The Legacy of Lead

Report on
CHILDHOOD LEAD POISONING
IN WISCONSIN 2008

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The Report on **Childhood Lead Poisoning** in Wisconsin

2008

Wisconsin Department of Health and Family Services
Division of Public Health
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Madison, WI 53702

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State of Wisconsin
Department of Health and Family Services

Jim Doyle, Governor
Karen E. Timberlake, Secretary

May 2008

I am pleased to present the *Legacy of Lead* report. This report provides valuable details about how we can use our current knowledge about the causes of childhood lead poisoning, along with an understanding of the housing in our communities, to focus our efforts to eliminate childhood lead poisoning. Ending this tragedy will require the collective efforts of many people and organizations.

The most compelling messages in this report are that childhood lead poisoning is highly destructive; it is preventable; it costs us all. Childhood lead poisoning continues to be a serious problem throughout our state; it threatens the health and long term well being of children. The health, learning and behavioral effects of childhood lead poisoning can persist throughout a person's lifetime. These effects exact a toll not only on individuals but on our society through increased expenses for medical care, special education, juvenile and adult correctional programs, local government case management interventions, lifelong loss of earnings, higher private health care insurance premiums and increased government expenses for Medicaid. With each poisoning that we prevent, we not only avoid unnecessary human tragedy, but the savings are estimated to be $40,000 - $50,000 per child.

Children living in Wisconsin are at higher risk for lead poisoning than children living in most other states. Much of the problem with childhood lead poisoning stems from Wisconsin's high percentage of older homes. One-quarter of our housing stock is made up of homes built before 1950, when lead-based paint was widely used. These homes are responsible for two-thirds of the childhood lead poisonings in Wisconsin. Fixing the lead paint hazards in these older homes would go far toward eliminating the primary lead poisoning threat to Wisconsin children.

I hope this report will serve as a blueprint as we work together to eliminate childhood lead poisoning in Wisconsin. I encourage you to contact the Wisconsin Childhood Lead Poisoning Prevention Program (608-266-5817) with your questions and ideas. By working together, we can do the right thing for all our children and our state.

Sincerely,

Karen E. Timberlake
Secretary

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About This Report

This report, presenting summary information on the status of childhood lead poisoning in Wisconsin, has been prepared by the Wisconsin Childhood Lead Poisoning Prevention Program (WCLPPP). It is intended to serve as a resource for local and regional public health agencies, health care providers, parents, property owners, legislators, community leaders, citizen or advocacy groups, school officials and others who want to end childhood lead poisoning in Wisconsin.

This report is an adjunct to the *Annual Summary Data* Report that the WCLPPP produces annually. Data from the reports may be viewed online or downloaded from http://dhfs.wisconsin.gov/Lead/Data/index.asp). The *Annual Summary Data Reports* provide the number of children tested and poisoned, and are summarized by age group and Medicaid and WIC enrollment for each local health department jurisdiction. The *Legacy of Lead* builds upon the data presented in the *Annual Summary Data Reports* by providing an analysis of the data along with discussion of strategies to eliminate childhood lead poisoning in Wisconsin.

The *Legacy of Lead* provides a snapshot of the key features of childhood lead poisoning in Wisconsin as of 2006 based on trends over the past decade, and incorporates geographic, racial, ethnic, age and economic associations. A discussion of the factors related to the distribution and risk of childhood lead poisoning is presented along with a discussion of the prevention actions that are needed to eliminate childhood lead poisoning in Wisconsin.

This report is organized into five sections:

Introduction

Wisconsin's children are being poisoned by lead in greater numbers than many other states (CDC Surveillance Data, 1997-2006), causing serious harm to the children and extensive costs to their families and society. Nearly all of Wisconsin's lead-poisoned children are poisoned by lead hazards in their own homes. These poisonings can be prevented!

The effects of lead poisoning can persist throughout a lifetime, and include negative changes in lifelong intellect, behavior and health. The costs to society include increased medical expenses, increased private health care insurance premiums, increased government expenses for Medicaid, and state and local government case management, lifelong loss of earnings, increased special education expenses, and increased use of juvenile and adult correctional programs by persons poisoned by lead as children (Needleman, et al, 1990).

Critical Lead Issues

Key Facts About Lead

Some of the key facts about lead and childhood lead poisoning include:

- Lead poisoning is preventable, and with appropriate effort and commitment, can be eliminated.
- There is no safe level of lead in the human body; even very low levels of lead exposure can cause permanent brain damage and negatively affect health throughout the child's life. Adverse health effects can occur in children with blood lead levels below the Wisconsin definition of lead poisoning (see pg. 4). A child with even slightly elevated levels of lead in their system might be at risk for developing adverse, longer-term health effects (Mendelsohn, et al, 1998).
- Lead interferes with the normal development of a young child's brain, and can result in reduced intellectual functioning, a diminished capacity to learn, attention disorders and developmental delays (Canfield, et al, 2003). Lead at high concentrations can also cause anemia, hearing loss, kidney damage, and reduced physical growth.
- In extreme cases lead poisoning can cause coma, seizures or death.
- Lead poisoning is associated with a greater chance that a child will experience problems in school due to learning difficulties and failure. These problems can lead to higher rates of high school dropout, teen pregnancy, and juvenile delinquency (Needleman, et al, 2002).
- There is a greater likelihood of antisocial behavior and behavior problems like aggression and hyperactivity among lead-poisoned children (Nevin, 2000).
- Recent research (Nevin, 2000; 2007) shows that childhood lead poisoning explained 88% of the variation in the violent crime rate in the United States over several decades, being a powerful predictor of school disciplinary problems, delinquency and adult criminality. These studies refer to lead poisoning as this country's most preventable cause of antisocial behavior.
- Studies by Needleman, et al (1990) and others have also shown that childhood lead exposure is linked to adult kidney disease, diabetes and cognitive deficits such as memory loss and Alzheimer's disease. Lead poisoning during childhood can increase the risk of death from stroke and heart attack as an adult.
- Nearly one of every 20 children entering the Wisconsin school system in the fall of 2006 was known to have been lead poisoned.
- Less than one third of Wisconsin children who are at the greatest risk of lead poisoning have been appropriately tested at their most vulnerable ages of one and two years.

- Ninety percent of lead-poisoned children in Wisconsin were first identified while living in housing built prior to 1950. Abatement of the lead-based paint hazards in these older homes would virtually eliminate childhood lead poisoning in Wisconsin.
- Lead poisoning is a statewide problem, with lead-poisoned children found in each of Wisconsin's 72 counties.
- During 2006, more than 75% of known lead-poisoned children lived within 266 census tracts (out of a total of 1,330 census tracts in Wisconsin). These high-risk census tracts are located in communities of all sizes throughout Wisconsin, and contain approximately 200,000 pre-1950 housing units.
- Fixing housing is the primary way to protect children from exposure to lead. Most lead-based paint hazards can be controlled or eliminated by stabilizing all deteriorating, cracked, chipped and peeling or flaking paint, replacing old windows, repairing roofs and other leak sources, and ensuring smooth cleanable surfaces on window sills and floors.
- Re-painting can effectively prevent lead exposure especially when performed on interior non-friction surfaces such as ceilings, walls, and trim. Re-painting is less effective for surfaces subject to weather or to friction, impact or abrasion such as windows, doors, floors and exterior components.

Details and references for these topics and other lead poisoning issues are included in the following sections of this report.

The Costs of Lead Poisoning

Definition of lead poisoning. In 1991, the Centers for Disease Control and Prevention (CDC) set the level of concern as a blood lead level equal to or greater than 10 micrograms per deciliter (mcg/dL) of whole blood (CDC, 1991). This level of concern was reaffirmed by the CDC in 2007 (CDC, 2007). For surveillance purposes in Wisconsin, any child identified with a blood lead level of 10 mcg/dL or more is considered to be lead poisoned [Wis. Stats 254.11(9)].

Childhood lead poisoning places an enormous burden on affected children, their families and society as a whole. The burden of time, resources and personal suffering associated with lead poisoning can devastate individuals and their families, and strain personal and societal resources. We estimate health savings worth $40,000-50,000 for each Wisconsin child under age six who is protected from lead poisoning by living in housing with new lead-free windows. With approximately 80,000 young children living in housing with lead-paint hazards in Wisconsin, the aggregate health benefits gained from protecting these children would be $3.6 billion. These benefits are based on a review of scientific literature by David Jacobs and Rick Nevin (Jacobs and Nevin, 2006). The following costs were considered in the estimate:

$21,195	Present value of lost lifetime earnings
1163	Avoided neonatal mortality
55	Avoided direct medical care
12,833	Avoided special education
2,362	Avoided expense for attention deficit hyperactivity disorder
+ 8,000	Avoided juvenile delinquency expense
$45,608	

The review, unlike previous cost estimates, includes the benefits of eliminating exposures both above and below the 10 mcg/dL level of concern. It includes the benefits that will be realized by preventing blood lead increases that would otherwise occur from old windows and other sources of lead dust. It is reasonable to assume that eliminating exposure elsewhere in the home will yield additional benefits and that exposures above 10 mcg/dL will generate higher medical and social costs. The tragic impact that lead poisoning has on individuals and their family is hard to put in dollars and cents, and hasn't been included in this estimate. Accordingly, the net estimated benefit in dollars is a minimum estimate, and does not include the economic benefits in energy savings and housing value to be gained by replacing windows.

