MINNESOTA MDH DEPARTMENT OF HEALTH

2011–2012 Blood Lead Surveillance Report

Environmental Health Division

Environmental Surveillance and Assessment Section

Environmental Impacts Analysis Unit

Childhood Lead Poisoning Prevention Program

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www.health.state.mn.us/lead

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Introduction

This 2011–2012 Blood Lead Surveillance Report describes the activities of the Minnesota Department of Health (MDH) Lead Poisoning and Healthy Homes Program (LPHHP) and the data resulting from the MDH Blood Lead Information System (BLIS) for the 2011 and 2012 calendar years. This report replaces the 2011 Annual Surveillance Report. Budget cuts at the federal level eliminated federal funding for BLIS and decreased the capacity at MDH to analyze BLIS data. This capacity has now been partially replaced by state funding, and the 2011 data have been reanalyzed.

The report contains a description of the trends in lead testing and elevated blood lead levels in Minnesota, and summarizes activities taking place in Minnesota to prevent childhood lead poisoning. The intent of this report is to provide information for stakeholders in Minnesota, document activities of the LPHHP, and assist local efforts to address housing-based health threats.

As the number of elevated blood lead cases in Minnesota has continued to steadily decline, the MDH LPHHP has also been incorporating "healthy homes" approaches into routine lead program activities. Applying healthy homes strategies will help use existing lead poisoning prevention resources to address additional housing-based environmental health threats, including asthma, pests, fire safety, radon, carbon monoxide, and mold/moisture. This report contains an overview of steps taken to implement a healthy homes program in Minnesota.

The loss of federal funding continues to impact the program plans and activities of the LPHHP. MDH is discussing available options with other public health programs and collaborating partners to prioritize program functions and identify supporting resources.

Lead Poisoning

Although the toxicity of lead has been known for thousands of years, lead poisoning remains one of the most common environmental health threats to children. There are many sources of lead, such as soil contaminated from years of leaded gasoline, lead dust accidentally brought home from parents' workplaces and hobby areas, and some imported products and traditional remedies. However, deteriorated lead paint in homes is the main source of lead exposure for U.S. children today. Although lead paint was banned for residential use in 1978, many older homes still contain lead paint. It is estimated that nearly one million homes in Minnesota still have lead paint. These homes may be found in both urban and rural areas. As lead paint deteriorates, it creates fine dust that is identical in appearance to ordinary house dust.

Elevated levels of blood lead occurring during the first years of life may not produce symptoms until the children enter school and display learning difficulties, reduction in IQ, or behavior problems.

Children less than six years old, and especially ages one to three years, are most vulnerable to lead's toxicity due to their growing bodies, nutritional needs, mouthing behavior, and spending time on the floor. Pregnant women and the developing fetus are also at risk because lead easily passes through the placenta to the fetus. The changing nutritional needs of the mother also cause release of lead stored in bone. Certain populations of children are at increased risk of lead poisoning. For example, children enrolled in medical assistance programs are more likely to live in older homes in poor condition, have poor nutrition, and live in urban areas that may contain lead-contaminated soils. Refugees and immigrants are also at increased risk because they are likely to have lead exposure in their home countries, may have poor nutritional status, and may live in substandard housing once in the U.S.

The Centers for Disease Control and Prevention (CDC) has recently discarded their "level of concern" of 10 micrograms of lead per deciliter whole blood (µg/dL) in favor of a reference value of 5 µg/dL. This value is based on the average blood lead level in the American population. Confirmed blood lead test results above the 5 µg/dL reference value are now expected to trigger a public health response. CDC also acknowledges that there is no safe level of exposure to lead, and the effects of lead exposure appear to be irreversible in the absence of any other interventions. Therefore, primary prevention, or preventing lead poisoning before it can start, is crucial.

Minnesota statute 144.9504 mandates environmental interventions for confirmed blood lead levels of 15 µg/dL or greater in children less than six years old. For levels of 5 µg/dL or greater, local public health nurses work with families to bring down elevated lead levels. An elevated blood lead level (EBLL) is defined in Minnesota statute 144.9501 Subd. 9 as a diagnostic blood lead test of at least 10 µg/dL. For most children and adults with lead poisoning, identification and elimination of the source of lead is the main treatment.

Healthy Housing Strategic Plan

In 2011, MDH engaged the Sustainable Resources Center (SRC), along with their partner the National Center for Healthy Homes (NCHH), for assistance in preparing a strategic plan for healthy housing in Minnesota, known as the Healthy Homes Strategic Plan (HH Plan).

The HH Plan was drafted through the participation of community partners, the HH Plan Steering Committee, and feedback from a statewide kick-off meeting and seven regional meetings. The Steering Committee for the HH Plan includes several programs within MDH (Asthma, Indoor Air, Lead Compliance, Injury Prevention, and Tobacco Prevention) and external collaborators:

MN Housing Finance Agency	MN Dept of Labor and Indust.
MN Council of Health Plans	MN Public Health Assoc.
MN Nurses Assoc.	MN Medical Assoc.
MN State Fire Marshal	MN Multi-housing Assoc.

