

Minnesota's Lead Poisoning Prevention Programs

Biennial Report to the Legislature



February 2007

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Minnesota Department of Health - Lead Poisoning Prevention Programs
Biennial Report to the Legislature, February 2007

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Executive Summary

The State of Minnesota has consistently played a leading role in identifying and addressing public health issues related to lead exposure. The current lead program at the Minnesota Department of Health (MDH) is positioned to maintain that leadership role and protect the health and well being of the citizens of Minnesota from the potentially devastating effects of exposure to high levels of lead. This report documents activities conducted by MDH between January 2005 and January 2007. Previous reports were prepared for the period of January 2001 to January 2005. Additional background information on lead issues and a comprehensive overview of basic roles and procedures for the MDH Lead Program was presented in the 2001 legislative report and is not reproduced in this document.

Lead poisoning prevention partners have been actively involved in collaborative lead reduction strategies over the past several years. The State of Minnesota 2010 Childhood Lead Poisoning Elimination Plan (**Appendix A**) is the result of one such effort. It adopted a goal of creating a lead-safe Minnesota where no child would have elevated blood lead levels by the year 2010. Elimination was defined as zero percent of at-risk children who are less than 72 months of age with blood lead levels > 10 µg/dL. The so called “2010 report” recommended using a collaborative, housing-based approach to promote primary prevention of lead exposure. This plan is in concert with federal goals of eliminating childhood lead poisoning by 2010 and formed the basis for much of the discussion of a work group convened to address a study required by the 2004 legislature. Based on the final report to the legislature from that 2004 study (which was presented as Appendix B of the 2005 Biennial Report to the Legislature; available at www.health.state.mn.us/divs/eh/lead), the 2005 Minnesota legislature amended MS144.9504 to lower the mandatory environmental intervention blood lead level to a single venous result of 15 µg/dL. Prior to that the level requiring a home investigation was a single venous test of 20 µg/dL or two venous tests of 15-19.9 µg/dL at least 90 days apart. The law became effective August 1, 2005.

MDH continued to collect information on all lead tests performed on Minnesota residents. The database is maintained in an Oracle platform for the highest possible data security, and the system was updated in 2006 to provide for interoperability with other MDH programs. During 2005 and 2006 there was once again a significant increase in the number of blood lead tests performed, reflecting a growing awareness of the need to check for potential exposure to lead. The number of elevated cases has been gradually decreasing, which is consistent with national trends. There also were several key studies performed using the lead surveillance system, including an examination of lead testing in refugee children and children enrolled in Medicaid, and targeted screening projects in Hennepin County and St. Paul. The state lead guidelines for screening, case management, and clinical treatment were evaluated and updated. The State Case Monitor, a public health nurse in the MDH Lead Program, continued to guide case management of elevated lead levels by local public health agencies. Collaborative groups were maintained to help foster a cooperative approach to addressing the multi-faceted lead problem.

MDH lead program compliance staff have continued their efforts in compliance assistance, compliance monitoring and enforcement activities. This is accomplished by promoting education and compliance training, licensing, and registering lead professionals and certifying firms

performing regulated lead work, approving training courses, and conducting compliance monitoring and enforcement activities. The main objective of MDH's lead compliance program is to make lead removal and assessment services available that serve and protect public health.

All members of the lead program staff share responsibility for educating and communicating effectively about the risks posed by lead. They carry out these activities in all areas of the state where cities of the first class have not assumed responsibility for lead inspection and hazard reduction.

Although reported blood lead levels appear to be declining nationally, a high level of commitment is required from the state if we are to effectively reach the remaining at-risk populations. Those populations tend to be diverse, under-served, and highly mobile. They often face barriers that impede effective communication. Fully addressing these issues will require continued funding support from the State.

Future activities will focus on maintaining current program capacity, addressing known gaps in our current knowledge, and assuring effective use of available funds. These activities will include:

- Working with the Centers for Disease Control and Prevention (CDC) and other agency partners on targeted efforts to reduce exposure to lead, with a special emphasis on addressing the needs of diverse and currently under-served populations and on implementing primary prevention strategies;
- Continuing examination of trends in lead poisoning in the Minnesota childhood Medicaid population and the development of collaborative efforts to reduce exposure and fully use available resources;
- Working with health plans to promote awareness of lead, ensure appropriate delivery of services to at-risk children, and sharing information to accurately identify areas of high risk for lead exposure across the state;
- Conducting feasibility studies on the use of electronic data transfer to help ensure that current reporting systems are secure, complete, accurate, and compatible with national databases that may be developed in the future;
- Continuing efforts to maintain the high quality of data in the surveillance database through ongoing review of data entry procedures, targeted studies of reporting from laboratories and clinics, and distribution of data reporting outcomes to partners;
- Increased educational outreach, especially to pregnant women and women of childbearing age and other at-risk populations;
- Continue to offer outreach and education to general rehabilitation contractors working on residential projects; educate them about the hazards associated with working with lead based paint;
- Continuing to evaluate compliance monitoring and enforcement efforts to ensure that a properly trained and skilled lead workforce exists in Minnesota;
- Continuing to provide education tools and materials to reduce lead poisoning cases among children and adults; and
- Continuing to provide compliance assistance opportunities and presentations to the public and the regulated community.

Introduction

This biennial report addressing state lead poisoning prevention activities is required by Minnesota Statutes (MS), section 144.9509 subd. 3, which states:

The commissioner shall examine compliance with Minnesota's existing lead standards and rules and report to the legislature biennially, beginning February 15, 1997, including an evaluation of current lead program activities by the state and boards of health, the need for any additional enforcement procedures, recommendations on developing a method to enforce compliance with lead standards, and cost estimates of any proposed enforcement procedure. The report shall also include a geographic analysis of all blood lead assays showing incidence data and environmental analyses reported or collected by the commissioner.

A comprehensive overview of the Minnesota Department of Health (MDH) Lead Program was presented in the report prepared for the Legislature dated February 2001. The complete 2001 report is available at the MDH website at: www.health.state.mn.us/divs/eh/lead. Update reports were prepared in January 2003 for the period of January 2001 to January 2003 and in January 2005 for the period of January 2003 to January 2005. Rather than duplicate the information in these documents, the current report will only present information and updates on activities occurring during January 2005 to January 2007. Due to the time lag involved in collecting, analyzing, and reporting data, some information prior to 2005 may also be presented.

This report cost \$3,000 to prepare, including staff time, printing, and distribution costs. Information used to compile this report was obtained from MDH files and publicly available sources, and is available upon request. The complete 2007 report may also be found at the MDH website at: www.health.state.mn.us/divs/eh/lead under the "Publications and Reports" subheading.

Current State Lead Programs

Lead poisoning prevention activities at MDH are housed within the Division of Environmental Health. The Environmental Impacts Analysis Unit, in the Environmental Surveillance and Assessment Section, is responsible for lead-related surveillance activities and implements the Centers for Disease Control and Prevention (CDC)-funded Childhood Lead Poisoning Prevention program (CLPPP). The Asbestos/Lead Compliance Unit, in the Indoor Environments and Radiation Section, is responsible for assuring compliance with state rules and statutes dealing with lead hazards. Other state agencies dealing with lead or blood lead testing include the Pollution Control Agency, Agriculture, Occupational Safety and Health Administration, Natural Resources, Housing Finance Agency, Human Services, and Employment and Economic Development. Cities of the first class and counties also have duties with respect to lead risk assessment and case management.

We make an effort to provide the best possible service to Minnesota families whose children have possible lead-related health problems. We also strive to provide needed information about

lead issues to county-level health officials, physicians, organized health care providers, and other professionals responsible for preventing and managing lead risks in the most effective and efficient manner possible.

I. Surveillance Activities

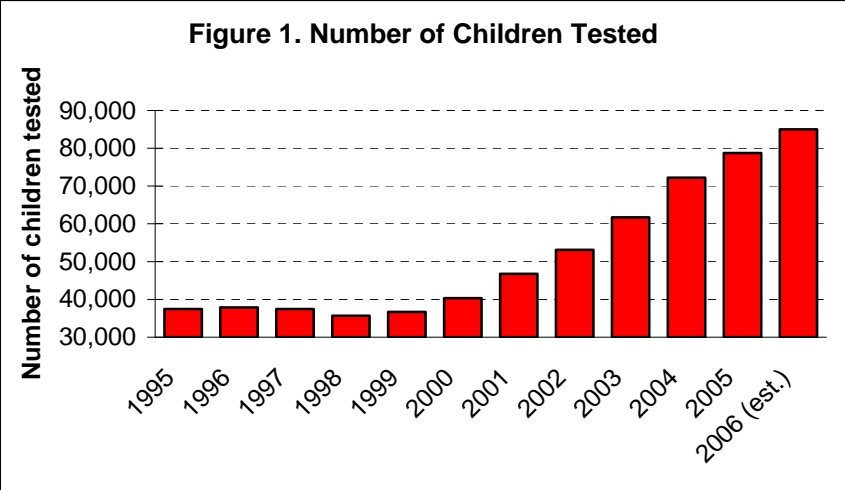
MDH maintains an extensive blood lead surveillance system for the purpose of monitoring trends in blood lead levels in adults and children in Minnesota. The data are maintained in an Oracle platform, which allows for high data security, and is compatible with other current and projected state agency systems for data transfer. As of January 1, 2007 the blood lead database contained 855,009 records of blood lead test results from 578,814 individual Minnesota residents dating back to 1992. 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.

It is impossible to draw specific conclusions regarding the actual rates of lead poisoning in Minnesota based upon these data. Since there is no universal testing among children, those tested are not representative of the entire population. Additionally, a direct comparison of numbers of children with elevated blood lead levels between counties is not appropriate because the counties have different rates of testing. However, it is possible to use the data to identify trends in screening practices from year to year, compare the total number of EBLLs reported to MDH over time, and characterize the population currently being screened. Section **I. Surveillance Activities** presents data on lead poisoning in children less than six years old and adults, an overview of projects targeted to at-risk populations, and MDH statewide lead guidance. Further surveillance data are available in the 2005 Surveillance Report (**Appendix B**). The 2006 Surveillance Report will not be available until June 2007 due to the time lag in reporting of blood lead tests for 2006.

A. Elevated Blood Lead Levels (EBLLs) in Minnesota

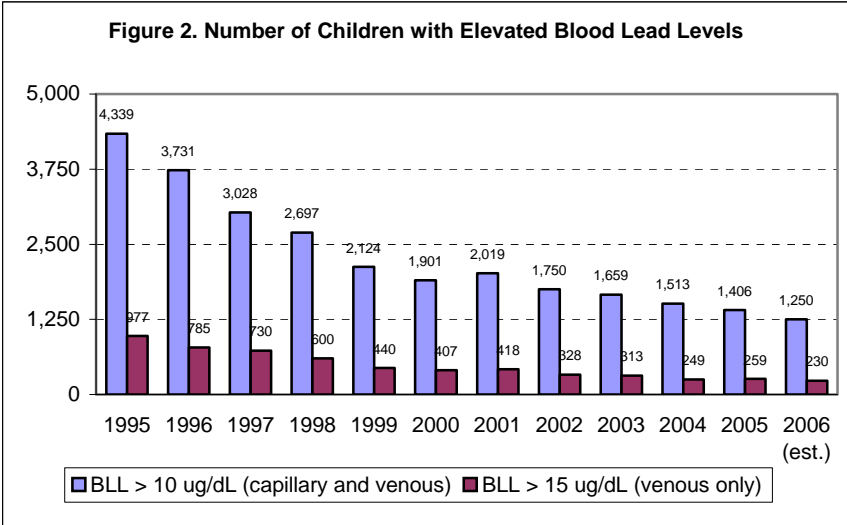
Blood Lead Levels in Children

Figure 1 compares the number of children less than six years old tested in past years and gives some indication of how screening practices may have changed. The number of blood lead tests reported statewide was fewest in 1998 and has been increasing since that year. Numbers for 2006 are estimated (based on the first six months of the year) due to a time lag in reporting from the analytical labs to MDH for tests results of less than 10 micrograms per deciliter of whole blood ($\mu\text{g}/\text{dL}$; i.e. not considered “elevated”). It can often take several months for these data to be reported and processed into the MDH surveillance database. The Lead Program is addressing this issue by promoting use of electronic reporting formats, which allow for greater efficiency in handling large numbers of records. With the addition of Mayo Clinic in 2006 we now receive 67 percent of reports electronically, up from 27 percent in 1997.



Since not all Minnesota children have a high risk for lead exposure, targeted screening is currently recommended for most areas of the state rather than universal screening. The goal is to test all children at risk for exposure to lead. Therefore, because not all Minnesota children are exposed to lead risk factors, the optimal level of screening will be less than 100 %.

The trends in the number of EBLL cases (e.g. tests greater than 10 µg/dL) in Minnesota children may also be compared across years (Figure 2). The general downward trend shown in Figure 2 is consistent with national trends, but should not be used to conclude that lead is no longer a significant public health threat in Minnesota. Numbers are also shown for venous blood lead levels greater than or equal to 15 µg/dL, which is the level at which an environmental assessment is required to identify and mitigate lead exposure. The values shown for 1995 – 2005 are different from those presented in past reports, which used 20 µg/dL as the environmental assessment threshold. Approximately 64% of the reports above 15 µg/dL in Minnesota come from Minneapolis and St. Paul, indicating that in specific areas of the state lead poisoning continues to be a major public health problem. For this reason, the MDH Childhood Blood Lead screening guidelines recommend universal testing in the cities of Minneapolis and St. Paul. While the rate of lead testing increased during the 1999 - 2006 period, the number of EBLL



cases slowly declined. Although these data are difficult to interpret due to many confounding factors, the downward trend for EBLs may indicate that the amount of lead exposure is declining in Minnesota.

Rate of follow-up testing for children with EBLs

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 (see case management guidelines below), but the maximum time is 90 days for any child with a blood lead level of 10 µg/dL or greater. Of the 1,406 Minnesota children identified with EBLs in 2005, 990 (70%) received a follow-up test. Of these, 696 (50% of the total children with EBLs) were retested within 90 days of their initial EBL. Working to improve this low follow-up rate would best serve children with EBLs by reducing and mitigating the effects of their lead exposure. This will take the combined efforts of providers, case managers and the MDH Lead Program.

Blood Lead Levels in Adults

Minnesota's Adult Blood Lead Epidemiology and Surveillance (ABLES) program began identifying eligible adults on January 1, 1998. Lead sources are identified for all adults with venous blood lead levels of 25 µg/dL or greater in the surveillance system. Lead testing data reported to MDH for adults in Minnesota are presented in Table 1.

Table 1: Minnesota Residents 18 Years or Older Reporting a Blood Lead Test

Year	# of Reports	# of Individuals	Range of Reported Results
2005	8,663	7,560	0.0 to 118.0 µg/dL
2006	8,906	7,827	<1 to 73 µg/dL

Table 2: Minnesota Adults with Elevated Blood Lead Levels in 2005 by Exposure Category

Occupation/Exposure	Adults with Levels of 25+ µg/dL	Adults with Levels of 40+ µg/dL
Painting	1	0
Construction and Demolition	5	1
Fishing Tackle Manufacturing	9	0
Lead Smelting	49	2
Brass Foundry	3	0
Gun Range Maintenance	3	0
Stained Glass	4	0
Ammunition Manufacturing	1	0
Previous Exposure in Another State	0	1
Unknown	14	0
Total	90	4

There were 90 adults with Blood Lead Levels (BLLs) of 25 µg/dL or greater reported to MDH in 2005, and there were four adults with reported levels greater than 40 µg/dL. Through clinic contacts and laboratory reports, information on occupation was obtained for most of these patients. Occupations and hobbies contributing to lead exposure in 2005 are listed in Table 2. Adult blood lead data for 2006 will be analyzed in spring of 2007.

B. Studies and Projects in At-Risk Populations

1. Lead in Children Enrolled in Medicaid

National studies (U.S. GAO, 1998, Pub. No. GAO/HEHS-98-78; Pirkle et al. 1998, *Env. Health Persp.* 106:745-750) have shown that Medicaid-enrolled children are three times more likely to have elevated blood lead levels (above 10 µg/dL) than non-enrolled children (9% compared to 3%). 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. In Minnesota, testing of children enrolled in Minnesota Health Care Programs (MHCP) is under the jurisdiction of the Minnesota Department of Human Services (DHS). Despite the testing requirement, nationally only about 19% of Medicaid-enrolled children ages one to five are tested nationwide.

The MDH Lead Program and DHS released a joint study in 2002. It showed that children enrolled in MHCP had higher lead poisoning rates. Of those tested between 1995 and 1998 and found to have EBLLs, 72% were enrolled in MHCP. MHCP children were nearly twice as likely as non-MHCP children to have EBLLs (9.8% compared to 5%). However, despite their high-risk status, only 13.3% of MHCP children were tested for blood lead in 1998.

Analysis of 1999-2003 data for Minnesota children enrolled in Medicaid funded programs have been published in Minnesota Medicine (**Appendix C**). This report provided good news about testing in the Medicaid-enrolled population. Unlike the 1995-1998 period, the rate of blood lead testing in the total population of 9- to 30-month-old children enrolled in Minnesota Health Care Programs (MHCP) increased from 17% to 29% between 1999 and 2003. The rate of elevated blood lead levels (EBLLs) (10 µg/dL or greater) in tested children declined from 6% in 1999 to 2.7% in 2003. However, there remained a two-fold higher rate of elevated blood lead levels in MHCP children in 2003 (3.4% and 1.5% for MHCP and non- MHCP children, respectively). The percentage of children with elevated blood lead levels who were re-tested within three months increased from 39% in 1999 to 50% in 2003. To help sustain these gains, DHS continues to provide an incentive for health plans that complete 10 health measures in children, one of which is blood lead testing. A \$30 incentive is provided for every child above the previous year's level of testing. DHS also includes a blood lead screening among the performance goals that must be met for health plans to receive the 5% of their contract that is withheld at the beginning of each contract. The Minnesota Medicine article is also available at www.mmaonline.net/publications/MNMed2006/May/clinical-zabel.htm in the May 2006, Volume 86 issue.

In conclusion, national research (U.S. GAO, 1998, Pub. No. GAO/HEHS-98-78; Pirkle et al. 1998, *Env. Health Persp.* 106:745-750) shows that Medicaid-enrolled children are a high-risk population. Data indicate that the same is true for Medicaid-enrolled children in Minnesota, and

that this population is under-tested. Blood lead testing of MHCP 1- and 2-year-olds during EPSDT well-child visits is necessary in order to identify lead-poisoned children and to comply with federal testing requirements. The health care providers of all Minnesota children must continue to be informed of the importance of timely follow-up testing to ensure that interventions are successful and that children's BLLs are reduced to safe levels.

2. Fatal Lead Poisoning in a Minnesota Child

A four-year-old Minneapolis child died February 22, 2006 of lead poisoning after swallowing a metal charm containing very high levels of lead. This is the first documented death of a child from lead poisoning in Minnesota. This is a very rare occurrence, not only in Minnesota but nationwide. The child was first brought to the hospital with vomiting on February 16, returned and was hospitalized on February 18, and was tested for lead only after a metal object was seen on abdominal x-ray. The child's blood lead level was 180 µg/dL. MDH state guidelines specify a blood lead of 60 µg/dL or greater to be a medical emergency.

Laboratory testing showed that the heart-shaped charm found in the child's stomach contained 99 percent lead. A similar heart-shaped charm attached to a bracelet sold with children's shoes obtained and tested by the Minneapolis Department of Regulatory Services contained 67 percent lead. The Consumer Products Safety Commission (CPSC) allows no more than 0.06 percent lead in children's jewelry sold in the United States. The CPSC and manufacturer issued a voluntary recall of the charms. Consumers who purchased shoes with heart-shaped metallic charm bracelets should keep the charm bracelet away from children, especially infants and toddlers who often place items in their mouths. The charm bracelet should be disposed of by bringing it to a household hazardous waste collection site. Health care providers should consider lead poisoning as a possible diagnosis if young children present with symptoms of increased intracranial pressure, unexplained gastric symptoms, and a history of eating or mouthing non-food objects.

Childhood lead poisoning is still a serious public health problem, but by far the greatest source of exposure in Minnesota is deteriorating lead paint or lead dust in housing built before 1978. Lead poisoning resulting from consumer products is rarely reported. However, the CPSC has issued previous product recalls for several types of children's toys or jewelry that have been manufactured with high lead content. The CPSC has also established a policy on lead in children's metal jewelry. Information on the CPSC lead in children's jewelry policy and recalls are available at the MDH Web site, www.health.state.mn.us/divs/eh/lead.

3. Lead in Refugees

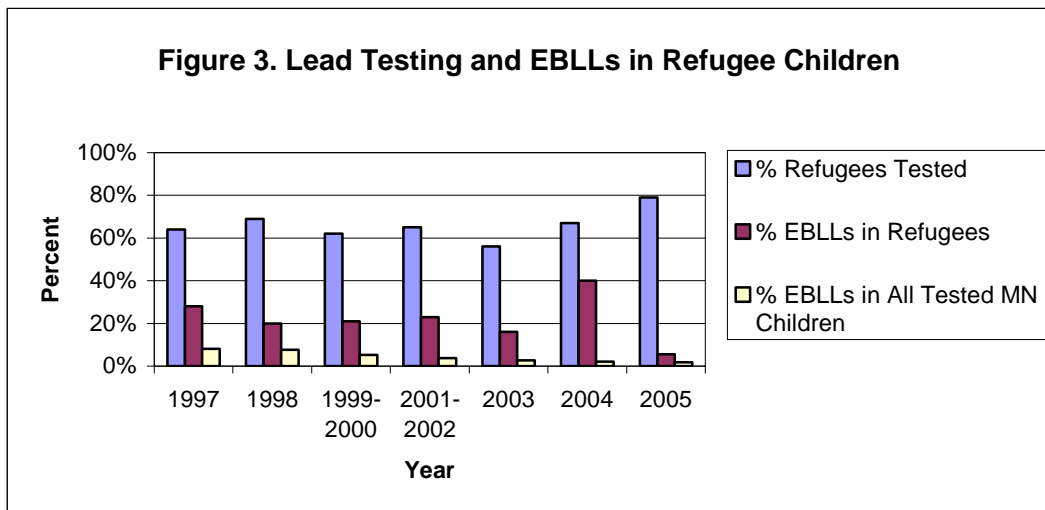
Refugees are a population at high risk for lead poisoning. The Division of Infectious Disease Epidemiology, Prevention, and Control at MDH collects demographic data on all refugees entering the state who receive an initial health screening. The 2004 and 2005 refugee data are the most recent information available for matching. Refugee children in Minnesota comprise a wide range of ethnic origins, as shown in Table 3. Of all refugee children entering Minnesota in 2005, 88 percent received health screening.

Table 3: Number and Percent of Refugee Children (0-72 Months) Tested and with Elevated Blood Lead Levels from 2004-2005 by Country of Origin

Ethnicity/ Region of Origin	# of Refugee Children*	# of Children Tested for Lead		Of Children Tested for Lead, # Tested Within Three Months of Arrival		Children w/Elevated Level (10 µg/dL)	
				#	%	#	%
Somalia	200	133	67%	127	95%	9	6.8%
Liberia	81	47	58%	45	96%	4	8.5%
Other Africa	52	32	62%	27	84%	4	12.5%
Burma	42	36	86%	35	97%	3	8.3%
Hmong	1,069	924	86%	911	99%	33	3.6%
Other SE Asia	4	2	50%	2	100%	0	0%
Former USSR	76	48	63%	46	96%	0	0%
Total	1,724	1,222	71%	1,193	98%	53	4.3%

*Data obtained from MDH Infectious Disease Epidemiology, Prevention and Control Division

Blood lead tests were also matched to refugee information in past years (Fig. 3). The rate of testing in refugee children remained between 56% and 69% from 1998 through 2004. This percentage increased significantly in 2005. For the total refugee population who entered the country in 2005, 79% of refugee children were tested for blood lead, and 98% of those tested were tested within three months of arrival. Of the children seen for an initial health screen, 85% were tested for blood lead. The rate of elevated blood lead levels for refugees was still approximately three times the rate for blood lead tests statewide in 2005 (1.8%). The decline in the rate of elevated blood lead levels in refugees in 2004 and 2005 may be due to the large increase in the number of Hmong refugees, who have historically lower rates of elevated blood lead levels than African refugees.



In early 2005, CDC issued new guidelines for blood lead testing in refugee children. These guidelines include lead testing for refugee children up through age 15, a repeat blood lead test after three to six months in the U.S., blood chemistry for iron status, use of pediatric multivitamins, and educational efforts for providers and families. These new guidelines were issued in response to a number of lead poisoning cases, including one death, in refugees in New Hampshire. In many of those cases, the children arrived with low lead levels, but were exposed to lead in the old homes in which they resided and absorbed this lead easily due to their poor nutritional status.

In response to these new guidelines, MDH Lead Program staff met with MDH Refugee Health Program staff to determine the feasibility of updating the recommendations for blood lead testing in refugees and to help raise awareness of educational materials in Somali. As a result of these meetings, MDH staff (both Refugee Health and CLPPP) decided to collaborate with the refugee health screening clinic at the St. Paul – Ramsey County Department of Public Health to conduct a pilot study to determine the feasibility of these recommendations. Some of the specific activities that occurred through this project were: testing blood lead levels in new refugee children aged 6 months through 15 years, performing complete blood count and blood chemistry for iron status, and obtaining follow-up lead tests on refugee children after three to six months in the U.S., even though their initial test was below the level of concern. This was to make sure their lead levels did not rise due to poor nutritional status when entering the country combined with lead exposure in the U.S. St. Paul - Ramsey Department of Public Health nurses followed up with parents and physicians on any test results that were of concern. Of the 150 children seen at the clinic, all received initial blood lead testing and 140 were tested a second time after living in the U.S. Initial EBLs were observed in five of the children screened, and only one child had a low initial test with an elevated second test. A summary of findings is in **Appendix D**.

4. High-Intensity Targeted Screening (HITS) Projects

St. Paul

In fall 2005 the MN CLPPP prepared a contract with the St. Paul - Ramsey County Health Department to complete an intensive screening project for high-risk children. The project targeted four WIC clinics that are home to a significant percentage of families eligible for Medicaid services. One of the clinics (La Clinica) contains a primarily Hispanic population. At these clinics, St. Paul - Ramsey County staff performed blood lead sampling and family education, worked with families to obtain follow-up services for children with EBLs, and referred children to the HUD lead hazard reduction program (St. Paul - Ramsey County has an ongoing HUD grant for lead hazard reduction). A total of 907 children were tested during the project. Only three children had BLLs of 10 µg/dL or greater, for an EBL rate of 0.3%. A full report is provided in **Appendix E**.

Hennepin County

In fall 2005 the MN CLPPP prepared a contract with the Health Protection Division (HPD) of the Hennepin County Department of Human Services and Public Health to complete an intensive

screening project for high-risk children in Hennepin County, including Minneapolis. HPD hired a bilingual staff member to draw capillary blood specimens at WIC clinics throughout the county. This staff member received training from the MDH State Case Monitor in use of filter paper blood lead testing, and also offered lead education directly to parents and guardians. Blood lead testing was performed at seven WIC clinics in Hennepin County, including four clinics in Minneapolis high-risk neighborhoods. A total of 1,358 children and pregnant women were tested. Four of those tested had BLLs of 10 µg/dL or greater, for an EBLL rate of 0.3%. A full report is provided in **Appendix F**.

The HITS projects described above observed a lower rate of elevated blood lead levels in the children attending WIC clinics in St. Paul and Minneapolis compared with children statewide. In combination with previous findings from HITS projects in four counties of Greater Minnesota, the findings from the above projects suggest that the population of children attending WIC clinics in Minnesota are not at higher risk of elevated blood lead levels than the general population of Minnesota children. However, individual WIC clinics may wish to continue testing children for lead as a way to reach an underserved population.

C. Screening and Case Management

1. Blood Lead Guidelines

MDH has developed a set of four guidelines for lead: Blood Lead Screening, Childhood Blood Lead Case Management, Childhood Blood Lead Clinical Treatment, and Blood Lead Screening for Pregnant Women. These guidelines were developed by collaborative workgroups and have been endorsed by a range of professional health organizations. All four guidelines may be found at the MDH Web site at www.health.state.mn.us/divs/eh/lead and the single page versions are include in **Appendix G**. In addition to the guidelines from MDH, local public health agencies may review risk factors for elevated blood lead and the available blood lead screening data to assess concerns about lead poisoning in their areas. This will allow local agencies to develop treatment guidelines tailored to the risks in their areas. Factors to be considered locally are the age and condition of housing stock, the size of the population, screening practices of the area health care providers, occupational and community sources of lead, socio-economic status of the population and other unique risk factors in the community. The assessment should address the amount of screening that takes place relative to the size of the childhood population, the relative number of elevated cases that are found, and the use of other screening tools, such as questionnaires, to identify risk factors.

Blood Lead Screening Guidelines

The MDH Blood Lead Screening Guidelines direct physicians to order blood lead tests for 1) children residing in specific geographic areas that have a high rate of cases of elevated blood lead; and 2) children matching specific demographic groups that have a high rate 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. It 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 MDH Childhood Blood Lead Case Management Guidelines are intended to serve as minimum case management guidelines for providing services to children with EBLLs. They were developed to establish standardized, minimum levels of care. However, those counties that have greater resources available may wish to take a more rigorous approach to case management. The objective is to ensure that a qualified case manager is available to oversee the treatment and recovery of each child, and to ensure that steps are taken to prevent further exposure of the child to potential sources of lead. It works in concert with the MDH Blood Lead Screening Guidelines for Minnesota to identify and manage lead exposure in children. Appropriate steps are presented for both capillary and venous test results.

In 2005, legislation was enacted to lower the environmental intervention blood lead level to 15 µg/dL from 20 µg/dL or two tests of 15-19 µg/dL. As a result the case management guidelines were not consistent because they recommend additional case management activities at a level of 20 µg/dL rather than 15. The CLPPP State Case Monitor led a meeting of local public health nurses and other stakeholders to perform a review of the MDH Blood Lead Case Management Guidelines. Recommendations from this meeting regarding childhood blood lead levels below 10 µg/dL and the new environmental intervention level of 15 µg/dL were incorporated into an evaluation and update of the case management guidelines. The revised guidelines were distributed to all local public health case managers and posted on MDH's website in June 2006.

Childhood Blood Lead Clinical Treatment Guidelines

The Childhood Blood Lead Clinical Treatment Guidelines were designed for physicians to assist them in treating a patient with an EBLL, thus ensuring that all EBLL cases in Minnesota receive a consistent level of care. An advisory group of physicians provided online feedback on issues relating to blood lead levels of 5-10 µg/dL, as well as follow-up on the use of two elevated capillary tests as confirmation of blood lead status. Although the current "actionable" level for lead case management and clinical treatment activities in Minnesota is 10 µg/dL, the CLPPP strongly believes that families with documented lead exposures below this threshold should receive guidance from public health and medical professionals. Clinical treatment guidelines for blood lead levels less than 10 µg/dL were reviewed by a group of five physicians during 2005. Their consensus was that education should be provided and encouraged for children with blood lead levels of 5-10 µg/dL, but further clinical treatment is not required.

Blood Lead Screening Guidelines for Pregnant Women in Minnesota

In June 2004, MDH developed Blood Lead Screening Guidelines for Pregnant Women in Minnesota. They are designed for Ob/Gyn physicians, nurse practitioners, and midwives to assist them in screening and treating pregnant women for elevated blood lead levels, thus ensuring that both the women and their children receive intervention to reduce their lead exposure.

