	Prevalence %
One Year	5,870	1,221	1,129	7.1	7.7
Two Year	10,743	1,110	820	7.6	10.3
Three Year	7,970	970	612	7.7	12.2
Four Year	7,821	869	504	6.4	11.1
Five Year	5,034	556	308	6.1	11.0
Age Unknown	3,030	151	137		
Total	**58,585**	**5,068**	**3,701**	**6.3**	**8.7**

* Elevated Blood Lead (Blood lead level ≥10 µg/dL)

Statewide, Baltimore City had the highest incidence of new cases of EBL (15.5%). The incidence for counties varied from 1.1% (Montgomery County) to 11.3% (Dorchester County). Overall, Eastern Shore counties had the highest incidence after Baltimore City (Exhibit Eleven).

Exhibit Nine

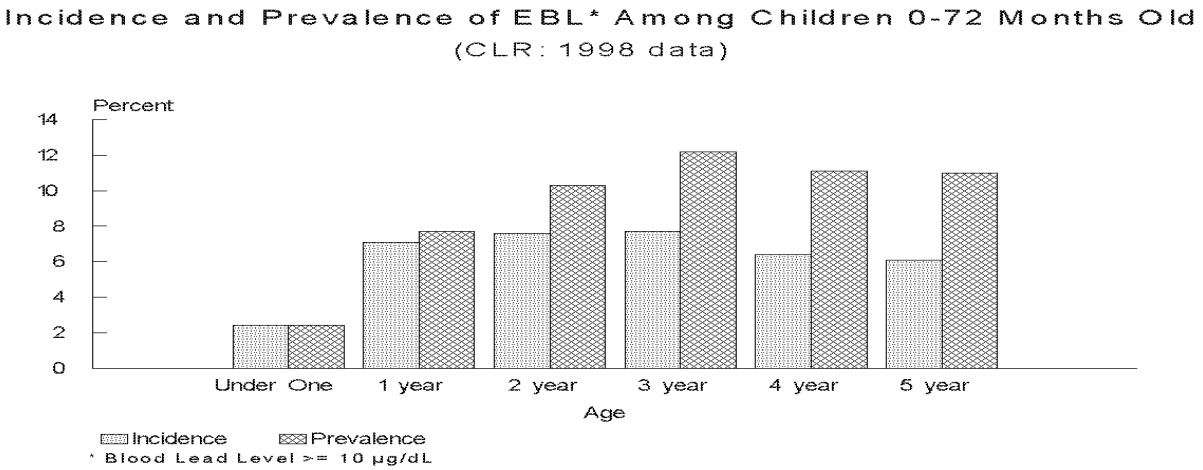

Exhibit Ten

City/County-Specific Incidence and Prevalence of EBL*

County	Number of children tested	Total number of EBL	New cases of EBL	New cases Incidence (%)	New plus old Prevalence (%)
Allegany	1,180	54	49	4.2	4.6
Anne Arundel	4,496	104	94	2.1	2.3
Baltimore	6,645	211	165	2.5	3.2
Baltimore City	17,753	3,949	2,743	15.5	22.2
Calvert	385	6	6	1.6	1.6
Caroline	363	39	24	6.6	10.7
Carroll	630	30	27	4.3	4.8
Cecil	379	23	20	5.3	6.1
Charles	959	14	12	1.3	1.5
Dorchester	319	46	36	11.3	14.4
Frederick	956	25	20	2.1	2.6
Garrett	241	4	3	1.2	1.7
Harford	1,072	38	33	3.1	3.5
Howard	977	18	17	1.7	1.8
Kent	322	14	13	4.0	4.3
Montgomery	8,044	101	92	1.1	1.3
Pr. George's	10,176	131	122	1.2	1.3
Queen Anne's	265	18	17	6.4	6.8
Somerset	314	41	35	11.1	
St. Mary's	351	6	6	1.7	1.7
Talbot	194	13	10	5.2	6.7
Washington	536	25	25	4.7	4.7
Wicomico	919	91	75	8.2	9.9
Worcester	441	30	26	5.9	6.8
Unknown	668	37	31		
Total	58,585	5,068	3,701	6.3	8.7

*Elevated Blood Lead (Blood lead level ≥10 μg/dL)

SUMMARY

Continued progress in decreasing blood lead exposure is demonstrated by a decrease in the average blood lead level and a decrease in the number of childhood lead poisoning cases. However, lead exposure and lead poisoning continue to occur well above national levels. Blood lead testing needs to increase, especially in high-risk areas to assure that poisoned children are identified and interventions are done to decrease the harm to the children.