The HH Plan will be used to organize and evaluate program goals and timelines. It was approved at a statewide meeting in 2012. The vision elements of the HH Plan include:

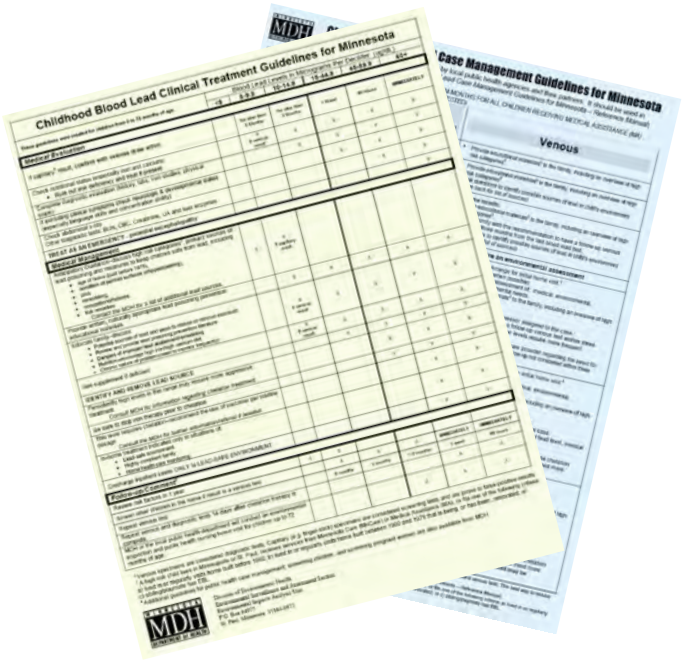
- Centralized and accessible information clearinghouse
- Increased public awareness and education
- Social connectedness
- Medical capacity and referral system
- Widespread and comprehensive healthy housing inspections
- Adoption of safe and healthy housing policies
- Resources and services
- Sustainable funding
- Health-centric leadership
- Evaluation infrastructure and documented outcomes

SRC, working with Minnesota Green Communities and other partners, also created an Alliance for Healthy Homes and Communities in Minnesota (Alliance). The Alliance acts as a source of information and collaboration and helps integrate efforts for healthy homes and communities. The HH Plan (the structure) and the Alliance (the people) are working together to provide a framework for goals/tasks and ensure statewide communication and consistency.

Progress reports and all previous versions of the Plan are available at the MDH Lead Program website: www.health.state.mn.us/lead.

State Blood Lead Guidelines

MDH has a set of four guidelines available for lead: Childhood Blood Lead Screening, Childhood Blood Lead Case Management, Childhood Blood Lead Clinical Treatment, and Blood Lead Screening for Pregnant Women, which may be found at the MDH Web site at www.health.state.mn.us/lead. These guidelines are intended to establish standardized screening practices and minimum levels of care for providing services to children. However, those counties that have greater resources available may wish to take a more rigorous approach to case management.



Childhood Blood Lead Screening Guidelines

The MDH Childhood Blood Lead Screening Guidelines direct physicians to order blood lead tests for 1) children residing in specific geographic areas that have high rates of elevated blood lead; and 2) children matching specific groups that have high rates of elevated blood lead. Universal screening is recommended for children residing in Minneapolis and St. Paul and those recently arriving from other major metropolitan areas or other countries. Screening is also recommended for children receiving Medicaid. The test is typically performed when the child is one and two years old, but may be done at any time if the parent is concerned or if a high-risk activity (e.g. remodeling a home built before 1950) has recently occurred.

Childhood Blood Lead Case Management Guidelines

The Case Management Guidelines work in concert with the MDH Blood Lead Screening Guidelines for Minnesota to identify and manage lead exposure in children. A qualified case manager should oversee the treatment and recovery of each child, and ensure that steps are taken to prevent further exposure of the child to potential sources of lead. Appropriate steps are presented for both capillary and venous test results. The guidelines recommend providing educational materials to the family of children with test results below 10 µg/dL.

Childhood Blood Lead Clinical Treatment Guidelines

The Childhood Blood Lead Clinical Treatment Guidelines are designed for physicians to assist them in treating patients in Minnesota with elevated blood lead levels, thus ensuring that all cases receive a consistent level of care. Because the CDC and MDH now recognize that there are no safe levels of exposure to lead, the clinical treatment guidelines now recommend engaging families through education for blood lead levels of 5–10 µg/dL, which is lower than the previously recommended level. Additional interventions are recommended for higher blood lead levels.

Blood Lead Screening Guidelines for Pregnant Women in Minnesota

The Blood Lead Screening Guidelines for Pregnant Women in Minnesota are designed to assist healthcare providers in screening pregnant women for elevated blood lead levels. Not every woman is at risk for lead exposure, so a risk screening questionnaire should be used to decide whether testing is recommended. Examples of risk factors for lead exposure include occupational exposure of the mother or another family member, remodeling a home containing lead paint, using non-commercial home remedies that contain lead, and pica behavior of the mother. Identifying and preventing elevated blood lead levels in pregnant women also serves to protect the developing fetus. The CDC and MDH consider 10 µg/dL and above to be an elevated blood lead level for pregnant women.

Case Management

The LPHHP provides technical assistance to all local public health agencies in the state of Minnesota through the State Case Monitor position. Assistance is provided to ensure case management services are available for children with blood lead levels of at least 5 µg/dL. These activities include:

- Assuring case management activities and follow-up testing for children and pregnant women are performed in accordance with MDH guidelines;
- Providing educational materials, in other languages as needed, to assist in communicating lead exposure prevention measures;
- Communicating regularly with the Asbestos and Lead Compliance Unit to assess progress on open lead cases and facilitate communication between the Asbestos and Lead Compliance Unit and local lead case managers.

Case monitoring activities have helped clinicians improve their adherence to Minnesota Guideline procedures and have provided increased collaboration between public health and housing staff at both the state and local level.

Data Collection

Lead Testing

Since not all Minnesota children have a high risk for lead exposure, targeted screening based on established risk factors is currently recommended for most areas of the state. For children living within the city limits of Minneapolis or St. Paul, universal screening is currently recommended at one and two years of age, and up to six years of age for children who have not previously been screened. The goal is to test all children at risk for exposure to lead. Because lead testing is neither universal nor randomly sampled, the data in this report may not be representative of all Minnesota children.