Sources of Lead Poisoning

Lead-Based Paint on Residential Surfaces. Lead-based paint is the primary source of lead in children's environments. Although the sale of lead-based paint for household use was banned in the United States in 1978, it still coats the walls, window frames and sills, doors, floors and ceilings of many older homes. Virtually all homes built before 1950 have lead-based paint, as do many built since 1950. Paint chips and dust from lead-based paint and varnish form on walls, ceilings and along friction surfaces. They collect on window sills, in window troughs, and on floors and stairwells, and are available for ingestion by toddlers and small children. This makes early blood lead testing important for children age one and two years, as recommended by the CDC and required by federal Medicaid policy (CDC, 2000)

Wisconsin is a rust-belt state, with an abundance of older neighborhoods and old housing built during the industrial boom that started in the mid-1800s. Much of Wisconsin's industrial base has been lost during the past decades, leaving these older neighborhoods without a viable economic base, subject to disrepair and neglect. Many Wisconsin families with young children live in such neighborhoods, in older homes that have lead-based paint hazards. The combination of old housing, poverty and associated socio-economic factors contribute to a risk of childhood lead poisoning in Wisconsin that is persistently much higher than the national average (CDC Surveillance Data 1996-2006). Residential sources of lead-based paint remain by far the leading source of lead exposure for Wisconsin children.

Non-residential sources of childhood lead poisoning. Though currently responsible for a small percentage of lead poisonings in Wisconsin, non-paint sources of lead hazards are becoming increasingly more visible in the public's view of childhood lead poisoning. Non-residential sources include a number of common items, such as toys, lunch boxes, children's jewelry, candies, ceramics, spices and other products that are commonly imported from China, Mexico and elsewhere. In 2006-2007, the USDA Consumer Product Safety Commission reported a large number of product recalls for containing unsafe levels of lead. In March 2006, a four-year old Minnesota child died from lead poisoning after swallowing a small lead charm that was a promotional item with a pair of athletic shoes.

Lead paint in excess of 0.06%, or 600 parts per million (ppm), has been banned in all toys sold in the United States since 1978; enforcement, however, has been irregular. Recent federal legislation and agreements have been proposed in order to strengthen the ban and provide additional assurances to keep lead out of toys and similar consumer goods. On September 12, 2007, the Consumer Product Safety Commission and China's General Administration of Quality Supervision, Inspection and Quarantine agreed to limit the use of lead in toys being exported to the United States. Legislation has been introduced to raise fines, increase funding for the Consumer Product Safety Commission, and require independent testing of certain consumer products that might contain lead. The Chinese government promised implementation of a comprehensive plan to eliminate the use of lead-based paint in toys exported to the United States, and to increase the number and frequency of inspections of factories that produce toys and other consumer goods.

For more information about lead in products and lead poisoning prevention visit the Lead-Safe Wisconsin website, dhfs.wisconsin.gov/lead.

Childhood Lead Poisoning in Wisconsin

The Scope of the Problem

The WCLPPP began systematically collecting information on all blood lead tests conducted in Wisconsin since 1994. Under the requirements of Wisconsin State Statute 254.13, laboratories must provide the WCLPPP with the results and specified demographic information associated with all blood lead tests. The WCLPPP maintains the blood lead testing data in a relational database (STELLAR). The STELLAR data base contains more than one million records of blood lead tests conducted since 1996. STELLAR data contains results for more than 740,000 children living at more than 543,000 addresses in Wisconsin, which form the basis for analyses and surveillance activities conducted by the WCLPPP and are presented in this report. Additional discussion about the WCLPPP database and key definitions and acronyms are included in Appendix A: Technical Information.

The STELLAR data for the period 1996 through 2006 show:

- More than 40,000 Wisconsin children were identified with lead poisoning.
- These 40,000 lead-poisoned children represent 7.4% of all children under age six who received a blood lead test during that time period.
- Lead-poisoned children were identified in each of Wisconsin's 72 counties See facts page 4.
- During 2006 alone, nearly 1,400 children were first identified with lead poisoning, almost four for every day of the year.
- Given the minimum estimated monetary burden of each lead-poisoned child is $45,608, these 40,000 children represent a minimum lifetime burden to the family and state of $1.82 billion.

Most of the 40,000 lead-poisoned children have entered, or will soon be entering, the Wisconsin school system, placing an additional burden on Wisconsin's educational system. Considering that only one-third of appropriate testing is being conducted, these figures likely grossly underestimate the true costs of childhood lead poisoning in Wisconsin. Furthermore, the true number of lead-poisoned children is likely greater, because two-thirds of the children who are at greatest risk of lead poisoning are not appropriately tested.

The 40,000 lead poisoned children were associated with more than 39,000 addresses throughout the state (Figure 1). Since lead poisoning is most often associated with lead-based paint in older housing, the majority of these 39,000 addresses represent environmental hazards which persist as threats to future generations of children. Additional houses with lead-based paint hazards are being identified every year. During 2006 alone, 1,282 new addresses were identified as being associated with lead-poisoned children. Since only a fraction of the total number of children living in older housing have been tested for blood lead levels, there likely are many more properties with lead-based paint hazards - and many more lead-poisoned children - that remain to be identified, but continue to be a source of lead poisoning for the population of children who may live in these homes for variable periods of time.

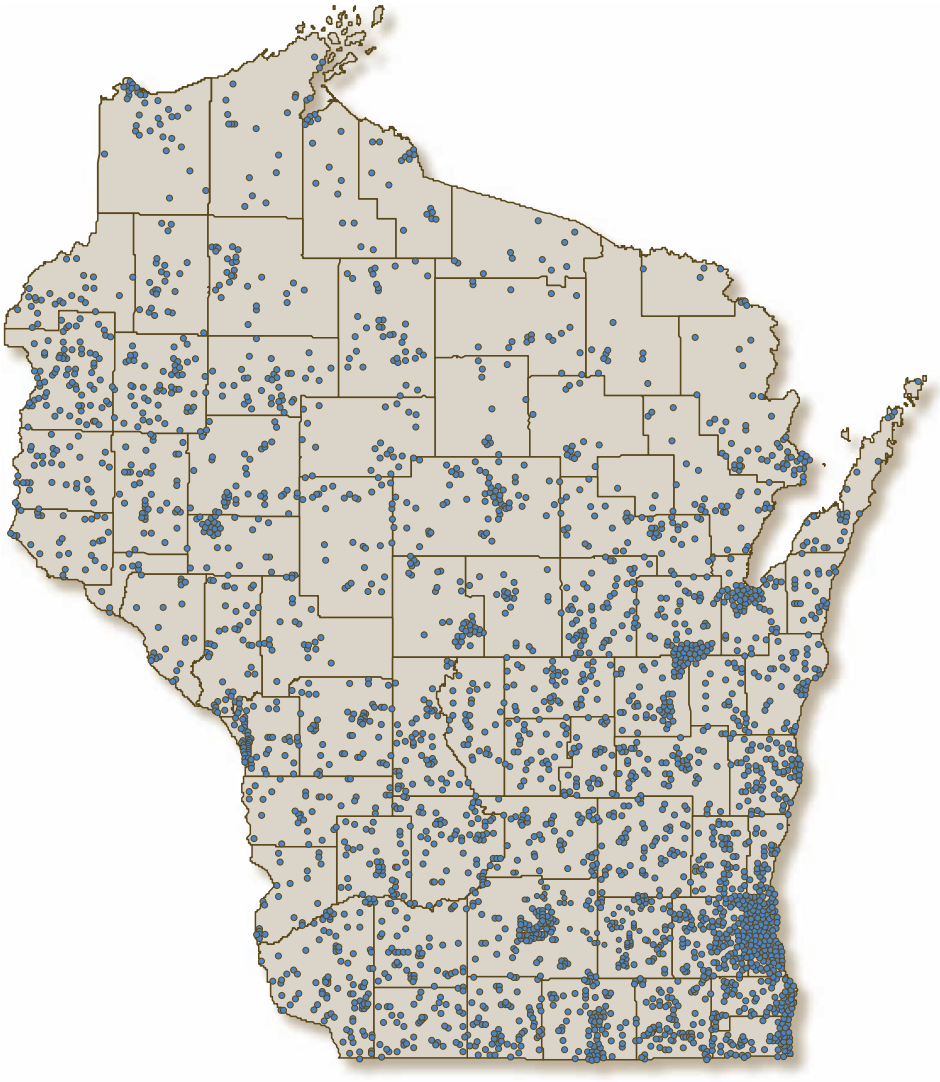

Figure 1
Dots represent locations associated with lead-poisoned children under age 6; Wisconsin, 1996-2006. (source: WCLPPP Surveillance Data)

Who is Being Lead Poisoned in Wisconsin?

WCLPPP data show that during 2006 more than 2,100 children under age 6, or 2.6% of children tested, were known to be lead poisoned. This prevalence rate is more than twice the 2006 national average of 1.2%. According to the 2006 data published by the CDC, Wisconsin ranked ninth among all states for the number of lead poisoned children. For the last decade Wisconsin has consistently ranked within the top nine states nationwide, and near the top among states in the Midwest. Figure 2 shows that among the eight Midwestern states that reported to the CDC in 2006, Wisconsin had the second highest number of lead poisonings per thousand children under age six statewide.

