

Elevated Blood Lead Levels

in Minnesota and the Medicaid Population



Minnesota Department of **Human Services**



Elevated Blood Lead Levels in Minnesota and the Medicaid Population

By:

Minnesota Department of Human Services

Susan E. Castellano

Margaret J. Boler, MPH

Minnesota Department of Health

Myron Falken, PhD, MPH

Erik Zabel, PhD, MPH

Andrea Michael, MPH

Daniel J. Virnig



Minnesota Department of Human Services

Performance Measurement & Quality Improvement Division

444 Lafayette Road

St. Paul, MN 55155-3865



Minnesota Department of Health

Environmental Impacts Analysis Unit

121 East Seventh Place, Suite 220

St. Paul, MN 55164-0975

February 2002

This report was partially funded by cooperative agreement number US7/CCU518477-02 from the U.S. Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC.

For copies of this report, please call:
651-296-2363

Or send requests to:

Minnesota Department of Human Services
Performance Measurement & Quality Improvement Division
444 Lafayette Road
St. Paul, MN 55155-3865
Fax: 651-215-5754

*This report may be reproduced without restriction.
Citation of the source would be appreciated.*

This information is available in other forms to people with disabilities by contacting us at 651-296-2363 (voice) or through the Minnesota Relay Service at 1-800-627-3529 (TDD) or 1-877-627-3848 (speech-to-speech relay service).

The photographs in this publication are from professional stock portfolios and do not represent individuals associated with the programs described within.

Table of Contents

	Page
Executive summary	1
Introduction	3
Background	3
Lead poisoning in the United States.....	4
Medicaid and blood lead testing	4
Lead poisoning in Minnesota.....	4
The Minnesota lead data match project	5
Results and discussion	6
Lead poisoning in Minnesota children	6
MHCP blood lead testing rates	8
Testing rates for MHCP children with EPSDT well-child visits	9
Follow-up testing rates in Minnesota children.....	10
MHCP lead poisoning rates by race/ethnicity	11
MHCP lead testing rates by race/ethnicity	12
MHCP follow-up testing by race/ethnicity.....	13
The effect of testing rates on EBLL rates.....	14
Study limitations	15
Conclusions	16
References	17
Appendices	19

Executive summary

Childhood lead poisoning is one of the most important environmental health threats to children in the United States. Lead poisoning in children can affect their cognitive development, growth, and behavior. At extremely high levels, lead poisoning may result in seizures, coma, or death. While blood lead levels in the United States have declined dramatically during the past 25 years, the risk of lead poisoning remains high for some groups of children.

High-risk groups include children who are poor, non-Hispanic black children, Mexican-American children, children living in large metropolitan areas, and children living in older housing. Because Medicaid serves many of these high-risk groups, lead poisoning is a significant problem for children enrolled in Medicaid. According to national data, Medicaid-enrolled children are three times more likely to have elevated blood lead levels (EBLLs) than non-enrolled children (9 percent compared to 3 percent).

Blood lead testing is an essential tool for identifying lead poisoned children, since most children with EBLLs do not develop clinical symptoms. 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, and between 36 and 72 months if testing has not previously been done. Despite the requirement, only about 19 percent of Medicaid-enrolled children ages 1 to 5 are tested nationwide.

The Minnesota lead data match project

This report presents the results of a joint study by the Minnesota Department of Human Services (DHS) and the Minnesota Department of Health (MDH) to examine the lead testing rates and results of Minnesota children. The study, known as the Minnesota Lead Data Match Project, linked MDH Blood lead Surveillance System data with DHS data for children under age 6 enrolled in Minnesota's Medicaid programs (referred to here as Minnesota Health Care Programs, or MHCP). This effort, which used data from 1995-1998, represents the first time that test result data on the entire MHCP population have been available. This study also



made it possible, for the first time, to make comparisons between MHCP children and Minnesota children who were not served by MHCP.

It is important to note that the rates given in this report do not represent the prevalence of lead poisoning in Minnesota children or children in any of the sub-groups described here. That is, the lead poisoning rates for the group of tested MHCP children do not necessarily represent the lead poisoning rate in MHCP children as a whole.

The findings covered in this report include the following:

MHCP children were more likely to have EBLLs

Children enrolled in MHCP had higher lead poisoning rates. Ten percent of Minnesota children under age 6 (approximately 38,500) are tested for lead poisoning each year. Of those tested and found to have EBLLs between 1995 and 1998, 72 percent were enrolled in MHCP. Within the two groups of tested children, MHCP children were nearly twice as likely as non-MHCP children to have EBLLs (9.8 percent compared to 5 percent).

Testing rates for MHCP children were low and declining

Despite their high-risk status, Minnesota's MHCP children had extremely low blood lead testing rates. Fewer than 15 percent of 1- and 2-year-old MHCP children received blood lead testing. Not only were testing rates low, but rates also declined throughout the study period from 14.9 percent in 1995 to 13.3 percent in 1998.

Required tests were missed during EPSDT well-child visits

Low testing rates existed, despite a federal requirement that all Medicaid children receive blood lead testing as a component of their 1- and 2-year-old EPSDT well-child visits. This study looked at 1- and 2-year-old MHCP children who received such well-child care and found that only one in four received a blood lead test as part of their visit. Testing rates for children receiving EPSDT well-child visits also declined from 26.2 percent in 1995 to 22.6 percent in 1998. Had all MHCP 1- and 2-year-olds received testing during their visits, the overall lead testing rate for 1998 would have been 58.8 percent, rather than 13.3 percent.

Follow-up testing rates were low for all Minnesota children

Three-month follow-up testing rates for children with EBLs were quite low. According to the study, only one-third of Minnesota children with EBLs received the recommended follow-up testing within three months. MHCP children were less likely than non-MHCP children to receive follow-up testing within three months (32 percent compared to 37 percent). While additional follow-up testing appeared to take place beyond three months, rates remained low.

Disparities Existed by Race/Ethnicity

Finally, the study showed that EBLs, testing rates, and follow-up testing rates for MHCP children all varied by race/ethnicity. Lead poisoning rates were found to be higher for children of color compared to white children. At the same time, children in racial/ethnic groups with higher EBLs generally had higher testing rates as well. The three-month follow-up testing rates tended to be higher for white and Hispanic children than for other racial/ethnic groups. It is important to note that the reason for higher rates of testing and their impact on lead poisoning rates by race/ethnicity are not available from the data. Furthermore, lack of prevalence data limits the use of these results for general comparison between racial/ethnic groups.

Conclusions

National research shows that Medicaid-enrolled children are a high-risk population. This study indicates that the same is true for Medicaid-enrolled children in Minnesota. Blood lead testing of MHCP 1- and 2-year-olds is necessary in order to identify lead-poisoned children and to comply with federal testing requirements. This report demonstrates the need to inform health care providers, as well as caregivers, about the importance of lead testing for MHCP children. In addition, the health care providers and caregivers of all Minnesota children need 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.

Introduction

Medicaid: health care assistance for low-income people, offered in partnership between federal and state governments

Medical Assistance (MA): Minnesota's Medicaid program

Minnesota Health Care Programs (MHCP): the collective name for several state health care programs. The two largest MHCP programs are Medical Assistance and MinnesotaCare. For the purposes of this report, MHCP may be considered equivalent to Medicaid.

(See Appendix I for more definitions.)

This report presents the results of a joint study by the Minnesota Department of Human Services (DHS) and the Minnesota Department of Health (MDH) to examine the lead testing rates and results of Minnesota children enrolled in the state's Medicaid programs (referred to here as Minnesota Health Care Programs, or MHCP). While DHS has studied lead testing rates and results for a sample of MHCP children on two previous occasions (Appendix II), this is the first time that test result data on the entire MHCP population have been available. Moreover, by isolating the MHCP population, it also became possible to identify and discuss results for children who were not served by MHCP.