The two main types of blood specimens used in blood lead testing are capillary and venous. Tests on capillary blood are considered "screening" tests because they are quick and inexpensive. Capillary blood specimens, which are drawn from a finger stick, tend to be more acceptable to parents and may be performed in a wider range of settings. However, a 2008 MDH study requested by the Legislature showed that 68% of elevated capillary results reported to MDH were false positives. Hand washing to reduce surface contamination with lead is a key step in preventing falsely elevated capillary samples.

Venous specimens are considered "diagnostic" tests because they are drawn directly from a vein, but they can be more difficult to obtain. Venous tests are required to initiate an environmental investigation of an elevated lead result because they are less prone to false positives than capillary tests. The full report on the 2008 MDH study of testing methods can be found at: http://www.health.state.mn.us/divs/eh/lead/reports/legislativerept07.pdf.

The MN Blood Lead Information System (BLIS)

MDH maintains a blood lead information system (BLIS) for the purpose of monitoring trends in blood lead levels in adults and children in Minnesota. Analytical laboratories submit results to the LPHHP, as mandated by Minnesota Statute 144.9502. The data are used to help identify populations at risk for elevated blood lead levels (EBLLs), to help ensure that screening services are provided to groups identified as having the highest risk of lead poisoning, and to ensure that environmental and medical follow up are provided to children with EBLLs.

The use of electronic reporting formats allows for greater efficiency in handling large numbers of records. The LPHHP works with the Minnesota Electronic Disease Surveillance System (MEDSS) to incorporate electronic reporting of blood lead test results in to routine data handling by MDH. Currently, approximately 80% of blood lead reports are received electronically, up from 27% in 1997.

Statewide Surveillance Data

Statewide data are available starting from 1995. Data for years 2000–2010 are shown for comparison to the 2011 and 2012 data. In 1995, fewer than 40,000 children were tested for lead and more than 4,300 children had blood lead levels of at least 10 µg/dL.

The number of children tested for lead in Minnesota increased from 2000 through 2008, then stabilized and began to decrease during 2009–2012. Approximately 91,000 children were tested in both 2011 and 2012 (**Figure 1**).

Blood Lead Levels in Children

The trends in the number of EBLL cases in Minnesota children may be compared across years (**Figure 2**). Thanks to ongoing prevention efforts, the number of EBLL cases has continued to decrease. However, there were still 532 Minnesota children with at least one blood lead level result of 10 µg/dL or greater in 2011 and 527 in 2012. That includes 103 children who had venous blood lead levels of at least 15 µg/dL in 2011 and 124 in 2012.

Figure 1: Number of Children Tested (Less than 6 Years of Age)

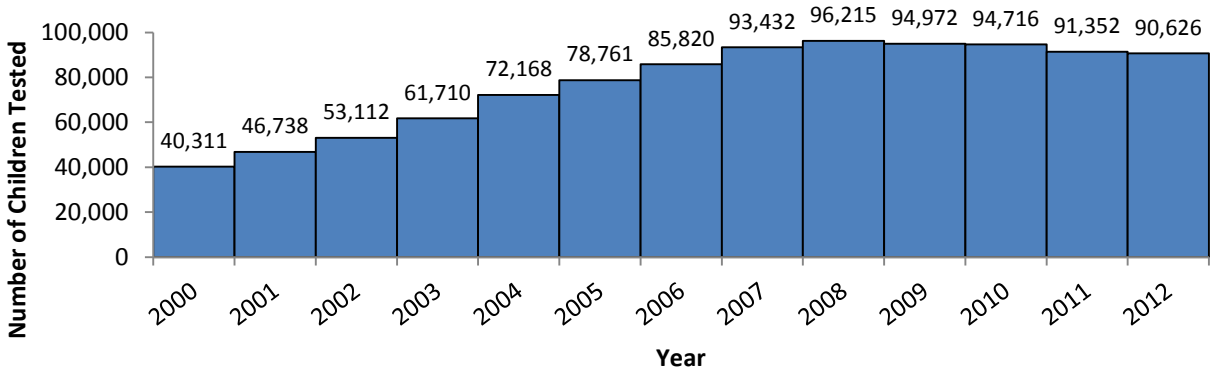
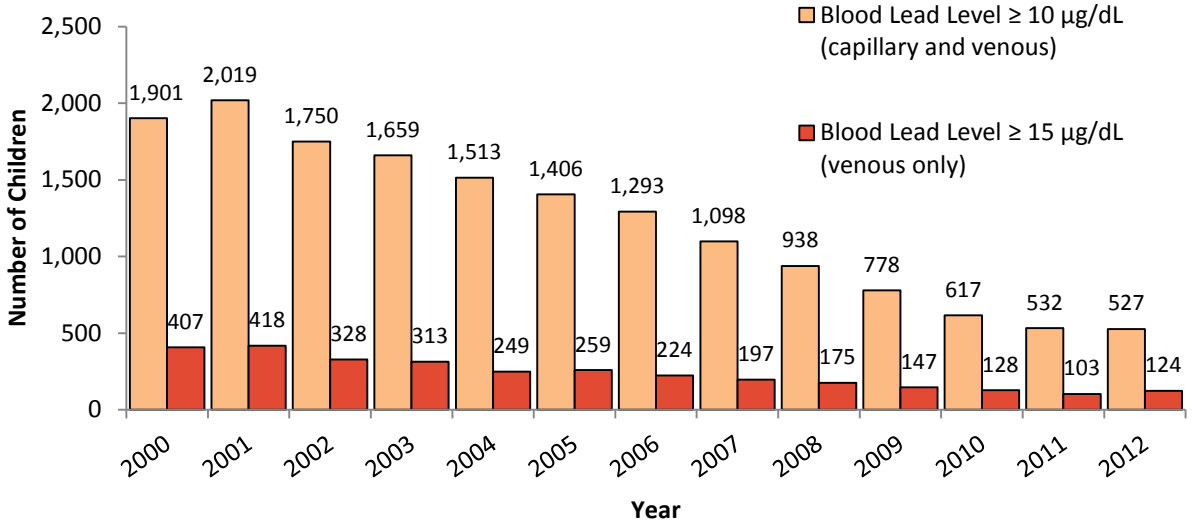