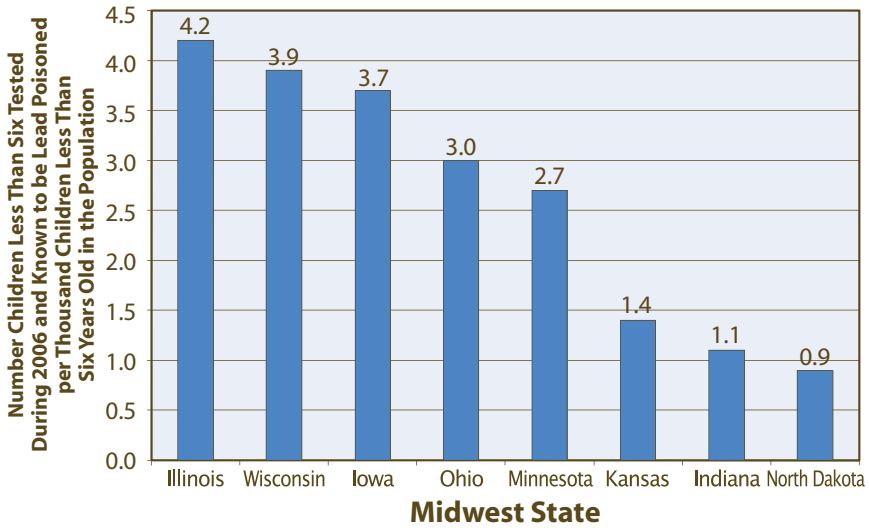

Figure 2
Comparison of Childhood Lead Poisoning Rates for States in the Midwestern U.S. (source: CDC Blood Lead Surveillance Data 1997-2006; WCLPPP Surveillance Data, 1996-2006)

The number and rate of children known to have lead poisoning have declined steadily since the effective start of comprehensive reporting under statute 254.13 during 1996 (Figure 3). In 1996, more than 10,500 children had lead poisoning, representing 16.2% of children tested. By 2006 the number of poisoned children dropped to just over 2,100, or 2.6% of those tested.

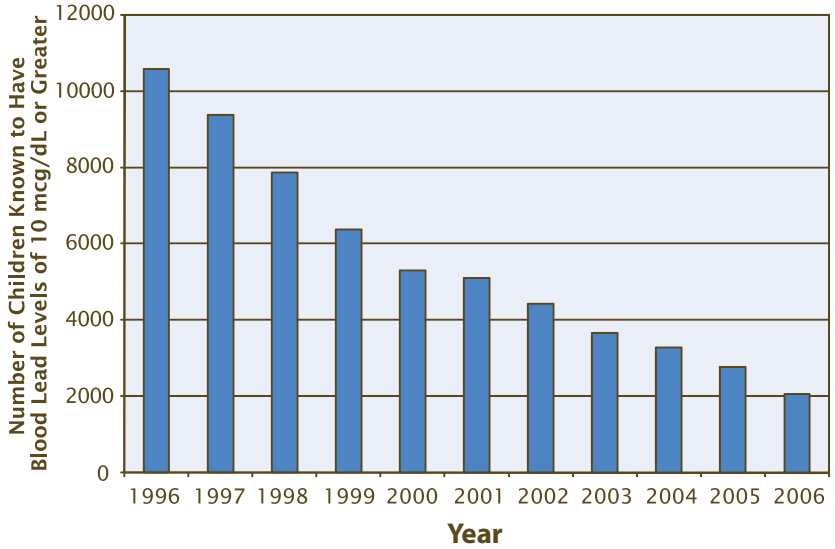

Figure 3
Number of Wisconsin children under age 6 who were lead poisoned by year, 1996-2006. (source: WCLPPP Surveillance Data)

Age of Child. Research indicates that a child's blood lead level tends to be highest between 18 to 36 months of age. This is attributed to frequent hand-to-mouth behavior and the increase in mobility during the 2nd and 3rd years which makes dust containing lead more accessible to the child. In Wisconsin (Figure 4), lead poisoning rates are highest at 2 years of age, and are only slightly lower at ages 1 and 3.

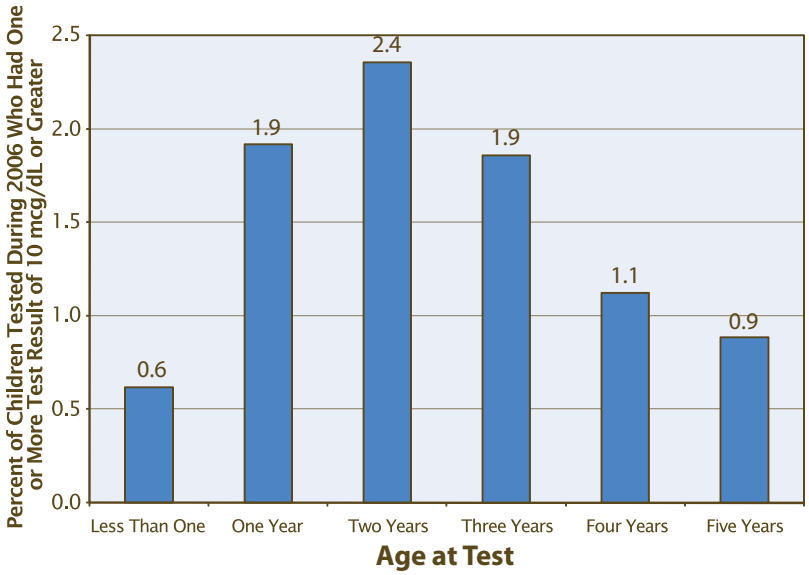

Figure 4
Age of Wisconsin child when first identified as being lead poisoned, 2006. (source: WCLPPP Surveillance Data)

Family Income. Children from low income families in Wisconsin are at greater risk for lead poisoning, largely because they have limited options for selecting housing. A child who receives either Medicaid health care benefits or vouchers from the Supplemental Food Program for Women, Infants and Children (WIC) is considered low income. In 2006, 86% of the children found to be lead poisoned were enrolled in one or both of these programs. The prevalence rate of lead poisoning among children enrolled in Medicaid or WIC was more than 3 times higher than among children who were not enrolled in either of these programs.

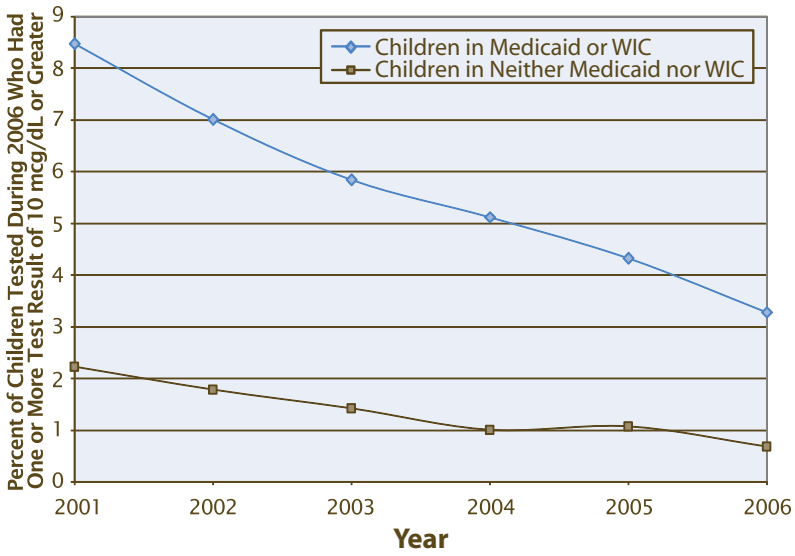

Figure 5

Prevalence of lead poisoning among Wisconsin children under age 6 by indicators of economic status (Medicaid or WIC enrollment), by year 2001-2006. (source: WCLPPP Surveillance Data; Medicaid Eligibility Data, Division of Health Care Access and Accountability; WIC Enrollment Data, Department of Health and Family Services, Division of Public Health)

Race/Ethnicity. Wisconsin children of all races and ethnicities have been identified with lead poisoning. However, minority populations share a greater burden of the lead poisoning problem. Figure 6 presents data on the percent of children tested by racial and ethnic group who were identified with lead poisoning. Lead poisoning rates are highest among African-American children, followed by Hispanic and Asian children.