The study, known as the Minnesota Lead Data Match Project, looked at data from 1995 through 1998 for children under 6 years of age. In addition to results from the match project, this report contains testing data from the DHS claims database. The information presented in this report includes:

- lead poisoning rates for Minnesota children under age six
- blood lead testing rates for MHCP 1- and 2-year-olds, and missed opportunities to test this group of children

- follow-up testing rates for Minnesota children under age six
- lead poisoning, lead testing and follow-up testing rates for MHCP children under age six, by race/ethnicity

Background

Childhood lead poisoning is one of the most important environmental health threats to children in the United States. Lead poisoning affects young children in particular because their developing nervous systems are especially vulnerable to injury. Toddlers are at greatest risk, since their mobility and normal hand-to-mouth activity allow them increased access to lead sources.¹

For children, an elevated blood lead level (EBLL) is defined by the Centers for Disease Control and Prevention (CDC) as a blood lead content equal to or greater than 10 micrograms per deciliter (10µg/dL). A blood lead level (BLL) of 10µg/dL or higher can adversely affect a child's cognitive development, growth, and behavior.² At extremely high levels (45µg/dL or higher), lead poisoning can result in seizure, coma, and death.^{1,3}

The dangers of lead poisoning have long been recognized. During the 1970s, the U.S. government took steps to reduce lead exposure by requiring its removal from gasoline, canned goods, and paint. These efforts have already resulted in dramatic decreases in BLLs among U.S. children.⁴

Although lead is no longer an ingredient in paint, old paint remains a common source of childhood lead exposure. Eighty-three percent of homes built in the United States before 1978 still contain lead-based paint.⁵ When paint containing lead deteriorates or becomes disturbed during home remodeling, lead is released into the environment in the form of dust and paint chips. Other lead sources include industrial byproducts, plumbing systems, crystal or ceramic tableware, folk medicines, cosmetics, lead dust in urban soil, and 'take home' lead from employment activities and hobbies.^{3,6}

Lead poisoning in the United States

An estimated 4.4 percent of U.S. children ages 1 to 5—about 890,000 children—have EBLs. The rate is highest among 1- and 2-year-olds, 5.9 percent of whom have EBLs.^{7,8} The prevalence of lead poisoning in U.S. children is determined through the National Health and Nutrition Examination Survey (NHANES).*

Despite overall declines in BLLs during the past 25 years, the risk of lead poisoning remains high for some groups of children. High-risk groups include children who are poor, non-Hispanic black children, Mexican-American children, children living in large metropolitan areas, and children living in older housing.⁷ According to NHANES, low-income children living in older housing have lead poisoning rates 30 times greater than middle-income children who live in newer housing.⁹

Because Medicaid serves many of the high-risk groups described above, lead poisoning is a significant problem for children enrolled in Medicaid. A General Accounting Office report points out that while one-third of the nation's 1- to 5-year-olds are served by Medicaid, about 60 percent of the lead poisoned children in this age group are Medicaid enrolled.¹

As mentioned, national prevalence studies found the lead poisoning rate for all children ages 1 to 5 to be 4.4 percent. The breakdown of this rate by Medicaid enrollment leads to an important distinction: within the group of the Medicaid children, 9 percent had EBLs, while the rate for non-Medicaid children was only 3 percent.¹ For this reason, CDC's guidelines for blood lead testing list Medicaid children as a high-risk group.

Medicaid and blood lead testing

Blood lead testing is an essential tool for identifying lead poisoned children, since children with BLLs in the 10-25µg/dL range may not develop clinical symptoms.¹⁰ Until recently, blood lead testing was recommended for virtually all 1- to 5-year-olds. In 1997, however, CDC changed its lead testing recommendation to one based on specific risk. Because Medicaid children are considered to be a high-risk

group, a universal lead testing policy remains in place for them.¹¹

Children enrolled in Medicaid receive testing through the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) program. Under the EPSDT program, Medicaid enrollees are to receive blood lead testing at 12 months and at 24 months. The regulations further state that, if they have not previously received testing, children between ages 36 and 72 months should also be tested.¹² Despite the EPSDT testing requirements and disproportionately high rates of lead poisoning, NHANES found that only 19 percent of Medicaid children ages 1 to 5 have ever been tested.¹

Lead poisoning in Minnesota

Like other U.S. children, children in Minnesota receive much of their lead exposure from deteriorating lead-based paint. Since 1.4 million homes in the state were built before 1978 (1990 U.S. Census data), the state's housing stock represents a significant lead hazard. Other lead exposure sources found nationally, such as those related to industry, vehicle exhaust fallout, and plumbing, are also present in Minnesota. In addition to the lead exposure sources that exist locally, people who move to Minnesota from other states or other countries may arrive with lead poisoning caused by exposure elsewhere (Appendix III).

The Minnesota Department of Health keeps records of blood lead analyses performed statewide in its Blood Lead Surveillance System. Established by state statute in 1986, the purpose of the surveillance system is to: monitor BLLs in children and adults; screen high-risk populations; ensure the delivery of related medical and environmental services to chil-

* Conducted periodically since 1960, NHANES examines the health and nutritional status of the civilian, non-institutionalized population of the United States. NHANES is designed so that each year of data constitutes a nationally-representative sample. The survey includes a household interview and a physical examination. As part of the physical exam, a blood lead test is administered to every participant over one year of age. The most recent version of the survey is NHANES III.

dren; and provide data for planning and implementation of primary prevention programs. The statute requires every hospital, clinic, laboratory, or other individual or facility performing lead analyses to report test results and related epidemiologic information to MDH.

Data from the MDH Blood Lead Surveillance System describe only that portion of the population that has been tested. Since these data are not derived from a random sample, they cannot be used to calculate the prevalence of lead poisoning for the state. However, Minnesota's prevalence rate may be estimated using the national rate. By applying the national prevalence rate of 4.4 percent to the state's population of 1- to 5-year-olds, an estimated 14,250 Minnesota children could have EBLs. National prevalence data would further predict that 60 percent of these children are Medicaid enrollees.

Lead poisoning rates based on data from the MDH Blood Lead Surveillance System have been compared with rates from similar surveillance programs in other states. A recent study looked at lead surveillance data from 19 U.S. states, including Minnesota. With an estimated 10 percent of Minnesota children under age 6 receiving lead testing each year, data from 1998 show that 7.5 percent of these have EBLs. This rate closely resembled the 19-state average of 7.6 percent.¹⁴

The Minnesota lead data match project

The Minnesota Lead Data Match Project is an ongoing effort by MDH and DHS to identify trends in lead testing and lead poisoning rates among children enrolled in MHCP. To do this, data from MDH's Blood Lead Surveillance System is matched with MHCP enrollment and claims data, held by DHS. The match makes it possible for the two state agencies to follow trends in lead testing and blood lead levels for children enrolled in MHCP; to track outcomes associated with blood lead testing and follow-up care; and to monitor the completeness of lead test reporting by state laboratories.

DHS and MDH staff have worked closely for three years to develop the process for exchanging and matching data. Through the data match project, DHS can obtain summary data on lead test results for children enrolled in MHCP, and MDH is able to isolate lead test results for children enrolled in the state's public health care programs.

The project uses a multi-step process to match children in the MHCP database with their corresponding test results in the MDH Blood Lead Surveillance System. The matching process is modeled after one developed by the MDH Center for Health Statistics using SAS computer software¹⁵ (Appendix IV). This report contains data on 79,055 MHCP children counted once per year between 1995 and 1998.



Results and discussion

Lead poisoning in Minnesota children

Approximately 10 percent of Minnesota children under age 6 receive blood lead testing each year (Figure 1). Slightly over half of the children tested for lead poisoning between 1995 and 1998 were enrolled in MHCP (Figure 2). Of the Minnesota children tested and found to have EBLs between 1995 and 1998, 72 percent were enrolled in MHCP (Figure 3).

MHCP children who received blood lead testing were nearly twice as likely to have EBLs compared to non-MHCP children who were tested. In 1998, the lead poisoning rate for tested MHCP children was 9.8 percent compared to 5 percent for non-MHCP tested children (Figures 4 & 5).