Figure 2. Number of Children with Blood Lead Levels of at least 10 µg/dL and 15 µg/dL

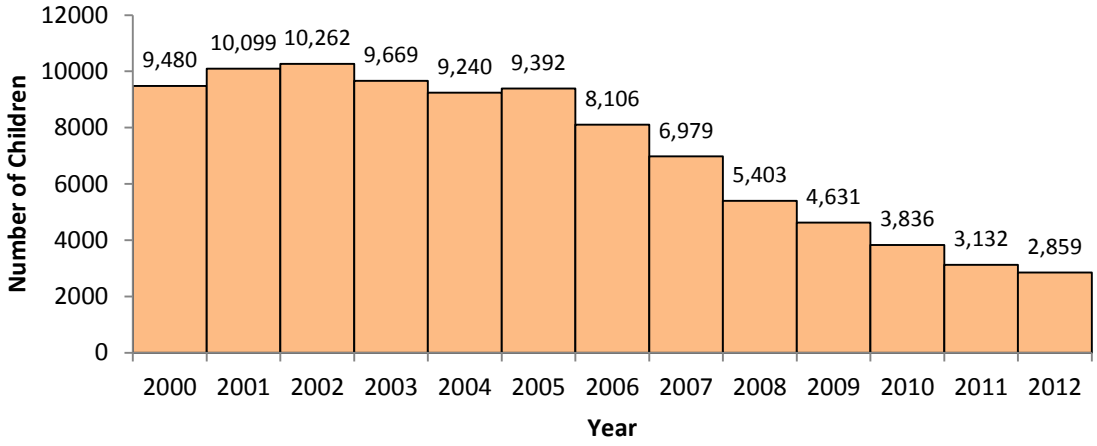


Blood Lead Levels Above Reference Range in Children

Starting in 2011, CDC discarded their "level of concern" of 10 µg/dL in favor of a reference value of 5 µg/dL based on the average blood lead level in the American population. In 2011, there were 3,887 venous and capillary test results from 3,132 children of at least 5 µg/dL. In 2012, there were 3,799 venous and capillary test results from 2,859 children of at least 5 µg/dL (**Figure 3**). Although the new reference value was not implemented until 2011, data are shown for years 2000–2010 for comparison.

Children with blood lead levels in this range should receive follow-up testing and educational materials, according to the Minnesota case management guidelines. Rates of follow-up testing are described below. After attempts at follow-up testing were made, 2,684 children in 2011 still had blood lead levels of at least 5 µg/dL, and 2,048 children in 2012 still had blood lead levels of at least 5 µg/dL.

Figure 3. Number of Children with Blood Lead Levels of at Least 5 µg/dL



Blood Lead Testing by County

County-specific data on blood lead testing and blood lead levels are provided at the end of this report in **Appendix A** for 2011 and in **Appendix B** for 2012.

Follow-up Testing

MDH guidelines recommend follow-up blood lead tests for children with elevated blood lead levels. The period of time recommended for re-testing varies according to the initial blood level, but the maximum time is 90 days for any child with a blood lead level of 5 µg/dL or greater. Of the 3,132 Minnesota children identified with a blood lead level of 5 µg/dL or greater in 2011, 1,416 (45%) received a follow-up test. Of these, 845 (27% of the children with blood lead levels of 5 µg/dL or greater) were retested within 90 days of their initial test. In 2012, 2,859 Minnesota children had a blood lead level of at least 5 µg/dL; 2,012 (70%) received a follow-up test, and 1,392 (49%) received a follow-up test within 90 days.

The numbers and percentages of cases that had follow-up tests cannot be directly compared to previous years because 2011 was the first year that follow-up testing was recommended for blood lead tests of at least 5 µg/dL. Fewer follow-up tests were conducted in 2011 because the change in the guidelines occurred mid-year. However, by 2012, the percentage of cases that received a follow-up test exceeded the percentage in 2010, before the new guidelines were implemented. Further increasing the follow-up rate and reducing the time between tests will take the combined efforts of providers, case managers, families, and the MDH Lead Program.

Special populations

Medicaid Children

Medicaid's Early and Periodic Screening Diagnosis and Treatment (EPSDT) program requires that well-child visits include blood lead testing at both 12 and 24 months. National studies have shown that Medicaid-enrolled children are three times more likely to have elevated blood lead levels than non-enrolled children. These data were supported by a joint study between the MDH Lead Program and Minnesota Department of Human Services (DHS) released in 2002. Children enrolled in Minnesota Health Care Programs (MHCP) were nearly twice as likely as non-MHCP children to have EBLLs (9.8% compared to 5%). However, despite their high-risk status, less than a third of MHCP-enrolled children are tested by the time they reach 72 months.

The Minnesota DHS no longer provides monetary incentives to health plans to encourage blood lead testing. However, to help assess blood lead testing rates, MDH routinely matches BLIS data with information from DHS (using a data sharing agreement to ensure data privacy) and reports on test reports received. The matched data are important to ensure that reporting to federal agencies on mandatory testing is as accurate as possible.