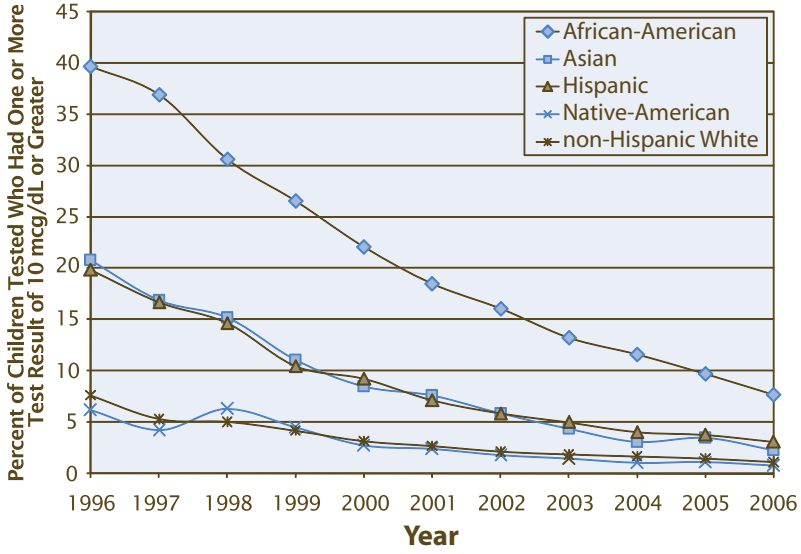

Figure 6
Prevalence of lead poisoning among Wisconsin children under age 6 by race and ethnicity, by year 1996-2006. (source: WCLPPP Surveillance Data, 1996-2006)

Age of Housing. National data have shown that children who live in old housing, where lead paint is more prevalent, are at greater risk for lead poisoning than children who live in newer housing. This same relationship is evident in Wisconsin, where 90% of children first identified with lead poisoning live in homes that were built before 1950 (see Figure 7).

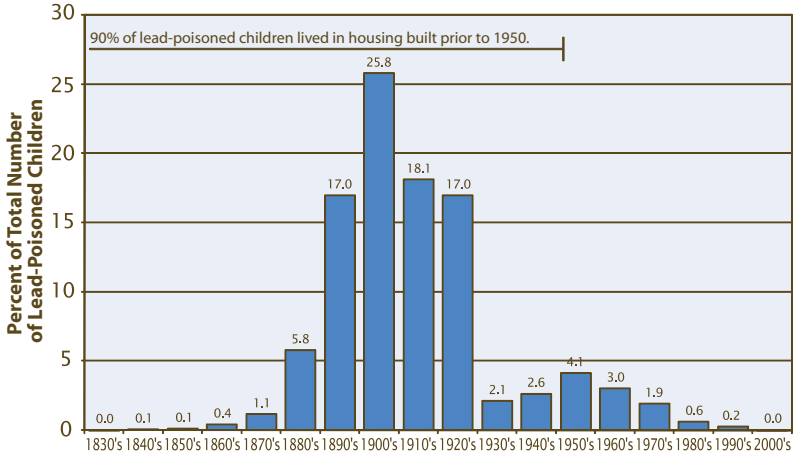

Figure 7
Age of housing associated with the first identification of a lead-poisoned child under age 6 by decade of construction as a percent of total, 1996-2006. (source: WCLPPP Surveillance Data, 1996-2006; Wisconsin Tax Assessor Data)

A recent study completed by the WCLPPP matched addresses in tax assessor files from 16 Wisconsin cities with addresses of children who had received blood lead tests. The risk of a child becoming lead poisoned was 6.4 times greater for tested children living in dwellings built before 1950 compared to children living in post-1950 dwellings.

Pockets of Risk. While lead poisoning is a risk statewide, significantly higher rates are seen in certain communities or parts of communities where older housing and other risk factors for lead poisoning occur in Wisconsin communities with the highest rates community-wide are Milwaukee, Sheboygan, and Racine, 6.1%, 4.5% and 3.1% respectively, considerably higher than the 2006 statewide rate of 2.6%. These rates are city-wide for these communities. Some individual neighborhoods and census tracts have much higher rates of poisoning.

Pockets of lead poisoning can be found in virtually every older Wisconsin community. Nearly one quarter of the 40,000 children poisoned from 1996 through 2006 live in communities with fewer than 50,000 residents, and more than 15% were from communities with fewer than 20,000 residents. Table 1 shows the communities that have one or more census tracts with poisoning rates significantly greater than the mean statewide rate of 2.6%. This shows that childhood lead poisoning is a shared, statewide health problem.

City	2000 Population	Census Tracts With Rate >= One Standard Deviation Above Mean	City	2000 Population	Census Tracts With Rate >= One Standard Deviation Above Mean
APPLETON	70,087	1	KENOSHA	90,352	1
BANGOR	1,400	1	MANITOWOC	34,053	1
BARABOO	10,711	1	MILWAUKEE	596,974	81 (48)
BELOIT	35,775	3	OSHKOSH	62,916	3 (1)
CAMBRIA	792	1 (1)	POPLAR	552	1
CUBA CITY	2,156	1	RACINE	81,855	1
EAU CLAIRE	61,704	1	RICHLAND CENTER	5,114	1
FALL RIVER	1,097	1	SHEBOYGAN	50,792	3
FOND DU LAC	42,203	1	SOUTH MILWAUKEE	21,256	1
GRANTSBURG	1,369	1	SPARTA	8,648	1
GREEN BAY	102,313	1	WAUKESHA	64,825	2
HARTFORD	10,905	1	WAUPUN	10,718	1
HAZEL GREEN	1,183	1	WAUSAU	38,426	2 (1)
JANESVILLE	59,498	1	WEST ALLIS	61,254	1
JUNEAU	2,485	1	WEYAUWEGA	1,806	1
KAUKAUNA	12,983	1			

Table 1
Cities with census tracts having lead poisoning rates that are significantly greater than the statewide average (i.e., more than one standard deviation greater than the 2006 statewide mean; parentheses show the number of tracts having rates more than two standard deviations greater than the statewide mean). (source: WCLPPP Surveillance Data; U.S. Census Bureau, 2000 Decennial Census – SF3)

Refugee children. The prevalence of lead poisoning among newly resettled refugee children has been found to be significantly higher than the prevalence for US children. Several risk factors exist for lead poisoning that are specific to the refugee population:

- Some cultural practices and behaviors could increase the chance of ingesting lead. Traditional medicines and cosmetics from the home country may contain lead.
- An overall lack of awareness about the dangers of lead and the need to protect children from known lead hazards makes the refugee population more vulnerable.
- A compromised nutritional status - evidence of chronic and acute malnutrition. Malnutrition is common in refugee populations. Anemia can enhance lead absorption and thus can increase risk for lead poisoning, even in housing with minimal lead exposure hazards.

Because of the increased risk for lead exposure, in 2005 the Centers for Disease Control and Prevention released recommendations for lead poisoning prevention in newly arrived refugee children. These recommendations include blood lead testing of all refugee children 6 months to 16 years old at entry to the US and repeat testing of all refugee children 6 months to 6 years old 3 to 6 months after they are placed in permanent residences, regardless of initial test results. Table 2 includes data on blood lead testing of children 5 years and younger who arrived in Wisconsin during 2004 and enrolled in the refugee resettlement program. Overall, 3.4% of refugee children who arrived during 2004 were found to be lead poisoned within three months of arrival. The short period of time since arrival suggests that these children were likely poisoned while still in their home countries or enroute. However, continued lead exposure while living in the U.S. can be detrimental to their health.

Region of Origin	Number Arriving 2004	Percent Tested w/in Three Months of Arrival	Percent Tested w/in Three Monts of Arrival and Had Follow Up Test	Percent Found to be Poisoned w/in Three Months of Arrival
SE Asia	707	60.8	15.6	2.8
Africa	81	44.4	23.5	11.1
Europe	6	16.7	0.0	
Asia	2	0.0	-	-
Cuba	1	0.0	-	-
Total	**797**	**58.6**	**16.2**	**3.4**

Table 2
Summary of Refugee Blood Lead Testing: Refugee Children less than six arriving in Wisconsin in 2004 (source: WCLPPP Surveillance Data; Wisconsin Refugee Health Program)

Children Entering The School System. Figure 8 shows the percentage of children entering the school system (i.e., incoming five year olds) who have had one or more blood lead test results of 10 mcg/dL or greater, indicating that they had been, or continue to be, lead poisoned. In the kindergarten class of 2006, 4.7% have been lead-poisoned, or roughly one student in every classroom in the state. Although the percentage of lead poisoned children has fallen with each consecutive kindergarten class, most of the impact from previous years' incoming kindergarten classes remains within the school system as children move on to first grade and beyond. These students may need special education or other special attention throughout elementary school, and beyond, due to the learning disabilities associated with lead poisoning.

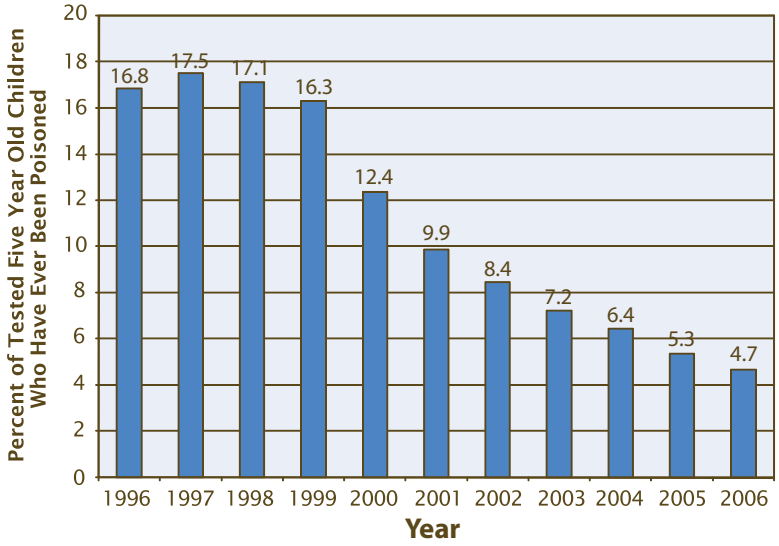

Figure 8
Percent of Wisconsin children entering kindergarten who were known to be lead poisoned before age 6; 1996-2006. (source: WCLPPP Surveillance Data)

Who is Being Tested for Lead Poisoning in Wisconsin?