Lead poisoning rates for all Minnesota children who received testing declined between 1995 and 1998 from 11.8 percent to 7.5 percent. The rates for MHCP and non-MHCP children dropped from 16.2 percent to 9.8 percent, and from 6.7 percent to 5 percent, respectively. While the rate of decrease over the study period was greater for MHCP children, they continued to exhibit EBLs at nearly twice the rate of non-MHCP children (Figure 6).

It is important to note that these results may have been influenced by the reason the children in each group were tested. An MHCP child may receive testing because 1) he or she has a risk factor, such as living in an older home, or 2) his or her health care provider is following the federal testing requirement. A non-MHCP child, meanwhile, likely receives testing only when a risk factor is present. To the extent that providers are following the testing requirement, the group of tested MHCP children might contain more low-risk children compared to the non-MHCP group.

In any case, these results generally reflect the national prevalence studies demonstrating increased risk related to Medicaid-enrollment status. Medicaid children nationwide were three times more likely to have elevated BLLs than were non-Medicaid children (9 percent compared to 3 percent), according to a General Accounting Office Report.¹

The Minnesota results also generally resemble those of neighboring Wisconsin, where 1999 data from that state's blood lead test database were used in a match process similar to the one reported here. In that study, Wisconsin also found lead poisoning rates of 9 percent and 3 percent, respectively, for their Medicaid and non-Medicaid 1- and 2-year-olds.¹⁶

Figure 1. Annual lead testing status of Minnesota children

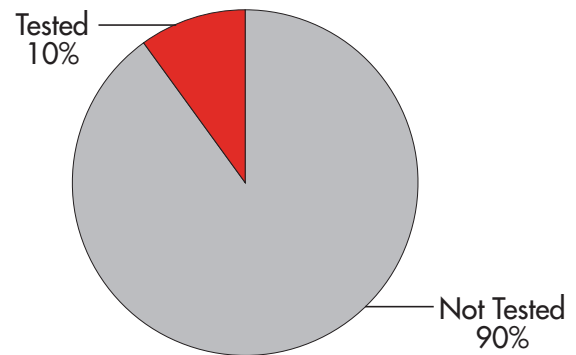


Figure 2. MHCP status for Minnesota children receiving lead testing, 1995-1998

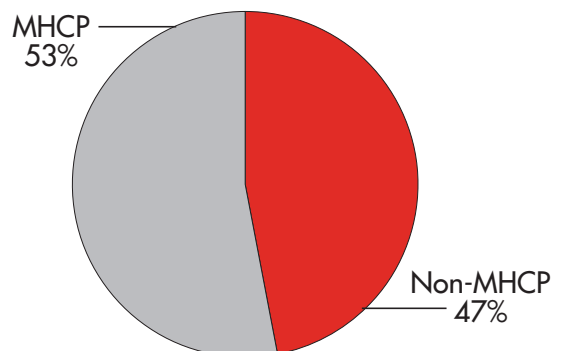


Figure 3. MHCP status for Minnesota children with EBLs*, 1995–1998

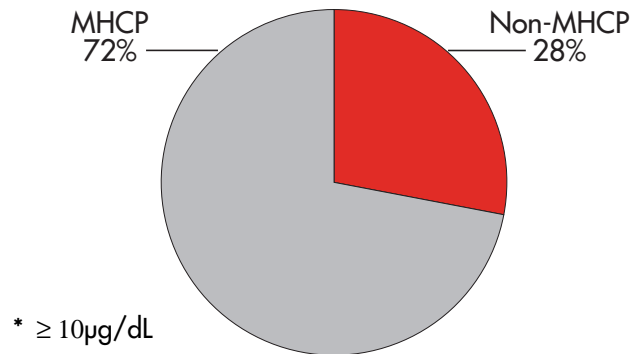


Figure 4. EBL* status for MHCP children tested for lead poisoning, 1998

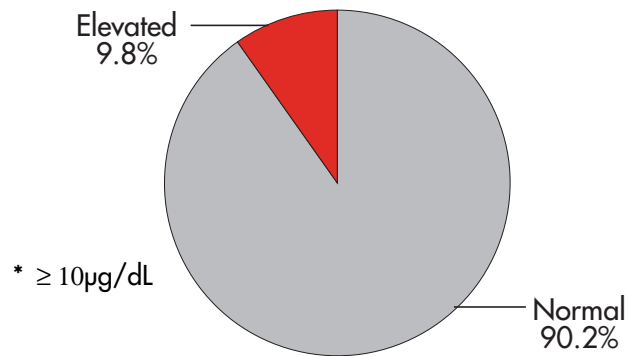


Figure 5. EBL* status for non-MHCP children tested for lead poisoning, 1998

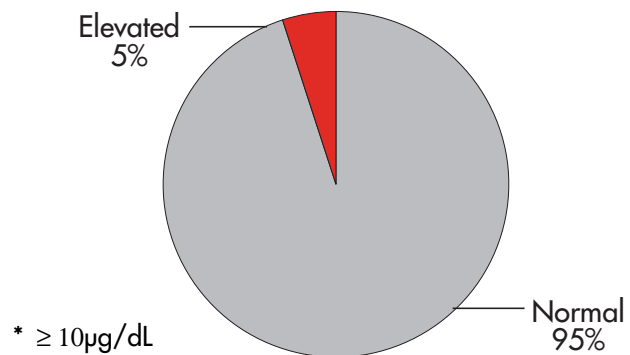
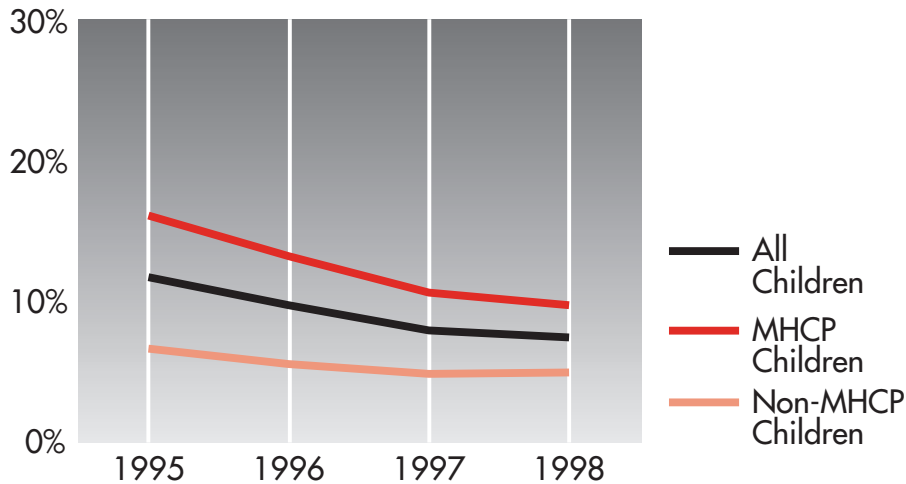


Figure 6. EBLL rates for all Minnesota children under age 6 tested for lead poisoning.
Data tables presented in Appendix V.



MHCP blood lead testing rates

Most lead testing occurs during well-child visits. Medicaid children receive well-child visits through the federal EPSDT program, referred to in Minnesota as the Child and Teen Checkups (C&TC) Program. Based on federal law, the C&TC program requires lead testing at 12 months, 24 months, and between 36 and 72 months for children who have not been previously tested.

In an effort to measure the state's adherence to the federal lead testing requirements, testing rates for 1- and 2-year-old children enrolled in MHCP were examined using DHS claims data. Because all MHCP children are expected to receive C&TC visits at ages 1 and 2, the rate of lead testing for this age group should ideally approach the EPSDT participation rate goal for well-child screening of 80 percent.