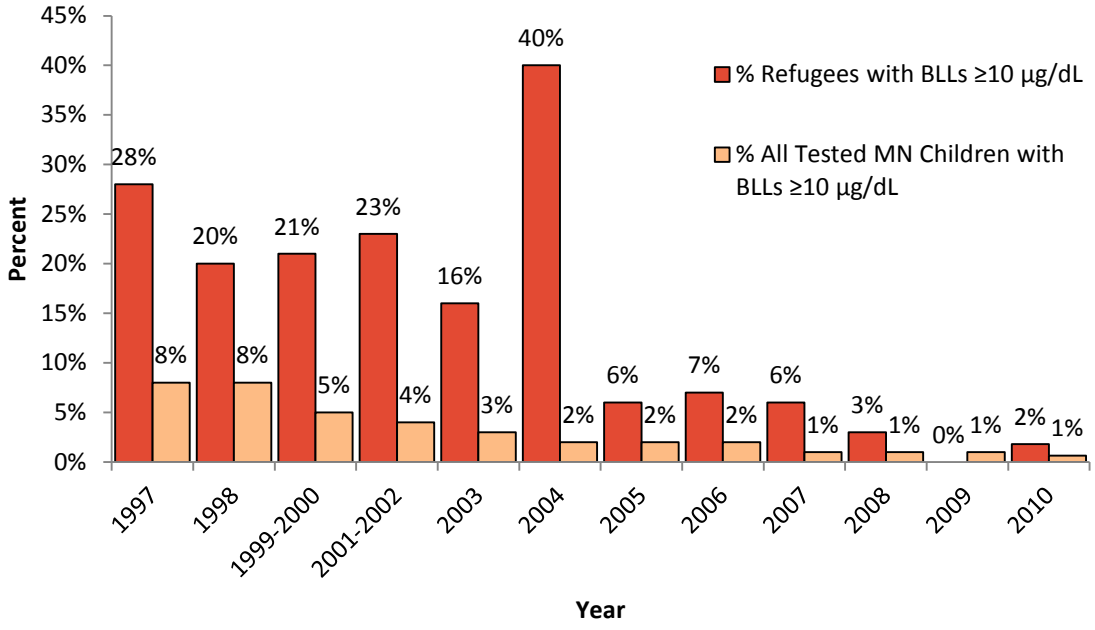
Refugee Children

Refugees are persons who are forced to leave their home country because of disasters, war, or persecution, and come to Minnesota with a special immigration status. They are a population at high risk for lead poisoning. Refugees may have lead exposure in their countries of origin, and once they are in the U.S., refugees frequently move into older housing with potential for exposure to lead-based paint. The Division of Infectious Disease Epidemiology, Prevention, and Control at MDH collects demographic data on all refugees entering the state who receive an initial health screening.

During the late 1990's, there were a substantial number of refugees arriving from Eastern Europe. Since that time, most refugees have originated from Sub-Saharan Africa and Southeast Asia.

Blood lead tests were matched to refugee information in past years (**Figure 4**). Blood lead levels of at least 10 µg/dL have been identified among refugee children from multiple regions. The rate of elevated blood lead levels for refugees has been declining in the past several years.

Figure 4. Blood Lead Levels (BLLs) of at Least 10 µg/dL in Refugee Children



Adults

CDC recommends a level of concern for adult exposure to lead of 25 µg/dL, while the Occupational Safety and Health Administration (OSHA) requires action in exposed workers at a level of 40 µg/dL. For pregnant adults, a blood lead level of 10 µg/dL or higher is considered elevated. Minnesota's Adult Blood Lead Epidemiology and Surveillance (ABLES) program has been identifying eligible adults since 1998.

The total number of tests reported in 2011 and 2012 for adults in Minnesota is presented in **Table 1**. In 2011, there were 90 adults with blood lead levels of 25 to 39 µg/dL, and 8 adults with reported levels of 40 µg/dL or greater. In 2012, there were 111 adults with reported levels of 25 to 39 µg/dL, and 12 adults with reported levels of 40 µg/dL or greater. Although pregnancy status is not a routine part of data collection, the LPHHP follows up on cases when notified that a patient with a blood lead level of at least 10 µg/dL is pregnant. Providers are urged to include a lead risk assessment questionnaire as a routine part of exams for pregnant women.

Federal funding for ABELS was discontinued during 2013. State resources will allow test results for adults to continue to be entered into BLIS, but the ability of the LPHHP to gather additional information on employers and occupations has been essentially eliminated.

Table 1: Minnesota residents 16 years or older with a reported blood lead level (BLL) in 2011 and 2012

	Year	
	2011	**2012**
Number of Reports	9,582	9,105
Number of Individuals Tested	8,532	7,960
Individuals with BLL of 10–24 µg/dL	442	416
Individuals with BLL of 25–39 µg/dL	90	111
Individuals with BLL of ≥ 40 µg/dL	8	12
Range of Reported Results	0.0–94.0 µg/dL	0.0–61.0 µg/dL

Evaluation of BLIS

In 2011, there were 100,490 total blood lead tests reported to BLIS, 81% of which were received electronically (**Table 2**). In 2012, there were 110,478 blood lead tests; 83% were received electronically. The majority of tests received in both years were capillary tests. Tests were received from 96 separate laboratories during 2011 and 2012.

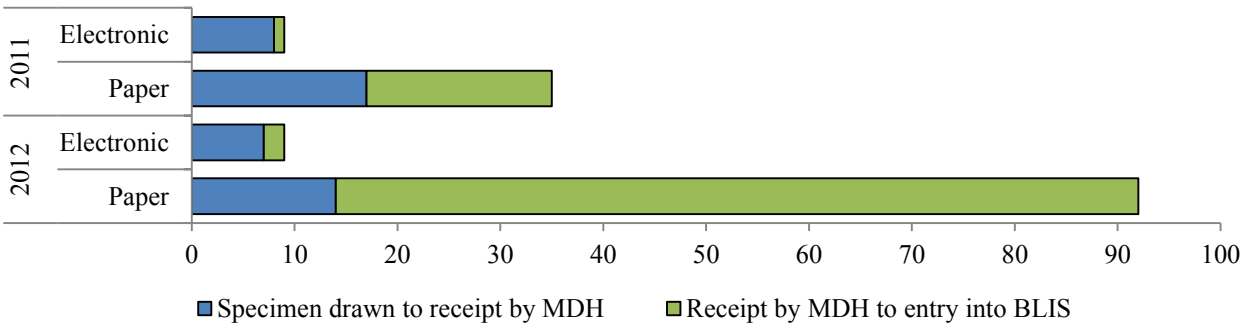
Extensive efforts are made by MDH staff to ensure the completeness of data in BLIS. During 2011 and 2012, both city and zip code were missing only 1–2% of the time, (down from 9% in 2006). The patient's date of birth was available for all records.