Prenatal lead exposure is of concern because it may have an effect on intellectual development

(Schnaas et al. 2006, *Env. Health Persp.* 114:791-797). In addition to fetal risk, lead may be a risk to the mother; it has been shown to be related to cardiovascular disease (Menke et al., *Circulation*, Sept. 2006). Lead is transferred from mother to the fetus because the placenta is a weak barrier to the passage of lead. Therefore, it may be assumed that fetal blood contains the same concentration of lead as maternal blood. The CDC and MDH consider 10 µg/dL and above to be an elevated blood lead level for pregnant women as well as children.

In many cases, high levels of lead in pregnant women arise from maternal occupational exposure. However, other lead exposures may occur, such as: remodeling a home containing lead paint that allows lead dust to become airborne and inhaled; a family member's occupation or hobby resulting in "take-home" lead; using non-commercial home remedies or cosmetics that contain lead; using non-commercial glazed pottery for cooking; and pica behavior of the mother, such as eating soil or pieces of clay pots. There may also be exposure of the fetus to lead coming out of the mother's bones. This may arise from long-term previous exposures of the mother even though lead exposure is not happening during the pregnancy. Lead may come out of maternal bones faster during pregnancy and lactation because of the mother and fetus's need for calcium. A diet rich in iron and calcium may help reduce absorption of lead during pregnancy.

Not every woman is at risk for lead exposure, so a risk screening questionnaire should be used to decide when to test a pregnant, or potentially pregnant, woman for lead. The MDH Blood Lead Screening Guidelines for Pregnant Women were highlighted at a national lead meeting in 2006 as an example for other states seeking to address the issue.

2. Case Management

The State Case Monitor provides technical assistance to all local public health agencies in the state of Minnesota to ensure case management services for children with elevated blood lead. Specifically, the state case monitor's duties include:

- Assuring case management activities and follow-up testing for children and pregnant women that have EBLLS above 10 µg/dL are performed consistent with MDH guidelines;
- 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; and
- Holding educational workshops to educate medical professionals about the Minnesota guidelines for Screening, Treatment, and Case Management.

Case monitor activities have helped clinicians improve their adherence to Minnesota Guideline procedures. A reporting and tracking form, and case monitoring database were developed in collaboration with local agencies. This allows for complete records on all medical cases and facilitates communication. One key issue resolved was the timely reporting back to local agencies when the follow-up test to an elevated capillary test is non-elevated (e.g. venous result less than 10 µg/dL). In addition, the process for sending notice letters to local agencies when an EBLL case occurs in their jurisdiction was automated in 2006. These steps assist in reducing caseloads and helped give the local agencies the most current information available.

D. Legislative Activities

The 2004 Minnesota Legislature passed a statute mandating a study looking at: (1) how to promote and encourage primary prevention; (2) how to ensure that all children at risk are tested; (3) whether or not to reduce the state mandatory intervention from 20 to ten micrograms of lead per deciliter of whole blood and if a reduction is not recommended whether to develop guidelines on intervention for children with blood levels between ten and 20 micrograms of lead per deciliter of whole blood; (4) how to provide incentives and funding support to property owners for lead hazard prevention and reduction; and (5) ways to provide resources for local jurisdictions to conduct outreach. Based on the final report to the legislature from that 2004 study, the 2005 Minnesota legislature lowered the mandatory environmental intervention blood lead level to a single venous result of 15 µg/dL. Prior to that change, the level requiring a home investigation was a single venous test of 20 µg/dL or two venous tests of 15-19.9 µg/dL at least 90 days apart. The law became effective August 1, 2005.

Lead program staff are regularly called upon to provide data, background, and technical perspective on bills addressing lead poisoning.

II. Compliance Activities

The 2000 U.S. Census estimates that Minnesota has just over 2 million housing units, with over 560,000 of those units built before 1950. Homes built prior to 1950 are the most likely to contain the highest levels of leaded paint. The MDH Lead Compliance Program ensures the public receives safe and proper lead hazard reduction, evaluation, and analytical services by requiring those services be conducted according to state regulations, and by trained and licensed personnel, and certified firms. The Lead Compliance Program was authorized by the U.S. Environmental Protection Agency in September 1999 to administer and enforce the lead accreditation and compliance program in Minnesota. The program licenses lead risk assessors, lead inspectors, lead workers, lead supervisors, lead project designers, and certifies firms who conduct regulated lead work. In addition, the Lead Compliance Program approves initial and refresher lead training courses for these disciplines and registers lead sampling technicians.

The goal of regulation and enforcement in the MDH lead program is to limit lead exposure for children with EBLs and their families, and increase their understanding of lead-related health hazards. This regulatory role contributes to the core public health function of assurance - that is, the process of assuring that populations are having their basic health needs met.

The number of firms certified to perform regulated lead work in Minnesota continues to be stable. The number of residential lead hazard reduction notices submitted to MDH decreased slightly over the past two years.

A. Compliance Monitoring

MDH is the primary agency for lead control and for regulating lead-related activities in Minnesota. MDH provides leadership on lead control program issues and works closely with federal, state, and local agencies, and other interested parties. Compliance monitoring involves

efforts by the lead program to monitor and evaluate individuals and companies as they perform regulated lead work.

A key objective of the lead compliance program is to make sure that potential environmental sources of lead exposure for persons with lead poisoning are properly addressed. The medical needs of the lead poisoned person are addressed through the collaborative efforts of surveillance staff, health care providers and case managers. Compliance monitoring involves efforts by the lead program to identify actual and potential environmental sources of lead exposure for persons with EBLs.

Currently, Minnesota has 132 certified lead firms. This is a slight increase from the number of certified firms reported in 2005. The total number of firms includes 23 firms that conduct lead inspections, risk assessments and project design. The other 109 firms conduct actual lead reduction services. The 2005 legislative report indicated a shortage of certified firms in greater Minnesota. It appears that this shortage has greatly diminished. Of the 132 certified lead firms, 58 percent of the certified firms in the state are located in greater Minnesota. Since the number of certified firms has not increased dramatically within the state, it appears that some Twin Cities firms have decided not to continue their certification and additional firms in greater Minnesota have become certified.

Table 4 reflects the current number of lead licensed individuals as of December 2006. The table also includes the number of registered lead sampling technicians. These licenses are renewed annually if the individuals want to continue conducting regulated lead work. Registered lead sampling technicians were not reported in the 2005 legislative report because no one registered with the state until March of 2005.

Table 4: Total Number of Licenses Issued Across Minnesota as of December 2006

License issued	Total in MN
Inspector	1
Project Designer	6
Risk Assessor	153
Supervisor	223
Worker	119
Lead Sampling Technicians	32

The number of lead inspectors and workers has increased by 1 and 18, respectively when compared with the December 2004 data in the 2005 legislative report. Whereas the number of lead risk assessors, supervisors, and project designers has declined by 25, 37 and 6, respectively. Most individuals choose to become licensed as risk assessors rather than inspectors because of the limited services the inspector category can provide.

B. Special Projects

MDH continues to work on improving the capacity of its lead compliance program through the Environmental Protection Agency (EPA) Special Projects for Compliance Assistance Grant. This

grant provided MDH the needed financial support to develop an interactive database with online access to training course providers by certified firms and licensed individuals who perform regulated lead work.

The EPA regulates lead as part of Section 406(b) under Title IV of the Toxic Substances Control Act (TSCA). Section 406(b) is also known as the Pre-Renovation Lead Information Rule or the PRE. In general, the PRE requires contractors to provide a lead informational pamphlet (notice) to occupants and property owners in housing built prior to 1978 prior to conducting any renovation activities. The contractors are required to document that the notice was provided. EPA continues to encourage state programs to develop requirements similar to that of the PRE in order to become authorized programs under EPA and administer the requirements at the state level rather than at the federal level. EPA's ability to actively investigate compliance with the PRE is limited by distance and sheer number of affected parties.

In September 2006, MDH assisted EPA in promoting compliance with the PRE by mailing out approximately 15,000 brochures to licensed contractors in the state. The brochure referred the contractors to the department's website (<http://www.health.state.mn.us/divs/eh/lead>) for additional resources and information and also offered a CD that contained all forms, fact sheets, and publications needed to comply with the PRE requirements. Approximately 180 companies have requested the CD.

In December 2006, MDH submitted a proposal to EPA for a compliance pilot project under the EPA Cooperative Agreement and Enforcement Grant program. At the time of this report, it is still being reviewed and assessed by EPA. MDH activities under this pilot project would include:

- Continuing to make available educational materials and training opportunities for the PRE within the state to general building contractors/operative builders (licensed by the Minnesota Department of Commerce), special trade contractors, commercial building trades people, property management firms of multi-family housing, and affected landlords.
- Responding to questions about the PRE.
- Training at least two staff for purposes of conducting PRE investigations within the state through the EPA's investigator credentialing program.
- Responding to PRE complaints within the state using designated compliance tools to determine compliance with the PRE requirements.
- Actively investigate PRE compliance in Austin and Virginia, Minnesota or two equally sized cities within the state within the current grant activity.
- Compiling data of activities and forward to EPA as part of existing grant cycle.
- Communicating on a regular basis with EPA compliance staff on the status of the pilot project.

This federal funding, if received, would benefit MDH in a number of ways, including enhancing our ability to provide additional framework for developing the PRE within the state, facilitate timely response to complaints, develop a more educated construction/renovation work force on issues of lead, and help us work towards a more educated consumer of renovation services on issues of lead.

C. Training Courses

For an individual to be licensed in Minnesota, they must successfully complete a training course provided by an approved training course provider. Currently five providers offer Lead Hazard Reduction training in Minnesota (www.health.state.mn.us/divs/eh/lead/prof/trainers.htm). Providers must furnish documentation that they employ a training manager and a principal instructor for each of the courses they offer. Both the training manager and principal instructor must meet experience, training and education requirements established in Minnesota Rules. The MDH lead compliance staff regularly review the training course content and ensure that it contains all the required topics.

D. Legislative Activities

As described above in the Surveillance section, the 2005 Minnesota legislature lowered the mandatory environmental intervention blood lead level to a single venous result of 15 µg/dL. Prior to that change, the level requiring a home investigation was a single venous test of 20 µg/dL or two venous tests of 15-19.9 µg/dL at least 90 days apart.

E. MDH Compliance Inspections

MDH monitors firms and individuals performing regulated lead work. This is done by verifying that certified firms are employing MDH-licensed individuals to perform regulated lead work in affected property (e.g., single-family residences, multi-family properties, or child-occupied facilities) through both notices and inspections. Non-compliance is managed according to the Health Enforcement Consolidation Act (MS 144.989 to 144.993). MDH also provides technical assistance to the regulated community through information on lead hazard reduction and compliance issues observed during inspections.

Table 5 reflects the number of lead abatement notices submitted to MDH, the number of inspections conducted by MDH and the number of project sites where enforcement actions were taken against certified lead firms and licensed individuals. Lead abatement notices are required when the “intent” of the work is lead abatement. MDH conducts inspections of lead abatement projects based on the notices submitted by lead certified firms. The numbers reflected in this table are based on the Environmental Protection Agency’s (EPA) fiscal cycle years 2005 and 2006. A cycle year runs from October to September. Therefore, 2005 cycle year is for October 2004 to September 2005, and 2006 cycle year is for October 2005 to September 2006.

Table 5: Number of Lead Notices and Compliance Activities for Fiscal Cycle 2005 and 2006

Item	2005	2006
Number of Lead Notices	52	166
Number of MDH Inspections	28	22
Number of MDH Audits	9	69
Number of Enforcement Cases	4	7

The number of lead notices per year had been declining up until fiscal cycle 2006. In 2006 the City of Minneapolis received a grant from the US Housing and Urban Development (HUD) to conduct lead hazard reduction and control on residential properties in Minneapolis. Because the intent of grant activity was designated as lead abatement, the two certified firms that were contracted by the city to conduct the lead hazard reduction work were required to notify per the Minnesota Lead Poisoning Prevention Act and Rules (MS 144.9505 and MR 4761.2580).

The number of MDH inspections is based on benchmarks defined in a work plan submitted and approved by EPA on an annual basis. The benchmark for both fiscal cycles was 35 inspections. The reduced number of inspection in FY 2005 (at 28 inspections) was due to the small number of notices submitted to MDH.

MDH also conducts audits of licensed risk assessors' risk assessment reports and licensed supervisors' lead hazard reduction reports. In fiscal year 2005, no enforcement was issued to any risk assessors or supervisors. MDH revised lead rules became effective on November 2004. Conducting the audits was a way for MDH to ensure that risk assessors and supervisors were preparing their reports as required by rule. In fiscal year 2006, two cases had enforcement issued for failing to notify MDH for regulated lead projects.

The remaining enforcement cases were based on lead hazard reduction project site inspections or complaints received by MDH. In fiscal year 2005, four cases included three violations of individuals failing to be properly licensed, two paperwork violations, and one work practice violation. In fiscal year 2006, the seven enforcement cases included four violations of failing to be properly licensed, one violation for failing to notify MDH of a regulated lead project, six violations for failing to have the proper paperwork at a project site or information within a risk assessor report, and one work practice violation.

III. Health Education and Outreach

The MDH Lead Program currently performs outreach and education activities for providers and the public through a variety of activities. A strong network has been forged through collaborative approaches to dealing with lead issues. Educational outreach has been conducted for numerous segments of professional and public groups through many types of meetings, and presentations. Public awareness of lead issues is further raised through National/Statewide events such as Lead Poisoning Awareness Week and federal requirements for home sellers to disclose information about lead hazards.

A. Networking

The development and implementation of effective lead poisoning prevention strategies is a collaborative activity. It requires strong partnerships between public health agencies, health care providers, housing agencies, non-profit organizations, and individual citizens. As part of a general effort to forge those partnerships, all lead program staff at MDH have assumed at least some responsibility for education and outreach activities, as part of their regular job duties.

The Minnesota Collaborative Lead Education and Assessment Network (M-CLEAN) continued to meet two times per year, bringing together statewide lead partners to assist with information sharing, provide program updates, and promote joint projects. For example, contacts fostered at an M-CLEAN meeting led to several federal lead grant applications for lead hazard reduction, lead education, healthy homes, and other issues.

Several staff from MDH assisted the City of Minneapolis and Hennepin County in the creation of their joint Minneapolis – Hennepin County Lead Testing Task Force. Although the task force was started in 1999, work continued in the current period through collaboration and subcommittee meetings. The primary goal of the task force is to have lead-safe children throughout Hennepin County and Minneapolis by increasing the availability of lead-safe housing.

In November 2006 MDH hosted a meeting of organizations receiving lead funding from the HUD. The goal of the meeting was to review grant status, goals, timelines and examine possible areas for collaboration in future applications. Attendees included the state Department of Employment and Economic Development (DEED), the City of Minneapolis, Hennepin County, St. Paul/Ramsey County Public Health, SRC, and MDH staff. Funding streams discussed included primarily Lead Hazard Control, Lead Hazard Reduction Demonstration, and Healthy Homes (all of these are HUD programs). Minnesota has been very successful in securing federal funding in this area in the past. Sustaining that funding will likely require a coordinated approach between agencies to ensure the best use of limited resources.

B. Outreach

MDH conducts outreach to both professional and public organizations. Young medical students and practicing physicians are exposed to lead issues and implications through grand rounds presentations, continuing medical education presentations, scientific conferences, and workshops on lead. The MDH lead program also works in collaboration with other MDH environmental health programs to offer educational programs and exhibits in a variety of venues, including home and garden shows, home improvement fairs, the Minnesota State Fair, and conferences dealing with children's health and education, housing and redevelopment issues, and other relevant issues and concerns.

MDH was contacted by the press for information on lead hazards from various sources including children's jewelry, holiday decorations, and imported candy. These requests were handled in addition to several general background information requests. All information requests were dealt with consistent to MDH guidelines.

One of the major partners of the MDH Lead Program is the Minneapolis-based Sustainable Resources Center (SRC). The SRC also operates the CLEARCorps (Community Lead Education and Reduction Corps; a federally funded "Ameri-Corps" organization) effort for Minnesota. SRC/CLEARCorps is currently contracted to do outreach services to rural areas and the Somali population and to perform targeted home cleaning and education services in coordination with local assessing agencies across the state. Rural outreach on lead education utilizes SRC/CLEARCorps relationships with Early Childhood Family Education (ECFE), daycares, and

other groups that work with families with young children. Somali outreach includes raising awareness of lead issues and capacity building for lead education and remediation. The CLEARCorps segment of the non-profit is equipped to help with primary prevention activities through lead hazard education and remediation activities. Swab team services are provided along with family education as a short-term primary prevention step to reduce lead exposure.

In September 2004, ECHO (Emergency and Community Health Outreach) launched a first-of-its-kind television series on Twin Cities Public Television (tpt) Channel 17. An estimated 1.2 million households in the Twin Cities Metro area and western Wisconsin are covered by the signal. Every month, tpt broadcasts a 20-minute segment (hosted by members from ethnic communities) in six languages: Hmong, Khmer, Lao, Somali, Spanish and Vietnamese. Since ECHO will broadcast live if a statewide crisis or emergency is underway, immigrant/refugee communities are familiar with the program and recognize its broadcasts as important to the health and safety of their families. ECHO is led by St. Paul-Ramsey County Public Health, Hennepin County Public Health, the Minnesota Department of Health, and other emergency preparedness agencies. In late 2005, the CLPPP contracted with ECHO to get lead poisoning prevention messages out to non-English speaking populations. The shows about lead were taped in July 2006 and were broadcast in October 2006. DVDs of the production are available for future use in education of non-English speaking populations. These productions are also available for viewing on ECHO's website at www.echominnesota.org.

Health Plan Workshops

During fall 2005, the CLPPP participated in a series of regional provider workshops along with staff from SRC/ClearCorps and sponsoring health plans. The health plans included Medicaid managed care providers UCare Minnesota, Medica, Metropolitan Health Plan, and HealthPartners. The workshops were held regionally to assure the best possible attendance by physicians and other health care providers in the area. The locations for the workshops were Detroit Lakes, Duluth, Minneapolis, Rochester, and St. Paul. The emphasis of the workshops was the federal requirement to test young children enrolled in Medicaid for blood lead. Learning objectives were developed for the workshops. A comprehensive packet of support materials was distributed during the meetings.

Overall, comments about the presentations were very positive. At the end of each workshop, small group discussions were held to discuss such issues as billing for Medicaid services, barriers to blood lead screening, and screening best practices. In response to the workshops, the health plan workgroup developed a packet of information that was mailed to workshop attendees. This packet included best practices, a description of issues related to on-site hand-held lead analyzers, a description of issues related to lead testing in the clinic, information on blood lead test billing practices, and a list of health plan contact information.

C. Internet Resources

The Lead Program maintains a web page through the MDH Internet site that provides a number of lead education materials for providers, regulated parties, and the general public (www.health.state.mn.us/divs/eh/lead). It contains information on hot topics (including current

data, projects and requirements), numerous fact sheets, a list of “frequently asked questions” and responses, all publications and reports (including guidelines for screening, case management, and clinical treatment in children, and screening of pregnant women), a downloadable version of a lead education workshop, and links to many external lead resources.

The Lead Program web-page shows how to sign up for an Email lead list serve that serves as a statewide clearinghouse for lead questions and information to local public health and private partners. This listserv location offers participants the ability to post information and discuss relevant issues about lead poisoning prevention within the state. MDH also posts relevant information to the discussion group and encourages other state groups or individuals to post and respond to information.

D. Promoting Lead Awareness

Efforts to raise awareness of lead poisoning have included national “Lead Poisoning Prevention Week,” which was held October 23– 29, 2005 and October 22-28, 2006. This time period was designated by key federal agencies that work most directly to prevent lead poisoning: CDC, EPA, and HUD. To support national lead week, the MDH lead program sought and obtained the endorsement and acknowledgement of this event in Minnesota by Governor Tim Pawlenty. In response, Governor Pawlenty signed a proclamation declaring the week of October 23-29, 2005 Minnesota Childhood Lead Poisoning Prevention Week (**Appendix H**). In addition, t-shirts displaying a lead-safe message for children were produced in collaboration with HUD funding and were distributed at a Lead Poisoning Prevention Week event at the Mall of America in Bloomington, MN in association with SRC.

Federal requirements promote awareness among homeowners and renters before they move into a new home. EPA and HUD both require sellers and leasers of pre-1978 housing to disclose the presence of known lead hazards, including lead-based paint. Sellers and leasers must also provide purchasers and lessees with any available records or reports with relevant information about such hazards. They must provide purchasers and lessees with the federally developed pamphlet “Protect Your Family From Lead In Your Home.” Lastly, sales and leasing contracts must include a Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards form. These requirements help ensure that families receive the necessary information to make informed decisions and protect their families from lead hazards when purchasing or leasing property. These forms and pamphlets are readily available from MDH at the Lead Program web site.

The annual surveillance report for 2005 for all local public health agencies was released on June 30, 2006 (**Appendix B**). The annual report is purposely prepared at the end of the fiscal year to include the most current data in the year-end analyses. The report included county-specific analyses of rates of screening and EBLLs, along with testing rates and rates of EBLLs in Minnesota’s high-risk populations, including refugee children and occupationally exposed adults. The full report and a cover letter were mailed to all local public health agencies each year.

Minnesota has one of the largest Hmong populations in the U.S., and in 2004 and 2005 the state welcomed approximately 5,000 new Hmong refugees from a refugee camp in Thailand. This has

created a need for accurate and up-to-date lead poisoning prevention information in Hmong. The state also has a significant Latino population; therefore two of the MDH CLPPP fact sheets (“Cleaning up Sources of Lead in the Home” and “Steps to Help Lower Your Child’s Blood Lead Level”) were translated into Hmong and Spanish. The translation process included back-translation and a community review to ensure accuracy of the information. The completed documents have been posted on the lead program web site (www.health.state.mn.us/divs/eh/lead) and an email notice was sent to all local public health agencies and other lead stakeholders in Minnesota. The CLPPP printed 1,000 copies for future distribution to local health agencies, local refugee resettlement agencies, and at educational events.

Policy Planning and Program Evaluation

The MDH Lead Program currently addresses all elements of a comprehensive state lead program. In addition to having sufficient legislative authority and staffing capacity to undertake current program activities, staff meet at regular intervals to assess service gaps and plan for ongoing activities. The capacity to address multiple aspects of lead poisoning prevention in Minnesota will contribute to the overall federal effort to eliminate childhood lead poisoning by 2010. The primary policy shift in the program over the past two years has been towards implementing primary prevention strategies (e.g. identifying and eliminating sources of lead before exposure occurs).

Quality control procedures have reduced errors and increased completeness in the reporting of testing data. Missing information such as the patient's date of birth, address, and the type of test used are obtained for all cases where the reported BLL is 10 µg/dL or greater. Each record is then reviewed for accuracy a second time, by a different member of the program staff before being entered into the permanent database. The completeness of the reporting data and the timeliness with which it is entered in the database are reviewed periodically. Results of this review process are shared with the reporting laboratories, and have contributed significantly to improvements in the quality of data submitted by the laboratories. Several manual quality control procedures were incorporated into the database when it was migrated into a new software platform in 2006. These included verification of key data fields (e.g. patient address, physician and clinic information), auto-fill of city and county based on zip code, and boundary warnings on test results. Additionally, analyzing labs are encouraged to send their information electronically. This reduces data entry errors and the time required for the data entry process.

2010 Elimination Planning

The CLPPP collaborated with a planning advisory work group during 2004 to develop a strategic plan to end childhood lead poisoning in Minnesota by 2010. This plan, which was endorsed by the Governor, is known as the Minnesota 2010 Childhood Lead Poisoning Elimination Plan. The CLPPP organized five subsets of the planning advisory work group during 2005 and 2006 to determine the feasibility of proposed activities for years three, four, and five of the plan, and to monitor the progress of ongoing activities. The groups consisted of ten or fewer representatives of organizations involved in each focal area. The work groups met in fall 2005 and winter and spring 2006 to monitor the elimination plan and to produce an updated plan (**Appendix A**).

The updated plan incorporated the new environmental intervention blood lead level of 15 µg/dL passed during the 2005 state legislative session. The 2010 plan was also reviewed and discussed at the October 6, 2005 and April 3, 2006 meetings of the MDH-sponsored Minnesota Collaborative Lead Education and Assessment Network (MCLEAN). Future meetings will allow collaborators to provide updates on the progress towards specific goals in the 2010 Elimination Plan.

Over the past two years there has been substantial progress in achieving the strategies laid out in the original Plan and in incorporating new ideas into the current Plan. This progress is evident in the following facts (see **Appendix A** for more detail):

- Of the 154 strategies listed in the 2004 version of the plan, implementation is now underway in all but 24. In Year 2005, implementation was underway in all but 61.
- There are 11 new strategies or initiatives in the 2006 version of the Plan that support overall lead elimination goals, but were not included in the 2004 version.
- Those projects successful in one jurisdiction have begun to be implemented in others.
- Cooperation among partners continues to build, with several joint or team projects underway, many of which link government agencies with nonprofits or geographically distinct agencies with one another.
- Initiatives among housing partners, such as the Minnesota Housing Finance Agency (MHFA) lead paint assessment policy and reimbursement for lead risk assessments, contribute to primary prevention in ways that are long-lasting.

Funding Status

State lead general funds are an important part of a larger public health effort to address lead poisoning in Minnesota. Overall program support sources are diverse but rely heavily on base state funding to help maintain capacity, both within MDH and with other partners in lead. The state's general fund allocates about \$300,000 annually to the program. These funds are used to help meet MDH statutory obligations and are a critical source of "matching" funds for federal grant applications.

The bulk of funding for the MDH lead program comes from federal sources via grants and cooperative agreements. The lead program has received funds for the last eleven years from CDC to maintain a CLPPP program, including blood lead surveillance activities. MDH received \$735,379 in Federal FY05 and \$603,857 in Federal FY06. The twelfth application will be submitted in February 2007. Although Minnesota has a very good reputation with federal funding agencies, this revenue stream must be revised annually to ensure alignment with federal priorities and must be regained every five years via a competitive grant application. The CLPPP award is anticipated to continue a gradual decline in funding, with a significant cut likely to come after 2010.

MDH has received Lead Cooperative Agreement and Enforcement grants from EPA since 1994. The funding amount has averaged about \$270,000 for each of the past two years. This funding has provided ongoing development and support for the infrastructure of the lead compliance program. As the program has developed, the requirements of the grant have shifted from program development to compliance assistance, compliance monitoring and enforcement. EPA

cannot guarantee that future funding will remain at current level but continues to work with all the region five state lead programs to ensure that they are informed of funding changes.

MDH completed and closed out an EPA special projects grant (TSCA Section 406b) on September 30, 2006. The total amount of the grant was \$111,835 over a four-year period. This was a one time funding source that was instrumental in expanding Minnesota's lead program activities by working towards the development of an educational program pursuant to Section 406(b) under Title IV of the Toxic Substances Control Act or the Pre-Renovation Education Rule that is currently overseen by EPA. This requires that residential contractors provide occupants of units they are to work on with an informational pamphlet prior to starting the renovation work.

The State Government Special Revenue Fund fee account has a flat revenue stream of about \$50,000 per year generated from accreditation and training permit fees. MDH regulates 132 certified firms and 534 licensed individuals. A small number of lead professionals are employed by local government (e.g. assessing agencies) and are exempt from credentialing fees.

The U.S. National Institutes of Safety and Health (NIOSH) has a purchase order agreement with MDH for approximately \$23,400 per year for quarterly data related to the Adult Blood Lead Epidemiology Surveillance Program. These funds allow MDH to: (1) put emphasis on collaboration and cooperation on lead surveillance issues, (2) maintain primary prevention activities for adults with EBLs, and (3) prevent "take-home lead" in children.

The Minnesota Department of Employment and Economic Development (DEED) currently has a HUD Lead Hazard Control Grant Program. The grant program target area was the non-entitlement area of Minnesota covered by the Small Cities Program, with additional focus on the five counties of the state identified as having a high lead poisoning risk for rural Minnesota (Beltrami, Otter Tail, Stearns, Blue Earth and Winona Counties). DEED contributed \$2,800,000 in local matching funds (Community Development Block Grant) to meet the requirements for submitting the application. The grant is slated to end on March 31, 2007 and has been successful in providing lead-based paint hazard control intervention services in 315 low-income privately owned housing units. One of the goals of the grant was to provide \$15,000 in lead hazard reduction work for each of 15 families (including residential daycare facilities) that have a child with an EBL. To date, 19 EBL cases have been completed.

This HUD grant was one of several made to jurisdictions throughout Minnesota to address lead-based paint hazards in older housing. The HUD grant to DEED provided funding for the training of various lead professions, and lead education and outreach efforts across Minnesota. It also contributed towards eliminating childhood lead poisoning in the State by 2010. Another outcome of the grant was linking up public health needs with housing resources at the local level.

The environmental health trends identified by lead surveillance and compliance activities will require a strong response with respect to assurance (e.g. compliance monitoring, case management) and policy/planning (e.g. primary prevention, provider/physician education). This will, in turn, require ongoing commitment from state general funds for these activities.

Future Directions

Future directions for the Minnesota Department of Health are largely determined by the requirements set by funding providers and the state legislature. CDC, which funds the Minnesota Childhood Lead Poisoning Prevention Program, has a federal plan to eliminate childhood lead poisoning by 2010. This will require outreach, surveillance, and follow-up activities in areas that have large numbers of children under six years old and have multiple risk factors for childhood lead poisoning. Primary prevention will be a key aspect of the ongoing federal strategies for lead and will need to be emphasized in future Minnesota efforts.

Another goal of CDC is to improve screening rates, information about screening rates, and follow-up services for children with Medicaid status. Screening rates for children with Medicaid status are lower than those for children without Medicaid status, even though federal law states that 1- and 2-year-olds should be screened for lead poisoning. CDC is encouraging states to link their state's Medicaid data with their statewide surveillance databases in order to determine testing rates for children with Medicaid status. MDH will continue to work with DHS, as funding allows, to gauge testing rates for the young Medicaid population in Minnesota.

Program staff are actively participating in activities to improve the recording and transfer of lead test data. Most large labs and clinics currently use some form of electronic data management. It is crucial that MDH continue to develop the capacity to interact with these data streams effectively so that transcription errors are minimized, and time saved. However, strict compliance with all data privacy limitations is also crucial.

U.S. EPA participates in the federal plan to eliminate childhood lead poisoning by 2010. Increasing education, compliance monitoring and enforcement of lead paint regulations continues to be a priority for the state as part of federal grant funding provided by EPA. Because the asbestos and lead compliance programs operate as a combined regulatory program within MDH, education, compliance monitoring and enforcement are done routinely. This is unique in comparison to other state programs within Region Five. MDH's staff is actively involved in public education, outreach, compliance assistance and monitoring, and responding to public inquiry regarding general indoor air, lead and asbestos issues. Compliance and administrative staff have the necessary training and skills to fully implement compliance and enforcement activities.

Health education is performed by all staff within the lead program using well established information sources and targeted outreach opportunities. As an interdisciplinary program, MDH lead staff will continue to generate unique and innovative approaches to institutional and scientific problems. These include forming cooperative workgroups to solicit input prior to generating guidelines, cooperating with other agencies to meet common goals, conducting research to address basic problems, and overseeing lead hazard reduction efforts to ensure complete and timely resolution of lead orders. This spirit of creativity will continue to be fostered, resulting in a program that is flexible, responsive, and well grounded in the core public health functions of assessment, assurance, and policy/planning.

Conclusions

Lead is a major, preventable pediatric environmental health risk. Children are particularly at risk from exposure to lead, with blood lead levels above 10 µg/dL considered elevated. Although lead is found throughout the environment, the major exposure pathway of public health concern for children is through deteriorated, lead-based paint.