Testing Requirements and Recommendations. In 1998, the *Wisconsin Blood Lead Screening Recommendations* were developed based on recommendations from a broad-based advisory committee. These guidelines recommend targeted screening of children who are at greatest risk for lead poisoning. The Wisconsin Medicaid Program has collaborated with the WCLPPP in linking program data to determine blood lead testing and lead poisoning among Medicaid-enrolled children. This linking has demonstrated that Medicaid-enrolled children in Wisconsin are at much higher risk of lead poisoning than non-Medicaid enrolled children. This has led to increased efforts within Wisconsin to assure compliance with the 1992 federal requirement that Medicaid-enrolled children receive blood lead tests at ages 12 months and 24 months, and through age 5 if not previously tested.

The *Wisconsin Blood Lead Screening Recommendations* include universal testing of all children living in the cities of Milwaukee and Racine. Because of the extremely high proportion of old housing in these communities, and therefore, the extremely high risk of lead poisoning, each child should have a blood lead test three times before the age of three years: around 12 months, 18 months and 24 months. When seeing children from all other areas of Wisconsin, health care providers are encouraged to use the Four Easy Questions to determine whether a child is at risk for lead poisoning and needs to be tested:

1. Does the child now live in or visit a house built before 1950, or have they ever lived in one in the past (including day care, homes of friends, grandparents, relatives)?
2. Does the child now live in or visit a house or building built before 1978 with recent or ongoing renovations, or have they ever in the past (including day care, homes of friends, grandparents, relatives)?
3. Does the child have a brother, sister or playmate who has/had lead poisoning?
4. Is the child enrolled in (or eligible for) Medicaid or WIC?

Testing in Wisconsin. During 2006:

- More than 82,000 children under age 6 received a blood lead test. This represents approximately 20% of children under age 6 in Wisconsin.
- 67% of children tested were enrolled in Medicaid or WIC.

The number of children tested increased significantly from 1996 to 2001 and has remained relatively stable the past five years (Figure 9). The large increase from 2000 to 2001 is likely due to efforts by the WCLPPP and the Medicaid program to encourage testing of Medicaid and other high-risk children.

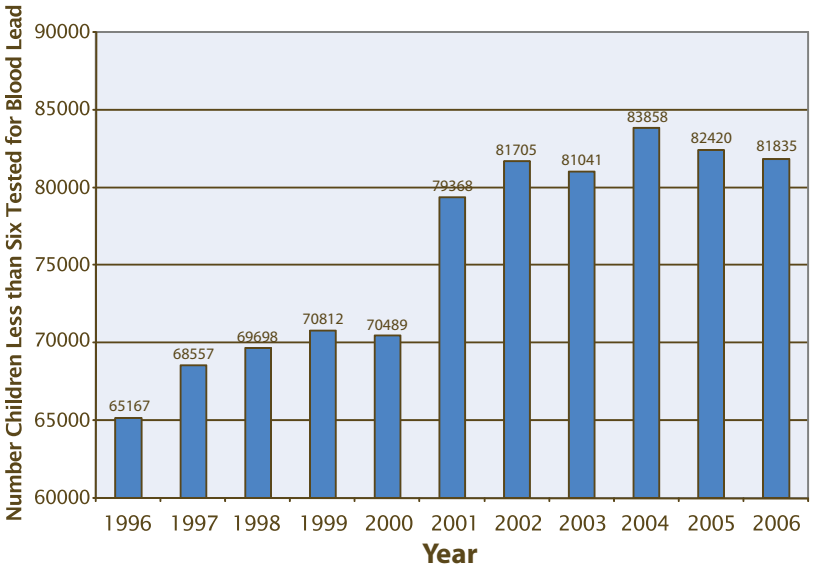

Figure 9
Number of Wisconsin children under age 6 who were tested for lead poisoning by year, 1996-2006. (source: WCLPPP Surveillance Data, 1996-2006)

Testing of Medicaid-Enrolled Children. Since 1992, federal Medicaid policy has required that children receive a blood lead test at ages 12 months and 24 months, and through age 5 years if previously untested. Despite this federal policy, in Wisconsin nearly two-thirds of children enrolled in Medicaid are not tested at the appropriate ages (Figure 10). In 2006, only 54% of 1-year olds, 41% of 2-year olds, and 11% of 3- through 5-year olds who were not previously tested (NPT) were tested. The numbers are even lower for those tested both at 12 and 24 months of age: Of the 38,729 Medicaid children who turned three during 2006, only 10,495 (27%) had their required tests at one and two years of age. If all children on Medicaid had been appropriately tested during 2006, it is likely that a number of additional children would have been identified as lead poisoned.

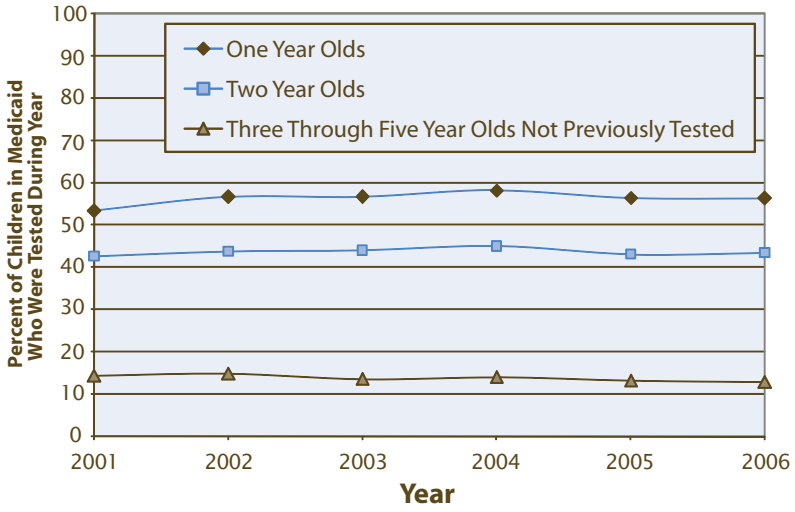

Figure 10
Testing rates for Medicaid-enrolled children in Wisconsin, 2001-2006, by age: 1 year, 2 years, and 3 to 5 years not previously tested (NPT). (source: WCLPPP Surveillance Data, 1996-2006; Medicaid Eligibility Data, DHCF)

Testing done at WIC. WIC projects in Wisconsin are strong partners in assuring that children who are at risk for lead poisoning receive the tests they deserve. In 2006, 39% of Medicaid-enrolled children who received a blood lead test were tested by their WIC provider rather than their primary health care provider. While blood lead testing is not a requirement for WIC participation, many WIC projects have voluntarily established successful testing programs..

Testing by Age Group. Current screening policy in Wisconsin includes a recommendation to test children who are at risk for lead poisoning at 1 year of age so that, if lead exposure has occurred, it can be identified early and interventions can take place to reduce the blood lead level. However, as noted in the previous section, it is also very important that children be tested again at 2 years of age or later when they become more mobile and their risk of exposure to lead is greater. A normal blood lead test at 1 year does not mean the child is not at risk for lead poisoning later on. Figure 11 demonstrates that, while lead poisoning is most often detected at two years of age, most Wisconsin children are tested only when they are 12 months of age.

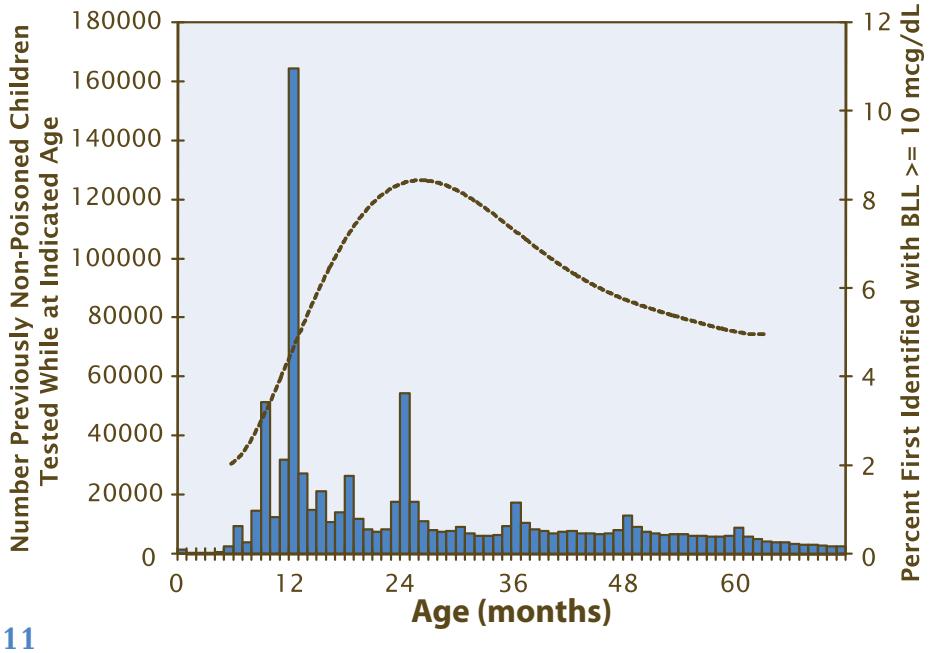

Figure 11
Number tested (shown by columns) and percent first identified with a blood lead level greater than or equal to 10 mcg/dL (shown by dashed line) by age in months at the time of test for previously non-poisoned Wisconsin children under age 6; 1996-2006. (source: WCLPPP Surveillance Data)

On Figure 11, the columns show that most of the children who are tested for blood lead levels are tested at 12 months of age, with far fewer tested at 24 months, whereas the dotted line shows that the peak rate of newly-detected lead poisoning occurs at approximately 23 months.