The median total time from specimen collection to entry into BLIS was 9 days for electronic records during both 2011 and 2012 (**Figure 5**). However, the loss of CDC funding led to a reduction in LPHHP staffing, causing an increase in the median time between specimen date and entry date for paper records from 35 days in 2011 to 92 days in 2012. Electronic reporting significantly improves timeliness and requires less staff time for entry of records into BLIS. However, it remains important to bolster the state's capacity to enter all records in a timely manner.

Table 2. Number and type of blood lead test results reported to BLIS, 2011 and 2012

	2011		2012	
	No.	***(%)***	***No.***	***(%)***
Blood lead tests reported	100,490	--	110,478	--
Paper reporting *(mail or fax)*	21,048	(19)	18,522	(17)
Electronic reporting *(encrypted email or secure web downloads)*	89,442	(81)	91,956	(83)
Blood test type				
Capillary	80,468	(73)	77,411	(70)
Venous	27,308	(25)	29,876	(27)
Unknown test type	2,714	(2)	3,191	(3)

Figure 5. Timing of electronic and paper blood lead test results reported to BLIS, 2011 and 2012



Other Resources Available from LPHHP

The Lead Program maintains a web page through the MDH Web site that provides a number of lead education materials for providers, regulated parties, and the general public (www.health.state.mn.us/lead). This site contains information on hot topics (including current data, projects and requirements), numerous fact sheets, a list of "frequently asked questions", all publications and reports (including guidelines for screening children and pregnant women, case management, and clinical treatment in children), and links to many external lead resources.

Swab Team Services Grants

MDH has collaborated with community partners through Swab Team Services Grants since 2006. The grants are authorized under Minnesota Statute 144.9512.

MDH's Swab Team Services Grant provides nonprofit organizations with funding to:

- Increase the screening of children under six years and pregnant women to determine elevated blood lead levels (EBLL) in populations at high risk, for lead exposure,
- Plan, implement, and execute successful lead screening events in communities with high lead exposure,
- Provide education and outreach services when an EBLL is identified, and
- Provide swab team services to protect populations from identified lead hazards in their residences.

Transition to Healthy Homes

Housing-related health and safety hazards have been identified through an in-home survey in 1,189 Twin Cities area homes. These homes are similar in demographic and building characteristics to homes receiving lead hazard reduction. The top five hazards observed or reported include 1) home not tested for radon (93%), 2) chipping or peeling paint (57%), 3) no CO alarm (43%), 4) mold/moisture issues (38%), and 5) fall hazards (18%).

Minnesota data compiled by MDH show that these housing-based hazards can have a significant impact on health and wellness:

- One in three Minnesota homes has high levels of radon and there is no area of the state that has a "low" radon exposure potential. Radon exposure increases the risk for lung cancer of Minnesota residents.
- Over 100,000 falls statewide were reported to the Minnesota Injury Data Access System in 2010; CDC estimates that about half of falls reported each year occur in the home.
- One in 14 children (about 7.0 %), and one in 13 adults (about 7.6 %), in Minnesota reported that they had asthma in 2010.
- Between 2002 and 2008, 131 Minnesotans died from unintentional exposure to carbon monoxide (CO). The majority of these deaths occurred in the home.

The anticipated transition of the Lead Program to a healthy homes approach was significantly impacted by the loss of CDC funding effective September 1, 2012. Although there are efforts at the federal level to restore the CDC support, MDH is preparing information on the scope and value of implementing healthy homes. The information may then be used by state decision makers to assess public health priorities and assign resources as appropriate.

Further Lead Information

More information about lead poisoning prevention in Minnesota is available at the MDH Lead Program web site: www.health.state.mn.us/lead or by calling 651-201-4620.

Appendix A: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2011

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County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Aitkin	0	10	0	1	0	0	170	948	18%
Anoka	14	65	1	2	4	1	6,118	27,058	23%
Becker	2	17	1	1	2	0	514	2,665	19%
Beltrami	0	12	1	0	0	0	655	4,032	16%
Benton	1	9	1	0	0	0	908	3,408	27%
Big Stone	0	3	0	0	0	0	78	346	23%
Blue Earth	8	16	1	0	0	0	877	4,479	20%
Brown	2	5	1	0	0	0	412	1,863	22%
Carlton	2	8	0	0	0	0	678	2,657	26%
Carver	2	11	0	0	0	0	1,145	8,272	14%
Cass	0	5	0	1	0	0	418	2,103	20%
Chippewa	3	5	0	0	2	0	211	963	22%
Chisago	1	12	1	0	0	0	724	4,011	18%
Clay	0	8	0	1	0	0	795	4,805	17%
Clearwater	0	0	1	0	0	0	60	727	8%
Cook	0	0	0	0	0	0	50	251	20%
Cottonwood	3	1	0	0	0	0	129	864	15%
Crow Wing	0	17	1	0	0	0	738	4,870	15%
Dakota	11	70	5	1	1	2	6,849	33,710	20%
Dodge	0	4	0	0	0	0	287	1,831	16%
Douglas	0	8	1	0	1	0	606	2,641	23%
Faribault	3	1	1	0	1	2	190	989	19%
Fillmore	2	11	0	0	0	0	178	1,713	10%
Freeborn	7	15	4	3	1	0	468	2,311	20%
Goodhue	1	25	1	0	3	0	607	3,519	17%
Grant	0	3	0	1	1	0	102	438	23%
Hennepin	261	318	51	18	33	3	21,555	91,263	24%
Houston	2	15	0	1	1	1	264	1,363	19%
Hubbard	0	5	0	0	0	0	235	1,501	16%
Isanti	1	9	0	0	0	0	778	3,226	24%

*When multiple results were available for an individual, the highest venous (confirmed) result was used to categorize the individual. If no venous results were available, the highest capillary (unconfirmed) result was used.