The MDH blood lead surveillance database collects blood lead reports on all Minnesota residents. New state guidelines will help standardize screening practices and raise awareness of high-risk populations. The average blood lead level reported to MDH has been gradually declining, consistent with national trends. Diverse populations are targeted to help address public health disparities.

Compliance monitoring ensures that lead hazard reduction is completed consistent with state statutes and best public health practices. This involves working with assessing agencies and licensed lead workers to address exposure issues (e.g. lead paint removal). Training is provided, inspections performed, and assessments audited as needed to ensure that public health concerns are addressed. Health education is performed by all staff within the lead program using well-established information sources and targeted outreach opportunities.

As an interdisciplinary program, the lead staff are required to generate unique and innovative approaches to institutional and scientific problems. These include forming cooperative workgroups to solicit input prior to generating guidelines, cooperating with other agencies to meet common goals, conducting research to address basic problems, and overseeing lead hazard reduction efforts to ensure complete and timely resolution of lead orders. This spirit of creativity and initiative is fostered, resulting in a program that is flexible, responsive, and well grounded in the core public health functions of assessment, assurance, and policy/planning.

Appendices

- Appendix A: 2010 Lead Poisoning Elimination Plan for Minnesota
- Appendix B: 2005 Blood Lead Surveillance Report
- Appendix C: Medicaid Report for 1999-2003
- Appendix D: Refugee Lead Testing Project Report
- Appendix E: St. Paul High Intensity Targeted Screening (HITS) Project Report
- Appendix F: Hennepin County HITS Project Report
- Appendix G: Single-Page Summaries of Blood Lead Guidelines
- Appendix H: Proclamation declaring October 23-29, 2005 as Minnesota Childhood Lead Poisoning Prevention Week

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Appendix A

2010 Lead Poisoning Elimination Plan for Minnesota

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*State of Minnesota
Childhood Lead Poisoning
Elimination Plan Update*

July 2006

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State of Minnesota Childhood Lead Poisoning Elimination Plan Update

July 2006

For more information, contact:

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List of Acronyms

ACOG – American College of Obstetricians and Gynecologists
ALCU – Asbestos/Lead Compliance Unit
BOMA – Building Owners and Managers Association
CBO – Community-based organization
CDBG – Community Development Block Grant
CDC – U.S. Centers for Disease Control and Prevention
CFH – Minnesota Department of Health Community and Family Health Division
CLEARCorps – Minnesota Community Lead Education and Reduction Corps
CLPPP – Childhood Lead Poisoning Prevention Program (CDC grant to MDH)
CPSC – Consumer Products Safety Commission
C&TC – Child and Teen Check-up (Minnesota equivalent of federal EPSDT)
DEED – Minnesota Department of Employment and Economic Development
DHS – Minnesota Department of Human Services
EBLL – Elevated Blood Lead Level (defined by Minnesota statute as > 10 ug/dL)
EIA Unit – Minnesota Department of Health Environmental Impacts Analysis Unit
EPA – U.S. Environmental Protection Agency
GIS – Geographic Information System
GMDCA – Greater Minneapolis Day Care Association
HRA – Housing and Rehabilitation Authority (local housing jurisdiction)
HUD – U.S. Department of Housing and Urban Development
LHR – Lead hazard reduction
LSWP – Lead-safe work practices
MA – Medical Assistance (Minnesota equivalent of Medicaid)
MCDA – Minneapolis Community Development Agency
MDH – Minnesota Department of Health
MHFA – Minnesota Housing Finance Agency
MPCA – Minnesota Pollution Control Agency
MVNA – Minnesota Visiting Nurse Association
NAHRO – National Association of Housing and Redevelopment Officials
NPCA – National Paint and Coatings Association
NRP – Neighborhood Revitalization Program
OSHA – Occupational Safety and Health Agency
PHA – Public Housing Authority
PHN – Public health nurse
RPO – Rental property owner
SRC - Sustainable Resources Center
WIC – Women, Infants and Children (Supplemental Nutrition Programs)

Additional definitions for lead in Minnesota can be found in statute (Minn. Stat. 144.9501) and in the MDH Childhood Blood Lead Case Management Guidelines for Minnesota at www.health.state.mn.us/divs/eh/lead.

The 2010 Childhood Lead Poisoning Elimination Plan Update Advisory Subgroup Members

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Introduction

Although lead poisoning is preventable and rates are declining in Minnesota, children living in substandard, pre-1950 housing continue to be disproportionately affected by lead. The Minnesota Department of Health (MDH) Childhood Lead Poisoning Prevention Program (CLPPP) developed a plan to eliminate statewide childhood lead poisoning by 2010. This contributes to meeting the national goal established by the U.S. Centers of Disease Control and Prevention (CDC) of eliminating childhood lead poisoning as a public health problem by 2010. The Minnesota Department of Health (MDH), as a recipient of a CLPPP award from CDC, therefore assumed responsibility for developing, implementing and updating the statewide childhood lead poisoning elimination plan.

The initial goals for the planning process were to establish an advisory workgroup to publish and implement a statewide childhood lead poisoning elimination plan. The group also serves to monitor the process of the elimination plan and to leverage resources and enhance cooperative efforts toward this goal. The workgroup includes representation from various stakeholders involved in solving the jurisdiction's lead poisoning problem.

In addition to key staff from the MDH Lead Program, which includes the Environmental Impact Analysis Unit (EIA) and the Asbestos/Lead Compliance Unit (ALCU), the invitees included a diverse and inclusive membership. Particular attention was paid to planning housing-base primary prevention activities. Partners included federal, state, and local government; community based organizations; health care providers; housing, real estate, landlord, and tenant organizations; and other disciplines.

The advisory workgroup reviewed and voted on a vision and mission statement prepared by the MDH. The group also considered and agreed upon a Minnesota definition of childhood lead poisoning "elimination." The mission statement for the workgroup was:

"To provide technical expertise and advisory support to the MDH through the development of a strategic plan to eliminate childhood lead poisoning by 2010."

The vision statement, which serves as the statement of purpose for the workgroup, was:

"To create a lead-safe Minnesota where all children have blood lead levels below 10 ug/dL by the year 2010."

The elimination definition approved by the workgroup was:

*"Lead poisoning will be considered eliminated when zero percent of at-risk children who are less than 72 months of age have blood lead levels \geq 10 ug/dL."***

** The definition of elimination is subject to change due to at least three variables: The definition of who is "at-risk" may change based on 1) changes in trends in elevated blood lead levels determined by ongoing analyses of blood lead surveillance and related data; 2) ongoing childhood lead poisoning prevention activities by governmental and nongovernmental agencies; and 3) changes to federal or state guidelines regarding acceptable levels of childhood blood lead.

This document updates the original plan, which was released in June 2004. The workgroup developed the original plan using five focus areas. Four of these focus areas are the same and one was eliminated and replaced with a new focus area.

Goal	Original Focus Area	Focus Area in Updated Plan
I.	Strategies for Lead Education and Training	Strategies for Lead Education and Training
II.	Strategies for Identifying at-Risk Properties and Children	Strategies for Identifying at-Risk Properties and Children
III.	Strategies to Better Coordinate Health and Housing Enforcement	Strategies to Better Incorporate Lead Paint Assessment and Control into Housing Activities and Infrastructure
IV.	Strategies to Identify Resources to Increase the Supply of Lead-Safe Housing in Minnesota	Strategies to Identify Resources to Increase the Supply of Lead-Safe Housing in Minnesota
V.	Strategies to Increase the Availability of Lead Liability Insurance for Contractors and Single- and Multi-Family Property Owners	Strategies to Respond to Emerging Issues, such as New Research, Legislation, Trends, Population Conditions and Other Developments

Plan Evaluation and Modifications

The outcomes presented in the work plan will be used as benchmarks for conducting ongoing evaluation of the elimination plan and developing new objectives and tasks. During the first and second years of the implementation phase, partners established key priorities based on the complete set of tasks in the plan.

An advisory group has been maintained to review plan progress and discuss any needed modifications to reach stated goals and objectives. The MDH currently convenes the Minnesota Collaborative Lead Education and Assessment Network (MCLEAN) twice a year (generally in April and October) for this purpose. Most members of the original workgroup regularly attend MCLEAN meetings. An overview of progress on the plan is a standard agenda item at all MCLEAN meetings, as is information about successful strategies and barriers to progress. An annual update on progress towards goals and objectives is prepared and posted each year on the MDH Lead Program Web site at www.health.state.mn.us/divs/eh/lead.

The plan will be formally updated every other year. In 2006, subgroups recruited from the MCLEAN membership met to discuss possible revisions to the work plan. Meetings in January and May focused on four of the five original goals. The consensus among subgroups was to eliminate goal five from the plan. However, the subgroups agreed to a new goal five, which is “Developing emerging strategies based upon new research, legislation, trends, population conditions and other developments.” Each subgroup had

the opportunity to review the work plan modifications, as did the MCLEAN membership as a whole.

An essential aspect of meeting goals and objectives related to eliminating childhood lead poisoning will be retaining current grants and funding sources, with special emphasis on HUD Lead Hazard Reduction programs. Minnesota currently has federal HUD lead hazard reduction or other awards to Minneapolis, Hennepin County, St. Paul-Ramsey County (this grant includes work in Duluth/St. Louis County), and to the Minnesota Department of Employment and Economic Development. When funding barriers are identified for various aspects of the plan, available resources will be examined at the local, state, and federal level. In addition to ensuring sufficient funding to undertake primary prevention activities and core functions of the Lead Program, the plan also must look to develop sustainable funding resources in the future.

The evaluation of 2010 Plan implementation will be reported to the legislature as part of the regular biennial MDH report (stipulated by Minn. Stat. 144.9509) on the Lead Program. This report is posted in several formats on the MDH Web site. It is next due in January 2007.

All of the above documents will be used, in conjunction with current surveillance, census, health plan, and other demographic data, as information sources for ongoing evaluation and amendment of the plan. As adjustments are necessary, they will be presented at the MCLEAN quarterly meetings for discussion and approval. Upon reaching consensus, changes will be made to the plan. All changes to the plan will be noted on the MDH Web site and reported to CDC via semi-annual reporting as part of the CLPPP's responsibilities.

Acknowledgements

This plan was the result of the hard work and dedication of the original workgroup and the subgroups, whose attention to detail and willingness to examine the complex and diverse issues underlying childhood lead poisoning has led to a comprehensive approach to eliminate lead as a pediatric health threat in Minnesota. Although designed as an inclusive plan that crosses many administrative boundaries, the planning effort and writing was primarily conducted by MDH using support from the CDC Childhood Lead Poisoning Prevention Cooperative Agreement US7/CCU522841-03.

Background on Minnesota’s Lead Poisoning Problem

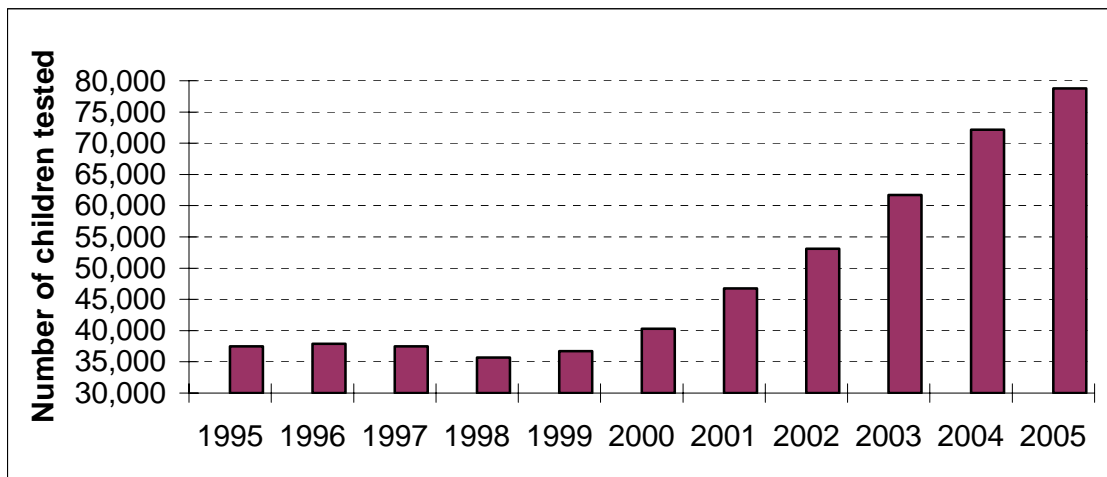
The State of Minnesota has consistently played a leading role in identifying and addressing public health issues related to lead exposure. Partners in lead poisoning prevention across Minnesota plan to maintain that leadership role and protect the citizens of Minnesota from the potentially devastating effects of exposure to high levels of lead.

The Minnesota Department of Health (MDH) is the lead state agency for childhood lead poisoning prevention efforts statewide. Lead poisoning prevention activities at MDH are housed within the Division of Environmental Health. The Environmental Impacts Analysis (EIA) Unit is responsible for lead-related surveillance activities and implements the CLPPP. The Asbestos/Lead Compliance (ALC) Unit is responsible for assuring compliance with state rules and statutes dealing with lead hazards. Other state agencies dealing with lead include the Pollution Control Agency, Agriculture, Occupational Safety and Health Administration, Labor and Industry, Natural Resources, Housing Finance Agency, Commerce and Employment and Economic Development. At the local level, cities of the first class and counties/local public health agencies have a wide variety of duties with respect to lead risk assessment and case management. Nongovernmental advocacy organizations, such as the Sustainable Resources Center (which houses CLEARCorps for Minnesota) and Project 504, also perform essential tasks regarding education, training, and primary prevention pilot projects and assessments.

The MDH collects blood lead reports on all Minnesota residents, both children and adults. State guidelines on screening, case management, clinical treatment and pregnancy help standardize practices and raise awareness of high-risk populations.

Figure 1 illustrates the trend in the number of children tested in past years and gives some indication of how screening practices have improved. Only data for children less than six years old are presented.

Figure 1: Number of children with blood lead tests reported to MDH from 1995 – 2005. Results include all test types (venous, capillary, unknown).



The dramatic increase in blood lead screening in Minnesota is the result of the combined efforts of local, state and federal government and private organizations recognizing the importance of testing children at high risk for lead poisoning and implementing innovative strategies to provide those services to an increasingly diverse and mobile population.

At the state level, the MDH Blood Lead Screening Guidelines for Minnesota were issued in 2000 and have been updated, distributed and promoted among health care providers statewide. In addition, the MDH produces annual reports on blood lead testing, breaking information down by county to provide local partners with data about their jurisdictions. The MDH also enforces lead regulations, trains and certifies lead professionals, and collaborates with the Department of Employment and Economic Development on U.S. Department of Housing and Urban Development (HUD) lead hazard control grants. The Minnesota Department of Human Services (DHS) established targets and financial incentives for health plans to perform complete Child and Teen Checkups, of which blood lead testing is a vital component, on children receiving Medical Assistance.

Other screening efforts have included targeted projects in Minneapolis, St. Paul-Ramsey County, Hennepin County, rural counties in west-central Minnesota, WIC clinics in high-risk counties, and specific screening projects for refugees and immigrants. As shown in Figure 2, the number of confirmed elevated blood lead levels reported to MDH has been gradually declining over time, consistent with national trends.

Figure 2: Number of elevated venous blood lead tests reported to MDH from 1995 – 2005. This is not the same as the number of children tested (some have multiple tests).

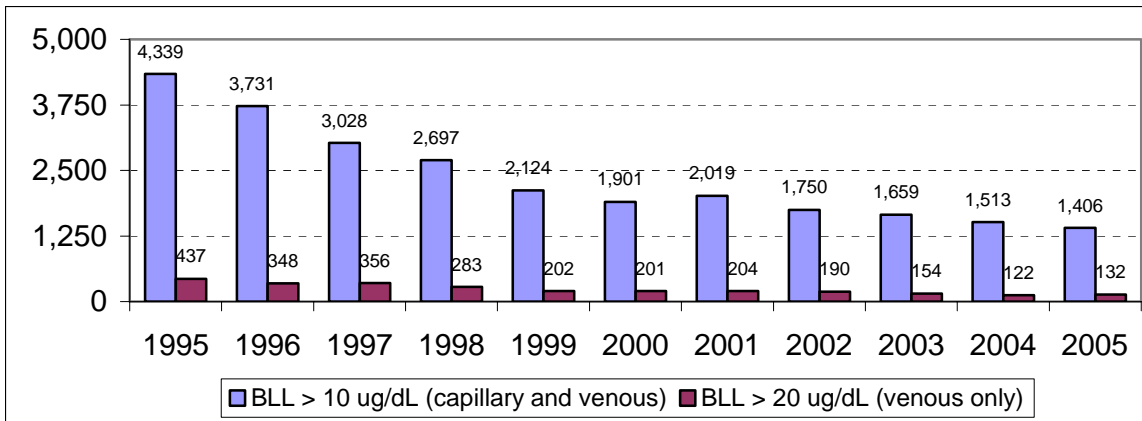


Table 1 presents the distribution of blood lead tests reported to MDH in 2005 based on concentration. The data show that 1,406 of the 78,761 children with reported tests (1.8 percent) were considered to be elevated, which is defined by Minnesota statute as greater than 10 ug/dL. The confirmed venous elevated blood lead test rate for Minnesota for 2005 was 0.8 percent.

Table 1: Distribution of Blood Lead Levels in Minnesota Children in 2005. Data are number of children in a given range. If a child had multiple tests, the highest venous level was chosen, followed by the highest capillary level if no venous test was performed.

Blood Lead Level (ug/dL)	< 5	5-9	10-14	15-19	20+	Total
Venous	12,680	1,573	363	127	132	14,875
Capillary/Unknown	56,207	6,895	566	117	101	63,886
Total	68,887	8,468	929	244	233	78,761

Compliance monitoring ensures that lead hazard reduction is completed consistent with state statutes and best public health practices. This involves working with assessing agencies and licensed lead workers to address exposure issues (e.g. lead paint removal, window replacement). Training is provided, inspections performed, and assessments audited as needed to ensure that public health concerns are addressed. Health education is performed within the lead programs using well-established information sources (such as a routinely updated Web site) and targeted outreach opportunities.

The complete list of assessing agencies in Minnesota is presented in Table 2 below. These are the governmental agencies with authority to conduct enforceable lead risk assessments on elevated blood lead cases. Many of these groups, along with nonprofit, private, and other organizations, also conduct advisory risk assessments across the state for concerned households on a voluntary basis, regardless of blood lead level.

Table 2: Assessing Agencies in Minnesota

MDH (82 Counties)	City of Bloomington	Dakota County
City of Minneapolis	St. Paul-Ramsey County	St. Louis County
City of Richfield	Hennepin County	Stearns County

Lead programs across Minnesota are required to devise unique and innovative approaches to institutional and scientific problems. These include forming cooperative workgroups to solicit input prior to generating guidelines, cooperating with other agencies to meet common goals, conducting research to address information gaps, and overseeing lead hazard reduction efforts to ensure complete and timely resolution of lead orders. Diverse populations are targeted to help address public health disparities. This spirit of creativity and risk-taking is fostered, resulting in programs that are flexible, responsive, and well grounded in the core public health functions of assessment, assurance, and policy/planning.

Assessment of Minnesota Lead Risks

The MDH maintains an extensive blood lead surveillance system for the purpose of monitoring trends in blood lead levels in adults and children in Minnesota. There are 757,528 tests in the system as of January 1, 2006. Of these tests, 646,428 were for kids under the age of six, and they were from 443,834 individual children. The data go back to 1995 and are used to help identify populations at risk for elevated blood lead levels, ensure that screening services are provided to groups with the highest risk of lead poisoning, and provide environmental and medical follow-up to children with elevated blood lead levels.

Work in Minnesota and nationally has shown that an estimate of lead risks may be performed based on two risk factors: living in an old home and being enrolled in Medicaid (e.g. MNCare). The data shown in Table 3 below are taken from the 2000 Census and DHS Medicaid/MNCare enrollment figures for 2001. These figures do not take into account homes that have already been made lead-safe and assume that the proportion of children is constant across different ages of homes. Children were defined as individuals less than 72 months of age. The number of children is based on a five-year period, assuming approximately 67,000 children per year group.

Table 3: Housing and population characteristics for Minnesota lead risk factors

	Built <1950	Built <1960	All Homes
# Housing Units in year 2000	560,322 (27%)	810,152 (39%)	2,065,946
# Children in Minnesota < 72 mo. (5 yr. period)	180,000	330,000	660,000
# Enrolled in MA/MNCare (5 yr. period)	44,000	63,000	160,000

The following responses to an elevated blood lead report are currently presented in Minnesota Statute (MS 144.9504) and the MDH Childhood Blood Lead Case Management Guidelines for Minnesota (updated in 2006):

- ✓ If levels are less than 10 µg/dL, information is entered into the surveillance database, and no additional follow-up is recommended (although partners offer education and followup).
- ✓ If levels of children are 10 µg/dL or greater, follow-up or confirmation testing and educational intervention is called for. This includes giving the children's parents or guardian a letter, bringing in the child for follow-up or confirmation testing, and providing information on how to reduce and/or avoid exposure to lead in the environment.
- ✓ If levels in a pregnant woman are 10 ug/dL or greater or are 15 µg/dL or greater for children, environmental follow-up is required. This includes a

housing risk assessment and may also include an education visit from a public health nurse, enforcement orders, lead hazard reduction or remediation, and clearance testing.

- ✓ Levels of 60 µg/dL or greater indicate a medical emergency, and immediate action is taken.

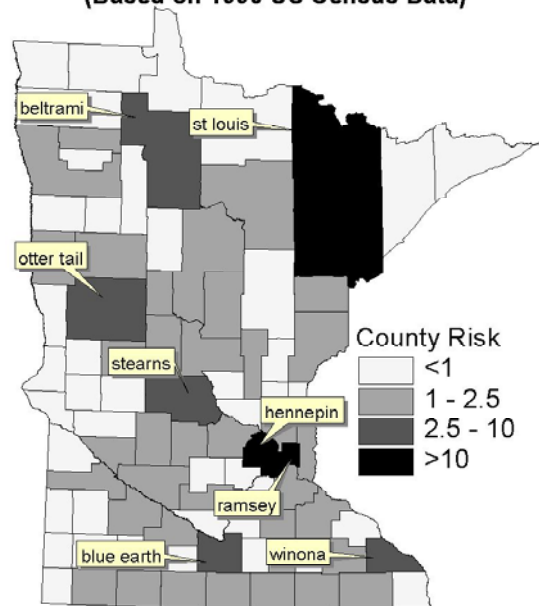
Although Minnesota has mandatory reporting from all facilities analyzing blood lead levels, blood lead testing is not universal, and the data collected by the surveillance system are not representative of all Minnesota children. Data are collected only when a health care provider orders a blood lead test or a child is screened in the community by request of the parent or guardian. The percentage of children tested varies greatly from county to county and from year to year.

Based on 2005 data, 27 percent of the children in the Minnesota blood lead surveillance database reside in large cities even though these cities contain only 15 percent of the state population. Therefore, the database contains fairly reliable information on the prevalence of lead poisoning in urban areas of Minnesota. Evidence shows, however, that some populations statewide are clearly at risk. For example, it is estimated that 70 percent of the Medicaid-eligible population in Minnesota did not receive a blood lead test in 2004. Although ongoing data matching shows that this trend is improving, it remains well short of the goal of 100 percent screening in Medicaid populations. In addition, a study conducted in a representative rural area of Minnesota showed lead poisoning rates of 2.1 percent at or above 10 ug/dL and 0.7 percent at or above 20 ug/dL, which is slightly below the rate reported to the MDH surveillance system but relatively consistent with national prevalence estimates.

Statewide Lead Poisoning Risk Estimates

The most important factors related to lead poisoning risk in Minnesota are the percentage of children in poverty and the percentage of homes built before 1950. Both of these characteristics were used, in conjunction with the population of children under six, to estimate the population-adjusted lead poisoning risk for individual geographic areas. For each geographic area the “County Risk” equals the number of children less than six years of age multiplied by the fraction of children in poverty multiplied by the fraction of homes that were built prior to 1950. The resulting number is NOT the expected number of EBLLs or percentage of EBLLs. It is simply a population-adjusted factor for comparing lead risk between counties or zip codes. Using the statewide county-level risk estimation, three counties have the greatest potential for lead poisoning (Figure 3). Of these, two counties contain the largest

Figure 3: Minnesota Relative Lead Risk by County (Based on 1990 US Census Data)

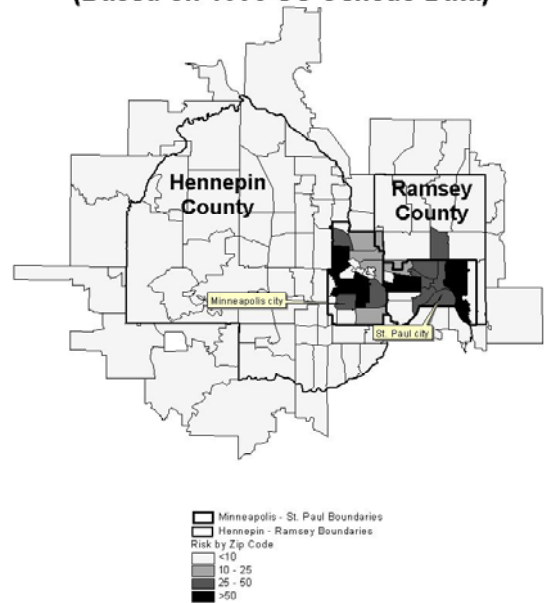


cities in Minnesota, Minneapolis (Hennepin) and St. Paul (Ramsey). Current state screening guidelines recommend screening of all children in Minneapolis and St. Paul at one and two years old. The other county at highest risk is St. Louis County, which contains the second largest urban area in Minnesota, the city of Duluth. Five counties are in the moderate category of lead poisoning risk (Beltrami, Otter Tail, Stearns, Blue Earth, and Winona). The remaining counties in Minnesota are at lower risk for significant numbers of lead-poisoned children.

Even within urban counties, most elevated blood lead tests are identified in Minneapolis and St. Paul. In 2005, 95 percent of the children with blood lead levels > 10 µg/dL, and 97 percent of the children with blood lead levels > 20 µg/dL in Ramsey county lived in St. Paul, and 84 percent of the children with blood lead levels > 10 µg/dl and 87 percent of the children with blood lead levels > 20 µg/dl in Hennepin county lived in Minneapolis.

Lead poisoning risk data by zip code for St. Paul and Minneapolis are presented in Figure 4. These city-specific data have been used to determine the most at-risk areas for lead poisoning. Both Minneapolis and St. Paul are classified as “cities of the first class” and are therefore designated as assessing agencies by Minnesota Statute and are responsible for lead risk assessment and case management. Local data show that positive tests in Minneapolis tend to concentrate in the Near North and Phillips Communities. Near North is one of the poorest in the City, has the greatest number of subsidized housing units, and is home to the highest ratio of Minneapolis’ children under age six. Most families are below the 80 percent poverty level, and are eligible for Medicaid programs. Nearly 90 percent of the housing stock in the Near North Community was built prior to 1950, 52 percent are rental units, and 34 percent of housing is classified as “Below Average.”

Figure 4: Mpls./St. Paul Relative Lead Risk by Zip Code (Based on 1990 US Census Data)



The City of St. Paul is divided into more than 80 individual census tracts. During the past five years, one or more children residing in 56 of these census tracts have been identified as having an elevated blood lead level. Of these 56 census tracts, a single census tract has nearly twice as many elevated blood lead cases as the other 55. The age and condition of housing within this target area is very consistent. Nearly 90 percent of the homes were built prior to 1940. Local data indicates that 95 percent of these homes contain lead based paint and 84 percent have deteriorated lead-based paint. Most have deteriorated paint on window components, the major source of lead exposure. This census tract is very near a major interstate. It has high levels of lead in the soil and many deteriorated houses throughout its neighborhoods.

The Updated Plan for Elimination of Childhood Lead Poisoning by 2010

The broad goals of the updated 2010 Plan to eliminate childhood lead poisoning includes:

- I. Developing strategies for lead education and training.
- II. Developing strategies for identifying at-risk properties and children.
- III. Developing strategies to better incorporate lead paint assessment and control into housing activities and infrastructure.
- IV. Developing strategies to identify resources to increase the supply of lead-safe housing.
- V. Emerging strategies based upon new research, legislation, trends, population conditions and other developments.

Each of these goals, along with specific objectives, tasks and measures are presented in the grid below. The Plan strongly advocates a collaborative, housing-based approach to primary prevention of childhood lead exposure, while still incorporating ongoing programs that are based on secondary prevention models. This is consistent with the federal elimination strategy to act before children are poisoned (primary prevention), intervene early when children have blood levels less than 10 ug/dL but rising (primary prevention), care for lead-poisoned children (secondary prevention), conduct research, and measure progress to refine lead-poisoning prevention strategies.

The updated plan differs from the original plan in several respects:

- The subgroups requested that tasks outlined in the updated plan be categorized to indicate their priority or status. Four categories were used for tasks: ongoing, in planning or implementation, scheduled for later fiscal years, or successful in one jurisdiction, extend to other jurisdictions. This eliminated the “current” versus “new” task designations in the original plan.
- The subgroups requested that the term “sponsor agency” previously used to indicate an organization’s responsibility for implementation, to “responsibility to implement.”
- Specified funding for each task has been eliminated, since sources of financial support for childhood lead poisoning prevention activities can be fluid.
- The “intended outcome” column has been replaced with “measure,” to reflect measurable outcomes related to the specific tasks. These measures will need to be evaluated in subsequent plan updates to ensure that they are realistic and achievable.
- While specific measures include projected dates of completion or landmarks, the work plan does not outline on which year the task will be completed in many cases. The subgroups, consisting of organizations dealing with reorganized services, staff changes, budgets and priorities, advised only that the tasks considered most important to the mission be considered top priority.
- The subgroups reported several places in the plan where tasks were redundant and requested consolidation of many items.
- Goal III was broadened to include efforts to incorporate lead poisoning prevention into infrastructure to make for sustainable progress. Goal III is “Strategies to Better

Incorporate Lead Paint Assessment and Control into Housing Activities and Infrastructure.”

- Goal V, “Strategies to Assess the Availability of Lead Liability Insurance for Single-Family Property Owners, RPOs and Contractors,” was eliminated. Pending federal regulations will to some degree reduce the necessity of such insurance. In addition, the subgroups agreed that this goal was too narrowly focused, in comparison to the others.
- An additional goal was added to encompass emerging research and information, as well as new legislative requests, population shifts, trends in surveillance data, and non-housing sources of lead that are not addressed elsewhere in the plan. Because of a lead fatality in Minnesota related to a lead-containing consumer product and the interest such products have generated publicly, developing a better method of dealing with imported lead-containing products was a priority for the subgroup.
- Annual reporting on 2010 Plan progress should include a list of those tasks that have been completed.

The role of the organization(s) listed under “responsibility to implement” is to develop models by completing new or ongoing projects that achieve the measurable outcomes or to organize collaborating agencies to examine the issue and implement reasonable approaches. If a task involves a statewide aspect or requires transfer of successful approaches to other jurisdictions, generally a state agency is listed as one of those organizations responsible to implement.