The disparity in the age of testing in relation to the age of first identification of lead poisoning is not desirable, and could allow many poisoned 2 year old children to go undetected. Ideally, children are to be tested at 1 and at 2 years of age

Fixing the Problem

The Wisconsin Childhood Lead Poisoning Elimination Plan Implementation and Oversight Committee. In 2004, a task force was convened to establish a strategic plan to eliminate childhood lead poisoning in Wisconsin by the year 2010. The task force was comprised of stakeholders with a variety of perspectives from the public and private sectors. The Wisconsin Childhood Lead Poisoning Elimination Plan (available at http://dhfs.wi.gov/lead/EP/WI_CLP_Elim_Plan_updated%20111506.pdf) includes statewide and community-based strategies.

The plan concentrates on four areas:

- increasing testing of high-risk populations;
- educating targeted audiences to prevent lead poisoning and support legislative and policy initiatives;
- correcting lead hazards in housing before a child is poisoned, and strengthening enforcement in response to cases of lead poisoning;
- seeking funding and leveraging resources to reduce lead hazards and make older housing in Wisconsin safe for children.

Following completion of plan development, the Implementation and Oversight Committee (IOC) was formed. This committee of 40 stakeholders meets three times per year to:

- track progress made on implementation of the plan;
- identify any necessary changes to the plan or approaches to implementation of the plan;
- support and oversee the activities of various implementation subcommittees;
- identify potential new members and resources to add to the committee and/or subcommittees.

The IOC is guided by co-chairs, one from the private sector and one from the public sector, who meet with the subcommittee chairs frequently to ensure each group stays on target in accomplishing its goals and objectives within the plan.

Childhood lead poisoning can be eliminated, but to do so requires that the routes of exposure be eliminated. Fixing the problem means keeping children from becoming lead poisoned in the first place. Since the major route of exposure to children is from lead paint dust found in their own homes, the best way to eliminate the problem of childhood lead poisoning is to fix the older housing units that have lead hazards.

Children can be exposed to lead-based paint in their homes, lead-contaminated soil in their yards, and to a much lesser extent, to lead in their toys, candy and other products. Preventing children from coming in contact with these sources requires removing these sources from their environment.

This approach, which stops childhood lead poisoning by taking actions to prevent the child from becoming exposed to lead, is commonly known as primary prevention, and includes a range of activities from educating parents and homeowners about the dangers of lead and steps they can take to eliminate lead hazards from the home environment, to removing, enclosing or stabilizing lead-based paint in homes.

If effective primary prevention programs were implemented throughout Wisconsin, and children were no longer exposed to lead in their homes and other buildings where they spend significant amounts of time, there would be little need for the next level of prevention, secondary prevention, which includes responses undertaken to reduce blood lead levels and limit the damage to individual children after they have already become poisoned. Unfortunately, these children are already harmed, likely permanently, before the public health response kicks in.

Children continue to become lead poisoned in their own homes. Preventing this from happening must be Wisconsin's driving objective, one that demands a coordinated effort to keep lead away from children.

Primary Prevention Step One:
Identifying the Highest Risk Housing

Many Wisconsin houses built before the 1978 nationwide ban on the sale of lead-based paint contain lead-based paint hazards. Houses built prior to 1950, before the widespread use of lead-free latex paint, are considered to have the greatest potential for containing lead-based paint hazards (see Figure 7). In many of these older homes lead-based paint may be found in one or more layers on painted surfaces, even though the top coat might be lead-free. Although these pre-1950 houses are considered to be at greatest risk for lead-based paint hazards, there are a number of other factors that need to be considered when identifying the housing that poses the greatest risk to small children. The first challenge in primary prevention is to use all of the available information to identify individual houses or neighborhoods that pose the greatest risk.

Housing and Lead Poisoning

The 2000 Census SF-3 (Standard File 3) housing data shows that:

- there were approximately 2,084,544 occupied housing units (31.6% renter-occupied) in Wisconsin;
- 652,291 (31.4% renter-occupied) of occupied housing units were built prior to 1950.
- The pre-1950 houses are located throughout the state, with pockets of predominantly older housing found in most small to large sized towns, villages and cities.

The WCLPPP data show that:

- The 740,000 Wisconsin children tested for blood lead were associated with 543,000 addresses; just under one quarter of the housing stock in Wisconsin as of 2000.
- Of these, 39,507 were associated with one or more child who had a blood lead level of 10 mcg/dL or greater.
- The year of construction for 365,000 of these housing units is not currently known.
- Of the remaining 86,807 housing units, more than two-thirds (58,170) were built prior to 1950.

Focusing on the Highest-Risk Housing

The WCLPPP blood lead testing database includes all addresses associated with each child in the state who has been tested for lead poisoning. A number of these addresses are known to be associated with multiple lead-poisoned children. WCLPPP data show that during the period 1996 through 2006 approximately 1,482 properties were investigated each year, 1,294 of which were found to have one or more documented lead-based paint hazards, and approximately 1,248 received some form of lead hazard reduction. A number of other properties are investigated and/or remediated annually as part of other proactive housing initiatives and general renovation activities conducted by owners and property developers. However, it is neither possible to track these private activities, nor pre-select which houses will be included. Other analyses need to be conducted to help identify the highest-risk housing and guide future remediation efforts.

The results of analyses presented in Appendix B - Housing Analyses, show that 110,000 housing units are likely to ever be associated with lead-poisoned children. Identifying and fixing these 110,000 housing units as soon as possible would shorten the time for eliminating childhood lead poisoning by decades, and prevent hundreds, if not thousands, of children from becoming lead poisoned. In an ideal world, we would be able to identify each of these 110,000 units, and take the necessary steps to make them lead safe. Unfortunately, we know with certainty only the 39,507 addresses that are already known to be associated with lead-poisoned children. We cannot identify individual addresses that will be among the remaining 70,000 or so estimated to be associated with future poisonings. Perhaps the best we can do is assume that the older addresses in areas with known high rates of lead poisoning and other factors associated with risk will be among those that have the greatest potential for poisoning children.

The analyses presented in Appendix B also show that:

- 66% of all known lead-poisoned children live within the 133 highest-risk (Top 10%) census tracts, containing approximately 100,000 pre-1950 housing units;
- nearly 76% of known lead-poisoned children live within the top 266 highest-risk (Top 20%) census tracts, containing approximately 200,000 pre-1950 housing units.

Cleaning up all of the pre-1950 housing units within these census tracts would likely remove the vast majority of the known and anticipated hazardous housing, and perhaps prevent many of the anticipated future childhood lead poisonings. Such an approach to eliminating the problem would provide optimal benefit using a coordinated, targeted effort. If future lead-poisoning trends follow those for 2006, then:

- the total number of pre-1950 housing units in the Top 10% includes only 15% of the total number of pre-1950 housing units in Wisconsin, yet has the potential of preventing 66% of future lead-poisonings;
- The Top 20% would include just over 30% of all pre-1950 housing units, yet prevent 76% of all potential future lead poisonings.

The challenges, however, will be to accurately identify and prioritize at-risk housing, and then to provide the funding and concerted effort to effectively and efficiently remove all lead-based based paint hazards. These challenges can be met using additional available information provided in the following sections.

Additional Considerations to Help Focus Primary Prevention Efforts

To aid in identifying priority properties for lead hazard reduction within the top 10 and 20 percent of highest risk census tracts, other factors can be considered, including:

The number of lead-poisoned children associated with an address. The WCLPPP database can be used to identify individual addresses that have a history of association with more than one lead-poisoned child. The Top 10% of census tracts contains 22,262 addresses associated with one or more lead-poisoned children between 1996 and 2006. Of these, 7,902 were addresses associated with more than one lead-poisoned child; 3,298 with more than two children, and 644 were associated with five or more lead-poisoned children. Communities with addresses that are associated with five or more lead-poisoned children include: Beloit, Janesville, Kenosha, Milwaukee, Racine, Sheboygan and Wausau. Of these, Milwaukee, Racine and Sheboygan each have addresses which are associated with seven or more lead-poisoned children, some of whom have had blood lead levels in excess of 40 mcg/dL. The CDC Lead Poisoning Prevention Branch suggests focusing enforcement actions on these repeat offenders, which can send a powerful message to property owners about the value of primary prevention.

The maximum blood lead level of any child who resided at an address. The WCLPPP database can be used to identify individual addresses associated with severely lead-poisoned children. During 2006, a number of communities had addresses associated with children having blood lead levels in excess of 40 mcg/dL. These include: Arcadia, Avoca, Beloit, Browntown, Cazenovia, Edgerton, Fond du Lac, Kenosha, Milton, Milwaukee, Monroe, Morrisonville, Racine, and South Milwaukee.