The study shows that only 13.3 percent of children between 9 and 30 months received blood lead testing in 1998 (Table 1). Furthermore, test rates for these children declined by 10.7 percent between 1995 and 1998. (Note: The age range for this measure was widened to include children ages 9 through 30 months in order to capture tests for children whose visits did not occur exactly on their first or second birthdays).

While lack of testing for MHCP children is clearly a problem in the state, Minnesota is not alone. Nationwide, only 19 percent of Medicaid children between ages 1 and 6 received blood lead testing.¹ Wisconsin, like Minnesota, examined the testing rates of 1- and 2-year-olds. The testing rate for children in Wisconsin was more than twice the rate of the Minnesota children (30 percent compared to 13.3 percent).¹⁶

Table 1. Blood lead testing rates for MHCP children between 9 and 30 months. Children with multiple tests were counted once per year.

MHCP Children, Ages 9 to 30 Months	1995	1996	1997	1998
# Enrolled Children	60,411	61,004	59,036	56,147
# Children Receiving Lead Tests	8,977	8,851	8,022	7,472
% Enrolled Children Tested for Lead	14.9	14.5	13.6	13.3

Testing rates for MHCP children with EPSDT well-child visits

Opportunity for testing MHCP children for lead poisoning is dependent on their being brought to their health care providers for EPSDT well-child visits. Adding to concern is the lack of lead testing that has been conducted when a child is brought in for an EPSDT well-child visit.

All 1- and 2-year-old MHCP children are required to receive lead testing as part of their EPSDT well-child visits. However, fewer than 1 in 4 who received such well-child care were tested in 1998. Furthermore, testing rates declined between 1995 and 1998, dropping from 26.2 to 22.6 percent (Table 2).

These “missed opportunities” greatly impact the overall testing rate among 1- and 2-year-old MHCP children. If all of the children who received EPSDT well-child care had been tested during their visits, the overall testing rate for this age group would have reached 58.8 percent in 1998, rather than 13.3 percent.

According to the literature, missed opportunities to test for lead poisoning occur for many reasons. One reason may be a belief among health care providers that lead exposure is no longer a problem in their communities.¹¹ Other factors include: length of time a provider has been practicing medicine, the extent to which a provider works with children of color and Medicaid children, the type of clinic a provider practices in, and whether a provider believes that the benefits of testing outweigh the costs.^{17,18,19}

Table 2 Blood lead testing rates for MHCP children between 9 and 30 months. Children with multiple tests were counted only once per year.

MHCP Children, Ages 9 to 30 Months	1995	1996	1997	1998
# Children with Well-child Visits	34,299	35,841	34,797	33,012
# Children Receiving Lead Tests	8,977	8,851	8,022	7,472
% w/ Well-child Visit Tested for Lead	26.2	24.7	23.1	22.6

Follow-up testing rates in Minnesota children

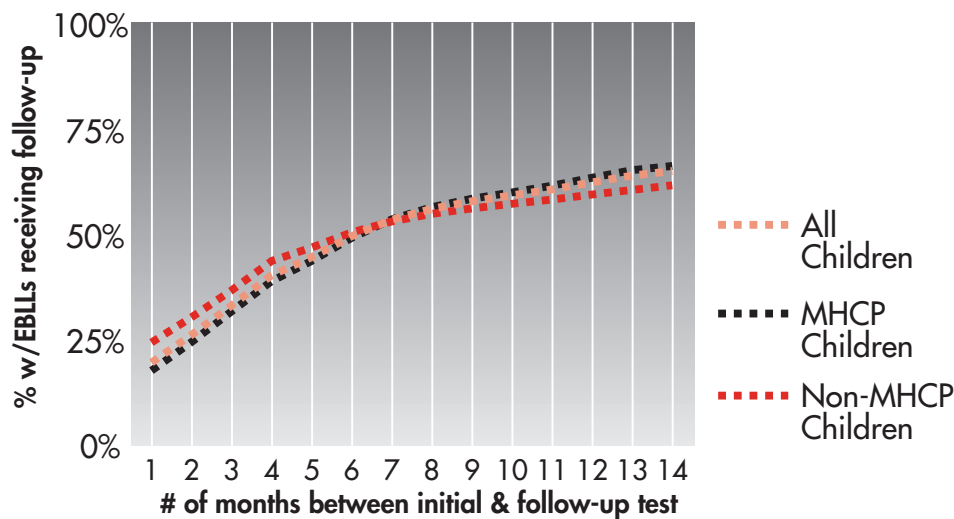
Once a child presents with lead poisoning, the CDC and MDH recommend follow-up testing.* Follow-up testing is done to ensure that BLLs are declining and that health threats have diminished. The recommended timeframe for follow-up testing varies depending on the severity of the elevation, but an initial follow-up test should be administered within three months in all cases.^{20,21}

Despite CDC and MDH recommendations, only about one-third of Minnesota children with EBLLs received follow-up testing within three months. Non-MHCP children were more likely to receive follow-up testing by the third month (37 percent) than MHCP children (32 percent).

However, when tracked to the eighth month and beyond, the follow-up rate for MHCP children slightly surpassed that of non-MHCP children (Figure 9). After 14 months, 66.6 percent of MHCP children and 62 percent of non-MHCP children had received follow-up testing.

Figure 7. Follow-up testing rates for children under age 6 with EBLLs, 1995-1998.

Data table presented in Appendix VII.



* Although follow-up testing should occur within three months of the initial elevated result, this study looked at follow-up testing through 14 months. Fourteen months was chosen to capture follow-up testing that occurred within a year of the recommended follow-up period. (Note: since the intent behind any occurrence of testing is unknown, it is possible that some tests have been erroneously counted here as follow-up tests).

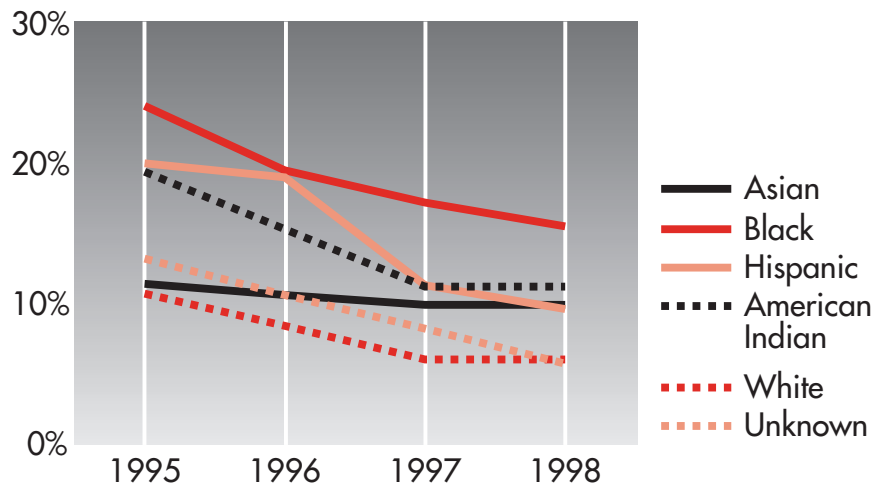
MHCP lead poisoning rates by race/ethnicity*

Lead poisoning rates for MHCP children under age 6 who received testing differed by race/ethnicity.³ In 1998, black children were more than twice as likely to have EBLs compared to white children (15.6 percent and 6.1 percent, respectively). American Indian children had the next highest levels (11.3 percent), followed by Asian children (10 percent) and Hispanic children (9.7 percent).

Lead poisoning rates decreased over the study period for all racial/ethnic groups. The decrease for Hispanic children was greatest, falling by 52 percent between 1995 and 1998, while the rate for Asian children decreased by 12.6 percent (Figure 7).

Disparities also exist on the national level. Black children ages 1 through 5 had EBL rates as high as 21.9 percent, while the corresponding rate for white children was 5.6 percent, according to NHANES. The rate for Mexican-American children, the only other group described, reached 13 percent.⁷

Figure 8. EBL rates for MHCP children under age 6 tested for lead poisoning. Data table presented in Appendix VII.