This updated plan includes several elements recommended by the CDC in its review of the initial 2010 Plan:

- CDC recommended that the members of the task force and implementation group, all of whom are represented in MCLEAN, include medical providers, real estate interests, banking interests, community members from high-risk areas and parents of lead-poisoned children. MCLEAN members include all of the major health plans (Medica, HealthPartners, Metropolitan Health Plan, UCare Minnesota, Blue Cross/Blue Shield); real estate interests (Minnesota Multi-Housing Association, Minnesota Association of Realtors); and community members from high-risk areas (Rep. Keith Ellison, D-Minneapolis). Representatives from the banking industry have been invited, but were not interested in participating in the 2010 planning. An element of the plan (Goal 5, Obj. E6) deals with assessing interest among parents of lead-poisoned children in planning 2010 strategies.
- CDC recommended that the plan contain prioritization of primary prevention efforts on properties with multiple EBLLs (Goal 2, Obj. C11), objectives for increased blood lead testing of children on Medical Assistance (Goals 2, Obj. A2, B1), and reimbursement by Medicaid of environmental case management (Goal 4, Obj. C2).
- CDC recommended targeting efforts in high-risk areas, and several plan elements focus on the highest risk communities and populations.
- Measures are included for all plan objectives and tasks.

The final draft updated *2010 Childhood Lead Poisoning Elimination Plan* was placed on the MDH Web site for comment by stakeholders in early June. It will be distributed to partners electronically and will be placed on the MDH Web site for download after comments have been incorporated.

Comments

The following issues were raised by comments received on the updated 2010 Plan:

Comment: Emphasis should be on pre-1978 housing without regard to the income or financial status of the child.

Response: Children of any economic status living in older housing with lead paint are at risk of childhood lead poisoning. However, children living in poverty can have additional risk factors, such as housing in deteriorating condition, inadequate nutrition or insufficient health care coverage. In addition, federal law requires blood lead screening for children on Medicaid.

Comment: Table I does not necessarily reflect the true number of EBLLs, since elevated capillary tests often are found to be less than 10 ug/dL on venous confirmation testing.

Response: The commenter is correct in observing that many capillary EBLLs are likely on venous confirmation testing to be less than 10 ug/dL. Table I is a snapshot in time using the data available.

Comment: More attention should be paid to two groups of children coming in from outside the United States, adopted children and immigrant children.

Response: Based upon the existing Blood Lead Screening Guidelines, children adopted from other countries should already be tested during routine intake screening as they enter the U.S. or during well-child visits scheduled by their adoptive families. Reaching immigrant children is much more difficult. Goal II, Obj. B, Task 6 does address that high-risk population, as does Goal V, Obj. E, Tasks 2, 3, 4 and 5.

Comment: Table III is confusing and the numbers in the final row that reflect children in older housing or on MA are inaccurate.

Response: The final row of the table has been removed from the updated 2010 Plan.

Comment: While children and pregnant women should be the focus of the 2010 Plan, adult chronic lead exposures and lead's role as a probable cancer-causing agent should be reflected in the Plan as reasons for lead-safe work practices.

Response: The updated 2010 Plan contains strategies to prevent "take home" lead from affecting children whose parents work with lead.

Comment: While cities of the first class have higher at-risk populations for childhood lead poisoning, communities in Greater Minnesota do not have housing inspection or code enforcement to monitor the housing stock. Initiatives to prevent lead poisoning are important in Greater Minnesota, where housing stock is old and in deteriorating condition.

Response: The updated 2010 Plan requires the routine examination of risk factors and re-examining the blood lead screening guidelines. Those guidelines apply equally to rural and urban children, and a child living in Greater Minnesota who is on MA, living in pre-1978 housing, or recently immigrated to the U.S. should be tested. The Plan also includes a Lead-Safe Cities Project, involving intensive work with pilot communities to develop housing ordinances and capacities to find and deal with lead paint deterioration.

Comment: More attention should be paid to dust from vinyl products exposed to UV rays, which have been tested at 800-1,700 mcg/sq. ft. We should not be installing a new lead hazard.

Response: This information will be evaluated by the Principal Investigator and added to the next update of the 2010 Plan, if warranted.

Comment: The EPA R&R rule, as written, would not accomplish lead hazard reduction in many at-risk housing units, nor does it provide assurance that a property is lead safe.

Response: The MDH and City of Minneapolis-Hennepin County Joint Lead Task Force commented upon these aspects of the plan.

The MDH would like to thank all the partners who volunteered for the subgroups and met to debate different methods for ending childhood lead poisoning in Minnesota. With their continued leadership in protecting the health and housing of the state's children, these partners ensure that the plan is statewide, inclusive and successful in achieving the elimination of a serious public health threat.

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Ongoing



In Planning or Implementation



Scheduled for Later Fiscal Years



Successful in One Jurisdiction, Extend to Other Jurisdictions

2010 Childhood Lead Poisoning Elimination Plan for Minnesota
Implementation Plan – Update July 1, 2006

Goal I.
Strategies for Lead Education and Training.

Objective A.
Increase awareness of and compliance with the Federal Pre-renovation Disclosure Law 406(b) and 1018 Disclosure Law among targeted audiences and the general public.

Tasks	Responsibility to Implement	Measure
1. Provide information on 406(b) and 1018 (in the form of “Protect Your Family from Lead in Your Home” EPA/CPSC/HUD brochures) with all building permits, rental licenses and paint inspection orders that pertain to pre-1978 properties.	MDH Lead Program and City Housing and Inspection Departments	Ten percent of Metro cities with populations greater than 30,000 will routinely provide 406(b) and 1018 information with city documents by July 2007.
2. Provide information on 406(b) and 1018 at all events and exhibits attended by the general public.	MDH Lead Program and ALL PARTNERS	All partners will provide the EPA/CPSC/HUD brochures at all education, training and outreach venues by December 2006.
3. Provide information on 406(b) and 1018 in homestead application materials that reach all Minnesota property owners.	MDH Lead Program and County Tax Assessors	Survey counties by June 2007 to determine the feasibility of providing disclosure information in homestead applications.

Tasks	Responsibility to Implement	Measure
4. Provide information packets on 406(b) and 1018 to housing rehabilitation agencies, community action programs and neighborhood housing groups, to include camera-ready copies of the EPA/CPSC/HUD pamphlet, "Protect Your Family from Lead in Your Home" and instructions on how to download from the Web site.	MDH Lead Program working with housing organizations.	Complete information mailing by March 2007.
5. Provide training on 406(b) and 1018 through building associations and other professional contractor groups.	MDH Lead Program, working with Building Owners and Managers Association, contractor groups	Assess feasibility of linking information on 406(b) and 1018 on organizations' Web sites by June 2007.
6. Provide one-hour lead refresher workshops including 406(b) and 1018 information for the Department of Commerce (approximately 10/year).	MDH Lead Compliance, Dept. of Commerce	Provide workshops weekly or every other week between January and March each year.
7. Conduct 406(b) and 1018 training through the Sustainable Resources Center and by subsidizing private training contractors to perform training.	MDH Lead Program, SRC	SRC and private training contractors will offer eight-hour training for rehab and renovation contractors and CLEARCorps staff at least six times each year.
8. Provide one-on-one education to at-risk families regarding 1018 disclosure requirements and options for noncompliance or retaliation through the Tenant Remedies Act, Minn. Stat. 504(b).	Project 504	At-risk families will be aware of their legal rights and options when renting properties with potential lead hazards.
9. Distribute EPA/CPSC/HUD brochure to property owners and real estate professionals to increase awareness of and compliance with 1018 requirements.	MDH Lead Program, NAHRO, real-estate professional groups	Assess feasibility of linking information on 1018 to organizations' Web sites by June 2008.

Tasks	Responsibility to Implement	Measure
10. Develop or distribute a video that includes 406(b) and 1018 information to rental property owners.	MDH Lead Program, HRAs (for Section 8), working with NAHRO and Minnesota Multi-Housing Association	Assess existing videos for rental property owners and develop a plan for reproduction/distribution by June 2007.
11. Provide community and housing education programs for first-time homeowners with information about 406(b) and 1018 and/or the EPA/CPSC/HUD brochure.	MDH Lead Program, community education programs statewide	New home buyers attending community education and other "first home" events will receive information on lead by June 2009.
12. Disseminate lead disclosure and lead-safe work practices information during "Truth in Housing" inspections on all pre-1978 properties.	Public and private housing inspectors	Lead information will be routinely provided by 90 percent of housing inspectors by June 2010.
Objective B. Ensure that health care providers statewide know and follow current guidelines on blood lead screening, medical case management and treatment.		
1. Review, update and disseminate state guidelines for blood lead screening (children and pregnant women), case management and treatment.	MDH CLPPP and consulting health provider partners	Guidelines will be reviewed and updated regularly and placed on the MDH Web site for use by partners.
2. Target education and training on blood lead testing and case management to specific clinics in high-risk geographic areas (i.e., Minneapolis and St. Paul) in which testing rates are low.	MDH CLPPP, Health Plans, DHS, SRC	Identify clinics in which testing rates are low by January 2007. Work with clinic managers to provide education and training on blood lead screening and case management by January 2008. Work with clinic managers in rural higher risk counties by January 2009.

Tasks	Responsibility to Implement	Measure
3. Educate physicians in high-risk counties about blood lead screening requirements for at-risk children.	MDH CLPPP, County Health Departments	Mail physicians practicing in high-risk counties the current set of blood lead screening, case management and treatment guidelines by June 2007.
4. Develop anticipatory guidance for childhood blood lead levels below 10 ug/dL.	MDH CLPPP, consulting health provider partners	Guidelines will be issued in June 2007.
5. Provide annual surveillance reports to health care providers to ensure that data trends, new information and analysis are available to them.	MDH CLPPP	Surveillance reports are issued, posted on the MDH Web site in June of each year.
6. Ensure that health providers can consult with an experienced case manager on specific patients or problems.	MDH CLPPP	State Case Monitor is available to assist local public health agencies and health providers on an ongoing basis.
Objective C. Train property owners and contractors in lead-safe maintenance and work practices.		
1. Promote lead-safe work practices training offered by the National Paint Coatings Association and other licensed trainers to property owners (including Section 8) and contractors.	NPCA, MDH Lead Compliance, County Health and Housing Departments, MHFA, others	The NPCA will conduct at least two trainings annually through 2011.
2. Continue to approve training courses and license/certify lead professionals.	MDH Lead Compliance	All requirements for an EPA-delegated program will be met.
3. Conduct quarterly lead-safe work practices training for rehab contractors/workers.	St. Paul/Ramsey County Public Health and Duluth Housing Rehab Authority	Rehab workers will be able to attend lead-safe work practices within a short timeframe.

Tasks	Responsibility to Implement	Measure
4. Develop lead-safe training or education presentations or tools for the “do-it-yourselfer” audience through hardware stores and other events.	MDH Lead Program, SRC, Local Housing Authorities	One major hardware chain will agree to partner on a lead education presentation by January 2007.
Objective D. Increase the supply of licensed and certified lead professionals, including lead sampling technicians.		
1. Provide six worker, supervisor, and sampling technician trainings over 42 months.	MDH Lead Compliance/DEED	Six trainings will be completed by March 2007.
2. Contract with licensed training firms to offer subsidized training to encourage remodelers, housing inspectors, and others to become lead professionals.	SRC/Hennepin County Housing	SRC and Hennepin County Housing have contracted with licensed firms to offer training.
3. Train at least four minority/small business contractors in lead-safe work practices and provide on-the-job training in 30 units.	St. Paul – Ramsey County Public Health	Four contractors will have certified lead supervisors and 30 houses will be completed by June 2007.
4. Conduct semi-annual lead sampling technician training for certified home inspectors and truth-in-sale housing evaluators.	St. Paul/Ramsey County Public Health	At least 30 home inspectors and truth-in-housing evaluators will become lead sampling technicians annually.
5. Support lead supervisor and lead sampling technician training statewide.	MDH Lead Program, local housing agencies, local public health departments	Each county will have at least one lead sampling technician available to do clearance testing by June 2009.

Tasks	Responsibility to Implement	Measure
Objective E. Provide messages to the general public that make the connection between childhood lead poisoning and lead paint in pre-1978 housing.		
1. Conduct survey research with the University of Minnesota Statewide Survey to determine whether Minnesotans understand the connection between lead poisoning and housing.	MDH CLPPP	Survey results will be available by January 2009.
2. Develop a statewide public information campaign on primary prevention of childhood lead poisoning.	MCLEAN partners	Campaign messages, materials will be ready for roll-out in January 2009, with assessment of results in January 2010.
3. Adapt or develop educational materials that provide the basic message about primary prevention and are translated into multiple languages.	MDH Lead Program, partners	ECHO broadcast/CD will be completed by December 2006. Other basic brochures on general lead issues, pregnancy will be translated by December 2006.
4. Maintain and enhance a comprehensive lead information Web site with material for both the general and professional audience.	MDH Lead Program	The MDH Lead Program Web site will be updated at least monthly with new and updated information.
5. Provide statewide, bicultural education on lead poisoning prevention and housing issues, along with cleaning services and instruction, to families with blood lead levels both above and below the 15 ug/dL intervention level.	SRC	Families statewide can access lead poisoning prevention education in English and Spanish by June 2006. Families will have access to cleaning and instruction services, even if children's BLL is below the intervention level.



Completed



In Planning or Implementation



Scheduled for Later Fiscal Years



Successful in One Jurisdiction, Extend to Others

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Goal II.
Strategies for Identifying At-Risk Properties and Children

Objective A.
Continue to maintain and improve the statewide blood lead surveillance system.

Tasks	Responsibility to Implement	Measure
1. Complete formal evaluation of surveillance system annually.	MDH CLPPP	Using the CDC’s “Guidelines for Evaluating Surveillance Systems,” the CLPPP will evaluate annually.
2. Complete data matching between blood lead information system (BLIS) and Medical Assistance data from the Minnesota Department of Human Services (DHS) annually.	MDH CLPPP, DHS	The data match will be completed annually, showing an increase of at least 10 percent per year in the rate of testing among Medicaid eligible children.
3. Develop data sharing agreements with health plans to help identify gaps in blood lead screening or testing.	MDH CLPPP, Health Plans	Develop data-sharing agreements with all health plans by June 2008.
4. Evaluate use of the CDC’s Lead Program Area Module when it is released as a replacement for the BLIS system.	MDH CLPPP	The MDH will decide on conversion to the Lead PAM by January 2007.
5. Develop the capacity to geo-code blood lead surveillance data for use of local public health departments.	MDH CLPPP	Geo-coding will be available for Minnesota blood lead data by June 2008.

Tasks	Responsibility to Implement	Measure
6. Conduct data matching between the BLIS data and Hennepin County Lead Program to help ensure data accuracy and quality.	MDH CLPPP, Hennepin County Lead Program	Conduct data matching on an ad hoc basis.
7. Work with MDH NEDSS staff to achieve the goal of 100 percent electronic data reporting, ensuring that all results (including those less than 10 ug/dL) are provided in a timely manner.	MDH CLPPP, NEDSS, Labs	Electronic reporting from one of the two outstanding labs will be available by June 2006. Greater than 95% of reporting will be done electronically by June 2008.
8. Make blood lead surveillance data available to local public health departments via the Internet, if data privacy and security concerns can be adequately addressed.	MDH CLPPP, Legislators, EH Division Management	Internet access of blood lead data will be available to local public health departments by June 2009.
9. Ensure that medical case managers have access to environmental investigation data to best work with children and families.	MDH Lead Program, Medical Case Managers, Environmental Assessment Agencies	All medical case managers will have access to housing data pertaining to their cases by June 2007.
10. Improve annual surveillance report with GIS and blood lead results from 5-9 ug/dL.	MDH CLPPP	The state's annual surveillance report includes blood lead results of 5-9 ug/dL. GIS data will be integrated into the surveillance system by June 2008.
11. Review professional literature to identify new risk factors for childhood lead poisoning and relay this information to partners.	All partners	Partners will relay information about new or emerging risk factors for childhood lead poisoning via the MCLEAN e-list and other formal and informal methods.
12. Mail compliance reports to all labs reporting blood lead analysis to the MDH.	MDH CLPPP	Compliance reports will be mailed to all reporting labs annually.
13. Mail annual letter to clinics including results of blood lead and MA data matching to remind clinics to screen one and two year old MA patients.	MDH CLPPP	Letters to clinics will be provided annually.

Objective B.**Promote blood lead screening for at-risk children and pregnant women and increase compliance with existing screening, case management, treatment and pregnancy guidelines.**

Tasks	Responsibility to Implement	Measure
1. Promote blood lead screening of Medicaid/MA eligible children through the statewide immunization registry.	MDH CLPPP, MDH Immunization Registry	A pop-up reminder to health care providers will flag Medicaid/MA eligible children for blood lead testing by June 2006.
2. Continue DHS targets and incentive pay to health providers for complete Child and Teen Checkups (including blood lead screening) on Medicaid/MA eligible children.	DHS, C&TC, Health Plans	DHS will increase screening targets included in contract with health providers each year.
3. Evaluate pilot projects to incorporate blood lead testing on children in WIC clinics and make recommendations about incorporating lead screening and testing in WIC clinics statewide.	MDH CLPPP, MDH WIC Clinic Coordinator, Hennepin County, St. Paul – Ramsey County Public Health, Minneapolis Department of Health and Family Support	Recommendations on blood lead testing in WIC clinics will be completed by June 2007.
4. Develop plans to address corrective action orders issued to health providers that do not meet screening targets and continue contracts that provide incentives to health providers meeting C&TC targets.	DHS, Health Plans	All plans will take steps to meet C&TC targets by June 2007.
5. Continue to develop High Intensity Targeted Screening (HITS) projects in Minneapolis, St. Paul and other areas with high-risk populations.	MDH CLPPP, Minneapolis Dept. of Health and Family Support, St. Paul-Ramsey County Public Health, SRC, public health departments in other high-risk areas.	<ul style="list-style-type: none">• Hennepin County HITS project focused on WIC clinics will be completed by June 2006.• St. Paul-Ramsey Public Health HITS projects in WIC clinics and with immigrant populations will be completed June 2006.

Tasks	Responsibility to Implement	Measure
6. Conduct blood lead screening and education activities for high-risk children and pregnant women through licensed daycares, reproductive health services, and other community settings statewide.	SRC, Health Plans, GMDCC, City of Minneapolis, St. Paul-Ramsey County Public Health, Hennepin County, local health departments	All partners will work cooperatively to find opportunities to screen and educate children and pregnant women at high risk for lead poisoning.
7. Explore whether immunization cards provided to parents can include a reminder to test blood lead at recommended ages.	MDH, local health departments	Assess feasibility of including blood lead testing on the cards by January 2007.
8. Encourage health plans to send a chart flag for lead testing (initial and follow-up) to clinic administrators for inclusion in chart.	Health Plan, SRC, clinic administrators	By 2008, 50 percent of clinics will include chart flags to remind about lead testing.
9. Continue to match MDH blood lead surveillance data with MDH Refugee Health Data and track trends in the immigrant/refugee communities in Minnesota.	MDH CLPPP, MDH Refugee Health, Hennepin County, immigrant/refugee groups statewide	Elevated blood lead levels among immigrant/refugee groups will be comparable to blood lead levels among Minnesota-born population by June 2010.
10. Continue targeted mailings to health care providers when guidelines for blood lead screening, case management, treatment and pregnancy are updated.	MDH CLPPP	Screening, case management and treatment guidelines will be familiar to all health professionals dealing with children or pregnancy.

Objective C.**Use data about housing age, population and income to identify properties that may have lead hazards, perform risk assessments and implement primary prevention.**

Tasks	Responsibility to Implement	Measure
1. Use GIS mapping to determine high-risk areas for lead exposure and children in need of blood lead testing.	Hennepin County Lead Program, MDH CLPPP, Dakota County, other partners	Hennepin County and Dakota County will continue to provide GIS mapping within their jurisdictions. MDH CLPPP will integrate GIS capability into BLIS or convert to the Lead PAM by June 2008.
2. Develop a statewide system to collect and analyze environmental case management data.	MDH Lead Program, assessing agencies, other partners	The MDH Lead Program will develop, in cooperation with partners, a basic reporting procedure by June 2007.
3. Encourage Section 8 property owners to access technical assistance and funding resources available from state and local lead poisoning prevention programs if inspections identify lead hazards.	Local housing authorities	Information on technical and funding assistance for lead hazard control will be made available to Section 8 property owners in the Metro area by June 2008.
4. Develop a Lead Safe Cities model for adaptation by rural Minnesota cities that includes a range of primary prevention strategies, tools, and model ordinances.	MDH Lead Program, League of Minnesota Cities, other partners	The MDH CLPPP will work with two rural Minnesota cities on a pilot project beginning July 2006.
5. Work to educate tenants of multiple-unit buildings with known lead hazards about landlord responsibilities and enforcement options.	Project 504, Legal Aid	Tenants seeking assistance in weighing legal options to reduce lead exposure will have resources.
6. Continue performing primary prevention risk assessments and dust wipe sampling in homes where children have blood lead levels of less than 10 ug/dL.	SRC	SRC will conduct primary prevention risk assessments for 150 homes annually.

Tasks	Responsibility to Implement	Measure
7. Conduct informational seminars for code enforcement officials and Section 8 inspectors to encourage referrals of at-risk housing occupied by young children to local lead programs.	St. Paul/Ramsey County Public Health, assessing agencies	Assessing agencies will develop relationships with code enforcement and Section 8 inspectors and provide information.
8. Develop database to record properties that received lead hazard reduction through a HUD Round XI Grant	HUD Grantees	Each HUD Grantee will maintain a database of properties that received lead hazard reduction dollars by June 2007.
9. Request lead hazard control funding from HUD through the Small Cities Development Program for eligible properties.	DEED, MDH Lead Program	The current SCDP grant program will operate through March 2007. Another application will be made for HUD funding in 2007.
10. Require lead risk assessments when state or local housing funds are used to renovate properties built before 1978.	MHFA	Renovation projects will comply with the policy established by MHFA requiring lead paint risk assessment.
11. Analyze EBLL data to determine the locations of housing units that poison multiple children and focus primary prevention efforts on those units.	MDH Lead Program	Analyze data annually.



Completed or Ongoing



In planning or implementation



Scheduled for later fiscal years



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Tasks	Responsibility to Implement	Measure
Goal III. Strategies to Better Incorporate Lead Paint Assessment and Control into Housing Activities and Infrastructure.		
Objective A. Ensure that lead paint assessment, control and compliance is integrated into housing code and policy.		
1. Ensure that programs and properties receiving HUD funding are aware of and in compliance with current HUD policies on lead paint assessment, lead safe work practices, and disclosure laws.	HUD, HUD Grantees, DEED, MHFA	HUD will continue to provide direction to grantees on lead paint issues in pre-1978 housing.
2. Integrate lead paint assessment and lead-safe work practices into statewide building and maintenance code applying to pre-1978 housing.	MDH Lead Program, Minnesota Department of Commerce, Builders' Association of Minnesota, Minnesota Area Housing Code Officials	Lead paint assessment and lead-safe work practices will be integrated into statewide building and maintenance code by June 2010.
3. Ensure that renovation and remodeling contractors are aware of and in compliance with the draft and final Renovation and Remodeling Rules.	EPA, MDH Lead Program, Contractor Groups	Renovation and remodeling contractors will receive information about the draft R&R rules by June 2006.
4. Conduct an analysis of the state building codes to determine whether they reflect best practices for lead paint in pre-1978 housing.	MDH Lead Program	An analysis will be completed by June 2008.

Tasks	Responsibility to Implement	Measure
5. Encourage local governments to incorporate lead paint inspection and compliance responsibilities into Housing Inspection Departments.	MDH Lead Program, AMC, LMC, elected officials	Develop a model based upon City of Minneapolis inspections for use in other jurisdictions by June 2007.
6. Develop a model for incorporating lead paint assessment, lead-safe work practices and disclosure into rental property licensing.	MDH Lead Program, LMC, elected officials	MDH CLPPP will assess City of Minneapolis's practice to develop a lead-safe cities model during a pilot project to begin July 2006.
7. Encourage local housing inspection officials to become certified lead sampling technicians able to take clearance samples, especially in rural areas where certified lead professionals are not as readily available.	MDH Lead Program, local housing inspectors, LMC	The number of lead sampling technicians in rural Minnesota will increase by 10 percent by June 2007.
Objective B. Ensure compliance with and enforcement of lead paint laws.		
1. Provide compliance assistance to regulated parties and licensed entities.	MDH Lead Compliance	The MDH provides ongoing assistance as an EPA-authorized program.
2. Enforce lead licensing requirements and regulated lead work practices.	MDH Lead Compliance	The MDH enforces regulated lead work practices and licensing requirements on an ongoing basis.
3. Continue to provide information about and promote compliance with federal lead requirements e.g. HUD 1012/1013, 1018, EPA 406(b), OSHA.	MDH Lead Compliance, housing and health authorities, others	Information about federal lead requirements will continue to be available to interested audiences.
4. Provide compliance oversight of HUD/DEED Lead Hazard Control Grant activities regulated under 1012/1013.	MDH Lead Compliance	The MDH provides ongoing compliance oversight of HUD 1012/1013.

Tasks	Responsibility to Implement	Measure
5. Develop Supplemental Environmental Project (SEP) proposals to make available as part of federal or state lead enforcement actions.	Project 504, MDH Lead Compliance	A plan will be developed and on file as of June 2007.
6. Develop legislative or administrative methods to allow MDH to analyze blood lead data by location and provide the locations of multiple EBLL cases for compliance follow-up.	MDH CLPPP, Minnesota Attorney General, U.S. Dept. of Justice, HUD, Minnesota Legislature	Continue to work within Minnesota Data Practices Act to assist in investigating housing with multiple EBLL cases.
Objective C. Identify partners who inspect family housing (single and multi) and encourage them to implement lead paint assessment and lead-safe work practices policies.		
1. Work to establish a partnership with the Department of Commerce to determine the feasibility of housing code inspectors becoming lead sampling technicians, including the visual identification of deteriorated lead paint as part of their work write-ups, and including lead-safe work practices (by weatherization crews) in project specs.	MDH Lead Program, Dept. of Commerce, CAP agencies	Meet with Commerce and survey CAP agencies to determine their current policies and willingness to work with lead programs by June 2007.
2. Work with Truth in Housing inspectors to encourage the inclusion of visual identification of deteriorated paint surfaces and lead sampling as part of their services to customers.	MDH Lead Program, Minnesota Realtors Association, private inspection individuals and firms.	Develop relationships with realtors and inspectors to assess this approach by June 2008.
3. Develop information on lead paint assessment and lead-safe work practices for county tax assessors who evaluate housing and property managers who deal with tax-forfeit properties.	MDH Lead Program, AMC, county tax assessors	Assess interest among county tax assessors by June 2008.



Completed or Ongoing



In Planning or Implementation



Scheduled for Later Fiscal Years



Successful in One Jurisdiction, Extend to Others

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Goal IV.

Strategies to Identify Resources to Increase the Supply of Lead-Safe Housing in Minnesota.

Objective A.

Improve coordination among DHS, CAP, DEED, HUD, USDA, SRC, MHFA, FHA, public health and lead hazard control programs.

Tasks	Responsibility to Implement	Measure
1. Develop relationships with USDA and rural development agencies to incorporate lead-safe work practices into homeowner education that accompanies efforts to rehab properties for the elderly and very low-income families.	USDA, Rural Development Agencies, MDH	Explore homeowner education requirements for the USDA rural development agencies by January 2009.
2. Continue to implement HUD lead hazard control requirements in all state-funded housing programs with a health and safety component.	MHFA	Implementation will continue in standard loan programs, deferred loan programs, home improvement programs and others.
3. Develop a geographic matrix or online map of all existing programs available in Minnesota for funding housing rehab and assess lead policies associated with each.	MDH Lead Program, other partners	Research and collect information for statewide matrix by June 2008.

Tasks	Responsibility to Implement	Measure
4. Ensure that HUD funding for lead hazard control activities is available statewide for qualifying families with children with blood lead levels of 15 ug/dL or greater.	MDH Lead Program, DEED, St. Paul – Ramsey County Public Health, Hennepin County Housing, City of Minneapolis Housing, and other cooperating partners.	Maintain all HUD grants in green light status. Apply for HUD funding during the current and future SuperNOFAs.
5. Work cooperatively with Community Action Programs to ensure that weatherization programs (especially window replacement) follow best practices for lead safe work.	Community Action Programs, MDH Lead Program, SRC and other partners.	Provide assessment of current CAP practices and models of successful partnerships by January 2007.
6. Develop a comprehensive e-list that includes health and housing contacts and provide periodic updates on new lead regulations, resources, training and emerging issues.	MDH Lead Program	Develop an e-list from the MCLEAN list base and provide periodic updates beginning in July 2006.
7. As part of geographic matrix or online map (see Task 4), ensure that housing organizations representing immigrant/refugee groups, tribes, and other racially and culturally diverse groups are included.	See Task 4.	See Task 4.
8. Work with HUD to ensure that efficiency units in which children under six may reside, either temporarily or permanently, are eligible for lead hazard control services if other units in the building have documented lead hazards.	HUD	HUD will consider the implementation of lead hazard control activities in efficiency units by June 2009.
Objective B. Leverage private and nonprofit funding mechanisms to identify and control lead paint hazards.		
1. Seek funding through AmeriCorps/CLEARCorps for lead hazard reduction and education in Minnesota.	SRC, NPCA	Continue applying for AmeriCorps/CLEARCorps lead hazard control and education funding.

Tasks	Responsibility to Implement	Measure
2. Assess the feasibility of applying for foundation funding to provide gap coverage for lead hazard control activities in types of housing not eligible for other public or private programs (including homeless shelters, drop-in centers, senior centers, and other buildings).	SRC, MDH CLPPP	Survey foundations to determine whether grant applications for lead hazard control activities are appropriate by June 2008.
3. Approach Habitat for Humanity to establish a policy on lead-safe work practices that Habitat can integrate into its activities in pre-1978 renovation work.	Twin Cities Habitat for Humanity Chapter, other Habitat Chapters statewide	Approach Habitat for Humanity's Twin Cities chapter and discuss before June 2007.
4. Develop relationships with private developers proposing renovation of buildings with lead-paint hazards and inform them of requirements and resources for lead-safe work.	MDH Lead Program	A needs assessment of redevelopment interests will be completed in June 2008.
Objective C. Evaluate potential legislation that would provide sustainable funding sources for lead surveillance and lead hazard control.		
1. Track bills that are introduced in each Minnesota Legislative Session and provide impact analysis or technical assistance to authors.	MDH Lead Program, other partners	MDH will continue to track bills and provide analysis and assistance.
2. Propose legislation permitting use of Medicaid funding for environmental risk assessment and case management.	DHS, City of Minneapolis, Hennepin County, others	Bill language will be introduced in the 2006 Legislative Session.
3. Investigate the possibility of using existing state hazardous waste cleanup funding (such as Superfund or brownfields redevelopment money) to address lead hazard control problems in aging multi-unit housing.	MPCA/OEA	Assess the possibility of using cleanup funding for lead paint cleanup by June 2009.
4. Investigate the feasibility of providing a tax reduction for lead hazard control work.	Minnesota Legislature	Bill introduced in 2005, re-introduced in 2006.

Tasks	Responsibility to Implement	Measure
5. Develop sustainable long-term funding source for the statewide blood lead surveillance system by 2010.	Minnesota Legislature	Recommendations for sustainable funding options will be included in the biennial report to the legislature, deliverable in January 2007.
6. Include lead hazard control activities in applications for funding for Healthy Homes initiatives.	All Partners	Monitor pending grant applications through EPA, CDC, HUD and other grant application information sites
7. Consider increasing funding for lead hazard reduction in the homes of low- and very-low income owner-occupants.	MHFA	Examine during preparation of next biennial budget during 2007 session how to increase funding with affordable terms and conditions for lead hazard reduction in the homes of low- and very-low income occupants.
8. Ensure that moderate-income families are aware of MHFA Fix-up Fund and Rehabilitation Loan Program for window replacement.	MHFA, All Partners	Include information about these funds in general resources about housing funds for moderate-income families.