The age of housing. Tax assessor data for communities can be used to identify individual housing units that were built prior to 1950. A number of census tracts within Wisconsin contain predominantly older homes. According to the 2000 Census SF-3, more than half of the homes in 309 of the 1,317 census tracts statewide were built prior to 1950; 45 census tracts have 80% or more of their housing stock built prior to 1950. These include tracts in the communities of: Appleton, Janesville, Kaukauna, Kenosha, Madison, Manitowoc, Milwaukee, Sheboygan, Shorewood, Watertown, Wausau, Wauwatosa, and Whitefish Bay.

The type of construction and overall condition of the housing unit. Many tax-assessor databases include information about the type of construction and overall condition of individual housing units. This information may be used to identify housing that is most likely to have lead-based paint hazards. For example, older housing that is noted to be in poor overall condition is likely to be poorly maintained in general, with lead-based paint hazards on the interior and exterior. This is especially true of houses that are of wood-frame construction with painted wood siding.

Whether the housing unit is renter-occupied or owner-occupied. This information can be obtained for individual addresses from many tax assessor databases, and from the Census SF-3 files for tract and community-wide numbers. This may be used to identify housing that is most likely to have lead-based paint hazards. People with few economic resources have few housing choices, and renters generally have limited control over the condition of paint in their home. Consequently, it is the older units that are rented to families with small children that are considered to have the greatest potential for containing lead-based paint hazards, and the greatest potential for poisoning children.

Indicators of the socio-economic status of the tenant and of their neighborhood. Information regarding the valuation of individual housing units can be obtained from tax assessor databases. These data can be compared to census tract and community averages in order to infer the economic status of individual properties and associated tenants. Census file SF-3 contains useful summary data regarding census tract and community employment, income levels, race and ethnicity, and other demographic information. Aggregate Medicaid Eligibility and WIC Enrollment data can provide additional demographic information about neighborhoods.

The WCLPPP has access to most of these databases, and can serve as a resource to support individual communities in their quest to focus primary prevention work on the highest-risk areas within their communities. Given this approach and the use of available data, the individual addresses that are considered to be at greatest risk may be identified, and eliminating lead hazards in the housing can proceed in an efficient and effective manner.

Primary Prevention Step Two:
Fixing the Highest Risk Housing

Evaluate the Hazards

The next step in primary prevention is to investigate the high-risk properties to evaluate potential lead hazards. To do this, surface coatings, i.e., paint or varnish, can be assumed to contain lead or they can be tested with an X-ray fluorescence instrument to determine lead content in the coating. Dust wipe sampling can be conducted to determine if an active lead hazard is present in the dwelling. A visual inventory must be conducted to identify surface coatings that appear to be chipping, cracking, peeling, worn or otherwise deteriorating. Any deteriorated surfaces and building components become the priorities for action.

Control the Hazards

Once all deteriorated surface coatings have been inventoried and assumed or tested to determine if lead is present, lead hazard remediation plans need to be developed to repair or replace building components and remove or repaint deteriorated surface coatings. The work choices made will depend on the overall condition of the property, personnel available to provide the service, and how much money is available to the owner.

The US Department of Housing and Urban Development (HUD) has published a guide for property owners on how to economically maintain older dwellings that are likely to have lead paint. The Lead Paint Safety Field Guide is available at: http://www.hud.gov/offices/lead/training/LBPguide.pdf

If more resources are available, an excellent way to control lead hazards is to replace old windows and doors. For many other building components, repainting can be very effective. However, if paint is failing because of substrate damage from water or moisture, it is important to first control the sources of excess moisture before repainting or the paint will quickly fail again. Repainting is less effective for controlling lead exposure from surfaces subject to weather, impact, or friction such as exterior walls, doors, or windows. Generally, interior walls, trim and ceilings can be safely repainted. Precautions should be taken to control and clean up lead-based paint chips and dust removed from surfaces before repainting.

Since on average there is more lead on the exterior surfaces of most houses than there is on interior surfaces, special emphasis should be placed on treating exterior building components. If resources are available, a very effective strategy for exteriors is to install siding and wrap trim. This is one of the treatment options described in the Lead Paint Safety Field Guide. For most houses, a combination of replacing windows, repainting interior surfaces and residing the exterior will effectively prevent lead poisoning.

Cost estimates for these approaches range from $5,000 to $13,000 per dwelling unit. A reasonable mid-range estimate based on the experience of HUD lead hazard control grantees for such work is $8,000 per unit. Funding assistance (loans or grants) may be available to help cover these costs. See http://commerce.wi.gov/CD/cd-boh-Home.html

Primary Prevention Step Three:
Education

Educating the public about lead hazards in the environment and ways to correct the hazards is a critical component of primary prevention. Education can be directed to a variety of audiences, including physicians, families who participate in WIC, Head Start or child care programs, as well as community action and weatherization program participants, construction trades and rental property owner organizations. Some of the key approaches and objectives include:

- Alerting local public health and housing agencies about the dangers posed by individual houses within their jurisdictions;
- Educating current and expectant parents and caregivers about lead poisoning risks, prevention and screening recommendations so they can take the right protective and corrective actions;
- Collaborating with local health departments, outreach agencies (including housing-based community agencies, e.g., Community Action, Inc. of Rock and Walworth Counties) and community organizations to make sure that they share an understanding of the overall objectives and messages for educating their communities about lead hazards;
- Press conferences and media events to alert the general public about the dangers of lead in their home environments and steps they can take to reduce the threat of lead poisoning to their children.

Secondary Prevention:
Testing and Interventions

Increasing Testing Rates

During 2006 fewer than one in three of the one and two-year old children who were enrolled in Medicaid, and therefore at high risk for lead poisoning, received the appropriate blood lead tests required by the Medicaid schedule. Many lead-poisoned children are never tested, and consequently, are never identified. These children go untreated, and are at risk of developing long-term health problems associated with prolonged exposure to lead. Federal rules require that children receiving Medicaid benefits be tested at one and two years of age in association with their Early and Periodic Screening, Diagnostic and Treatment (EPSDT), i.e. HealthCheck, visits to their pediatrician. As mentioned in the discussion on testing rates, only 54% of one year olds and 41% of two year olds on Medicaid in Wisconsin were tested during 2006, and less than one-third had both of their required tests.

The reasons for these lower-than-required rates of testing have not been fully identified, but likely include:

- The health care provider does not adequately pursue testing with the child's parent/guardian, possibly under the mistaken belief that the child is not at risk, or the provider is unaware of the testing requirement;
- The health care provider refers the child outside the provider's office or clinic for a blood draw, which can be an inconvenience for the parents and the blood draw is never completed;
- The parent/guardian mistakenly assures the health care provider that the child had been previously tested elsewhere (e.g., at WIC);
- The parent/guardian decides not to have their child tested;
- The health care provider may not have the means to accurately assess whether their patients have been tested at WIC or elsewhere.

Medicaid Provider Testing Reports. During May and June, 2006, the WCLPPP distributed nearly 1,000 individualized Blood Lead Testing Reports to those Medicaid providers who saw 50 or more children during the period July 2004 through June 2005. A sample Medicaid Provider Testing Report is presented in Appendix C. These reports presented testing numbers and rates so individual providers could track their testing performance. The immediate intent of these reports was to encourage health care providers to track their personal testing rates, and compare their rates with those of their peers. The ultimate goal was to encourage providers to improve their scores by increasing the number of children they test. Preliminary analysis of provider response to these reports indicates that many providers increased their testing rates, with a significant increase in the number of children tested by these providers during the ensuing year. A second set of more than 1,700 individualized reports was distributed in May 2007 to providers who saw 25 or more children during the period July 2005 through June 2006. This second round of report cards also included lists of children who have not received their appropriate blood lead tests. Initial analysis of the effectiveness of these report cards indicates a significant increase in the number of children tested by private Medicaid providers. If this result is confirmed, and the report cards are determined to be effective at increasing testing of Medicaid-enrolled children, future reports will be distributed on an annual basis to allow individual providers to track their progress – or lack thereof – from year to year. These are the result of a unique, collaborative partnership between the WCLPPP and the Wisconsin Medicaid program, and have generated considerable interest by the CDC and childhood lead poisoning prevention programs nationwide.

Interventions

In order to reduce the risk of long-term damage associated with lead poisoning, local public health agencies respond to new and existing cases of lead poisoning. These interventions typically include home visits by a public health nurse and follow-up blood lead testing. Secondary prevention can also include an investigation of the child's home environment to determine the source(s) of lead exposure. This is done as part of the standard response to the identification of a child with an EBLL in an effort to reduce the child's exposure to lead and prevent future lead poisonings at the same address. In Wisconsin, a child is considered to be severely poisoned (also known as having an Elevated Blood Lead Level or EBLL) if the child has one or more venous blood lead levels of 20 mcg/dL or greater, or two blood lead levels of 15 mcg/dL or greater taken 90 or more days apart. This is the current statutory threshold above which public health interventions are mandated, even though recent studies have shown negative impacts at much lower levels. State and local public health lead risk assessors conduct an investigation to identify any lead hazards in the poisoned child's home environment. The occupants and owners are notified of identified hazards, which the owner is required to correct or abate within a prescribed time period. All activities associated with these properties are documented and tracked in the WCLPPP database, along with certain investigation and lead hazard control activities for properties associated with other lead hazard control and housing initiatives.