* The racial/ethnic groupings used are those required for federal reporting. Data on race and ethnicity are collected as part of the MHCP application process. Children identified as Hispanic at enrollment were categorized as Hispanic for this report; those not identified as Hispanic were categorized here by race. Recent DHS claims data contain a category of children described as “Other.” This category reflects children for whom more than one racial affiliation was chosen. The race/ethnicity data were incomplete for non-MHCP children and, therefore, is not included here.

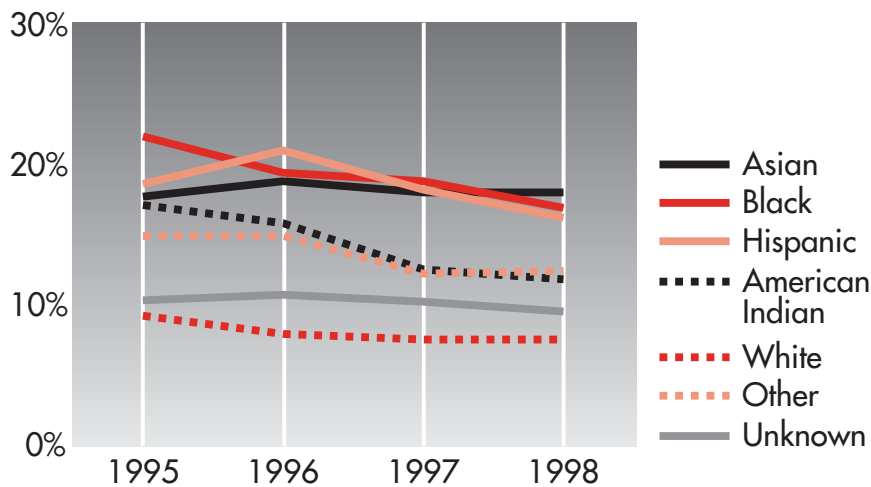
MHCP lead testing rates by race/ethnicity

Blood lead testing rates for MHCP children under age 6 were also examined by race/ethnicity. While there was some variation between groups, lead testing rates were low for all racial/ethnic groups. The 1998 test rate was highest for Asian (18.1 percent), black (17 percent), and Hispanic children (16.3 percent). The rate for American Indian children was second lowest (11.9 percent), followed by that of white children (7.6 percent).

Test rates fell for most groups between 1995 and 1998. The greatest declines occurred among American Indian children and black children, whose rates dropped from 17.2 percent to 11.9 percent, and from 22.1 percent to 17 percent, respectively (Figure 8).

Differences in testing rates by race/ethnicity may reflect geographic differences that influence provider choices or testing protocol used at different clinics. Providers who serve children in high-risk areas or in high-risk groups may test children more aggressively. Since the majority of Minnesota's children of color live in the metro area, differences in how metro providers deliver care may explain some of the variation in the testing rates seen here.

Figure 9. Blood lead testing rates for MHCP children under age 6. Data table presented in Appendix VIII.



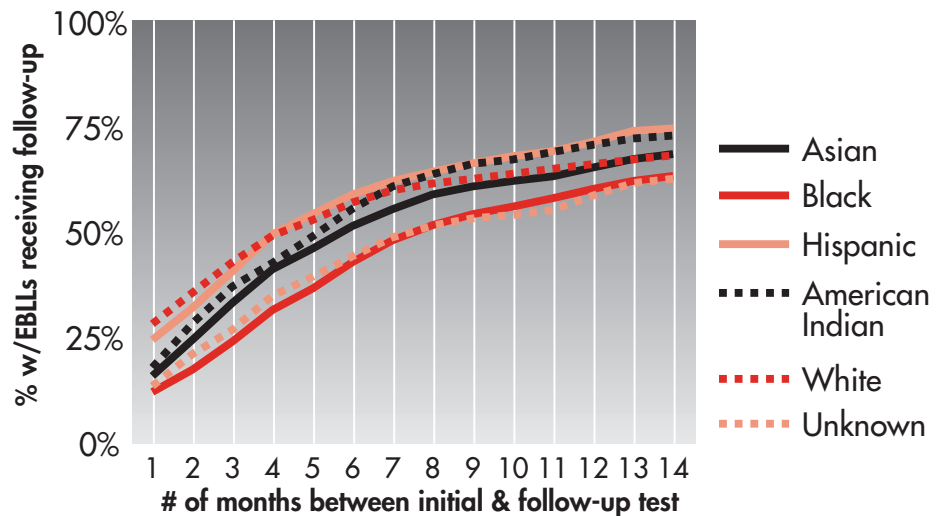
MHCP follow-up testing by race/ethnicity

In contrast to the overall testing data, in which white children had the lowest testing rates of all race/ethnicity groups, white children had the highest three-month follow-up testing rate of any group (43.2 percent). Black children, meanwhile, had the lowest three-month rate (24.3 percent). Rates for Hispanic, American Indian and Asian children were 41 percent, 37.4 percent, and 33.5 percent, respectively.

By 14 months, Hispanic children were the most likely to receive follow-up testing (75 percent), followed by American Indian (73.3 percent), Asian (68.9 percent), and white children (68.6 percent). Black children remained the least likely (63.7 percent) to receive follow-up testing after 14 months (Figure 10).

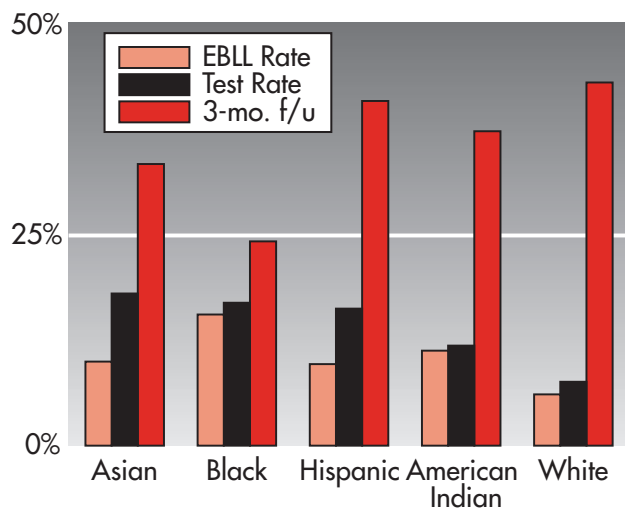
Figure 10. Follow-up testing rates for MHCP children under age 6 with EBLs, 1995-1998.

Data table presented in Appendix IX.



In Figure 11, below, 1998 data on EBLL rates, test rates, and three-month follow-up test rates by race/ethnicity are presented together. This graphic illustrates how EBLL rates and test rates for each racial/ethnic group were generally in proportion. That is, groups with higher EBLL rates generally had higher test rates. Follow-up testing, by contrast, was not reflective of EBLL rates or testing rates. For example, black children had the highest EBLL rate, the second highest test rate and, the lowest three-month follow-up test rate, while white children had the lowest EBLLs, the lowest test rate and the highest three-month follow-up test rate.

Figure 11. 1998 EBLL rates, test rates, and three-month follow-up testing rates by race/ethnicity



The effect of testing rates on EBLL rates

Lead poisoning rates among MHCP children who received testing appear to be falling. However, since testing rates have also declined, and because it is not clear why the MHCP children received testing (because they were high-risk or because testing was required), it is not possible to say conclusively whether, or by how much, the lead poisoning rates for this group have actually fallen. Similarly, test rates by race/ethnicity show that children of color were consistently tested more often than white children (11.9 percent and greater compared to 7.6 percent). The impact of disparate test rates such as these on the lead poisoning rates in this study is unclear.

Study Limitations

The results of the Minnesota Lead Data Match Project have some limitations.

The study results cannot be considered indicative of prevalence. By using data from the MDH Blood Lead Surveillance System, the project makes use of data on children who received blood lead testing. Since the data did not come from a random sample, they are not considered representative of any larger group. That is, the lead poisoning rate for a group of tested children (such as MHCP children or American Indian children) do not represent the prevalence of EBLs in that group of children as a whole.