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Scheduled for Later Fiscal Years



Successful in One Jurisdiction, Extend to Others

Goal V.

Strategies to Respond to Emerging Issues, such as New Research, Legislation, Trends, Population Conditions and Other Developments.

Objective A.

Improve blood lead screening and testing through focused educational efforts with providers and insurers.

Tasks	Responsibility to Implement	Measure
1. Update Minnesota's blood lead screening guidelines to require blood lead screening (i.e., asking screening questions and ordering testing based upon risk factors) or testing (if screening questions will not be asked) on children of recommended ages statewide.	MDH, partners and providers	This approach will be explored in guidelines to be developed by June 2007.
2. Identify and educate health care providers (individuals or clinics) that do not follow the statewide screening guidelines.	ALL PARTNERS	Partners will identify five clinics where blood lead screening guidelines are not followed and the MDH or partners will offer on-site education by December 2007.
3. Revive partnership with the medical schools (U. of M., UMD, and Mayo) to provide education to students on the risk factors for lead poisoning and the screening guidelines.	MDH	MDH will approach the U. of M. Medical School to revive the partnership by December 2007.
4. Investigate which insurance carriers or policies will not cover blood lead testing or other preventive health care.	ALL PARTNERS	Research and collect information by June 2008.

Tasks	Responsibility to Implement	Measure
Objective B. Reduce childhood lead exposures by educating adults with EBLs or lead-intensive occupations about “take home” lead.		
1. Restore process of contacting adults with blood lead levels of 25 or more to provide education and resources and suggest screening children in the home.	MDH	MDH will resume adult contacts drawn from ABLES database in January 2007.
2. Provide information about the potential impacts of lead exposure during pregnancy to women in industries in which lead is used.	EPA, OSHA	Integrate lead-in-pregnancy information into EPA communication planning process underway in 2006.
3. Work cooperatively to provide adults working in conditions of lead exposure with information about potential hazards via the “take-home lead” fact sheet.	MDH, Labor and Industry	MDH will develop a project with Labor and Industry to provide workers in lead industries with the “take-home” lead fact sheet.
Objective C. Develop methods to prevent children from exposure to lead-containing products.		
1. Outline the critical path that would be followed by the State of Minnesota to remove a lead-containing children’s product from sale.	MDH, MPCA, Commerce	Define the steps to remove lead-containing children’s products from sale by December 2006.
2. Refer information about packaging used for children’s products that intentionally includes lead to the MPCA for education, enforcement and recall.	MPCA, ALL PARTNERS	MPCA will achieve product recalls for two lead-containing children’s products by June 2007.
3. Develop or partner with a Web site that lists products or packaging with confirmed lead content exceeding CPSC guidelines for use by health care providers, merchants, lead professionals and the general public.	MDH, MPCA	MDH and MPCA will develop a plan by March 2007 to make lead product and packaging information available online.

Objective D. Encourage technologies for accurate, effective and cost-efficient lead detection, lead hazard control, lead clearance testing and surveillance.		
Tasks	Responsibility to Implement	Measure
1. Support testing and accreditation for NITON sampling equipment that can provide immediate results of dust and paint samples on site.	EPA, CDC, HUD, MDH in Minnesota	Federal agencies will pursue testing and accreditation.
2. Ensure that lead partners in Minnesota and other states are updated on progress in technologies that can break up lead paint using light pulses.	HUD	HUD will continue to test and evaluate light pulse lead removal technologies.
Objective E. Develop effective communication channels to reach immigrants/refugees and other populations at higher risk for lead poisoning.		
1. Develop a pilot project to include lead-safe housing and education information in an affordable housing registry.	Hennepin County Housing, Housing Link	Hennepin County and Housing Link will include lead information for property owners and prospective renters by June 2007.
2. Support an information phone line (possibly in cooperation with DHS) allowing health-related questions in languages spoken by Minnesota's immigrant/refugee populations.	MDH, DHS	Continue to work among state agencies to develop a phone line for response in many languages.

Tasks	Responsibility to Implement	Measure
3. Cooperate with faith communities to provide a “train the trainer” public health awareness event for immigrants/refugees who prefer receiving health information from respected members of their own communities.	MDH, SRC, CUHCC	Develop an outreach event involving local mosques sponsoring a public health day for Somalis by March 2007.
4. Explore the possibility of working with Hispanic/Latino radio stations to develop public health programming regarding childhood lead poisoning or lead-safe work practices.	SRC, MDH	Research and develop a proposal by March 2007.
5. Strengthen the Emergency Communication and Health Outreach (ECHO) Minnesota Collaborative to ensure a recognized channel for immigrants/refugees to receive emerging public health information.	MDH, St. Paul – Ramsey County Public Health, City of Mpls. Healthy Homes and Lead Hazard Control, EPA, health plans	Complete ECHO segment on lead and lead hazards by November 2006.
6. Assess interest among parents of lead-poisoned children in attending MCLEAN by contacting community organizations serving lead-poisoned children and their families.	MDH	Provide an assessment by March 2007.

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Appendix B

2005 Blood Lead Surveillance Report

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Minnesota Blood Lead Surveillance Data, 2005

Background

This report is an overview of the 2005 blood lead testing data for Minnesota residents as reported to the Minnesota Department of Health (MDH). It is prepared annually by the Environmental Impacts Analysis Unit (EIA) of the Environmental Health Division. The work described here was partially funded by cooperative agreement US7/CCU522841-03 from the U.S. Centers for Disease Control and Prevention (CDC).

Recognizing and treating lead poisoning can be difficult because it often occurs with no distinct symptoms. Lead can damage the central nervous system, kidneys, and reproductive system. Children under six years old, pregnant women, and the developing fetus are the most vulnerable to lead and are considered to have "elevated" blood lead levels (EBLLs) if their blood test results are greater than or equal to 10 micrograms of lead per deciliter whole blood ($\mu\text{g}/\text{dL}$). Even low levels of lead are harmful in children and are associated with decreased intelligence, impaired neurobehavioral development, decreased stature and growth, and impaired hearing acuity (ATSDR, 1999). Recent studies have found that blood lead levels (BLLs) below 10 $\mu\text{g}/\text{dL}$ in children are associated with decreases in IQ (Canfield et al. 2003) and cognitive deficits (Lanphear et al. 2000). At higher levels of exposure, adults can also be negatively affected by lead poisoning. The workplace BLL standard established by the Occupational Health and Safety Administration (OSHA) for adults is 40 $\mu\text{g}/\text{dL}$.

Previous research has helped to identify some risk factors for childhood lead exposure. They are as follows:

- **Age** - from six months to six years due to behavior and physiology
- **Low income** - associated with poor housing, diet, health care, and/or education
- **Poor nutrition** - iron and calcium deficiencies increase lead absorption
- **Urban residence** - more lead sources such as contaminated soils
- **Recent or ongoing home remodeling** - increases dust from paint in home
- **Recent immigration to Minnesota** - previous exposure

Exposure pathways may include lead in the air, food, drinking water, lead-containing children's products, and glazes on pottery dishes, as well as "take-home lead" by way of adult occupations and hobbies. The most common source of childhood lead exposure is lead dust from paint manufactured before 1978. More than 80 percent of all homes built before 1978 in the U.S. have lead-based paint. Based on 2000 census information, this correlates to nearly one million homes in Minnesota. Deteriorating paint (chipping, flaking, and peeling) and paint disturbed during home remodeling contributes to lead dust, contaminates bare soil around a home, and makes paint chips containing lead accessible to children. Workplaces that use lead are the most common source of adult lead exposure. Additionally, families may be unknowingly exposed to lead dust brought home from these workplaces.

How the data are collected

The results of **ALL** blood lead analyses for Minnesota residents are reported to the MDH by an estimated 35 independent laboratories that service approximately 1,000 medical clinics, hospitals, and employer groups. Minnesota statute (144.9502) states that the blood lead analysis reports must specify:

- whether the specimen was a capillary or venous sample;
- the date the sample was collected;
- the results of the blood lead analysis;
- the date the sample was analyzed;
- the method of analysis used;
- the full name, address, and phone number of the laboratory performing the analysis;
- the full name, address, and phone number of the physician or facility requesting the analysis;
- the full name, address, and phone number of the person with the BLL, and the person's birth date, gender, and race.

Blood lead results of 15 µg/dL or greater must be sent to MDH within two days of the laboratory analyses, with written confirmation of the results sent within one month. Results less than 15 µg/dL must be sent to MDH within one month of laboratory analyses. All results are entered into a comprehensive, secure database. Increasing use of electronic data transmission should shorten the time required to enter information into the database. Timely information will facilitate better communication and collaboration among public health agencies. The MDH State Case Monitor tracks blood lead reports through the state surveillance system to assist local public health agencies in case management of EBLLs.

Trends in the data

The MDH maintains an extensive blood lead surveillance system for the purpose of monitoring trends in BLLs in adults and children in Minnesota. As of January 1, 2006, the database contained 757,528 records of blood lead test results from 513,997 individual Minnesota residents dating back to 1992. The data are used to help identify populations at risk for EBLLs. The surveillance system then uses this information to help ensure that screening services are provided to groups identified as having the highest risk of lead poisoning and that environmental and medical follow-up are provided to children with EBLLs.

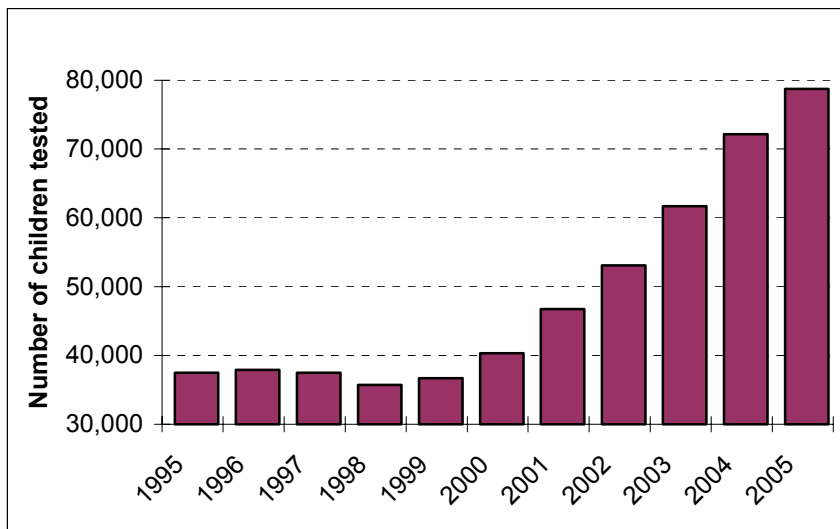
Although Minnesota has mandatory reporting from all facilities analyzing BLLs, it is important to recognize that blood lead testing is not universal and that the data are not representative of all Minnesota children. The data include only children for whom a family member has requested a test or for whom a health care provider has ordered a test. Therefore it is impossible to draw specific conclusions regarding the actual rates of lead poisoning in Minnesota based upon these data. Additionally, comparison of numbers of children with EBLLs among counties does not reflect the true prevalence of lead poisoning because testing is not conducted randomly, and the rate of testing varies from county to county. However, it is possible to use the data to identify trends in screening practices from year to year, compare the total number of EBLLs reported to

MDH over time, and characterize the population currently being screened. Local public health agencies can use this information to assist in making decisions regarding education of the medical community to increase screening and testing of children identified at high risk for blood lead poisoning.

All children less than six years old:

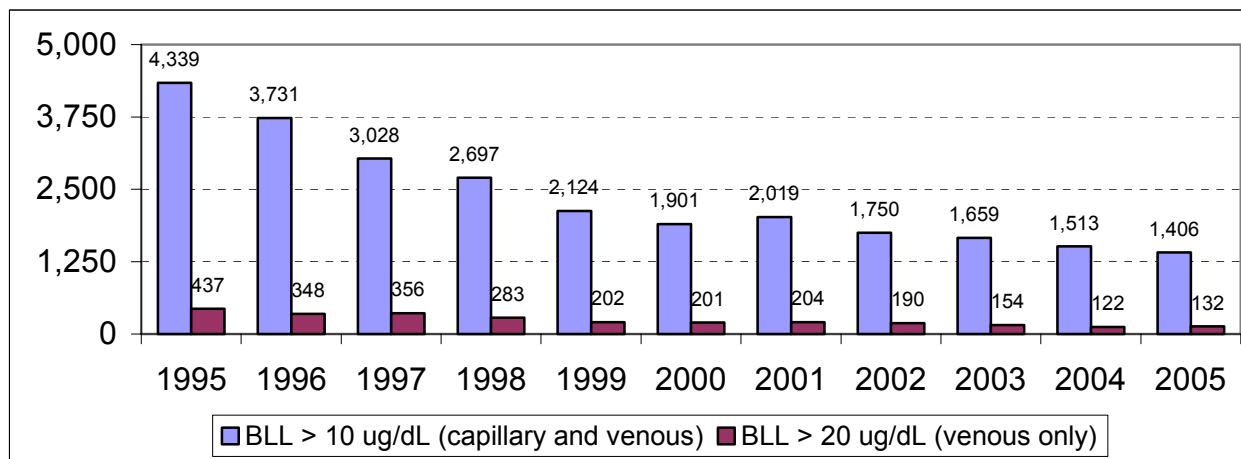
A total of 83,711 blood lead results from 78,761 children less than six years old, along with associated demographic information, were reported to MDH in 2005. Figure 1 compares the number of children tested in past years and gives some indication of how screening practices may have changed. Only data for children less than six years old are presented. The number of children tested statewide was lowest in 1998 and has been increasing since. This increase may be due, in part, to the efforts of MDH and other organizations involved with lead poisoning prevention to raise awareness of childhood lead poisoning and the development of statewide screening, case management and clinical treatment guidelines. The Minnesota Department of Human Services (DHS) has implemented financial incentives for health plans to perform complete Child and Teen Checkups, of which blood lead testing is a vital component. These incentives will likely lead to further increases in the number of children tested for blood lead, especially the population of children enrolled in Medicaid-funded programs. The goal of the state screening program is to test all children at risk for exposure to lead.

Figure 1



The trends in the number of EBLL cases (e.g. tests greater than 10 µg/dL) in Minnesota children may also be compared across years (Figure 2). The general downward trend shown in Figure 2 is consistent with national trends, but should not be used to conclude that lead is no longer a significant public health threat in Minnesota. In order to remain consistent with reports from past years, Table 2 also describes venous test results greater than 20 µg/dL. However, on August 1, 2005, state law established a 15 µg/dL as the blood lead level requiring environmental investigation. Future reports will describe the trends in blood levels of 15 µg/dL and higher.

Figure 2



While the rate of lead screening increased during the 1999 - 2005 period, the number of EBLL cases has continued to decrease. Although these data are difficult to interpret due to many confounding factors, this decrease in EBLL cases may be due to successes of lead hazard reduction and education efforts. It is safe to conclude that the average childhood BLL in Minnesota has declined from its historic high over the past nine years.

Rate of follow-up testing for children with EBLLs:

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 (see case management guidelines below), but the maximum time is 90 days for any child with a blood lead level of 10 µg/dL or greater. Of the 1,406 Minnesota children identified with EBLLs in 2005, 990 (70%) received a follow-up test. Of these, 696 (50% of the total children with EBLLs) were retested within 90 days. This low re-testing rate corresponds closely with findings from a recent study of Medicaid children in Michigan (Kemper et al. 2005), and a previous analysis of lead poisoning in the Minnesota Medicaid population (Castellano et al. 2002).

Fatal lead poisoning case:

The Minnesota Department of Health (MDH) offers its condolences to the family of a four-year-old Minneapolis child who died February 22 of lead poisoning after swallowing a metal charm containing very high levels of lead. This is the first documented death of a child from lead poisoning in Minnesota. This is a very rare occurrence, not only in Minnesota but nationwide. The child was first brought to the hospital with vomiting on February 16, returned and was hospitalized on February 18, and was tested for lead only after a metal object was seen on abdominal x-ray. The child's blood lead level was 180 ug/dL. The MDH state guidelines specify a blood lead of 60 ug/dL or greater to be a medical emergency. A level of 10 ug/dL or above is considered elevated. Health care providers should consider lead poisoning as a possible diagnosis if young children present with symptoms of increased intracranial pressure, unexplained gastric symptoms, and a history of eating or mouthing non-food objects.

Laboratory testing shows that the heart-shaped charm found in the child's stomach contained 99 percent lead. A similar Reebok heart-shaped charm attached to a bracelet sold with children's shoes obtained and tested by the Minneapolis Department of Regulatory Services contained 67 percent lead. The Consumer Products Safety Commission (CPSC) allows no more than 0.06 percent lead in jewelry sold in the United States. The CPSC has recalled Reebok charms. Consumers who have purchased shoes with heart-shaped metallic charm bracelets should keep the charm bracelet away from children, especially infants and toddlers who often place items in their mouths. The charm bracelet should be disposed of by bringing it to a household hazardous waste collection site.

Childhood lead poisoning is still a serious public health problem, but by far the greatest source of exposure in Minnesota is deteriorating lead paint or lead dust in housing built before 1978. Lead poisoning resulting from consumer products is rarely reported. However, the CPSC has issued previous product recalls for several types of children's toys or jewelry that have been manufactured with high lead content. The CPSC has also established a policy on lead in children's metal jewelry. Information on the CPSC lead in children's jewelry policy and recalls are available at the MDH Web site, www.health.state.mn.us/divs/eh/lead.

Refugee Children:

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. The 2005 refugee data are the most recent information available for matching with the Minnesota Blood Lead Surveillance Database. Refugee children in Minnesota comprise a wide range of ethnic origins, as shown in Table I.

Table I: Number and Percent of Refugee Children (Less than Six Years Old) Tested and with Elevated Blood Lead Levels in 2005

Ethnicity/ region of origin	Refugee children	Children tested for lead		Children tested for lead within three months of arrival		Children w/elevated level (10 µg/dL)	
Somalia	85	55	65%	51	93%	5	9.1%
Liberia	36	17	47%	15	88%	2	12%
Rest of Africa	25	14	56%	11	79%	1	7.1%
Burma	18	16	89%	15	94%	1	6.3%
Hmong	406	353	87%	346	98%	17	4.8%
Rest of Southeast Asia	4	2	50%	2	100%	0	0%
Former USSR	27	15	56%	15	100%	0	0%
Totals	601	472	79%	455	96%	26	5.5%

Of the total refugee children entering Minnesota in 2005, 88 percent received health screening. Blood lead tests were also matched to refugee information in past years. The rate of testing in refugee children remained between 56 percent and 69 percent from 1998 through 2004. This percentage increased significantly in 2005. For the total refugee population who entered the country in 2005, 79 percent of refugee children were tested for blood lead, and 96 percent of those tested were tested within three months of arrival. Of the children seen for an initial health screen, 85 percent were tested for blood lead. The rate of elevated blood lead levels in new refugees in 2005 was 5.5 percent, compared with 4 percent in 2004, 16 percent in 2003, 23 percent in 2001-2002, 21 percent in 1999-2000, and 20 percent in 1998. The rate of elevated blood lead levels for refugees was still approximately three times the rate for blood lead tests statewide in 2005 (1.8 percent). The decline in the rate of elevated blood lead levels in refugees in 2004 and 2005 may be due to the large increase in the number of Hmong refugees, who have historically lower rates of elevated blood lead levels than African refugees.

Medicaid children:

A report has been published in *Minnesota Medicine* describing testing rates, elevated blood lead levels and follow-up testing rates in Minnesota children enrolled in Medicaid funded programs during 1999-2003. This report is a follow-up to a similar report prepared in 2002 for the period of 1995-1998. It has been posted on the MDH lead program Web site at www.health.state.mn.us/divs/eh/lead. The *Minnesota Medicine* article is available at www.mmaonline.net/publications/MNMed2006/May/clinical-zabel.htm in the May 2006, Volume 86 issue.

Adults:

CDC recommends a level of concern for occupational exposure to lead of 25 µg/dL, while the Occupational Safety and Health Administration (OSHA) requires action at a level of 40 µg/dL. Minnesota's Adult Blood Lead Epidemiology and Surveillance (ABLES) program began identifying eligible adults on January 1, 1998. The total number of tests reported in 2005 for adults in Minnesota is presented in Table II.

Table II: Number and range of Minnesota residents 16 years or older reporting a blood lead test

# of reports	# of individuals	Range of reported results
8,663	7,560	0.0 to 118.0 µg/dL

There were 90 adults with BLLs of 25 µg/dL or greater identified through the ABLES program in 2005, and there were four adults with reported levels greater than 40 µg/dL. Occupations and hobbies contributing to lead exposure are listed in Table III.

Table III. Occupation/Exposure Categories for Adults with Elevated Blood Lead Levels

Occupation/Exposure	25+ µg/dL	40+ µg/dL
Painting	1	0
Construction and Demolition	5	1
Fishing Tackle Manufacturing	9	0
Lead Smelting	49	2
Brass Foundry	3	0
Gun Range Maintenance	3	0
Stained Glass	4	0
Ammunition Manufacturing	1	0
Previous Exposure in Another State	0	1
Unknown	14	0
Total	90	4

Lead Guidelines for Minnesota

MDH has developed a set of four guidelines for lead: Blood Lead Screening, Childhood Blood Lead Case Management, Childhood Blood Lead Clinical Treatment, and Blood Lead Screening for Pregnant Women. These guidelines were developed by collaborative workgroups and have been endorsed by a range of professional health organizations. All four guidelines may be found at the MDH Web site at <http://www.health.state.mn.us/divs/eh/lead>.

Blood Lead Screening Guidelines

The MDH Blood Lead Screening Guidelines direct physicians to order blood lead tests for 1) children residing in specific geographic areas that have a high rate of cases of elevated blood lead; and 2) children matching specific demographic groups that have a high rate 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. It 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 MDH Childhood Blood Lead Case Management Guidelines are intended to serve as minimum case management guidelines for providing services to children with EBLLs. They were developed to establish standardized, minimum levels of care. However, those counties that have greater resources available may wish to take a more rigorous approach to case management. The objective is to ensure that a qualified case manager is available to oversee the treatment and recovery of each child, and to ensure that steps are taken to prevent further exposure of the child to potential sources of lead. It works in concert with the MDH Blood Lead Screening Guidelines for Minnesota to identify and manage lead exposure in children. Appropriate steps are presented for both capillary and venous test results. The Case

Management Guidelines have been updated in 2006 to include revised guidance based on the change in the statutorily mandated intervention level of 15 µg/dL and recommendations for blood lead levels less than 10 µg/dL.

Childhood Blood Lead Clinical Treatment Guidelines

The Childhood Blood Lead Clinical Treatment Guidelines were designed for physicians to assist them in treating a patient with an EBLL, thus ensuring that all EBLL cases in Minnesota receive a consistent level of care. The appropriate level to begin chelation therapy was the main issue in developing the guidelines. In addition to the guidelines from MDH, local public health agencies may review risk factors for elevated blood lead and the available blood lead screening data to assess concerns about lead poisoning in their areas. Factors to be considered locally are the age and condition of housing stock, the size of the population, screening practices of the area health care providers, occupational and community sources of lead, socio-economic status of the population and other unique risk factors in the community. The assessment should address the amount of screening that takes place relative to the size of the childhood population, the relative number of elevated cases that are found, and the use of other screening tools, such as questionnaires, to identify risk factors.

Blood Lead Screening Guidelines for Pregnant Women in Minnesota

In June 2004, MDH developed Blood Lead Screening Guidelines for Pregnant Women in Minnesota. They are designed for Ob/Gyn physicians, nurse practitioners, and midwives to assist them in screening and treating pregnant women for elevated blood lead levels, thus ensuring that both the women and their children receive intervention to reduce their lead exposure.

Prenatal lead exposure is of concern because it may have an effect on cognitive development and may increase delinquent and antisocial behaviors when the child gets older. Prenatal lead exposure may also reduce neonatal weight gain. In addition to fetal risk, lead may be a risk to the mother by causing an increase in blood pressure. Lead is transferred from mother to the fetus because the placenta is a weak barrier to the passage of lead. Therefore, it may be assumed that fetal blood contains the same concentration of lead as maternal blood. The CDC and MDH consider 10 µg/dL and above to be an elevated blood lead level for pregnant women as well as children.

In many cases, high levels of lead in pregnant women arise from maternal occupational exposure. However, other lead exposures may occur, such as: remodeling a home containing lead paint that allows lead dust to become airborne and inhaled; a family member's occupation or hobby resulting in "take-home" lead; using non-commercial home remedies or cosmetics that contain lead; using non-commercial glazed pottery for cooking; and pica behavior of the mother, such as eating soil or pieces of clay pots. There may also be exposure of the fetus to lead coming out of the mother's bones. This may arise from long-term previous exposures of the mother even though lead exposure is not happening during the pregnancy. Lead may come out of maternal bones faster during pregnancy and lactation because of the mother and fetus's need for calcium. A diet rich in iron and calcium may help reduce absorption of lead during pregnancy.

Not every woman is at risk for lead exposure, so a risk screening questionnaire should be used to decide when to test a pregnant, or potentially pregnant, woman for lead.

2005 Blood Lead Testing in Children by County

As stated previously, a total of 83,711 blood lead results from 78,761 children less than six years old, along with associated demographic information, were reported to MDH in 2005. The results included in this report represent submitted reports of blood lead tests of Minnesota children aged less than six years, for specimens drawn between January 1, 2005 and December 31, 2005. Data on the total number of children for whom lead tests have been performed and the specific breakdown of EBLLs for individual counties in Minnesota are presented in Table VI.

It is important to recognize that the data are not representative of all Minnesota children. The data include only children for whom family members have requested tests or for whom a health care provider has ordered tests. Blood lead testing is not mandatory for children in Minnesota, and with the exception of those populations identified in the screening guidelines, is not universally recommended. Some children who are lead poisoned may not have been detected because they have not been tested. These children do not appear in the statistics shown here.

For further information on surveillance for EBLLs and to request a copy of this report, contact the Environmental Impacts Analysis Unit: Erik Zabel, 651/201-4931, erik.zabel@health.state.mn.us. Additional information on lead may be found at the MDH Web site at <http://www.health.state.mn.us/divs/eh/lead>.

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**Table VI: Numbers of Children 0 - 72 months of Age, Tested in 2005,
According to Blood Lead Level in Micrograms Per Deciliter (µg/dL)**

County	5 to 9.9	10 to 14.9	15 to 19.9		20 µg/dL or greater		Total Children Tested				
	µg/dL	µg/dL	µg/dL	µg/dL	Venous	Capillary	Venous	Capillary	All test types	Population (2000)	Percent Tested
Aitkin	21	1	1	1	0	0	0	0	173	858	20%
Anoka	263	27	6	4	0	4	0	4	3,898	27,287	14%
Becker	25	3	2	0	0	0	0	0	298	2,244	13%
Beltrami	28	1	0	2	0	0	0	0	304	3,394	9%
Benton	32	7	0	1	0	1	0	1	746	2,949	25%
Big Stone	5	1	0	0	0	0	0	0	63	336	19%
Blue Earth	53	5	1	1	0	0	0	0	708	3,709	19%
Brown	38	4	1	0	0	2	0	2	280	1,752	16%
Carlton	49	9	3	0	0	1	0	1	645	2,266	28%
Carver	97	4	0	0	1	1	0	1	683	7,493	9%
Cass	27	0	0	0	0	0	0	0	309	1,688	18%
Chippewa	27	7	1	0	0	0	0	0	155	922	17%
Chisago	30	5	0	1	1	0	0	0	506	3,750	13%
Clay	32	1	1	2	0	0	0	0	317	3,826	8%
Clearwater	6	0	0	0	0	0	0	0	66	594	11%
Cook	8	0	0	0	0	0	0	0	37	292	13%
Cottonwood	20	1	0	0	0	1	0	1	145	862	17%
Crow Wing	83	4	1	0	1	0	0	0	850	3,999	21%
Dakota	303	25	7	6	5	6	5	6	4,550	33,353	14%
Dodge	25	2	0	0	0	0	0	0	185	1,613	11%
Douglas	32	2	0	0	0	0	0	0	502	2,216	23%
Faribault	27	3	0	1	0	0	0	0	209	1,025	20%
Fillmore	26	3	0	0	1	0	0	0	190	1,458	13%
Freeborn	33	5	1	0	2	0	0	0	412	2,209	19%
Goodhue	40	7	0	2	0	0	0	0	482	3,258	15%
Grant	8	0	0	0	0	0	0	0	87	392	22%
Hennepin	2,209	307	55	49	54	31	54	31	19,534	88,005	22%
Houston	32	4	0	1	0	1	0	1	184	1,389	13%
Hubbard	11	0	0	0	0	0	0	0	92	1,232	7%
Isanti	34	3	0	0	1	0	0	0	484	2,497	19%
Itasca	71	5	0	1	0	0	0	0	771	2,825	27%
Jackson	9	2	1	0	0	1	0	1	109	723	15%
Kanabec	19	1	0	0	0	0	0	0	174	1,116	16%
Kandiyohi	189	13	1	1	2	2	2	2	833	3,080	27%
Kittson	5	0	0	0	0	1	0	1	37	407	9%
Koochiching	20	6	0	0	0	1	0	1	212	958	22%
Lac Qui Parle	19	0	0	1	1	0	0	0	121	508	24%
Lake	14	0	0	0	0	0	0	0	160	670	24%
Lake of the Woods	2	1	0	0	0	0	0	0	35	244	14%
Le Sueur	26	3	0	0	1	0	0	0	284	1,923	15%
Lincoln	16	1	0	0	0	0	0	0	68	435	16%
Lyon	109	10	0	0	0	1	0	1	545	2,009	27%
McLeod	49	6	1	1	0	1	0	1	570	2,935	19%

Mahnomen	6	3	0	0	0	0	85	453	19%
Marshall	7	0	0	0	0	0	72	703	10%
Martin	36	7	1	1	0	0	298	1,449	21%
Meeker	42	5	1	0	0	0	349	1,760	20%
Mille Lacs	36	2	0	1	0	1	378	1,648	23%
Morrison	51	3	0	0	0	0	540	2,513	21%
Mower	24	3	1	0	2	0	389	2,860	14%
Murray	8	1	0	0	0	1	101	600	17%
Nicollet	26	4	0	0	0	0	409	2,143	19%
Nobles	42	3	0	2	3	1	548	1,736	32%
Norman	12	0	0	0	1	0	75	556	13%
Olmsted	71	8	0	0	2	0	960	10,691	9%
Otter Tail	70	5	2	1	0	0	395	3,772	10%
Pennington	6	0	0	0	0	0	147	999	15%
Pine	46	4	1	2	0	0	345	1,784	19%
Pipestone	6	1	0	0	0	0	55	678	8%
Polk	21	2	1	0	0	0	265	2,261	12%
Pope	11	0	0	0	0	0	134	660	20%
Ramsey	1,670	231	32	17	37	25	9,310	41,990	22%
Red Lake	2	0	0	0	0	0	37	289	13%
Redwood	41	4	0	1	0	0	220	1,252	18%
Renville	56	9	0	1	0	1	266	1,260	21%
Rice	84	8	2	0	1	0	895	4,206	21%
Rock	9	1	1	0	2	0	43	733	6%
Roseau	6	0	0	0	0	0	95	1,460	7%
Scott	62	7	0	2	0	1	1,466	12,737	12%
Sherburne	27	6	0	0	1	0	1,109	10,001	11%
Sibley	34	4	0	0	0	0	219	6,497	3%
St. Louis	358	46	6	5	7	4	3,452	12,737	27%
Stearns	184	14	0	1	0	3	2,402	10,311	23%
Steele	34	5	1	1	1	1	723	2,832	26%
Stevens	13	1	0	0	0	0	153	631	24%
Swift	23	2	0	1	0	0	138	775	18%
Todd	42	5	0	0	0	3	285	1,743	16%
Traverse	7	0	1	0	0	0	53	277	19%
Wabasha	19	1	0	0	0	0	203	1,540	13%
Wadena	10	0	0	0	0	0	174	1,014	17%
Waseca	19	3	0	1	0	1	322	1,554	21%
Washington	142	13	2	0	3	0	1,799	18,636	10%
Watonwan	26	2	0	0	0	0	165	1,022	16%
Wilkin	4	0	0	1	0	1	68	548	12%
Winona	70	11	0	0	3	0	443	3,385	13%
Wright	61	11	0	3	0	3	1,458	8,947	16%
Yellow Medicine	30	3	1	1	0	1	119	757	16%
Unknown	742	5	0	0	0	0	6,286	N/A	N/A
Minnesota Totals	8,468	929	127	117	132	101	78,761	397,581	20%

Appendix C

Blood Lead Testing in the Minnesota Medicaid Population, 1999-2003

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Lead Poisoning in Minnesota Medicaid Children

By Erik W. Zabel, Ph.D., M.P.H., and Susan Castellano

ABSTRACT

This article presents data on blood-lead testing in Minnesota children from 1999 through 2003. The number of Minnesota children younger than 6 years of age who were tested for blood lead increased from approximately 38,000 in 1999 to 61,000 in 2003. The rate of blood-lead testing in 9- to 30-month-old children enrolled in Medical Assistance and MinnesotaCare, the state's Medicaid programs for children, increased from 17% to 29% between 1999 and 2003. The rate of elevated blood-lead levels (10 $\mu\text{g}/\text{dL}$ or greater) in all tested children declined from 6% in 1999 to 2.7% in 2003. However, the rate of elevated blood-lead levels in children enrolled in the 2 public programs in 2003 (3.4%) was 2-fold higher than that in children who were not on Medical Assistance or MinnesotaCare (1.5%). The percentage of all children with elevated blood-lead levels who were retested within 3 months increased from 39% in 1999 to 50% in 2003.