†Population data obtained from: US DHHS, CDC, NCHS, United States July 1st resident population by state, county, age, sex, bridged-race, and Hispanic origin. Compiled from bridged-race Vintage 2012 (2010-2012) postcensal population estimates. Accessed at CDC WONDER On-line Database: http://wonder.cdc.gov/bridged-race-v2012.html on Oct 28, 2013.

Appendix A: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2011

County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Itasca	2	11	0	0	0	0	781	3,035	26%
Jackson	1	1	0	0	0	0	142	735	19%
Kanabec	1	3	1	0	0	0	207	1,196	17%
Kandiyohi	4	21	2	2	1	0	861	3,448	25%
Kittson	0	1	0	0	0	0	14	275	5%
Koochiching	0	2	1	1	0	0	206	771	27%
Lac Qui Parle	2	2	0	0	2	0	100	460	22%
Lake	0	9	0	0	0	0	188	688	27%
Lake of the Woods	0	0	0	0	0	0	37	250	15%
Le Sueur	3	6	0	0	0	0	315	2,261	14%
Lincoln	1	2	0	0	1	0	81	459	18%
Lyon	2	15	3	0	1	0	721	2,190	33%
McLeod	1	7	0	1	0	0	639	2,958	22%
Mahnomen	0	1	0	0	0	0	65	564	12%
Marshall	0	3	0	0	0	0	64	669	10%
Martin	4	13	1	1	0	0	285	1,455	20%
Meeker	2	10	0	0	0	0	359	1,941	18%
Mille Lacs	0	7	0	0	0	0	471	2,256	21%
Morrison	1	5	0	0	0	1	716	2,719	26%
Mower	9	2	1	0	1	0	481	3,398	14%
Murray	0	3	0	0	0	0	121	618	20%
Nicollet	2	3	1	0	0	0	435	2,587	17%
Nobles	5	10	2	0	4	1	607	1,973	31%
Norman	0	2	0	0	0	0	41	489	8%
Olmsted	2	8	2	1	3	0	1,418	12,966	11%
Otter Tail	0	8	1	0	0	0	492	3,920	13%
Pennington	0	1	0	0	1	0	131	1,148	11%
Pine	1	10	0	0	0	0	424	2,107	20%
Pipestone	0	2	0	0	0	0	126	798	16%
Polk	9	2	2	0	0	0	219	2,498	9%

*When multiple results were available for an individual, the highest venous (confirmed) result was used to categorize the individual. If no venous results were available, the highest capillary (unconfirmed) result was used.

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Appendix A: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2011

County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Pope	0	10	0	1	0	0	165	768	21%
Ramsey	181	458	35	24	23	3	11,899	41,610	29%
Red Lake	0	1	0	0	0	0	25	352	7%
Redwood	1	16	0	0	1	0	279	1,288	22%
Renville	2	11	0	1	0	0	305	1,096	28%
Rice	5	19	1	2	2	1	1,181	4,904	24%
Rock	0	6	0	0	0	0	105	821	13%
Roseau	0	1	0	0	0	0	131	1,183	11%
St. Louis	13	74	5	3	2	0	3,218	13,084	25%
Scott	3	9	0	0	3	1	2,276	13,013	17%
Sherburne	0	17	0	0	0	1	1,656	8,321	20%
Sibley	3	15	0	1	1	0	251	1,280	20%
Stearns	4	20	1	0	1	0	2,638	11,610	23%
Steele	2	16	0	0	1	0	772	3,193	24%
Stevens	1	7	0	0	0	0	150	713	21%
Swift	1	8	0	0	0	0	173	669	26%
Todd	1	13	0	0	0	0	457	2,009	23%
Traverse	0	1	0	0	0	0	33	212	16%
Wabasha	2	5	0	0	0	0	224	1,618	14%
Wadena	0	3	0	0	0	0	227	1,092	21%
Waseca	2	4	2	0	0	0	393	1,475	27%
Washington	15	98	3	5	2	1	3,438	18,971	18%
Watonwan	2	9	0	0	1	0	213	906	24%
Wilkin	1	3	0	0	0	0	79	457	17%
Winona	4	3	2	0	2	0	412	3,242	13%
Wright	0	16	2	2	0	1	2,178	12,863	17%
Yellow Medicine	2	6	0	1	0	0	152	788	19%
Unknown	3	13	0	0	0	0	776	N/A	N/A
Minnesota Totals	**626**	**1,720**	**140**	**76**	**103**	**19**	**91,352**	**427,197**	**21%**

*When multiple results were available for an individual, the highest venous (confirmed) result was used to categorize the individual. If no venous results were available, the highest capillary (unconfirmed) result was used.