Moreover, because they are not based on prevalence data, the results of this study do not compare directly to the national data gathered through NHANES. Results of studies based on NHANES data have been included here for general comparison and because they represent the only available data on prevalence of lead poisoning.

The race/ethnicity data is not complete. MHCP race/ethnicity data are either self-reported or, in some cases, reported by county employees. In addition, race/ethnicity data were missing or unknown for 3 to 8 percent of the children in this study. As such, the results may not accurately reflect the race and ethnicity of the study subjects. However, when compared to birth certificate data, MHCP race/ethnicity data have proven reliable.

Data may be missing due to match failure. Because the data-matching process relies on data sources being identical or nearly identical match failure is inevitable. Therefore, some of the data in this report



may be either missing or miscategorized. There is, however, no reason to believe that the unmatched data introduce bias into the results.

Conclusions

MHCP children were more likely to have EBLs

The findings of the Minnesota Lead Data Match Project demonstrate that children enrolled in MHCP were at increased risk for lead poisoning. Approximately 10 percent of Minnesota children are tested for lead poisoning each year. Of those

tested and found to have EBLs between 1995 and 1998, 72 percent were enrolled in MHCP. Within the two groups of tested children, MHCP children were nearly twice as likely as non-MHCP children to have EBLs in 1998 (9.8 percent compared to 5 percent). These findings are consistent with national studies showing that children on Medicaid are a high-risk population.

Testing rates for MHCP children were low and declining

Despite their high-risk status, Minnesota's MHCP children had extremely low blood lead testing rates. The study revealed that fewer than 15 percent of MHCP 1- and 2-year-olds received blood lead testing. Not only were testing rates low, but they also declined from 14.9 percent in 1995 to 13.3 percent in 1998. Blood lead testing rates for MHCP children need to be improved so that children with EBLLs can be identified and treated.

Required tests were missed during EPSDT well-child visits

Low testing rates exist despite a federal law requiring that all Medicaid children receive blood lead testing as a component of their 1- and 2-year-old EPSDT well-child visits. The study looked at 1- and 2-year-old MHCP children who received such well-child care and found that only one in four of them received a blood lead test as part of their visit. Testing rates for this group of children also declined from 26.2 percent in 1995 to 22.6 percent in 1998. Had all MHCP 1- and 2-year-olds received testing during their visits, the overall lead testing rate for 1998 would have risen to 58.8 percent. Significant improvement in testing rates would be seen if health care providers tested all MHCP children who come to them for EPSDT well-child care.

Follow-up testing rates were low for all Minnesota children

Three-month follow-up testing rates for children with EBLLs were quite low. According to the study, only one-third of Minnesota children with EBLLs received follow-up testing within the recommended three-month timeframe. MHCP children were less likely than non-MHCP children to receive follow-up testing within three months (32 percent compared to 37 percent). While additional follow-up testing appeared to take place beyond three months, timely follow-up is crucial. All Minnesota children with EBLLs should receive timely follow-up testing in to ensure that their blood lead levels have decreased to safe levels.

Disparities existed by race/ethnicity

Finally, the study showed that EBLLs, testing rates, and follow-up testing rates for MHCP children all varied by race/ethnicity. Lead poisoning rates were found to be higher for children of color compared to white children. At the same time, children in racial/ethnic groups with higher EBLLs generally had higher testing rates as well. The three-month follow-up testing rates tended to be better for white and Hispanic children than for other racial/ethnic groups. It is important to note that the reason for higher rates of testing and their impact on lead poisoning rates by race/ethnicity are not available from the data. Furthermore, lack of prevalence data limits the use of these results for comparison between racial/ethnic groups. It remains, however, that all MHCP children should receive blood lead testing and follow-up testing without regard to race/ethnicity.

Conclusion

National research shows that Medicaid-enrolled children are a high-risk population. This study indicates that the same is true for Medicaid-enrolled children in Minnesota. Blood lead testing of MHCP 1- and 2-year-olds is necessary in order to identify lead-poisoned children and to comply with federal testing requirements. This report demonstrates the need to inform health care providers, as well as caregivers, about the importance of lead testing for MHCP children. In addition, the health care providers and caregivers of all Minnesota children need 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.

References

- (1) US General Accounting Office. *Medicaid: Elevated Blood Lead Levels in Children*. Washington, DC: US Health, Education, and Human Services Division; 1998. GAO/HEHS-98-78.
- (2) National Research Council. *Measuring Lead Exposure in Infants, Children and Other Sensitive Populations*. Washington, DC: National Academy Press; 1993.
- (3) US Centers for Disease Control and Prevention. *Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials*. Atlanta, GA: US Health, Education, and Human Services Division; 1997.
- (4) Pirkle JL, Brody DJ, Gunter, EW, et al. The decline in blood lead levels in the United States. *JAMA*. 1994;272:284-291.
- (5) US Environmental Protection Agency. *Report on the National Survey of Lead-Based Paint in Housing: Base Report*. Washington, DC: Office of Pollution Prevention and Toxics; 1995. EPA-747-R95-003.
- (6) US Centers for Disease Control and Prevention. *Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control*. Atlanta, GA: US Department of Health and Human Services, Public Health Service; 1991.
- (7) US Centers for Disease Control and Prevention. Update: blood lead levels – United States, 1991-1994. *MMWR Morbid Mortal Wkly Rep*. 1997;46:141-6.
- (8) US Centers for Disease Control and Prevention. Erratum: 1997;46:141-6. *MMWR Morbid Mortal Wkly Rep*. 1997;46:607.
- (9) Pirkle JL, Kaufmann RB, Brody DJ, Hickman T, Gunter EW, Paschal DC. Exposure of the US population to lead, 1991-1994. *Environ Health Perspect*. 1998;106:745-50.
- (10) US Centers for Disease Control and Prevention, Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP). Recommendations for blood lead screening of young children enrolled in Medicaid: targeting a group at high risk. *MMWR Morbid Mortal Wkly Rep*. 2000;49(RR14):1-13.
- (11) US General Accounting Office. *Lead Poisoning: Federal Health Care Programs Are Not Effectively Reaching At-Risk Children*. Washington, DC: US Health, Education, and Human Services Division; 1999.
- (12) US Health Care Financing Administration. *Early and Periodic Screening, Diagnosis and Treatment (EPSDT)*. State Medicaid Manual, Part 5. Baltimore, MD: US Health Care Financing Administration, September 1998.
- (13) MN Department of Health. *Minnesota Blood Lead Surveillance Data, 1999-2000*. St Paul, MN: MDH Division of Environmental Health; 2001.
- (14) US Centers for Disease Control and Prevention. Blood lead levels in young children –United States and selected states, 1996-1999. *MMWR Morbid Mortal Wkly Rep*. 2000; 49:1133-7.
- (15) Palermo J. Purge those merge problems: realistic solutions for accurate and more complete matching of inexact data fields that occur in the everyday world. *Proceedings of the 23rd Annual SAS Users Group International Conference*; March 22-25, 1998.
- (16) La Flash S, Joosse-Coons M, Havlena J, Anderson H. Wisconsin children at risk for lead poisoning. *Wisc Med J*. November 2000:18-22.
- (17) Campbell JR, Schaffer SJ, Szilagyi PG, et al. Blood lead screening practices among U.S. pediatricians. *Pediatrics*. 1996;98:372-7.