Lead poisoning is one of the primary environmental health concerns for children, yet it can be prevented entirely by eliminating exposure to lead. Fortunately, children's blood-lead levels have been greatly reduced since the 1970s mainly because of the phase-out of leaded gasoline and the 1978 ban on lead in residential paint. However, old lead paint and contaminated soil remain major sources of lead poisoning for some children.¹⁻⁴ Toddlers are at the greatest risk because their nervous systems are developing, they absorb lead more easily because of their nutritional needs combined with lead's ability to substitute for calcium in enzymatic processes, and they spend time on or near the floor and put things in their mouths, making them more likely to come in contact with lead-contaminated soil, paint dust, or paint chips.⁵ Additional risk factors include living in a home built before 1950 because of the higher lead concentration in paint, having poor nutrition (diets that are high in fat or low in calcium and iron promote lead absorption), having a family member with a lead-related occupation or hobby, having contact with jewelry that contains lead, and using traditional remedies or consuming imported spices or Mexican candy that contain lead. Children who are minorities, have low socioeconomic status, and live in the inner city are disproportionately affected.^{6,7}

Lead poisoning during early childhood is particularly

insidious because it usually has no symptoms, and neurodevelopmental effects such as lower IQ and behavioral problems may not appear until the child begins school. Blood-lead testing is the only way to determine whether a child has lead poisoning. Both the Centers for Disease Control and Prevention (CDC) and the Minnesota Department of Health (MDH) consider a blood-lead concentration of 10 $\mu\text{g}/\text{dL}$ or greater to be an elevated blood-lead level.

Children who receive health care through the Medicaid program are at increased risk for lead poisoning. The third National Health and Nutrition Examination Survey (NHANES III) found that Medicaid enrollees accounted for 83% of the U.S. children ages 1 to 5 years who had blood-lead levels of 20 $\mu\text{g}/\text{dL}$ or greater.⁸ Regional and local studies have produced similar results; however, the absolute risk for each geographic area depends on characteristics such as the percentage of old housing stock and the presence of industries that use lead. One study in western Minnesota found a 1.6-fold higher risk of elevated blood-lead levels among children on Medical Assistance (MA) and MinnesotaCare (MNCare), the state's Medicaid programs for children, than among those who were not enrolled in the programs.⁹ Because of the increased risk of elevated blood-lead levels in children on Medicaid, federal law requires testing of all children receiving Medicaid Early and Periodic Screening, Diagnostic, and Treatment Program services during well-child visits at 1 and 2 years of age, and any visit thereafter through age 5 if the child has not previously been tested.

Analysis of blood-lead testing and Medicaid enrollment data from 1995 through 1998 showed that only 13% of all children ages 9 to 30 months in the state who were enrolled in MA or MNCare were tested for lead in 1998.¹⁰ The study also found that among children ages 9 to 30 months who were on MA or MNCare and were seen for a well-child visit, only 23% were tested for lead in their bloodstream. This represented a decline from the 1995 testing rate of 26%, but it was above the national rate of 19% estimated by NHANES III.⁸ The NHANES III report also described a 2-fold higher risk of elevated blood-lead levels in Medicaid children. The current analysis sought to determine whether this downward testing trend has continued or improved because of efforts by the MDH, the Minnesota Department of Human Services (DHS), and others to expand lead testing of Medicaid children in the state.

Methods

Data Preparation

Laboratories performing blood-lead analyses on people in Minnesota are required by statute to report results to the Environmental Health Division of the MDH. These reports make up Minnesota's blood-lead surveillance system. Because the DHS maintains separate files on MA and MNCare enrollment, a matching process was necessary to link children's enrollment and lead-testing information. Children enrolled in MA or MNCare for at least 1 month between January 1, 1993, and December 31, 2003, were selected from DHS data. Corresponding data on blood-lead tests were selected from the MDH lead surveillance database by choosing children age 6 years and younger who were tested for lead poisoning between January 1, 1999, and December 31, 2003. Age was calculated as the difference between the date of the blood-lead sample draw and the child's birth date. DHS billing data provided the number of MA and MNCare children seen for well-child visits.

Data Linking

An iterative 8-step matching process similar to that used by Castellano et al. and Gyllstrom et al. was used to link children in the DHS database with children in the MDH lead surveillance database.^{10,11} The variables used in matching were first name, middle name, last name, gender, and day, month, and year of birth. The first iteration matched on exact first and last name and date of birth. The remaining iterations became progressively broader on matching criteria. Results of all iterations after the first were verified on paper. The information on children who matched was then compared with that in the lead surveillance database to determine which tests occurred when the child was enrolled in MA or MNCare.

Calculation of MA and MNCare Enrollment

Total enrollment of children in MA and MNCare to determine blood-lead testing rates was calculated 2 different ways. The first was simply to total the number of children enrolled for any length of time each year who were of the appropriate age at some point during that year. Because some children who met the age criteria were only enrolled for a short period of time during each year, they had less of a chance of being seen for a provider visit during the period of analysis, leading to an artificially low screening rate. In order to take into account the amount of time children were enrolled in MA or MNCare, enrollment was also calculated as the total number of "child years" per calendar year. The number of child years, or full years of enrollment, was calculated by summing the total number of months of enrollment for all children per calendar year and dividing by 12 months. Therefore, one child year is equivalent to one child being enrolled in MA or MNCare for a full calendar year.

This was merely a method of accounting for less enrollment time for some children.

Race and Ethnicity Data

Racial and ethnic information was available for children enrolled in MA and MNCare. The race categories were Asian, Pacific Islander/Native Hawaiian, black or African-American, American Indian/Alaskan Native, and white. Because so few children fell in the Pacific Islander/Native Hawaiian category, that category was folded into one called Asian/Pacific Islander. The children who had a reported Hispanic ethnicity were counted as Hispanic in the analysis. The percent of children with unknown or missing racial/ethnic information increased from 4.7% in 1999 to 8.4% in 2003. Those children were included in a separate category for analysis.

Age Categories

Two age groups were used in the analyses—children younger than 72 months of age and those 9 to 30 months of age. The category "children younger than 72 months" was used because this is the group covered by both CDC and MDH blood-lead screening and treatment guidelines. It is also used when describing elevated blood-lead levels and follow-up testing rates. "Children ages 9 to 30 months" was used because this age range captures children who should be tested according to federal Medicaid requirements (age 1 and 2 years at well-child visits) and reflects the higher risk of elevated blood-lead levels in younger children. These 2 age groups allowed a direct comparison with the previous report covering data from 1995 through 1998.¹⁰

Results

Linking Process

The MDH Lead Surveillance Database contained information about 213,663 children who were younger than 6 years of age at the time of their lead test between January 1, 1999, and December 31, 2003. The DHS MA and MNCare enrollment dataset contained information on 307,677 children with birth dates between January 1, 1993, and December 31, 2003. A total of 107,649 children were matched between the 2 databases.

Rate of Testing

The number of children tested for blood lead increased between 1999 and 2003 (Figure 1). The rate of lead poisoning testing in children enrolled in MA and MNCare was calculated using 3 different denominator populations: the total number of children enrolled in the public programs, calculated "child years" of enrollment, and the number of children seen for well-child visits. Using all 3 denominators, the percentage of MA- or MNCare-enrolled children who were tested for lead also increased between 1999 and 2003.

The percentage of children on MA and MNCare ages 9 to 30 months who were tested for lead rose from 16% in 1999 to 29% in 2003. A similar increase—from 14% to 20%—was seen for all children younger than 72 months. When child years were used to calculate the screening rate, the percentage of children 9 to 30 months old tested in 2003 was 51% versus 28% for all children younger than 72 months. The percentage of children with well-child visits who were tested for lead increased from 1999 to 2003, with a higher percentage of children ages 9 to 30 months tested (37% to 53%) compared with children younger than 72 months (27% to 34%).

Rate of Elevated Blood-Lead Levels

The percentage of tested children who had elevated blood-lead levels dropped throughout the period analyzed. For all children younger than 72 months, it decreased from 6.0% in 1999

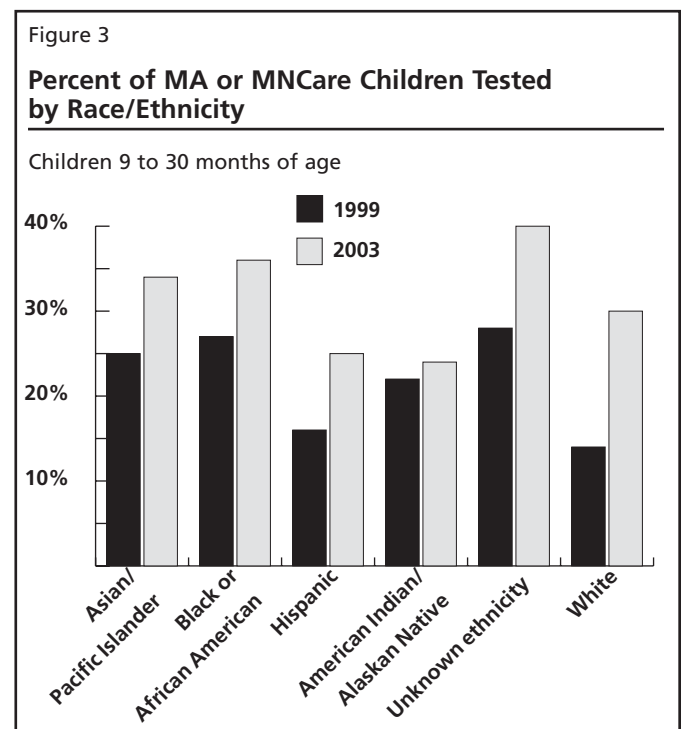
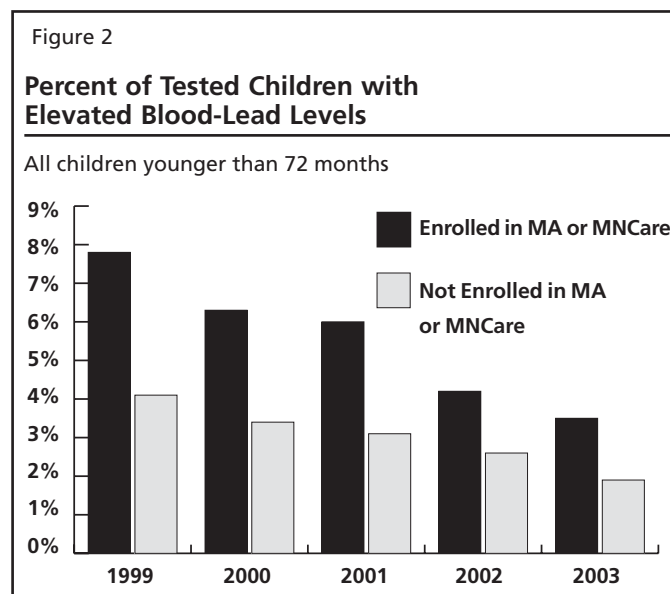
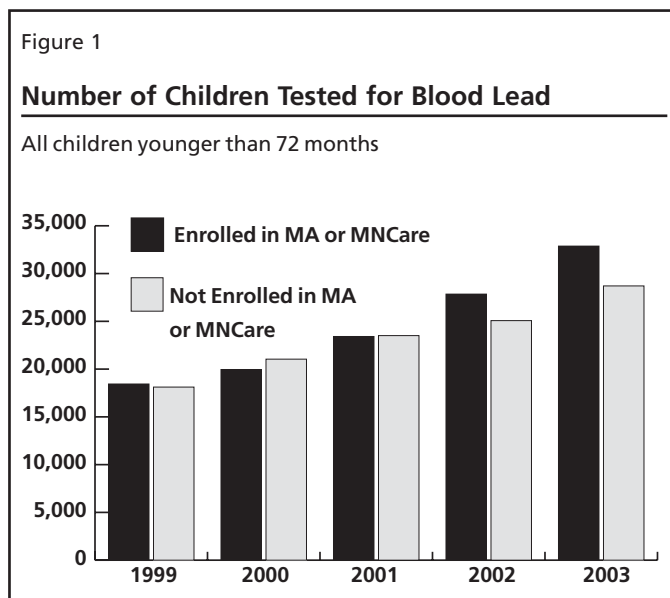
to 2.8% in 2003. For children ages 9 to 30 months, it fell from 5.2% to 2.6%. However, the rate of elevated blood-lead levels in children on public health programs remained approximately twice that of children who were not enrolled in such programs (3.5% and 1.9%, respectively, in 2003 for all children younger than 72 months; and 3.3% and 1.7%, respectively, for children 9 to 30 months). Figure 2 describes this trend for all children younger than 72 months.

Rate of 3-Month Follow-up Testing

The percentage of children with elevated blood-lead levels who were retested within the recommended 3 months increased from 39% in 1999 to 50% in 2003 for children who were and were not enrolled in public health insurance programs. It remained slightly higher in children who were not on MA or MNCare. The follow-up rate was slightly higher in children younger than 72 months compared with children 9 to 30 months old. However, the percentage of children retested within 3 months remained low at approximately 50% to 60% for both groups.

Race/Ethnicity Analysis

Based on total enrollment, child years, or well-child visits, the rate of testing increased consistently for children ages 9 to 30 months in all racial and ethnic groups (Figure 3). Blood-lead testing rates in 2003 were highest in the unknown race/ethnicity category (40%), followed by the black or African-American (36%), Asian/Pacific Islander (34%), white (30%), Hispanic (25%), and American Indian/Alaskan Native (24%) groups.



Elevated blood-lead levels declined for all racial groups between 1999 and 2003. The rate of elevated blood-lead levels in 2003 was highest among black or African-American (5.0%), Asian/Pacific Islander (4.0%), Hispanic (5.0%), and American Indian/Alaskan Native children (4.3%). Lower rates were found in the white (2.4%) and unknown (2.9%) categories. Follow-up testing increased somewhat for all racial groups between 1999 and 2003. The rate of 3-month follow-up testing in 2003 was highest in the white (59%), unknown (58%), and Hispanic (55%) groups, with lower rates of follow-up in American Indian/Alaskan Native (49%), black or African-American (35%), and Asian/Pacific Islander (40%) children.

Discussion

The number of children tested for lead in Minnesota who were not enrolled in public health care programs increased between 1999 and 2003. The release of statewide screening guidelines in 2000 and ongoing efforts to increase screening in high-risk populations are likely reasons for this increase. Also, the rate of elevated blood-lead levels in tested children decreased during the period studied. This is likely the result of an increase in testing for all children and ongoing efforts to reduce lead sources. It is important to emphasize the fact that the children whose data is entered in the blood-lead surveillance system do not reflect a random sample of Minnesota children. Testing is performed in response to guidelines and/or at the discretion of the health care provider and parent.

Providers cannot test children who are not seen for routine care. To look at only the children enrolled in public health care programs who are seen for preventative visits, we used DHS billing records to calculate the blood-lead testing rate in children seen for well-child visits. Even though the rate of testing during well-child visits increased from 37% in 1999 to 53% in 2003, the rate remained well below the optimal 100%.

Our analysis also found that children enrolled in MA and MNCare had an approximately 2-fold higher rate of elevated blood-lead levels than children who were not enrolled in those programs. This is very similar to the increase that has been shown in national studies and in a previous analysis of Minnesota blood-lead surveillance data.^{8,9} Improvements have been made in the blood-lead testing rate of children on MA and MNCare. However, more work needs to be done to ensure testing because of the higher risk of lead poisoning among this population and federal laws requiring all Medicaid children to be tested during both 1- and 2-year well-child visits.

The percentage of children with elevated blood-lead levels who were retested within the recommended 3 months increased from 1999 to 2003. Still, the rate among both children who were and were not enrolled in public health programs remained low, approximately 50% to 60%. Even though the population covered by MA and MNCare tends to be more

mobile and less likely to use health care resources, improving the follow-up testing rate should be an important goal of future childhood lead poisoning prevention efforts.

The percentage of children with elevated blood-lead levels dropped for all racial and ethnic groups between 1999 and 2003. This occurred among children ages 9 to 30 months and all children younger than 72 months. However, in 2003 the rate of elevated blood-lead levels remained higher in Asian/Pacific Islander, black or African-American, Hispanic, and American Indian/Alaskan Native children who were tested compared with white children and children with unknown race/ethnicity. This correlates with previous studies that showed a higher risk for lead poisoning in minority populations, which is likely due to living in substandard rental housing and living in urban areas that have higher concentrations of lead in soil.^{6,7}

Testing rates were highest in Asian/Pacific Islander and black or African-American children and lowest among Hispanic and American Indian/Alaskan Native children. The follow-up rate increased for all racial groups between 1999 and 2003. However, the 3-month follow-up rate was highest among whites and the unknown group and lowest in the Asian/Pacific Islander and black or African-American groups.

Limitations

Use of the data in this report to describe the overall Minnesota population is limited. First, surveillance data are not a random sample of Minnesota children. Providers and parents make the decision to test each child, and they have a variety of reasons for doing so. Second, the race and ethnicity data used in this report are for children in public health care programs only. The differences between racial and ethnic groups may not be similar in those children who are not enrolled in such programs. Also, race and ethnicity data were missing or unknown for some children (8% in 2003). This may lead to an inaccurate analysis by race/ethnicity. Finally, there may be errors in matching between databases even though attempts were made to search for nonidentical but similar names and birthdates.

Conclusion

Our analysis found that the rate of blood-lead testing in children on MA and MNCare increased from 1999 to 2003 in contrast to the decline observed between 1995 and 1998. The rate of elevated blood-lead levels continued to decline in both children who were and were not enrolled in public health programs. The rate of follow-up testing in children with elevated blood-lead levels remained low, however, and improving follow-up should be a focus of efforts in childhood lead poisoning prevention. Continuing analysis of blood-lead surveillance data for all children will help track Minnesota's progress toward elimination of childhood lead poisoning by

2010, which is one of the goals of the Healthy People 2010 federal initiative. MM

For blood lead screening guidelines and more information on lead, visit the MDH Lead Program Web site at www.health.state.mn.us/divs/eh/lead. For guidelines specific to children enrolled in Medicaid, see pages C-19 and C-20 in the Child and Teen Checkups Provider Manual at www.dhs.state.mn.us/main/groups/county_access/documents/pub/dhs_id_000307.hcsp.

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cial pillow that can form a pocket of air around the wound.

Nurses educated his family about his condition and instructed them to not let him disturb his bandages. Team members also consulted with a nutritionist to make sure the patient was being tube-fed the correct amount of food (the body needs good nourishment in order to heal damaged skin). Two and half weeks later, the man's ulcers were healed, Murphy says.

By the time of HCMC's next skin team audit in March of 2006, the number of pressure ulcers dropped by nearly half. The audit team found 49 ulcers and only one reportable stage III ulcer in the 178 patients they inspected.

Working the Workflow

The key to preventing serious pressure ulcers is integrating skin checks and patient adjustments into a nurse's daily routine, says Jane Pederson, M.D., director of medical affairs at Stratis Health. Pederson was involved in developing the protocol for treating and preventing pressure ulcers. "Theoretically, if we looked at everyone's backside every shift, we'd catch everyone, but it's not happening," she says.

Nursing homes generally lead hospitals in terms of making pressure ulcer prevention part of people's jobs. Pederson explained how one facility in Delaware restructured the workload so each day two nursing assistants took re-

sponsibility for turning patients.

However, in a hospital, the challenge is to treat the acute illness and still find time to assess skin and execute treatment plans. That's not always an easy task, considering some treatment plans call for patients to be turned hourly. "When you talk to nurses, it isn't that they don't understand the importance of preventing pressure [sores], but it is very hard to put it into their work flow," Pederson says.

Physicians also need to be aware of what they can do to help patients avoid an advanced-stage pressure ulcer. Pederson says they should know the basic risk factors for skin problems and sort out the etiology once a wound develops.

Pressure, arterial problems, venous stasis, or neuropathy can cause a wound on a person's leg, for example. "Each of these etiologies has a different treatment, and you've got to know which one you're dealing with, and that is the realm of the physician," she says.

Pederson believes electronic medical record systems will help nurses and physicians know which patients are high-risk so that they automatically order a pressure-relieving bed, chair cushion, and turnings.

She also expects efforts such as HCMC's will help lead to change at other facilities. "As we get better at systematically looking for these ulcers, it is going to help us and push us to change to get the best practices incorporated into the daily work flow of physicians and nurses." MM

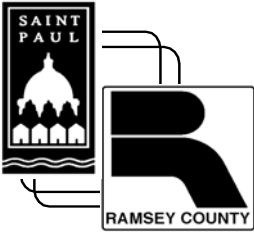
Scott Smith is a staff writer for *Minnesota Medicine*.

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Appendix D

Refugee Lead Testing Project Report

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**Saint Paul – Ramsey County
Department of Public Health**

Rob Fulton, Director

Childhood Lead Poisoning
Prevention Program
555 Cedar Street
Saint Paul, MN 55101-2260
651-266-1292 Fax: 651-266-1201

**High-Intensity Targeted Screening Project
Refugee Screening
Saint Paul – Ramsey County
Department of Public Health
7/25/2006**

Mary Ellen Smith, PHN
Program Manager
Childhood Lead Poisoning Prevention Program

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HITS Refugee Screening Project

Period Referenced:

October 10, 2005 – June 30, 2006

Premise:

Centers for Disease and Control (CDC) released Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children in May 2005. Their statement cited that the prevalence rate of newly resettled refugee children with elevated blood lead levels is 2.2% higher than the prevalence for US children. Their statement referenced a project in New Hampshire. 96 refugee children, predominately from Africa were tested for lead upon arrival. Most had capillary blood lead levels less than 10 mcg/dL. Venous tests 3 to 6 months later found that 40% had elevated blood lead levels over 10 mcg/dL. The children in New Hampshire with elevated blood lead levels showed evidence of extreme chronic malnutrition.

Aim of Grant:

Saint Paul-Ramsey County Department of Public Health completed a similar intensive screening project looking at blood lead and nutritional status of new refugee children relocating to Ramsey County in Minnesota. Venous lead tests and a nutritional panel of tests of Refugee children were taken within one month after U.S. arrival. Lead levels were re-checked 3-6 months later.

- The results of these tests can be found in Appendix I
- A table of lab values can be found in Appendix II

Nutritional and Lead Screening Tests:

Tests drawn at initial refugee screening:

- Lead
- Hemoglobin
- Hematocrit
- Mean corpuscular volume (MCV)
- Red cell distribution width (RDW)
- Ferritin
- Transferrin saturation (%saturation)
- Iron
- Total iron binding capacity (TIBC)

Recruitment and Population Tested:

- New refugee children under the age of 16 years were tested for lead and received additional nutritional lab tests at Saint Paul – Ramsey County Department of Public Health
- The repeat blood lead test was done at Saint Paul – Ramsey County Dept. of Public Health
- Nearly all of the children tested had been in the United States for only 1-2 months at the time of the initial lead and nutritional screen
- Ethnic breakdown
 - Number of Hmong children tested 65 (43.3%)
 - Number of Somali children 45 (30%)
 - Number of Karen children 27 (18%)
 - Number of Liberian children 7 (4.7%)
 - Number of Oromo children 4 (2.7%)
 - Number of Amharic children 1 (0.7%)
 - Number of Sierra Leone children 1 (0.7%)

- Places of origin
 - Somali families originated from Somalia; most detained and departed from Kenya. Some departed from Syria, Ethiopia and Egypt
 - Hmong families originated from Laos; detained and departed from the Wat Camp in Thailand
 - Karen families originated in Burma; detained and departed from Thailand
 - Oromo speakers departed from Ethiopia and Kenya
 - Amharic speakers departed from Kenya
 - Liberian families originated from Liberia; departed from Guinea
 - Sierra Leone families originated from Sierra Leone; departed from Guinea
- Ages
 - Children were under the age of 16 years of age
 - 43 of the 150 children tested (28.7%) were under the age of 6 years
 - 7 (or 4.7%) were infants under the age of 1 year (12 months)
 - 36 (or 24%) were between the ages of 1 year through 5 years (12 – 71 months)
 - 107 of the children tested (71.3%) were 6 years of age and over

Time frame:

Our initial Refugee Screening tests began on October 10, 2005 and continued until February 10, 2006. Repeat lead testing continued until June 30th, 2006

Outcomes:

- 1) Number of children screened initially:
 - 150 refugee children ages 6 months through 15 years of age received an initial blood lead test and nutritional lab tests
- 2) Number of children screened within six months of initial refugee screen:
 - 140 out of 150 children (93.3%) received a second blood lead test within six months of the original lead test
 - 6 children (3 families) have moved out of Ramsey County
 - 2 children (1 family) has failed appointments 3-4 times
 - 2 children (1 family) cannot be reached
- 3) Total number of children with blood lead elevations at time of first and second lead test
 - 6 out of 150 (4%) children were identified with an elevated blood lead levels
- 4) Number of children identified with an elevated lead at the time of the initial Refugee Screening
 - Five (5/150) or 3.3% had elevated lead levels
- 5) Number of children identified with an elevated lead 3-6 months after initial Refugee Screening
 - Three (3/150) or 2% had lead elevations at their second lead screening
 - Two of these were elevated at both the initial screen and at the second
 - Only one child had a rise in blood lead after arrival to the US.
 - That child was 6-months of age at the first screening, and was 9-months second test. His test rose from 7 to 10 ug/dL
 - All but one child experienced blood lead regression

6) Lead elevation and the correlation to abnormal nutritional labs

- o The presence of an elevated blood lead level did not seem to correlate with abnormal nutritional labs. See Appendix I: Refugee Children Tested for Lead and Nutritional Status
- o 57 of 150 children (38%) had abnormal nutritional labs
- o Only 1 of the 6 children with elevated blood lead levels had an abnormal nutritional screen

Those with lead exposure:

- o Since most children received their lead exposure prior to refugee screening it was difficult to ascertain the exact source of exposure. Parents were unsure where the child was exposed
 - o Three children with elevations were from Somalia
 - We learned that there are vendors who work with metals on the streets in Somalia
 - o The other three were from Thailand, Sierra Leone and Liberia
 - Only the Hmong child was given a cultural medication in the refugee camp for fever: pay-looh, combined with shung-fa
 - o No one admitted to exposure to ammunition
 - o Only one admitted to use of cultural medication
 - o No one admitted to use of cultural cosmetics
 - o No use of pottery admitted
 - o There was no exposure to remodeling
 - o The rise in lead of the Liberian infant seemed to be due to dirty carpets.
 - Apartment constructed in 1973. Windows were high and composed of metal. Walls in tact. Stucco exterior. The 2 bedroom apartment was over-crowded. Child was not fully engaged in exploratory activities yet

Table I (Abstracted from MDH's screening questionnaire)

2

Age	Sex	Origin	Year house built	Remodel-ing	House-mates with lead	Medical Assist-ance	First lead test	Second lead test
13 years old	boy	Somalia	1981	no	no	yes	15	13
15 years	girl	Somalia Oromo	1) 1906 2) out of county	no	no	yes	13	<5
9 years	boy	Somali	1) 1951 2) 2002	no	no	yes	10	<5
6 months	boy	Liberian	1973	no	no	yes	7	10
6 years	girl	Hmong	1890	no	no	yes	14	12
10 years	boy	Sierra Leone	1948	no	no	yes	10	7

Things we have learned about lead exposure in this population group:

- 1) The ages of the children with initial lead elevations was older than expected
 - o Their ages were 15, 13, 10, 9, and 6 years
- 2) Most lead levels are falling 3-6 months post arrival to Ramsey County
 - o With the exception of the Liberian infant

- 3) Anemia or indicators of malnutrition did not seem to be a strong predictor of future lead elevations
 - Only 1 out of 6 had an abnormal nutritional lab
- 4) Hematuria did not seem to be a strong predictor of low hemoglobin and/or lead susceptibility
 - 44 out 150 children tested had hematuria (29.3%)
 - 14 of those with hematuria had abnormal nutritional labs
 - 3 of those with hematuria had a low hemoglobin
 - Only 2 children with blood lead elevation had hematuria
- 5) Blood lead elevation did not occur among other family members
 - Only one child in a family of 1-7 children experienced blood lead elevation
- 6) Half of the children with elevated blood lead levels (EBL's) are residing in housing built post 1950 (see Table I)
- 7) No Keren children had elevated lead levels

Things we have learned about executing this grant

- 1) It is favorable to do initial and repeat testing at the same site
 - It was difficult to get the message to multiple providers about the risks of lead for refugees and the need to do repeat testing
 - Clients had been to Public Health before and seemed to be comfortable coming for repeat testing. There was an element of trust
 - We had better control of who was tested and who needed re-testing
 - There was lab consistency
- 2) Evening work may be needed
 - Calls oftentimes needed to be done late afternoon and evening
 - Many of the parents and children were in school. Many sponsor parents work
 - Evening lab tests did not work out well. Transportation through the PMAP's was not reliable
- 3) Many of the sponsors spoke English
 - We were able to avoid excess use of contract interpreters by communicating through the sponsors
- 4) Transportation
 - Transportation costs could be paid for by going through the PMAP
 - Sometimes two vehicles and car seats were needed because of the size of the family
 - Lab appointments typically would only take about 10 minutes. However, the transportation company would not wait for clients, making the process very lengthy for families
 - We needed to call most families twice to arrange for transportation. Once to schedule the appointment and twice on the day before as a reminder of the appointment
 - Many did not understand that they needed to be dressed, ready, and look for the ride
 - Most transportation providers do not work past 4:30 pm
- 5) Bundling groups by language
 - It seemed helpful to organize calling of results and appointments by language
 - Initially we hired a contracted interpreter every few weeks to call about the need for follow-up on abnormal nutritional labs, schedule lead appointments and call lead results. Later we found it easier just to work through the sponsors. Many spoke English

- 6) Lack of understanding the American Medical System
 - Refugee families often did not know the name of their clinic or where it was located. Sometimes they did not know if they have medical insurance, making follow-up on abnormal labs difficult
 - They may not value or understand the relevance of anemia, lead and the need for follow-up
 - Parents would sometimes not be present for consent when repeat lab work was needed
- 7) Shift from MA to a PMAP
 - Refugee families initially are on Medical Assistance. By the time of their second lead test their insurance shifted to a PMAP. Time was needed to look up changes in MNITS and for verification again
- 8) Internal logistics
 - Access to the charts was difficult
 - Charts are shared between variable clinics, providers, and functions
 - We found it was helpful if we made copies of the following forms. Information could be accessed more easily for arranging lab appointments and clinic follow up:
 - the family relationship page
 - the Reception and Placement Program Assurance Form (lists a relative and the VOLAG)
 - lab results
 - Extra time was needed to do case management of the abnormal nutritional labs
 - Neither Refugee Clinic nor our Lead Program anticipated this
 - Families are provided their labs in Refugee Clinic and instructed several times to establish contact with a primary care provider in the near future
 - We discovered that 4-6 weeks after the Refugee Clinic many families had not been to a new primary clinic despite abnormal lab work
 - Sponsors oftentimes were not at the last Refugee Clinic visit. If blood work was abnormal, they may not know that the family needs to be taken to a clinic soon
 - Many of these families were also being followed in the TB clinic. It took an extra measure of coordination to try to coordinate their visits to the Public Health Department
 - Families oftentimes could not tell our reception people why they were here again. Interpreters were not present. We found that it was helpful to have appointments put into a shared centralized appointment system for the building
- 9) An Access database was helpful for organizing grant data

Conclusions:

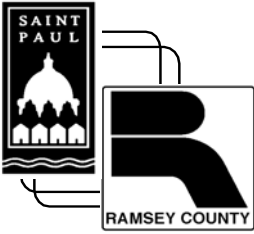
- Nutritional status appeared not to have a bearing on susceptibility to lead ingestion
- Most Ramsey County Minnesota children experiencing blood lead elevation most likely acquired lead in their homeland
- Less than 29% of the test population was under the age of 6 years. Lead vulnerability possibly may have had a stronger correlation if the population group was younger
- Ramsey County probably is making strides at providing more lead safe housing for vulnerable refugee children. Primary Prevention Strategies in Ramsey County may be working
- Possibly lead education in the Refugee clinic helped families find more suitable and lead safe housing
- Refugees are a vulnerable population. We should encourage medical providers to be vigilant to the home environment. Use of MDH's Lead Screening Questionnaire annually until age 6 years is advisable.