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Appendix B: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2012

Appendix B: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2012

County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Aitkin	0	1	1	1	0	0	122	948	13%
Anoka	27	36	3	3	2	0	6,150	27,058	23%
Becker	2	1	1	2	0	0	549	2,665	21%
Beltrami	0	4	2	0	1	0	588	4,032	15%
Benton	2	9	1	0	0	0	936	3,408	27%
Big Stone	0	0	0	0	0	0	99	346	29%
Blue Earth	3	13	1	0	1	0	885	4,479	20%
Brown	4	6	1	0	0	0	446	1,863	24%
Carlton	0	5	0	0	0	0	686	2,657	26%
Carver	1	7	0	0	0	0	1,012	8,272	12%
Cass	3	2	0	0	1	1	469	2,103	22%
Chippewa	2	3	0	1	0	0	212	963	22%
Chisago	4	3	0	0	0	0	682	4,011	17%
Clay	1	5	0	1	0	0	715	4,805	15%
Clearwater	0	0	0	0	0	0	74	727	10%
Cook	1	2	0	0	0	0	71	251	28%
Cottonwood	0	1	0	0	1	0	159	864	18%
Crow Wing	0	9	0	2	1	0	766	4,870	16%
Dakota	19	30	1	1	5	2	6,824	33,710	20%
Dodge	0	3	0	0	2	0	249	1,831	14%
Douglas	1	5	2	0	0	0	403	2,641	15%
Faribault	6	4	2	0	1	0	201	989	20%
Fillmore	1	2	1	0	0	0	186	1,713	11%
Freeborn	11	8	1	2	0	1	431	2,311	19%
Goodhue	8	4	1	0	1	0	631	3,519	18%
Grant	0	3	0	0	0	1	82	438	19%
Hennepin	316	204	60	11	43	3	21,814	91,263	24%
Houston	0	15	0	0	0	0	263	1,363	19%
Hubbard	1	2	0	0	0	0	182	1,501	12%
Isanti	3	3	0	0	0	0	686	3,226	21%

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Appendix B: Blood Lead Testing, Children Aged Less than 6 Years, by County, 2012

County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Itasca	0	6	0	2	0	0	779	3,035	26%
Jackson	4	1	0	1	0	0	158	735	21%
Kanabec	0	2	1	0	0	0	199	1,196	17%
Kandiyohi	9	7	1	0	3	0	861	3,448	25%
Kittson	0	1	0	1	0	0	27	275	10%
Koochiching	0	5	0	1	1	0	202	771	26%
Lac Qui Parle	3	1	0	0	2	0	107	460	23%
Lake	1	2	0	0	0	0	159	688	23%
Lake of the Woods	0	0	0	0	0	0	32	250	13%
Le Sueur	4	4	0	0	1	0	338	2,261	15%
Lincoln	0	2	1	0	0	0	87	459	19%
Lyon	2	7	0	0	2	0	705	2,190	32%
McLeod	1	4	1	0	0	0	566	2,958	19%
Mahnomen	1	0	0	0	0	0	106	564	19%
Marshall	0	1	0	0	0	0	63	669	9%
Martin	2	4	0	1	1	0	256	1,455	18%
Meeker	1	4	0	0	0	0	398	1,941	21%
Mille Lacs	2	5	0	0	1	0	453	2,256	20%
Morrison	1	1	0	0	0	0	636	2,719	23%
Mower	9	1	2	0	1	0	566	3,398	17%
Murray	0	2	0	0	0	0	134	618	22%
Nicollet	0	6	1	0	0	0	469	2,587	18%
Nobles	8	14	2	0	1	0	612	1,973	31%
Norman	1	0	0	0	0	0	49	489	10%
Olmsted	13	12	1	0	3	0	1,399	12,966	11%
Otter Tail	6	7	1	1	1	0	397	3,920	10%
Pennington	0	4	0	0	0	0	74	1,148	6%
Pine	1	10	0	0	0	0	383	2,107	18%
Pipestone	1	1	0	1	0	0	129	798	16%
Polk	4	4	1	0	0	0	196	2,498	8%

*When multiple results were available for an individual, the highest venous (confirmed) result was used to categorize the individual. If no venous results were available, the highest capillary (unconfirmed) result was used.

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County	5 to 9.9 µg/dL*		10 to 14.9 µg/dL*		15 µg/dL or greater*		Total Children Tested		
	Venous	Capillary	Venous	Capillary	Venous	Capillary	Any test type	Population (2010)†	Percent Tested
Pope	0	2	1	0	0	0	155	768	20%
Ramsey	209	243	25	15	25	5	11,644	41,610	28%
Red Lake	0	0	0	0	0	0	14	352	4%
Redwood	4	4	0	1	2	0	272	1,288	21%
Renville	3	4	0	0	0	0	339	1,096	31%
Rice	5	6	3	1	4	0	1,238	4,904	25%
Rock	1	1	0	0	0	0	115	821	14%
Roseau	1	0	0	0	0	0	123	1,183	10%
St. Louis	23	36	3	2	2	0	3,236	13,084	25%
Scott	3	0	0	0	3	0	2,131	13,013	16%
Sherburne	2	5	0	0	0	1	1,614	8,321	19%
Sibley	2	7	0	0	0	0	252	1,280	20%
Stearns	6	24	2	1	4	0	2,948	11,610	25%
Steele	1	12	1	1	1	0	672	3,193	21%
Stevens	0	0	0	0	2	0	170	713	24%
Swift	3	2	0	0	0	0	193	669	29%
Todd	0	9	0	0	1	0	428	2,009	21%
Traverse	0	1	0	0	1	0	57	212	27%
Wabasha	1	4	0	0	0	0	273	1,618	17%
Wadena	0	5	0	0	0	0	267	1,092	24%
Waseca	0	10	0	0	0	0	319	1,475	22%
Washington	7	36	2	3	1	1	3,355	18,971	18%
Watonwan	3	5	1	0	1	0	204	906	23%
Wilkin	0	2	0	0	0	0	73	457	16%
Winona	8	2	1	0	0	0	402	3,242	12%
Wright	3	11	2	1	1	0	2,240	12,863	17%
Yellow Medicine	1	4	0	1	0	0	169	788	21%
Unknown	0	1	0	0	0	0	610	N/A	N/A
Minnesota Totals	**776**	**944**	**131**	**58**	**124**	**15**	**90,626**	**427,197**	**21%**

*When multiple results were available for an individual, the highest venous (confirmed) result was used to categorize the individual. If no venous results were available, the highest capillary (unconfirmed) result was used.

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