- (18) Schaffer SJ, Campbell JR, Szilagyi PG, et al. Lead screening practices of pediatric residents. *Arch Pediatr Adolesc Med.* 1998;152:185-9.
- (19) Furguson SC, Lieu TA. Blood lead testing by pediatricians: practice, attitudes, and demographics. *Am J Public Health.* 1997;87:1349-51.
- (20) MN Department of Health. *Blood Lead Screening Guidelines for Minnesota.* St Paul, MN: MDH Division of Environmental Health; 2000. 3/2000-141-0250
- (21) MN Department of Health. *Childhood Blood Lead Case Management Guidelines for Minnesota.* St Paul, MN: MDH Division of Environmental Health; 2001. 5/2001-141-0278.
- (22) Peer Review Systems. *Focused Study: Childhood Lead Screening Statewide Report - October 31, 1996.* Westerville, OH: Peer Review Systems; 1996.
- (23) FMAS, A DynCorp Company. *1999 External Quality Review Study Child and Teen Checkups Participation Rate Review Final Report: August 2000.* Reston, VA: FMAS; 2000.



Appendix I

Definitions

Elevated blood lead level (EBLL): for children, an EBLL is defined by the CDC as a blood lead content equal to or greater than 10 micrograms per deciliter (10µg/dL).

Blood lead testing: a laboratory test in which a sample of blood, taken from a vein (venous test) or fingertip (capillary test), is examined for the presence of lead. Capillary tests are prone to contamination with lead that may be present on the fingertip, therefore venous tests are considered the more accurate of these two tests.

Blood lead screening: screening is carried out in an effort to detect the presence of a disease-causing agent or condition in a given population. Screening programs may be targeted based on risk, or they may be universal, in which all members of a certain group are tested without considering the

risk status of the individual. In the case of lead poisoning, screening is done using a blood lead test. To avoid confusion with risk assessment (below), screening has been referred to as 'testing' in this report.

Risk assessment: often confused with screening, risk assessment is a decision process used by health practitioners to assign risk and thus determine which individuals to screen. Risk assessment uses a questionnaire or other assessment tool. There is no blood lead testing involved with risk assessment, although it may be done as a result of risk assessment, where risk is determined to be high.

Prevalence: a rate that expresses the proportion of persons, in a given population at a specific time, who have a particular disease or attribute.

MHCP claims data: data derived from records of services provided to MHCP enrollees.

Appendix II

Past studies of lead poisoning and the MHCP population

DHS first examined the issue of EBLLs in MHCP children in 1996 with a study of blood lead testing rates and results among children enrolled in managed care plans. The study looked at a sample of children ages 6 months to 72 months who were continuously enrolled in MHCP and who received a primary care visit during the study period. Of these children, 32.5 percent had a lead test documented in their medical record. EBLLs were found in 7.6 percent of those tested.²²

DHS revisited blood lead testing with a larger study using data from 1998. In that study, medical records for a sample of children ages 12 months to 35 months were examined. Of the children in the sample, 34 percent had received blood lead testing at some time in their lives, and 7.2 percent of those tested had EBLLs.²³

While the results of these two studies appear relatively close, it should be noted that the studies differ substantially with respect to timeframe and sampling frame. The previous studies differ from the study described in this report for the same reasons, and in that they were based on chart reviews rather than administrative claims data.

Appendix III

Ethnicity/Region of Origin	# Children	# tested	% tested	# elevated	% elevated
Somalia	123	107	87%	34	32%
Liberia	58	53	93%	11	21%
Rest of Africa	64	45	69%	10	23%
Hmong	26	25	96%	5	20%
Laos	41	36	88%	13	36%
Rest of SE Asia	42	23	55%	11	48%
Former Yugoslavia	111	71	64%	2	3%
Russia	59	30	51%	0	0%
Ukraine/Belarus/Moldova	96	44	45%	1	2%
Rest of Former USSR	32	14	44%	1	14%
Middle East	8	6	75%	1	17%
Cuba	2	1	50%	0	0%
Totals	662	455	69%	89	20%

Appendix III. Data from Minnesota Blood Lead Surveillance Data, 1999-2000. MDH, Division of Environmental Health. Data represent refugee children (0-72 Months) number and percent tested and with EBLs.

Appendix IV

The Minnesota lead data match project: Methods

In preparation for the data match, DHS created a file containing MHCP children born between January 1, 1989, and December 31, 1998. Included in this preliminary file were all children enrolled in MHCP between 1995 and 1998. The file contained 292,407 records with each child's name, date of birth, sex, and county of residence. An additional file included information on specific enrollment dates, program types, and race/ethnicity for each child.

The MDH file was a subset of the state's Blood Lead Surveillance System. It contained blood lead test results, as reported by state laboratories between 1995 and 1998, for all children under age 6. This file included the last name, first name, date of birth, sex, and lead test results for 181,473 children.

Data matching method

The data matching process consisted of seven steps, or iterations. Each step looked at some form of the child's first name, last name and date of birth. Gender was also used as a constraint in two of the steps. After each iteration, the matched records were moved to a separate database and the unmatched records were sent to the next step for matching under different constraints. (Table 1)

For all iterations following the first one, a visual check was made to eliminate false positive matches. No visual scan was performed for the first iteration (in which 85,000 records were matched) because of the large number of matches it produced, and because the stringent matching criteria meant there was little chance for error.

Data match results

The data match produced data on 60,296 children who were enrolled in MHCP and received one or more lead test(s) between 1995 and 1998. Because multiple testing and follow-up testing occurred, the same 60,296 children were associated with 92,116

tests during the four-year study period. The data presented in this report are based on the highest test result for each child during each year of the study. With each child counted in this manner, the total became 79,055 children, some of whom are counted in multiple years. (Note: children who did not match were counted as non-MHCP children, therefore it is possible that the non-MHCP group contains some MHCP children who failed to match).

Further results: Laboratory reporting rates

In order to check the completeness of reporting to the MDH Blood Lead Surveillance System, a separate DHS file containing records of MHCP children with blood lead testing claims was matched against the blood lead surveillance data. The DHS file contained records of 86,053 blood lead tests for the years 1995-1998. Of these, 69,978, or 81.3 percent matched* with records in the MDH system. Thus 18.7 percent of the blood lead tests for which DHS received claims were not reported to the MDH Blood Lead Surveillance System. There is no reason to believe that the unreported tests introduce a bias into the results.

* The matching criteria required that the test date match within one month in each file. Some degree of match error is possible.

Table 1. Minnesota Blood Lead Data Match Project match process steps with resulting percent of matched records.

Constraint	Match	Cumulative Match
Iteration 1: Exact last and first name, and exact month, day, and year of birth.	85.2%	85.2%
Iteration 2: Index function on last and first names, and exact month, day, and year of birth.	7.2%	92.4%
Iteration 3: Index function on last and first names, gender, exact month, and year of birth.	1.7%	94.1%
Iteration 4: Index function on last and first names, gender, exact day, and year of birth.	0.6%	94.6%
Iteration 5: 'Sounds like' operator on matching last name, first name, exact day, month, and year of birth.	5.1%	99.7%
Iteration 6: Same as Iteration 5, but month of birth is removed as a matching factor.	0.1%	99.8%
Iteration 7: Same as Iteration 5, but day of birth is removed as a matching factor.	0.2%	100%



Appendix V

Note: An elevated blood lead level is defined as a blood lead content equal to or greater than 10 micrograms per deciliter (10µg/dL).

Table 1. Lead test results for all tested Minnesota children under age 6. Each child was counted once per year. For children with multiple tests, the highest test result was used.

BLL	1995		1996		1997		1998		Total	
	#	%	#	%	#	%	#	%	#	%
<10 µg/dL	33,102	88.2	34,267	90.2	34,326	92.0	32,917	92.5	134,612	90.7
10-15 µg/dL	2,721	7.3	2,310	6.1	1,872	5.0	1,693	4.8	8,596	5.8
15-20 µg/dL	925	2.5	714	1.9	582	1.6	511	1.4	2,732	1.8
>20 µg/dL	787	2.1	690	1.8	543	1.5	460	1.3	2,480	1.7
Total	37,535	100.0	37,981	100.0	37,323	100.0	35,581	100.0	148,420	100.0
% Elevated	4,433	11.8	3,714	9.8	2,997	8	2,664	7.5	13,808	9.3

Table 2. Lead test results for tested MHCP children under age 6.

Each child was counted once per year. For children with multiple tests, the highest test result was used.