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Appendix E

St. Paul High Intensity Targeted Screening (HITS) Project Report

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**Saint Paul – Ramsey County
Department of Public Health**

Rob Fulton, Director

Childhood Lead Poisoning
Prevention Program
555 Cedar Street
Saint Paul, MN 55101-2260
651-266-1292 Fax: 651-266-1201

**High-Intensity Targeted Lead Screening
WIC Project
Saint Paul – Ramsey County
Department of Public Health
9/5/2006**

Mary Ellen Smith, PHN
Program Manager
Childhood Lead Poisoning Prevention Program
651-266-1293

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High-Intensity Targeted Screening (HITS) Project

Period Referenced:

June 1, 2005 – April 30, 2006

Outcomes:

- Number of children tested in WIC June 1, 2005 – April 30, 2006 907
- Number of children with fingerstick lead levels 20 mcg/dl and above 1
- Number of children with fingerstick lead levels 15 - 19.9 mcg/dl 0
- Number of children with fingerstick lead levels 10 - 14.9 mcg/dl 2
- Percentage of children tested in WIC with lead levels ≥ 10 mcg/dL 0.33%
(There were 48 children with lead levels 6 - 9.9 mcg.dL)
(There were 856 children with lead levels of 5 mcg/dL or less.)

What has been learned:

There is a decreased incidence of elevated blood lead levels in the screened high-risk population. (See Recruitment and Population tested.)

- For a definition of “high-risk” please see the document: “Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials” – November 1997
- Lead screening was done in WIC at this agency in the past.
 - In 1997 14.3% of children tested in WIC had lead levels over 10
 - In 1998 12.6% of children tested in WIC had lead levels over 10
 - In 1999 10.6% of children tested in WIC had lead levels over 10
 - In 2005 .47% of children tested in WIC had lead levels over 10 (3 out of 644 children)
 - In 2006 0% % of children tested in WIC had lead levels over 10 (0 out of 263 children)
(These tests were done Jan.– April when lead levels seasonally tend to be low)

Recruitment and Population Tested:

Population

- Children enrolled in WIC, ages 1 to 5 years of age (60 months)
- Parents were offered a free lead test for their child at the same time the required WIC blood work was being done.
- Children tested were <185% of poverty
- Test group consisted of children with varied cultures and races

Location

- Targeted-screening occurred in four urban WIC sites in the City of St. Paul
 - Midway WIC, serving primarily Thomas-Dale and Midway neighborhoods of St. Paul and Summit-University, but also Merriam Park, Highland, and North End
 - East Side WIC, serving the East Side of St. Paul
 - LaClinica, serving the West Side of St. Paul & much of the Hispanic population of St. Paul
 - Department of Public Health, serving the whole city of St. Paul
- The WIC sites selected serve areas where families reside in predominantly pre-1950 housing
- Targeted areas have a disproportionately high concentration of families with low incomes
- The neighborhoods served had historical incidence of children with elevated blood lead levels

Profile of the children with elevated lead levels

- The children with abnormal lead levels ≥ 10 mcg/dL were of various racial origins. One was White; one was White Hispanic; and one was Black.
- The three children with lead levels ≥ 10 mcg/dL were 2 years of age

- All three of the children were found at the DPH site. Two of them lived East side of St. Paul and one was from the West Side of St. Paul.
- (One of the 3 children with elevated lead levels was a child that was diagnosed previously with a lead level of 20 mcg/dl five months earlier. This helped to validate our test methodology.)

Method of blood lead screening tests:

Filter paper fingerstick lead tests

- Tests were drawn with parental consent at the time of the WIC re-certification blood draw

Physician/clinic contact

Lab results were sent to the Medical Homes (primary care clinics) when parents could identify their provider clinic

Environmental Inspections and environmental intervention

Environmental Inspections were done at two of the three homes.

HUD window projects were done on those two homes.

The family with the lead level of 12 mcg/dL has been contacted many times by phone messages and letter. Phone is currently disconnected. Several visits to the home have found no one there during the day. We were unable to proceed with environmental intervention.

Conclusions

It would appear that Ramsey County is making good strides to meet the 2010 goal of eliminating lead poisoning by the year 2010. Numerous lead hazard efforts have been done in Saint Paul and Ramsey County. The majority of lead cases in Ramsey County occur in St. Paul. Two of the WIC tests sites in St. Paul have been specifically targeted for lead hazard reduction activities in the past years. Without our primary prevention strategies we would most likely see an increase in the number of children detected in WIC and throughout the City of St. Paul. Our strategies appear to be working.

Appendix F

Hennepin County Suburban HITS Project Report

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**The Hennepin County HITS WIC Lead Testing Project,
November 18, 2005-May 22, 2006**

Submitted August 15, 2006 to the

Childhood Lead Poisoning Prevention Program
Minnesota Department of Health

by

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Abstract

Hennepin County Human Services and Public Health Department (HSPHD) tested blood lead levels (BLLs) of 1,053 children and 305 pregnant women attending County Women, Infants and Children (WIC) clinics from November 18, 2005 to May 22, 2006. Three (0.3%) children and one (0.3%) pregnant woman had elevated BLLs of 10 ug/dl or higher. The median BLL of all WIC clients was 1 ug/dl. By analysis of covariance, BLL was positively associated with requiring an interpreter during the WIC interview (odds ratio [OR]=1.8, 95% confidence interval [95% CI] 1.4-2.4) and attending an urban clinic (OR=1.6, 95% CI 1.3-2.0), and negatively associated with being a pregnant woman (OR=.7, 95% CI .5-.8) and hemoglobin level (-1.15 grams/dl per ug/dl increase in BLL); however, the model only poorly predicted BLL (R-Squared =.086). Although persons tested for lead comprised only 30.9% of clients scheduled for WIC visits during this interval, they did not differ substantially on the basis of demographic variables from random samples of persons who did not keep their WIC appointments or persons who kept their appointments but were not tested. Hennepin County WIC clients appear to be at low risk of elevated BLL in 2006.

Introduction

In spring 2005, Hennepin County Human Services and Public Health Department (HSPHD) received a High Intensity Targeted Screening (HITS) grant from the Minnesota Department of Health (MDH) and the U. S. Centers for Disease Control and Prevention (CDC). The intent of HITS grants is to focus blood lead testing efforts in a circumscribed area or community (Dignam et al., 2004). HSPHD focused its efforts on the clients served by its seven Women, Infants and Children (WIC) clinics. WIC clients disproportionately participate in Medical Assistance and other government-sponsored aid programs, and WIC children are considered to be at higher risk of lead exposure than children in the general population by virtue of living in older housing where leaded paint is more likely to be present (Rothenberg et al., 1996; CDC, 1997a; CDC, 1997b). HSPHD secured the permission of WIC administrators to approach WIC clients about having blood lead tests done during their WIC appointments. Lead testing began in November 2005, and continued for the next six months.

Methods

HSPHD began lead testing at the seven County Women, Infants and Children (WIC) clinics on November 18, 2005, and concluded on May 22, 2006. Testing of pregnant women began on December 30, 2005; only pregnant women were tested from May 1 to May 22, 2006.

A Senior Community Health Worker (HW) did all lead testing. The HW approached WIC parents and pregnant women in the following WIC classifications and asked if they were interested in a test: Certified Child, Mid-term Certification, Recertification, Certified Pregnant Woman, and Certified Infant at least six months of age. If the client

desired more information about lead or lead testing, the HW provided it to the best of her ability, when necessary supplementing oral information with informational brochures available in English, Somali and Spanish (Appendices 1-3). An interpreter assisted if the client did not speak English. If the client wanted a lead test, he/she was given a consent form in the appropriate language to review and sign. The consent form solicited basic demographic and health provider information, and was available in English, Hmong, Somali and Spanish (Appendices 4-10).

The HW then washed one of the client's hands with soap and water for at least 30 seconds, dried the hand, gloved herself, swabbed the middle finger of the washed hand with alcohol, and stuck the finger with a surgical lancet. She discarded the first drop of blood and applied the second and third drops to the indicated circles on the filter paper collection card (Appendix 11). If required for WIC records, the HW obtained another drop of blood to determine the person's hemoglobin level using a Hemacue ® Beta-Hemoglobin analyzer. She then put a band-aid on the wound and advised the client that results would be available in two to three weeks. Next, she filled in preliminary identifying information on a laboratory form (Appendix 12), put the client's name on the collection card, transferred the identifying barcode sticker from the form to the card, filed the laboratory and consent forms together, and placed the card in a resealable plastic envelope. She repeated this process for each lead test. During slow periods at the clinic, she completed the laboratory form and placed cards and forms in a manila envelope for collection by HSPHD staff.

At the end of each day, the HW obtained a copy of the clinic roster, which indicated who had actually come to the clinic for a scheduled or "squeeze in" appointment. The HW then indicated who had received a lead test as well.

HSPHD staff assigned a HITS Project identification number to consent and laboratory forms, entered the information in an Access database, and filed the forms in the project folder. The laboratory had pre-numbered and bar coded laboratory forms and lead test cards. These were matched by number, placed in a bulk mailer with other form-card pairs, and mailed to the laboratory each day.

MedTox ® Laboratory in New Brighton, MN tested samples using the filter paper-inductively-coupled plasma/mass spectrometry (ICP/MS) method (MedTox, 2003). The laboratory faxed test results directly to HSPHD, where they were date-stamped and filed with the client's other information, and results were entered in the database. The detection limit of lead was 1 ug/dl. Values reported as "less than 1 ug/dl" were assigned a value of 0.5 ug/dl for statistical analyses.

After results were entered in the database, a results letter was generated and mailed to the WIC client, and the mailing date was recorded in the database. The project identification number was entered on a copy of the letter, which was then filed with the client's other information. Letters had been prepared in advance to conform to pre-determined categories of lead test results: ≥ 10 ug/dl, < 10 ug/dl, and insufficient sample. The first two were available in English and Spanish, the predominant languages of the Hennepin

County WIC clientele, the last in English only (Appendices 13-17). If the client had a blood lead level of 10 ug/dl or greater, which the CDC and MDH define as elevated (EBLL), his/her healthcare provider was sent a letter advising of the result (Appendix 18).

When a results letter was returned to Central Office as undeliverable, the accuracy of the address was checked in the WIC Children's Health Insurance Program (CHIP) database. If the address was incorrect or another address was found, the letter was resent.

Medical Assistance (MA) enrollment was verified using the computerized Minnesota Medical Information System (MMIS) and the Minnesota Department of Human Services (DHS)-sponsored, web-based billing system for enrolled Minnesota Health Care Program providers (MN-ITS).

Persons who did not come for their WIC appointments (No Shows) and persons who came for their appointments but did not receive lead tests (Untested) were identified on the daily rosters and tallied. A 15-percent random sample of each group was identified, and demographic and certain other variables were compared with Tested persons' (Research Randomizer, 2006). Time and budget limitations precluded verification of MA enrollment for No Shows and Untested persons.

Statistical analyses were conducted using SPSS v. 14. Differences in proportions were evaluated using the Mantel-Haenszel odds ratios (OR) and 95% confidence intervals (95% CI), and differences in median values were compared using the non-parametric Mann-Whitney U test. The Pearson correlation coefficient (r) was used to evaluate the relationship between two continuous variables. In Tested persons, the relationship of independent variables to BLL was assessed by analysis of covariance (ANCOVA).

Results

Tested persons

Blood lead tests were given to 1,358 people between November 18, 2005 and May 22, 2006; 1,053 were children and 305 were pregnant women. English language consent forms were preferred by 962 clients (70.8%), Spanish by 310 (22.8%), Hmong by 46 (3.4%), and Somali by 40 (2.9%). Clients specified 42 preferred languages or language combinations on the consent form. English (47.0%), Spanish (21.9%), Somali (5.8%), Hmong (5.4%), Russian (1.3%), and Arabic (0.8%) were the most frequent choices and accounted for more than 80 percent of preferences. Interpreters were required during the WIC visit by 315 (23.2%) clients.

The number of persons tested, days of testing, and the average number of tests per day for each WIC clinic are shown in Table 1.

Table 1: Number & percent of total lead tests, number of test days, and average number of tests per day by WIC clinic

	Frequency	Percent	# of test days	Average # of tests/day
Champlin	92	6.8	7.0	13.1
Century Plaza	154	11.3	12.5	12.3
Hopkins (Westside)	217	16.0	14.5	15.0
Lake St. (Southside)	323	23.8	25.5	12.7
Mound	44	3.2	3.0	14.7
North Point	251	18.5	18.0	13.9
Northwest	277	20.4	13.0	15.4
Total	1358	100.0	93.5	14.50

The median age of tested children was 2.4 years (range 0.5-5.8 years); 524 (49.8%) children were female. The median age of pregnant women was 26.3 years (range 15.7-44.5 years). Race (Table 2) and ethnicity (Table 3) are shown for all Tested subjects, since children and pregnant women differed little.

Table 2: Tested WIC clients by race

	Frequency	Percent
Valid None given	31	2.3
Asian	151	11.1
Black	471	34.7
NA_Esk_Aleut	52	3.8
Multiracial	138	10.2
White	515	37.9
Total	1358	100.0

Table 3: Tested WIC clients by ethnicity

	Frequency	Percent
Valid None given	30	2.2
Hispanic	381	28.1
Hispanic/Other	1	.1
Not Hispanic	946	69.7
Total	1358	100.0

Median household size was four, and did not vary by clinic of attendance, age, race, or ethnicity.

Household income information was available in CHIP for 861 (63.4%) clients. Median annual per capita household income (APCHI) was \$4,533, and varied considerably by clinic (Table 4), although in general suburban clients had a higher median APCHI than urban clients (\$5,200 vs. \$3,900, Mann-Whitney U 76470, p<.001).

Table 4: Tested WIC clients' APCHI (\$) by WIC clinic

Annual per capita household income (APCHI)		
WIC Clinic	N	Median
Champlin	64	5964.0
Century Plaza	112	3023.4
Hopkins (Westside)	167	4220.5
Lake St. (Southside)	203	4030.0
Mound	28	3289.0
North Point	126	3921.8
Northwest	160	5408.0
Total	860	4533.4

According to MMIS and MN-ITS data, 687 (50.6%) persons were enrolled in MA at the time of their WIC visit. Like income, MA participation varied considerably by clinic (Table 5). Urban clients were more frequently enrolled in MA than suburban clients (29.9% vs. 20.7%, OR=1.6, 95% CI 1.3-1.9). Based on CHIP data, clients were also more likely to receive support from the Minnesota Families Investment Program (MFIP) (6.8% vs. 2.8%, OR=2.3, 95% CI 1.5-3.3) and food stamps (6.5% vs. 2.6%, OR=2.3, 95% CI 1.6-3.5). Four (0.3%) clients were receiving SSI.

Table 5: Tested WIC clients' MA enrollment status by WIC clinic

			MA-enrolled (MMIS)		Total
			No	Yes	
WIC Clinic	Champlin	Count	68	24	92
		% within WIC Clinic	73.9%	26.1%	100.0%
	Century Plaza	Count	84	70	154
		% within WIC Clinic	54.5%	45.5%	100.0%
	Westside)	Count	135	82	217
		% within WIC Clinic	62.2%	37.8%	100.0%
	Lake St. (Southside)	Count	150	173	323
		% within WIC Clinic	46.4%	53.6%	100.0%
	Mound	Count	11	33	44
		% within WIC Clinic	25.0%	75.0%	100.0%
	North Point	Count	88	163	251
		% within WIC Clinic	35.1%	64.9%	100.0%
	B'klyn Ctr (Northwest)	Count	135	142	277
		% within WIC Clinic	48.7%	51.3%	100.0%
Total		Count	671	687	1358
		% within WIC Clinic	49.4%	50.6%	100.0%

BLL was also positively associated with MMIS-verified MA enrollment (Mann-Whitney U 204,587.0, $p < .001$); CHIP-verified eligibility for MFIP (Mann-Whitney U 64,692.4, $p < .001$) and food stamps (Mann-Whitney U 65282.0, $p = .008$); and requiring an interpreter during the WIC interview (Mann-Whitney U 122,964.5, $p < .001$).

Of 1,358 blood lead samples, six (0.4%) could not be analyzed because sample volume was insufficient. The median BLL of the remaining 1,352 samples was 1 ug/dl. Minneapolis children had a higher median BLL (2 ug/dl) than suburban children (1 ug/dl, Mann Whitney U 161,793, $p < .001$). Three (0.3%) children had EBLs. Their values were 10, 18 and 19 ug/dl, and all were seen at the Century Plaza Clinic. The children with 18 ug/dl and 19 ug/dl were siblings residing in the same home. The median BLL for pregnant women was also 1 ug/dl. One (0.3%) pregnant woman attending the Lake St. Clinic had an EBL of 13 ug/dl. The distribution of BLLs by WIC clinic is shown in Table 6 for all subjects. Sixty-eight (5.0%) BLLs were 5 ug/dl or greater.

Table 6: Mean, median, minimum and maximum BLL in Tested WIC clients

Blood lead level					
WIC Clinic	N	Mean	Median	Minimum	Maximum
Champlin	91	1.1538	1.0000	.50	5.00
Century Plaza	153	2.1863	2.0000	.50	19.00
Hopkins (Westside)	217	1.2880	1.0000	.50	6.00
Lake St. (Southside)	321	2.1012	2.0000	.50	13.00
Mound	44	1.7273	1.0000	.50	9.00
North Point	250	1.9340	2.0000	.50	8.00
Northwest	276	1.6630	1.0000	.50	9.00
Total	1352	1.7840	1.0000	.50	19.00

BLLs by race and ethnicity are shown in Tables 7 and 8, respectively.

Table 7: Mean, median, minimum and maximum BLL in Tested WIC clients by race

Blood lead level					
Race	N	Mean	Median	Minimum	Maximum
None given	31	1.8871	2.0000	.50	6.00
Asian	150	1.8567	1.0000	.50	8.00
Black	469	1.6919	1.0000	.50	10.00
NA_Esk_Aleut	52	2.2115	2.0000	.50	6.00
Multiracial	138	2.1486	1.5000	.50	19.00
White	512	1.6992	1.0000	.50	13.00
Total	1352	1.7840	1.0000	.50	19.00

Table 8: Mean, median, minimum and maximum BLL in Tested WIC clients by ethnicity

Blood lead level					
Ethnicity	N	Mean	Median	Minimum	Maximum
None given	30	1.7333	1.0000	.50	6.00
Hispanic	380	2.0632	2.0000	.50	13.00
Hispanic/Other	1	2.0000	2.0000	2.00	2.00
Not Hispanic	941	1.6727	1.0000	.50	19.00
Total	1352	1.7840	1.0000	.50	19.00

By ANCOVA, requiring an interpreter (OR=1.8, 95% CI 1.4-2.4) and attending a Minneapolis clinic (OR=1.6, 95% CI 1.3-2.0) were positively associated with BLL. Being a pregnant woman (OR=0.7, 95% CI 0.5-0.8) and hemoglobin level were negatively associated. In this model, hemoglobin decreased 1.15 grams/dl (95% CI 1.06-1.25 g/dl) per unit increase of blood lead. These variables contributed little to explaining the variance in BLL (R-Squared), as shown in Table 9.

Table 9: Variables associated (p<.001) with BLL in HITS WIC clients

Dependent Variable: Blood lead level					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	136.143 ^a	4	34.036	17.456	.000
Intercept	.687	1	.687	.352	.553
City_Sub	32.608	1	32.608	16.724	.000
Age	21.726	1	21.726	11.142	.001
Hemoglobin	21.021	1	21.021	10.781	.001
Interpreterneeded	44.068	1	44.068	22.601	.000
Error	1355.118	695	1.950		
Total	3570.750	700			
Corrected Total	1491.261	699			

a. R Squared = .091 (Adjusted R Squared = .086)

Analyzed separately, children's BLLs were positively associated with attending a Minneapolis clinic (OR=1.9, 95% CI 1.5-2.4) and negatively associated with hemoglobin level (-1.197 g/dl [95% CI -1.080- -1.328 g/dl] per ug/dl of blood lead). R-Squared for the model was .058. In pregnant women, the only factor significantly associated with BLLs was requiring an interpreter (OR=3.6, 95% CI 2.3-5.8, R-Squared .129).

BLLs transformed to their natural logarithms were associated with the same variables in the same directions as the untransformed BLLs for all subjects, children and pregnant women. The R-Squared values of these ANCOVA models increased to .139, .095, and .164, respectively, although individual associations were weaker in every instance.

Results letters were sent to 1,356 (99.9%) WIC clients. The two families who did not receive letters had not signed consent forms, did not respond to letters informing them of this fact, and could not be reached by telephone to obtain verbal consent. Forty-three (3.2%) letters were returned to HSPHD as undeliverable, and 33 of these were resent to corrected or new addresses. Seven resent letters were returned, i.e., 17 (1.3%) results letters were ultimately undeliverable. The median interval from the date of blood sample collection to the initial mailing date was 16 days (range 5-33 days).

No Shows

Daily clinic rosters contained the names of 1,459 No Shows from November 18, 2005 to May 22, 2006, 219 of whom were randomly sampled. Two (0.9%) duplicate records were identified and 13 (5.9%) clients were subsequently found to have attended WIC clinic on another date and received a lead test. These records were eliminated, reducing the No Show denominator to 204. Partial information only (sex, age, race, ethnicity, and household size) was available for 39 (19.1%) of these, primarily because these clients had recently arrived from or departed for other jurisdictions.

No Show children and pregnant women were similar in most respects and were therefore treated as a group. No Shows were more likely to be Black (43.1% vs. 37.7%, OR=1.4, 95% CI 1.1-1.9) or have no race indicated in the CHIP database (8.3% vs. 2.3%, OR=3.9, 95% CI 2.1-7.2), and less likely to be Hispanic (20.1% vs. 28.1%, OR=.6, 95% CI .4-.9). They also required an interpreter less often (8.9% vs. 23.2%, OR=.3, 95% CI .2-.6) and were less likely to be eligible for MA, according to CHIP (as opposed to being *enrolled* in MA per MMIS data, which wasn't available for No Shows) (34.4% vs. 47.2%, OR=.6, 95% CI .4-.8). Median APCHI was lower for No Shows (\$0 vs. \$4,533, Mann-Whitney U test 38826.0, $p<.001$); however, CHIP income data for No Shows was considerably older than it was for Tested persons (median age 181 days vs. 0 days, Man-Whitney U 12339.5, $p<.001$).

Untested persons

Seven hundred fifty-three Untested persons were identified and 113 were randomly sampled. Three (2.7%) were eliminated because they had received a lead test at WIC clinic on another date, leaving a denominator of 110. Reasons frequently given by Untested individuals for not receiving a lead test were 1) refusal and 2) no time to wait for the test. Because of time and budget constraints, this group was only sampled from November 18, 2005 to January 31, 2006.

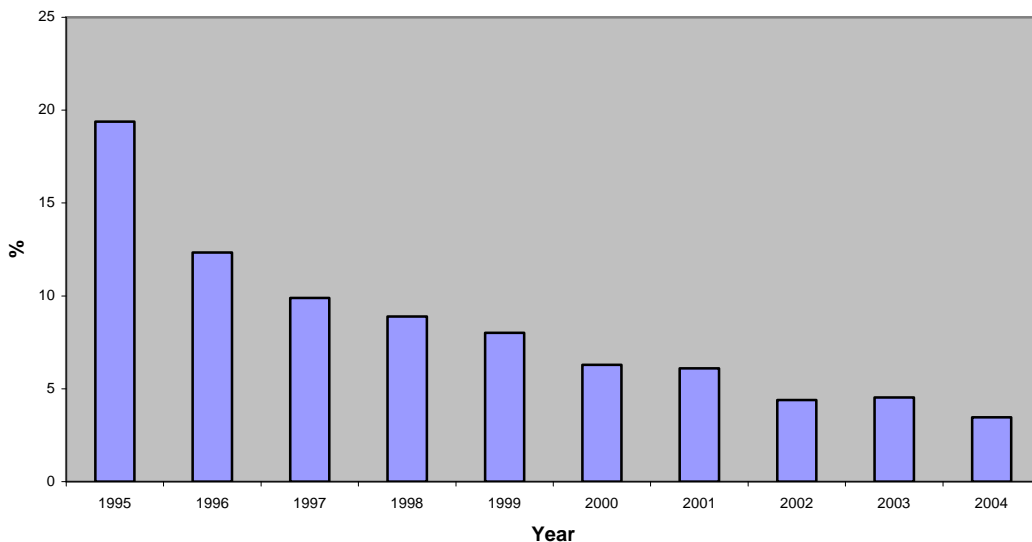
Compared with Tested persons, Untested persons were more Asian (25.5% vs. 15.7%, OR=1.8, 95% CI 1.1-3.0) and their median hemoglobin level was lower (11.8 g/dl vs. 12.2 g/dl, Mann-Whitney U 13326.0, $p=.010$). Their median APCHI was lower (\$3,650 vs. \$4,333, Mann-Whitney U 9132.0, $p=.011$) and the median age of this information was 0 days for both groups. Untested pregnant women were less likely than Tested pregnant women to be eligible for MA (25.0% vs. 65.0%, OR=.2, 95% CI .1-.6).

Discussion & Conclusions

The results of the HITS Project suggest that EBLs are not a major public health problem in Hennepin County WIC clients. The pair of siblings with EBLs also had a sibling who was tested at their pediatrician's office and found to have a BLL of 27 ug/dl. The pediatrician was notified of the EBL in the other siblings and the family was referred to Hennepin County Housing officials for evaluation of the potential for lead exposure in their home and other environments.

EBL occurrence was identical in WIC children and pregnant women, implying stability of occurrence in the community in which these populations reside. In addition, the St. Paul/Ramsey County Health Department (SPRCHD) HITS Project conducted from June 1, 2005 to April 30, 2006, likewise reported EBL occurrence of 0.3% (three of 907 children) (M. E. Smith, personal communication, May, 2006). Such consistency across studies is remarkable and suggests that lead exposures in Minnesota's two most populous counties are equivalent and equally rare. The low proportion of EBLs in Hennepin County WIC clients is also consistent with the drop in EBL occurrence there in 1995-2004 (Figure 1) (E. Zabel, personal communications, 2000-2006).

Figure 1: % EBL in Hennepin County children <6 years, 1995-2004



However, a number of factors argue against uncritical acceptance of these results as representative of the Hennepin County WIC and larger communities. The HITS project was essentially a pilot study, obtaining preliminary information on BLL distribution in a population considered "high risk" (CDC, 1997b). The study period was only six months and the longest interval spent at any clinic was 25.5 days. HITS did no sampling in summer, the season in which Hennepin County BLLs have been highest historically. Average first BLL in children less than six years old in 1995-2002, for example, was 4.9

ug/dl, dropping in the fall, spring, and winter to 4.4, 4.3 and 4.1 ug/dl, respectively (E. Zabel, personal communications, 2001-2003). That said, the SPRCHD HITS Project sampled over an 11-month period, including the summer, and their results were similar to ours.

Caution may also be warranted in interpreting these data because of potential non-participation bias. By January 31, 2006, at which point 47.9% of all HITS blood samples had been collected, 753 Untested person were identified. Extrapolating this figure to the entire Hennepin County HITS test period yields 1,573 persons. When this number is added to the number of Tested persons and No Shows, the total is 4,390, i.e., the 1,358 Tested persons represented only 30.9% of scheduled WIC clients.

No Shows had a lower median APCHI, which would generally imply greater risk of lead exposure, although income was not related to BLL in this study (Rothenberg et al., 1996; CDC, 1997b). APCHI was also probably confounded by its much greater age than comparable information for Tested persons, and probably of lesser quality. On the other hand, the higher proportion of Blacks (a protective factor in this study), and the reduced proportions of Hispanics, persons requiring an interpreter at WIC interview, and pregnant women enrolled in MA indicated that No Shows were unlikely to receive more lead exposure than Tested persons.

Among Untested persons, lower median hemoglobin level was a risk factor for increased BLL, although this difference with Tested persons was not large and was based on hemoglobin data from only 64 (58.2%) persons. Its effect was also offset by the reduced proportion of MA-enrollment in pregnant women.

ANCOVA analyses identified as many as four variables associated with BLL in study subjects. However, R-Squared values for all models were low and the predictive value of the variable sets negligible. The single most important predictor of BLL – the age of the person's home – was not available in our database. It is likely that inclusion of home age in the ANCOVA models would eliminate any or all variables presently associated with BLL. Data on home age may be available in the future. The ANCOVA models can then be reexamined and this report revised accordingly.