BLL	1995		1996		1997		1998		Total	
	#	%	#	%	#	%	#	%	#	%
<10 µg/dL	16,916	83.8	17,931	86.7	17,856	89.3	16,408	90.2	69,111	87.4
10-15 µg/dL	1,996	9.9	1,673	8.1	1,309	6.5	1,116	6.1	6,094	7.7
15-20 µg/dL	673	3.3	535	2.6	435	2.2	345	1.9	1,988	2.5
>20 µg/dL	595	3.0	537	2.6	403	2.0	327	1.8	1,862	2.4
Total	20,180	100.0	20,676	100.0	20,003	100.0	18,196	100.0	79,055	100.0
Elevated	3,264	16.2	2,745	13.3	2,147	10.7	1,788	9.8	9,944	12.6

Table 3. Lead test results for tested non-MHCP children under age 6. Each child was counted once per year. For children with multiple tests, the highest test result was used.

BLL	1995		1996		1997		1998		Total	
	#	%	#	%	#	%	#	%	#	%
<10 µg/dL	16,189	93.3	16,366	94.4	16,470	95.1	16,509	95.0	65,501	94.4
10-15 µg/dL	725	4.2	637	3.7	563	3.3	577	3.3	2,502	3.6
15-20 µg/dL	252	1.5	179	1.0	147	0.9	166	0.9	744	1.1
>20 µg/dL	192	1.1	153	0.9	140	0.8	133	0.8	618	0.9
Total	17,355	100.0	17,305	100.0	17,320	100.0	17,385	100.0	69,365	100.0
Elevated	1,166	6.7	939	5.6	850	4.9	876	5	3,864	5.6

Table 4. Percent EBLL rate change over time in lead test results for Minnesota children under age 6, by MHCP-enrollment status for years 1995-1998.

Children	1995 Rate	1998 Rate	Change	% Change
All Children	11.8	7.5	-4.3	-36.4
MHCP-Enrolled	16.2	9.8	-6.4	-39.5
Non-Enrolled	6.7	5	-1.7	-25.4

Appendix VI

Follow-up testing rates for children under age 6 with EBLs, 1995-1998. Data presented by MHCP-enrollment status and number of months between the first elevated test received and the next occurring test, up to 14 months.

Months	Enrolled		Not Enrolled		All Children	
	Number	Cum %	Number	Cum %	Number	Cum %
1	1783	17.9	950	24.6	2733	19.8
2	676	24.7	230	30.6	906	26.4
3	723	32.0	247	37.0	970	33.4
4	720	39.2	272	44.0	992	40.6
5	474	44.0	125	47.2	599	44.9
6	550	49.5	138	50.8	688	49.9
7	433	53.9	101	53.4	534	53.8
8	289	56.8	69	55.2	358	56.4
9	203	58.8	51	56.5	254	58.2
10	147	60.3	42	57.6	189	59.6
11	157	61.9	37	58.6	194	61.0
12	192	63.8	47	59.8	239	62.7
13	180	65.6	41	60.9	221	64.3
14	103	66.6	44	62.0	147	65.4
Total	6630	66.6	2394	62.0	9024	65.4
EBLLs	9944	100.0	3864	100.0	13808	100.0

Appendix VII

Table 1. EBLL rates for MHCP children under age 6 tested for lead poisoning.

Race/Eth	1995			1996			1997			1998		
	Tests	Elevated	%	Tests	Elevated	%	Tests	Elevated	%	Tests	Elevated	%
Asian	2,160	248	11.5	2,414	259	10.7	2,274	227	10.0	2,103	211	10.0
Black	6,327	1,531	24.2	6,276	1,230	19.6	5,958	1,029	17.3	5,267	822	15.6
Hispanic	730	147	20.1	1,037	198	19.1	1,511	172	11.4	1,354	131	9.7
Am. Indian	1,338	261	19.5	1,335	205	15.4	1,176	133	11.3	1,047	118	11.3
White	8,234	892	10.8	7,867	666	8.5	7,489	454	6.1	6,814	413	6.1
Unknown	1,391	185	13.3	1,747	187	10.7	1,595	132	8.3	1,611	93	5.8
Total	20,180	3,264	16.2	20,676	2,745	13.3	20,003	2,147	10.7	18,196	1,788	9.8

Table 2. Percent EBLL rate change over time in lead test results for MHCP children, by race/ethnicity for years 1995-1998.

Rate Change	Asian	Black	Hispanic	Am. Indian	White	Unknown	Total
1995 Rate	11.5	24.2	20.1	19.5	10.8	13.3	16.2
1998 Rate	10.0	15.6	9.7	11.3	6.1	5.8	9.8
Change	-1.5	-8.6	-10.4	-8.2	-4.7	-7.5	-6.4
% Change	-12.6	-35.5	-52.0	-42.2	-44.1	-56.6	-39.2

Appendix VIII

Table 1. Blood Lead testing rates for MHCP children under age 6.
Data presented by race/ethnicity and by year for years 1995-1998.

Race/Eth	1995			1996			1997			1998		
	Children	Tests	Rate	Children	Tests	Rate	Children	Tests	Rate	Children	Tests	Rate
Asian	11404	2027	17.8	11395	2153	18.9	11145	2021	18.1	10237	1857	18.1
Black	25838	5723	22.1	25959	5072	19.5	24649	4669	18.9	24076	4095	17.0
Hispanic	12107	2262	18.7	12928	2726	21.1	12673	2324	18.3	12616	2059	16.3
Am. Indian	7548	1302	17.2	7069	1123	15.9	6736	846	12.6	6442	769	11.9
White	96255	8951	9.3	91715	7367	8.0	84276	6398	7.6	75826	5744	7.6
Other	374	56	15.0	419	63	15.0	464	57	12.3	505	63	12.5
Unknown	4418	461	10.4	4790	518	10.8	5290	545	10.3	5932	572	9.6
Total	157944	20782	13.2	154275	19022	12.3	145233	16860	11.6	135634	15159	11.2

Table 2. Percent testing rate change over time in lead testing rates for MHCP children, by race/ethnicity for years 1995-1998.

Rate Change	Asian	Black	Hispanic	Am. Indian	White	Other	Unknown	Total
1995 Rate	17.8	22.1	18.7	17.2	9.3	15.0	10.4	13.2
1998 Rate	18.1	17.0	16.3	11.9	7.6	12.5	9.6	11.2
Change	0.3	-5.1	-2.4	-5.3	-1.7	-2.5	-0.8	-2
% Change	1.7	-23.1	-12.8	-30.8	-18.3	-16.7	-7.7	-15.2

Appendix IX

Appendix IX. Follow-up testing rates for MHCP children under age 6 with EBLs, 1995-1998.

Data presented by race/ethnicity and number of months between the first elevated test received and the next occurring test, up to 14 months.

Mo.	Asian	Black	Hispanic	Am. Indian	White	Unknown	Total
1	16.1	12.3	24.7	18.1	28.5	13.7	17.9
2	24.7	17.6	32.3	28.6	35.9	21.3	24.7
3	33.5	24.3	41.0	37.4	43.2	27.1	32.0
4	41.5	31.8	49.8	43.0	49.5	35.2	39.2
5	46.4	36.9	54.6	49.3	53.2	39.7	44.0
6	51.8	43.2	59.3	55.9	57.4	44.6	49.5
7	55.8	48.4	62.5	61.2	60.3	49.1	53.9
8	59.3	52.0	64.7	64.1	61.9	51.9	56.8
9	61.2	54.6	66.7	66.6	63.0	53.6	58.8
10	62.5	56.4	68.4	67.6	64.2	54.4	60.3
11	63.6	58.4	69.6	69.4	65.4	55.6	61.9
12	65.7	60.6	71.8	71.1	66.5	59.0	63.8
13	67.7	62.5	74.4	72.6	67.6	62.0	65.6
14	68.9	63.7	75.0	73.3	68.6	63.0	66.7