It should also be noted that the entire complement of independent variables and factors examined in the ANCOVA modeling was available for only 700 (51.5%) Tested subjects, so the models may themselves be biased. If data for a particular variable are available for a larger number of subjects, the univariate relationship with BLL may differ from that found in ANCOVA. Hemoglobin is a case in point. While the inverse relationship between hemoglobin level and lead level found here has been reported previously, the limited number of subjects in the multivariate analysis and the narrow hemoglobin and blood lead ranges suggest that this finding is of more statistical than physiological relevance (Bradman et al., 2001). Hemoglobin data were available for 1,248 (92.3%) Tested persons. In contrast to the ANCOVA findings, when hemoglobin alone was correlated with BLL for this larger group, we found no relationship ($r=.038$, $p=.178$).

Reservations about the design and execution of Hennepin County HITS Project aside, when major findings are considered - the very low proportion of EBLs, the very low median BLL, the absence of large differences between the Tested persons, Untested persons, and No Shows – we must conclude that Hennepin County WIC children and pregnant women are at low risk of EBL in 2006.

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Appendix G

Single-Page Summaries of Blood Lead Guidelines

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Childhood Blood Lead Screening Guidelines for Minnesota

A Physician Should Test a Child at Any Age:

- If the parent expresses a concern about, or asks for their child to be tested for, blood lead poisoning
- If the child moved from a major metropolitan area or another country within the last 12 months

Routine Screen:

Child health-care providers should **use a blood lead test*** to screen children at one and two years of age, and children up to six years of age who have not previously been screened if:

The child lives within the city limits of Minneapolis or St. Paul;

or

The child receives services from Minnesota Care (MnCare), the Supplemental Food Program for Women, Infants, and Children (WIC), or Medical Assistance (MA) - which includes the Prepaid Medical Assistance Program (PMAP);

or

The child does not fit the criteria above, and the answer to any of the following questions is “Yes” or “Don’t Know:”

- During the past six months has the child lived in or regularly visited a home, childcare, or other building built before 1950?
- During the past six months has the child lived in or regularly visited a home, childcare, or other building built before 1978 with recent or ongoing repair, remodeling or damage (such as water damage or chipped paint)?
- Has the child or his/her sibling, playmate, or housemate had an elevated blood lead level?

Periodic Evaluation:

In order to monitor a change in the child’s status, administer the following questions annually to all children **three to six years of age** whose previous test results were less than 10 µg/dL. Screen the child with a blood lead test* if the answer to any of the following questions is “**Yes**” or “**Don’t Know.**”

Since the child’s last blood lead test:

- Does the child have a playmate, housemate, or sibling who has recently been diagnosed with an elevated blood lead?
- Has the child moved to or started regularly visiting a home, childcare, or other building built before 1950?
- Has there been any repair, remodeling, or damage (such as water damage or chipped paint) to a home childcare, or other building built before 1978 that the child lives in or regularly visits?

* A blood lead test for lead poisoning is a laboratory analysis for lead in the blood of a child or adult. An elevated blood lead test is a result greater than or equal to 10 micrograms lead per deciliter (µg/dL) of blood. Laboratories performing blood lead analysis are required to report all results to the Minnesota Department of Health.



Division of Environmental Health
Environmental Surveillance and Assessment Section
Environmental Impacts Analysis Unit
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The following are general guidelines. For Childhood Blood Lead Clinical Treatment Guidelines for Minnesota, please call the MDH at (651) 201-4610, or visit our website at: www.health.state.mn.us/divs/eh/lead/reports.

Follow-up Care

If result of capillary screening test ($\mu\text{g}/\text{dL}$) is:	Perform diagnostic test on venous blood within:
10-14.9	3 months
15-44.9	1 week
45-59.9	48 hours
≥ 60	Immediately (as an emergency lab test)

Follow-up testing for children with elevated diagnostic BLLs

- Children with diagnostic BLLs of 10-14.9 $\mu\text{g}/\text{dL}$ should have at least one follow-up test within 3 months.
- If the result of the follow-up testing is ≥ 15 $\mu\text{g}/\text{dL}$, the child should receive clinical management, which includes follow-up testing.

Clinical management includes

- Clinical evaluation for complications of lead poisoning.
- Family lead education and referrals.
- Chelation therapy, if appropriate.
- Follow-up testing at appropriate intervals.

Provide appropriate chelation therapy

- A child with a BLL ≥ 45 $\mu\text{g}/\text{dL}$ should be treated promptly with appropriate chelating agents and be removed from sources of lead exposure.

Environmental Management

- Contact the Minnesota Department of Health/Local Public Health Agency.

Sources of Lead

THE MOST COMMON SOURCES OF LEAD ARE PAINT, DUST, SOIL, AND WATER. OTHER SOURCES INCLUDE:

Traditional Remedies/Cosmetics

IN ASIAN, AFRICAN, & MIDDLE EASTERN COMMUNITIES:

As a cosmetic, or a treatment for skin infections or umbilical stump.

- alkohl, kajal, kohl, or surma (black powder)

IN ASIAN COMMUNITIES:

For intestinal disorders.

- bali goli (round flat black bean)
- ghasard/ghazard (brown powder)
- kandu (red powder)

IN HMONG COMMUNITIES:

For fever or rash.

- pay-loo-ah (orange/red powder)

IN LATINO COMMUNITIES:

some salt-based candies made in Mexico
For abdominal pain/empacho.

- azarcon (yellow/orange powder), also known as: alarcon, cora, coral, liga, maria luisa, and rueda
- greta (yellow/orange powder)

IN SOUTH ASIAN (EAST INDIAN) COMMUNITIES:

For bindi dots.

- sindoor (red powder)

As a dietary supplement.

- Ayurvedic herbal medicine products

Occupations/Industries

- Ammunition/explosives maker
- Auto repair/auto body work
- Battery maker
- Building or repairing ships
- Cable/wire stripping, splicing or production
- Construction
- Ceramics worker (pottery, tiles)
- Firing range worker
- Leaded glass factory worker
- Industrial machinery/equipment
- Jewelry maker or repair
- Junkyard employee
- Lead miner
- Melting metal (smelting)
- Painter
- Paint/pigment manufacturing

- Plumbing
- Pouring molten metal (foundry work)
- Radiator repair
- Remodeling/repainting/renovating houses or buildings
- Removing paint (sandblasting, scraping, sanding, heat gun or torch)
- Salvaging metal or batteries
- Welding, burning, cutting or torching
- Steel metalwork
- Tearing down buildings/metal structures

Hobbies/Miscellaneous

May include above occupations.

- Some children's jewelry
- Antique/imported toys
- Chalk (particularly for snooker/billiards)
- Remodeling, repairing, renovating home
- Painting/stripping cars, boats, bicycles
- Soldering
- Melting lead for fishing sinkers or bullets
- Making stained glass
- Firing guns at a shooting range



Childhood Blood Lead Case Management Guidelines for Minnesota

(This document is intended for use by local public health agencies and their partners. It should be used in conjunction with the *Childhood Blood Lead Case Management Guidelines for Minnesota – Reference Manual*)

REMINDER: BLOOD LEAD SCREENING IS REQUIRED AT 12 AND 24 MONTHS FOR ALL CHILDREN RECEIVING MEDICAL ASSISTANCE (MA) (OR UP TO SIX YEARS OF AGE IF NOT PREVIOUSLY TESTED)

Capillary

CAPILLARY TESTS ARE CONSIDERED A SCREENING TEST ONLY, VENOUS TESTS ARE CONFIRMATORY

< 10
µg/dL

- Provide educational materials* to the family.

According to Minnesota State Statute, all childhood blood lead levels ≥ 10 µg/dL are considered elevated.

Within one month:

10 - 14.9
µg/dL

- Provide educational materials* to the family.
- Contact the family with the recommendation to have a follow-up venous test.

VENOUS RETEST WITHIN THREE MONTHS

Within one week:

15 – 44.9
µg/dL

- Provide educational materials* to family.
- Contact the family to have a follow-up venous test.
- If feasible, contact the medical care provider regarding a follow-up venous test.
- Offer the medical care provider MDH's screening, treatment, and pregnancy guidelines.

VENOUS RETEST WITHIN ONE WEEK

Within two business days:

45 – 59.9
µg/dL

- Provide educational materials* to family.
- Contact the family to have a follow-up venous test.
- Contact the medical care provider regarding a follow-up venous test.
- Ensure that the medical care provider is aware of the screening, treatment, and pregnancy guidelines available from the MDH.

VENOUS RETEST WITHIN TWO BUSINESS DAYS

Immediately:

≥ 60
µg/dL

- Provide educational materials* to family.
- Contact the family to have a follow-up venous test.
- Contact the medical care provider regarding a follow-up venous test.
- Ensure that the medical care provider is aware of the screening, treatment, and pregnancy guidelines available from the MDH.

VENOUS RETEST IMMEDIATELY

Venous

- Provide educational materials* to the family.

Within one month:

- Provide educational materials* to the family.
- Contact family with the recommendation to have a follow-up venous test within three months from the last blood lead test.

- Within one week:** Arrange for initial home visit.** (in primary language when possible).
- Complete an in-depth assessment of: medical, environmental, nutritional, and developmental needs.
- Provide educational materials* to the family.
- Make necessary referrals.
- Communicate with the risk assessor assigned to the case.

Encourage the family to obtain a follow-up venous test *within three months* from the last test. Higher levels require more frequent monitoring.

Contact the family and/or medical care provider regarding the need for follow-up venous testing if venous follow-up not completed within three months from the last test.

- Within two business days:** Arrange for initial home visit.** (in primary language when possible).
- Complete an in-depth assessment of: medical, environmental, nutritional, and developmental needs.
- Provide educational materials* to the family.
- Make necessary referrals.
- Attempt to facilitate alternative, lead-safe housing.
- Communicate with the risk assessor assigned to the case.
- Contact the medical care provider to determine blood lead level, medical status, treatment and follow-up plans.

At this level the medical care provider will most likely provide chelation therapy (see MDH treatment guidelines) and the child will need more frequent monitoring of their blood lead level.

- Immediately:** Arrange for initial home visit.** (in primary language when possible).
- Complete an in-depth assessment of: medical, environmental, nutritional, and developmental needs.
- Provide educational materials* to the family.
- Make necessary referrals.
- Attempt to facilitate alternative, lead-safe housing.
- Communicate with the risk assessor assigned to the case.
- Contact the medical care provider to determine blood lead level, medical status, treatment and follow-up plans.

At this level the medical care provider will most likely provide chelation therapy (see MDH treatment guidelines) and the child will need more frequent monitoring of their blood lead level. **The child may be hospitalized at this level.**

*Use suggested educational materials in the appropriate language (see *Childhood Blood Lead Case Management Guidelines for Minnesota – Reference Manual*). MDH lead educational materials are available by completing and sending in the order form at <http://www.health.state.mn.us/divs/eh/lead/fs/index.html> or by calling (651) 201-4610. Order EPA lead documents via the Internet at <http://www.epa.gov/lead/nlicdocs.htm>.

** When possible, it is recommended to complete at least one follow-up home visit.

Sources of Lead

The most common sources of lead are paint, dust, soil, and water.

Other sources include:

Products Used in Ethnic Communities

IN ASIAN, AFRICAN, & MIDDLE EASTERN COMMUNITIES:

As a cosmetic or a treatment for skin infections or umbilical stump.
alkohl, kajal, kohl, or surma (black powder)

IN ASIAN COMMUNITIES:

For intestinal disorders.

- bali goli (round flat black bean)
- ghasard/ghazard (brown powder)
- kandu (red powder)

IN HMONG COMMUNITIES:

For fever or rash.

- pay-loo-ah (orange/red powder)

IN LATINO COMMUNITIES:

- Some salt-based candies made in Mexico

For abdominal pain/empacho.

- azarcon (yellow/orange powder), also known as: alarcon, cora, coral, liga, maria luisa, and rueda
- greta (yellow/orange powder)



IN SOUTH ASIAN (EAST INDIAN) COMMUNITIES:

For bindi dots.

- sindoor (red powder)
- As a dietary supplement.*
- Ayurvedic herbal medicine products

Hobbies

May also include some of the occupations listed.

- Bronze Casting
- Collecting, Painting or Playing Games with Lead Figurines
- Copper Enameling
- Electronics with Lead Solder
- Hunting and Target Shooting
- Jewelry Making with Lead Solder
- Liquor Distillation
- Making Pottery and Ceramic Ware with Lead Glazes and Paints
- Making Stained Glass and Painting on Stained Glass
- Melting Lead for Fishing Sinkers or Bullets or Lead Figurines
- Painting/Stripping Cars, Boats, and Bicycles
- Print Making and Other Fine Arts (When Lead White, Flake White and Chrome Yellow Pigments are Involved)
- Remodeling, Repairing, and Renovating Homes

Miscellaneous

- Antique/Imported Toys
- Chalk (Particularly for Snooker/Billiards)
- Imported Candy
- Imported Pottery
- Non-Commercially Prepared Pottery
- Non-Commercially Prepared Leaded Crystal
- Some Children's Jewelry

Occupations/Industries

- Ammunition/Explosives Maker
- Auto Repair/Auto Body Work
- Battery Manufacturing and Repair
- Bridge, Tunnel and Elevated Highway Construction
- Building or Repairing Ships
- Cable/Wire Stripping, Splicing or Production
- Ceramics Worker (Pottery, Tiles)
- Construction
- Firing Range Work
- Glass Recycling, Stained Glass and Glass Work
- Jewelry Maker or Repair
- Lead Abatement
- Lead Miner
- Leaded Glass Factory Worker
- Manufacturing and Installation of Plumbing Components
- Manufacturing of Industrial Machinery and Equipment
- Melting Metal (Smelting)
- Metal Scrap Yards and Other Recycling Operations
- Motor Vehicle Parts and Accessories
- Occupations Using Firearms
- Paint/Pigment Manufacturing
- Pottery Making
- Production and Use of Chemical Preparations
- Radiator Repair
- Remodeling/Repainting/Renovating Houses or Buildings
- Removing Paint (Sandblasting, Scraping, Sanding, Heat Gun or Torch)
- Steel Metalwork
- Tearing Down Buildings/Metal Structures
- Welding, Burning, Cutting or Torching

For more information about lead,
contact the **MDH Lead Program at (651) 201-4610**

If you require this document in another format, call:
(651) 201-5000 • 1 (800) 657-3908
MDH TTY (651) 201-5797
Minnesota Relay Service TTY 1-800-627-3529



Mailing Address:

Environmental Health
Lead Program
625 North Robert Street
P.O. Box 64975
St. Paul, MN 55164-0975

Childhood Blood Lead Clinical Treatment Guidelines for Minnesota¹

These guidelines were created for children from 6 to 72 months of age.

Blood Lead Levels in Micrograms Per Deciliter (µg/dL)
<10 10-14.9 15-44.9 45-59.9 ≥ 60

Medical Evaluation

	3 Months	1 Week	48 Hours	IMMEDIATELY
If capillary result, confirm with venous draw within:				
Ask questions to identify sources of lead in the child's environment (age of home, condition of painted surfaces, pica, remodeling, occupations/hobbies, folk remedies, etc.) <i>Contact the MDH for a list of additional lead sources.</i>	X	X	X	X
Rule out iron deficiency and treat if present		X	X	X
Complete diagnostic evaluation (history, labs, iron studies, physical exam)		X	X	X
If exhibiting clinical symptoms check:				
• Nutritional status (especially iron and calcium)				
• Neurological and developmental status (especially language skills and concentration ability)		X	X	X
At this level check:				
• Abdominal x-ray			X	X
Other diagnostic tests:				
• BUN, CBC, Creatinine, UA and liver enzymes				
TREAT AS AN EMERGENCY - potential encephalopathy				X

Medical Management

Anticipatory Guidance—discuss primary sources of lead poisoning and measures to keep children safe from lead; provide lead poisoning prevention literature	X			
Assess for lead poisoning risk at every well-child visit	X			
Educate family—discuss:				
• Potential sources of lead and ways to reduce exposure; review and provide literature		X	X	X
• Dangers of improper lead abatement and/or remodeling				
• Nutrition—encourage high iron/high calcium diet				
• Chronic nature of problem (need to monitor frequently)				
Iron supplement if deficient	X	X	X	X
IDENTIFY AND REMOVE LEAD SOURCE	X	X	X	X
Persistently high levels in this range may require more aggressive treatment (consult MDH for information regarding chelation treatment)		X		
Be sure to stop iron therapy prior to chelation		X	X	X
This level requires chelation—recommend the use of succimer per routine dosage (consult the MDH for further information if needed).			X	X
In-home treatment indicated only in situations of:				
• Lead-safe environment			X	X
• Highly compliant family				
• Home health care monitoring				
Discharge inpatient cases ONLY to LEAD-SAFE ENVIRONMENT			X	X

Follow-up/Comment²

Review risk factors in 1 year	X			
Screen other children in the home		X	X	IMMEDIATELY IMMEDIATELY
Repeat venous test in 3 months		X		
Repeat venous test in 1 to 3 months (higher levels require more frequent monitoring)			X	
Repeat venous and diagnostic tests 14 days after chelation therapy is complete.			X	X
MDH or the local public health department will conduct an environmental inspection and public health nursing home visit for children up to 72 months of age.		X	X	X

¹Guidelines for clinical treatment of adults with elevated blood lead levels are available through the Minnesota Department of Health (MDH).

²Additional guidelines for public health case management of children are also available through the MDH.



Division of Environmental Health
 Environmental Surveillance and Assessment Section
 Environmental Impacts Analysis Unit
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Childhood Blood Lead Clinical Treatment Guidelines for Minnesota¹

< 10 µg/dL

Medical Evaluation

- Ask questions to identify sources of lead in the child's environment²

Medical Management

- Anticipatory Guidance—discuss primary sources of lead poisoning and measures to keep children safe from lead; provide lead poisoning prevention literature
- Assess for lead poisoning risk at every well-child visit

Follow-up/Comment³

- Review risk factors in 1 year

10-14.9 µg/dL

Medical Evaluation

- If capillary result, **confirm with venous draw** within 3 months
- Ask questions to identify sources of lead in the child's environment²
- Rule out iron deficiency and treat if present
- Complete diagnostic evaluation (history, labs, iron studies, physical exam)

Medical Management

- **Identify and remove lead source**
- Educate family—discuss:
 - ♦ Potential sources of lead and ways to reduce exposure; review and provide literature
 - ♦ Dangers of improper abatement/remodeling
 - ♦ Nutrition—encourage high iron/high calcium diet
 - ♦ Chronic nature of problem (need to monitor frequently)
- Iron supplement if deficient

Follow-up/Comment³

- Screen other children in the home
- Repeat venous test in 3 months

15-44.9 µg/dL

Medical Evaluation

- If capillary result, **confirm with a venous draw** within 1 week
- Ask questions to identify sources of lead in the child's environment (age of home, condition of painted surfaces, pica, remodeling, occupations/hobbies, folk remedies, etc.)²
- Rule out iron deficiency and treat if present
- Complete diagnostic evaluation (history, labs, iron studies, physical exam)
- If exhibiting clinical symptoms check:
 - ♦ Nutritional status (especially iron and calcium)
 - ♦ Neurological and developmental status (especially language skills and concentration ability)

Medical Management

- **Identify and remove lead source**
- Educate family—discuss:
 - ♦ Potential sources of lead and ways to reduce exposure; review and provide literature
 - ♦ Dangers of improper abatement and/or remodeling
 - ♦ Nutrition—encourage high iron/high calcium diet
 - ♦ Chronic nature of problem (need to monitor frequently)
- Iron supplement if deficient
- Persistently high levels in this range may require more aggressive treatment (consult MDH for information regarding chelation treatment).
- Be sure to stop iron therapy prior to chelation

Follow-up/Comment³

- Screen other children in the home
- Repeat venous lead in 1 to 3 months (higher levels require more frequent monitoring)
- MDH or the local public health department will conduct an environmental inspection and public health nursing home visit for children up to 72 months of age.

45-59.9 µg/dL

Medical Evaluation

- If capillary result, **confirm with a venous draw** within 48 hours
- Ask questions to identify sources of lead in the child's environment (age of home, condition of painted surfaces, pica, remodeling, occupations/hobbies, folk remedies, etc.)²
- Rule out iron deficiency and treat if present
- Complete diagnostic evaluation (history, labs, iron studies, physical exam)
- If exhibiting clinical symptoms check:
 - ♦ Nutritional status (especially iron and calcium)
 - ♦ Neurological and developmental status (especially language skills and concentration ability)
- At this level check:
 - ♦ Abdominal x-ray
- Other diagnostic tests:
 - ♦ BUN, CBC, Creatinine, UA and liver enzymes

Medical Management

- **Identify and remove lead source**
- Educate family (as in 15-44.9 µg/dL)
- Iron supplement if deficient
- This level requires chelation—recommend the use of succimer per routine dosage (consult the MDH for further information if needed).
- Be sure to stop iron therapy prior to chelation
- In-home treatment indicated only in situations of:
 - ♦ Lead-safe environment
 - ♦ Highly compliant family
 - ♦ Home health care monitoring
- Discharge inpatient cases **ONLY** to LEAD-SAFE ENVIRONMENT

Follow-up/Comment³

- Screen other children in the home **immediately**
- Repeat venous and diagnostic tests 14 days **after** chelation therapy is complete.
- MDH or the local public health department will conduct an environmental inspection and public health nursing home visit for children up to 72 months of age.

≥ 60 µg/dL

Medical Evaluation

- **TREAT AS AN EMERGENCY** - potential encephalopathy
- If capillary result, **confirm with a venous draw IMMEDIATELY**
- Ask questions to identify sources of lead in the child's environment (age of home, condition of painted surfaces, pica, remodeling, occupations/hobbies, folk remedies, etc.)²
- Rule out iron deficiency and treat if present
- Complete diagnostic evaluation (history, labs, iron studies, physical exam)
- If exhibiting clinical symptoms check:
 - ♦ Nutritional status (especially iron and calcium)
 - ♦ Neurological and developmental status (especially language skills and concentration ability)
- At this level check:
 - ♦ Abdominal x-ray
- Other diagnostic tests:
 - ♦ BUN, CBC, Creatinine, UA and liver enzymes

Medical Management

- **Identify and remove lead source**
- Educate family (as in 15-44.9 µg/dL)
- Iron supplement if deficient
- This level requires chelation—recommend the use of succimer per routine dosage (consult the MDH for further information if needed).
- Be sure to stop iron therapy prior to chelation
- In-home treatment indicated only in situations of:
 - ♦ Lead-safe environment
 - ♦ Highly compliant family
 - ♦ Home health care monitoring
- Discharge inpatient cases **ONLY** to LEAD-SAFE ENVIRONMENT

Follow-up/Comment³

- Screen other children in the home **immediately**
- Repeat venous and diagnostic tests 14 days **after** chelation therapy is complete.
- MDH or the local public health department will conduct an environmental inspection and public health nursing home visit for children up to 72 months of age.

¹Guidelines for clinical treatment of adults with elevated blood lead levels are available through the Minnesota Department of Health (MDH). These guidelines were created for children from 6 to 72 months of age.

²Contact the MDH for a list of lead sources.

³Additional guidelines for public health case management of children are also available through the MDH.

Blood Lead Screening Guidelines for Pregnant Women in Minnesota

Prenatal lead exposure is of concern because it may have an effect on cognitive development and may increase delinquent and antisocial behaviors when the child gets older. Prenatal lead exposure may also reduce neonatal weight gain. In addition to fetal risk, lead may be a risk to the mother by causing an increase in blood pressure.

Lead is transferred from the mother to the fetus because the placenta is a weak barrier to the passage of lead. Therefore, it may be assumed that fetal blood contains the same concentration of lead as maternal blood. The Centers for Disease Control and Prevention (CDC) and the Minnesota Department of Health (MDH) consider 10 micrograms per deciliter ($\mu\text{g}/\text{dL}$) and above to be an elevated blood lead level for children.

In many cases, high levels of lead in pregnant women arise from maternal occupational exposure. However, other lead exposures may occur, such as: remodeling a home containing lead paint that allows lead dust to become airborne and inhaled; a family member's occupation or hobby resulting in "take-home" lead; using non-commercial home remedies or cosmetics that contain lead; using non-commercial glazed pottery for cooking; and pica behavior of the mother, such as eating soil or pieces of clay pots. There may also be exposure of the fetus to lead coming out of the mother's bones. This may arise from long-term previous exposures of the mother even though lead exposure is not happening during the pregnancy. Lead may come out of maternal bones faster during pregnancy and lactation because of the mother's and fetus's need for calcium. A diet rich in iron and calcium may help reduce absorption of lead during pregnancy.

Not every woman is at risk for lead exposure, so a risk screening questionnaire should be used to decide when to test a pregnant, or potentially pregnant, woman for lead.

Blood Lead Screening Risk Questionnaire for Pregnant Women in Minnesota

Health-care providers should **use a blood lead test** to screen pregnant women if they answer, "yes" or "don't know" to any of the following questions, or if they have moved to Minnesota from a major metropolitan area or another country within the last twelve months:

1. Do you or others in your household have an occupation that involves lead exposure?
2. Sometimes pregnant women have the urge to eat things that are not food, such as clay, soil, plaster, or paint chips. Do you ever eat any of these things—even accidentally?
3. Do you live in a house built before 1978 with ongoing renovations that generate a lot of dust (for example, sanding and scraping)?
4. To your knowledge, has your home been tested for lead in the water, and if so, were you told that the level was high?
5. Do you use any traditional folk remedies or cosmetics that are not sold in a regular drug store or are homemade? (See list on back.)
6. Do you or others in your household have any hobbies or activities likely to cause lead exposure? (See list on back.)
7. Do you use non-commercially prepared pottery or leaded crystal?



*Environmental Health Division
Environmental Surveillance and Assessment Section
Environmental Impacts Analysis Unit – Lead Program
P.O. Box 64975
St. Paul, Minnesota 55164-0975*

These guidelines have been reviewed and approved by the Minnesota Chapter of the American College of Obstetricians and Gynecologists (ACOG)

The guidelines were based on the New York State Department of Health,
Lead Poisoning Prevention Guidelines for Prenatal Care Providers.

Sources of Lead

The most common sources of lead are paint, dust, soil, and water. Other sources include:

Traditional Remedies/Cosmetics

IN ASIAN, AFRICAN, & MIDDLE EASTERN COMMUNITIES:

As a cosmetic or a treatment for skin infections or umbilical stump.

- alkohl, kajal, kohl, or surma (black powder)

IN ASIAN COMMUNITIES:

For intestinal disorders.

- bali goli (round flat black bean)
- ghasard/ghazard (brown powder)
- kandu (red powder)

IN HMONG COMMUNITIES:

For fever or rash.

- pay-loo-ah (orange/red powder)

IN LATINO COMMUNITIES:

- Some salt-based candies made in Mexico

For abdominal pain/empacho.

- azarcon (yellow/orange powder), also known as: alarcon, cora, coral, liga, maria luisa, and rueda
- greta (yellow/orange powder)

IN SOUTH ASIAN (EAST INDIAN) COMMUNITIES:

For bindi dots.

- sindoor (red powder)

As a dietary supplement.

- Ayurvedic herbal medicine products

Hobbies

May also include some of the occupations listed in the right column.

- Bronze Casting
- Collecting, Painting or Playing Games with Lead Figurines
- Copper Enameling
- Electronics with Lead Solder
- Hunting and Target Shooting
- Jewelry Making with Lead Solder
- Liquor Distillation
- Making Pottery and Ceramic Ware with Lead Glazes and Paints
- Making Stained Glass and Painting on Stained Glass
- Melting Lead for Fishing Sinkers or Bullets or Lead Figurines
- Painting/Stripping Cars, Boats, and Bicycles

- Print Making and Other Fine Arts (When Lead White, Flake White and Chrome Yellow Pigments are Involved)
- Remodeling, Repairing, and Renovating Homes

Occupations/Industries

- Ammunition/Explosives Maker
- Auto Repair/Auto Body Work
- Battery Manufacturing and Repair
- Bridge, Tunnel and Elevated Highway Construction
- Building or Repairing Ships
- Cable/Wire Stripping, Splicing or Production
- Ceramics Worker (Pottery, Tiles)
- Construction
- Firing Range Work
- Glass Recycling, Stained Glass and Glass Work
- Jewelry Maker or Repair
- Lead Abatement
- Lead Miner
- Leaded Glass Factory Worker
- Manufacturing and Installation of Plumbing Components
- Manufacturing of Industrial Machinery and Equipment
- Melting Metal (Smelting)
- Metal Scrap Yards and Other Recycling Operations
- Motor Vehicle Parts and Accessories
- Occupations Using Firearms
- Paint/Pigment Manufacturing
- Pottery Making
- Production and Use of Chemical Preparations
- Radiator Repair
- Remodeling/Repainting/Renovating Houses or Buildings
- Removing Paint (Sandblasting, Scraping, Sanding, Heat Gun or Torch)
- Steel Metalwork
- Tearing Down Buildings/Metal Structures
- Welding, Burning, Cutting or Torching

Miscellaneous

- Antique/Imported Toys
- Chalk (Particularly for Snooker/Billiards)
- Imported Candy
- Imported Pottery
- Non-Commercially Prepared Pottery
- Non-Commercially Prepared Leaded Crystal
- Some Children's Jewelry

www.health.state.mn.us/divs/eh/lead

For more information about lead, contact the **Lead Program at (651) 201-4610**

If you require this document in another format, such as large print, Braille, or cassette tape, call:

(651) 201-5000 ♦ 1-800-657-3908 ♦ MDH TTY (651) 201-5797
or the Minnesota Relay Service TTY 1-800-627-3529

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Appendix H

**Proclamation Declaring October 23-29, 2005
Minnesota Childhood Lead Poisoning Prevention Week**

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STATE of MINNESOTA

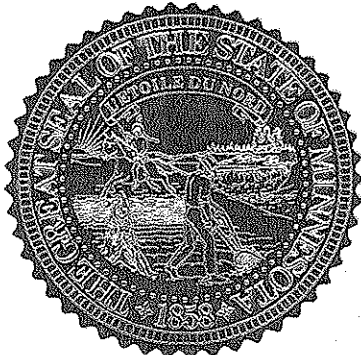
Proclamation

- WHEREAS: Lead poisoning is a significant environmentally related health problem facing our children, both in Minnesota and nationwide; and
- WHEREAS: Minnesota has adopted the federal government's goal of eliminating childhood lead poisoning by the year 2010; and
- WHEREAS: Even at relatively low levels, lead poisoning can slow a child's growth, damage hearing, cause behavior problems, and make it harder to concentrate or do well in school; and
- WHEREAS: These subtle health problems caused by lead poisoning are often invisible in children and can be irreversible; and
- WHEREAS: In 2004, blood lead screening and testing discovered more than 1,500 Minnesota children younger than the age of six with elevated blood lead levels; and
- WHEREAS: Minnesota has developed guidelines for screening children and pregnant women, managing lead poisoning cases, and treating lead poisoning, which help ensure appropriate identification and care of children with elevated blood lead levels; and
- WHEREAS: The primary source of lead exposure for children is lead-based paint, which can be found on the interior and exterior surfaces of as many as 45 percent of homes built before 1978 in Minnesota; and
- WHEREAS: Increased awareness of childhood lead poisoning is critically important so that parents, health care providers, housing authorities, building and construction interests, educators, and others can work to prevent children from being exposed to lead in the environment.

NOW, THEREFORE, I, TIM PAWLENTY, Governor of Minnesota, proclaim the week of October 23 - 29, 2005, to be:

CHILDHOOD LEAD POISONING PREVENTION WEEK

in the State of Minnesota.



IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of Minnesota to be affixed at the State Capitol this 12th day of September in the year two thousand and five, and of the State the one hundred forty-seventh.

Mary Kiffmeyer
SECRETARY OF STATE

Tim Pawlenty
GOVERNOR