An early intervention approach has been successfully employed by local health departments and agencies, including the Sixteenth Street Community Health Center (SSCHC) Community Lead Outreach Program in Milwaukee's south side. Through a combination of primary and secondary prevention activities, including home-based education, assessment and intervention, targeted testing and door-to-door outreach, SSCHC in collaboration with the Milwaukee Health Department have contributed significantly to the decrease in lead poisoning prevalence rates for children on Milwaukee's south side. Dr. Tom Schlenker and others (Schlenker et al, 2001) documented the use of community-based outreach for primary prevention in the Sixteenth Street Community.

Many of the primary and secondary prevention activities for reducing the burden of childhood lead poisoning, and the legacy of lead in the environment, are currently being implemented by public health agencies, housing agencies, private individuals and many others at the state and local level. This is especially true, and important, for housing-based primary prevention interventions which strive to remove lead from the accessible environment so children are no longer exposed to the serious health threat that lead poses. Wisconsin has come a long way in the past few years toward eliminating these hazards and protecting our future generations of children from the harmful lasting effects of lead poisoning. Although much work remains, we share the knowledge and resolve to eliminate childhood lead poisoning forever.

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WCLPPP Surveillance Data, 1996 – 2006, Division of Public Health.

WIC Enrollment Data, 2000 – 2006, Wisconsin WIC Program, Division of Public Health.

Appendix A: Technical Information

WCLPPP Lead Testing Database

The WCLPPP maintains a statewide database of blood lead testing using the CDC Systematic Tracking of Lead Levels And Remediation (STELLAR) database management system. Data maintained within the WCLPPP database include information on the blood lead test date, test type and provider, test results, and children's names, ages and addresses associated with every blood lead test for Wisconsin children tested since 1996. The Milwaukee and Racine health departments maintain their own STELLAR databases, and provide the WCLPPP with their data files on a bi-weekly basis. The combined statewide STELLAR database currently contains more than 1.1 million test results for more than 740,000 children living in 543,000 addresses throughout Wisconsin (including the cities of Milwaukee and Racine), some of which are associated with tests prior to 1996.

Data are added to the WCLPPP STELLAR database daily, with approximately two-thirds of the records arriving from the analytical laboratories in electronic format. The remainder arrives via FAX or surface mail. The electronic data are downloaded from the laboratory web sites or the Wisconsin Health Alert Network (HAN). Individual files typically arrive in Excel format, and are imported into the STELLAR database using a series of SAS-based file conversion and quality-checking programs in conjunction with the CDC's SOLAR/SOLAB software. The hardcopy test results are hand-entered directly into STELLAR. The STELLAR database for the state, outside of Milwaukee and Racine, is rebuilt weekly. The STELLAR extracts received from the Milwaukee and Racine health departments are used to populate the Milwaukee and Racine databases within the WCLPPP statewide STELLAR, and are rebuilt on a bi-weekly basis.

Further information and downloads of the STELLAR and SOLAR/SOLAB programs may be obtained from the CDC's website (http://www.cdc.gov/nceh/lead/surv/stellar/stellar.htm), along with documentation, Frequently Asked Questions and other relevant information.

Data Integrity and Quality

The WCLPPP uses a series of quality assurance computer routines to check the quality of the data within the statewide STELLAR database. This is done every Monday using a series of SAS-based computer routines, which check for:

- duplicate ID numbers for children and addresses;
- children being tracked by more than one database (e.g., being tracked by both Milwaukee and the WCLPPP);
- duplicate tests;
- typos and incorrectly spelled city and county names;
- invalid test dates and/or birthdates (e.g., test date occurring before date of birth);

In addition, the weekly file maintenance programs check for new EBLL cases for children having two blood lead levels of 15 or more mcg/dL tested 90 days apart, and lists addresses requiring an

investigation or abatement. The resulting lists and information are used within the WCLPPP to revise the STELLAR data and are shared with Milwaukee, Racine, and other local health departments.

Supplementary Data and Data Sharing

The WCLPPP has data-sharing agreements with the state Medicaid and WIC programs. These agreements allow two-way transfer of data and information between the programs in order to provide the information they need to better fulfill their functions, and ensure that providers are appropriately screening those children at highest risk of lead poisoning.

Each quarter, the WCLPPP data are extracted and transmitted to the Medicaid program's data consultant for use in the preparation of quarterly reports of untested children. These quarterly reports list individual children who have not received an age-appropriate blood lead test, and are provided to managed care organizations and others serving the Medicaid community. Development of the reports requires that the Medicaid data is merged with the WCLPPP data extracts, a process that requires a series of matching routines conducted by the Medicaid consultant and the WCLPPP, with sufficient care to ensure that no untested child is overlooked. WCLPPP has developed and uses a multi-step, SAS-based matching procedure that provides optimal matching for even the more difficult cases (e.g., typos, misspellings, hyphenated and truncated names), which serves as an integral part of the quarterly report development process.

The WCLPPP Surveillance Manager also has real-time access to the Medicaid eligibility database from which extracts are downloaded on a monthly basis. Each monthly extract is added to a cumulative internal Medicaid database maintained by the WCLPPP, and merged with WCLPPP STELLAR lead testing data using the SAS-based multi-step matching routines. The resulting working file is used for offline statistical analysis of testing and poisoning rates, and other trends and analyses used for surveillance within the WCLPPP.

Similarly, the WCLPPP has real-time access to the WIC program's ROSIE database, from which data are downloaded monthly and merged into the WCLPPP working files. The resulting data file was used for the analyses presented in this report, including those showing the relationship between testing, poisoning and WIC/Medicaid status.

Definitions

Except where noted, the following definitions were incorporated into the text and analyses presented in this report:

Age. The chronologic age of a child at the time of a blood lead test or other event. Unless otherwise specified, the age of interest for this report is children from birth until their 6th birthday (i.e., children under six). Individual years specified by:

- One Year = 12 through 23 months;
- Two Years = 24 through 35 months;
- Three Years = 36 through 47 months;
- Four Years = 48 through 59 months;
- Five Years = 60 through 71 months;
- 3-5 NPT = children three through five years of age (36 through 71 months; 1096 through 2192 days) who had not been tested previously;

- 0-5 yrs = birth through 71 months (2191 days);

Age- BYC. Age as Birth Year Cohort. Used for analyses and with populations for which there is no specific date of interest (i.e., no test date, or other reference date). For example, the number of Medicaid Eligibles less than six during a given year is given by counting those children who were born during that year or during any of the five previous years (for 2005, this includes children born during 2000, 2001, 2002, 2003, 2004 and 2005). Determination of Testing Penetration requires the use of Birth Year Cohorts for both the denominator and the numerator.

Elevated Blood Lead Level (EBLL) Case. A child is considered to be an EBLL case if they have one or more venous tests of 20 mcg/dL or greater, or two or more venous tests of 15 to 19 mcg/dL spanning at least 90 days. Note that this designation requires venous test results.

Incidence. The percent of previously non-poisoned children receiving a blood lead test who had one or more test results meeting the definition of Lead Poisoned during the age/time period of interest - typically noted as the time of first identification. Note that this is the percent among those children tested rather than among the entire population of children, and hence is not a true incidence. More appropriately referred to as Percent First Identified during the given time period.

Lead Poisoned. Children who have one or more blood lead test results of 10 mcg/dL or higher, according to the following criteria:

"If the blood lead test was capillary with a venous follow-up test within 90 days, then use the test result associated with the follow-up venous test rather than the initial capillary; otherwise, use the test result associated with the initial test (capillary or venous)."

MA-WIC. Children who were Medicaid Eligible and/or WIC Enrolled during a portion of the year of interest. See Medicaid Eligible and WIC Enrolled for more information.

Medicaid Eligible. Children less than 6 years of age who were listed within the Medicaid Eligibility Database as having at least a portion of one or more eligibility periods occurring during a given year. For example, for a child having a record within the Eligibility Database showing a December 10, 2004 eligibility begin date and a May 31, 2005 eligibility end date, that child is considered as Medicaid Eligible for the years 2004 and 2005, even though they were only eligible for portions of each year.

Non MA-WIC. Children who were neither Medicaid Eligible nor WIC Enrolled at any point during a year of interest. See MA-WIC for more information.

Penetration (Screening or Testing). The percent of all children within a specified group who received a blood lead test during the period of interest; uses Census Bureau population numbers/estimates as the denominator for the overall population, and actual numbers eligible/enrolled as denominators for the Medicaid, WIC or MA-WIC populations, based on year of birth (Age – BYC: see Birth Year Cohort).

Prevalence. The percent of children receiving a blood lead test who had one or more test meeting the definition of Lead Poisoned during the age/time period of interest. Note that this is the percent among those children tested rather than among the entire population of children, and hence is not a true incidence. More appropriately referred to as Percent Poisoned.

WIC Enrolled. Children less than 6 years of age who were listed within the WIC Database as having at least a portion of one or more enrollment periods occurring during a given year. For example, for a child having a record within the WIC Database showing a December 10, 2004 certification date and a May 31, 2005 termination date, that child is considered as 'WIC Enrolled' for the years 2004 and 2005, even though they were only enrolled for portions of each year.

Appendix B
Housing Analyses

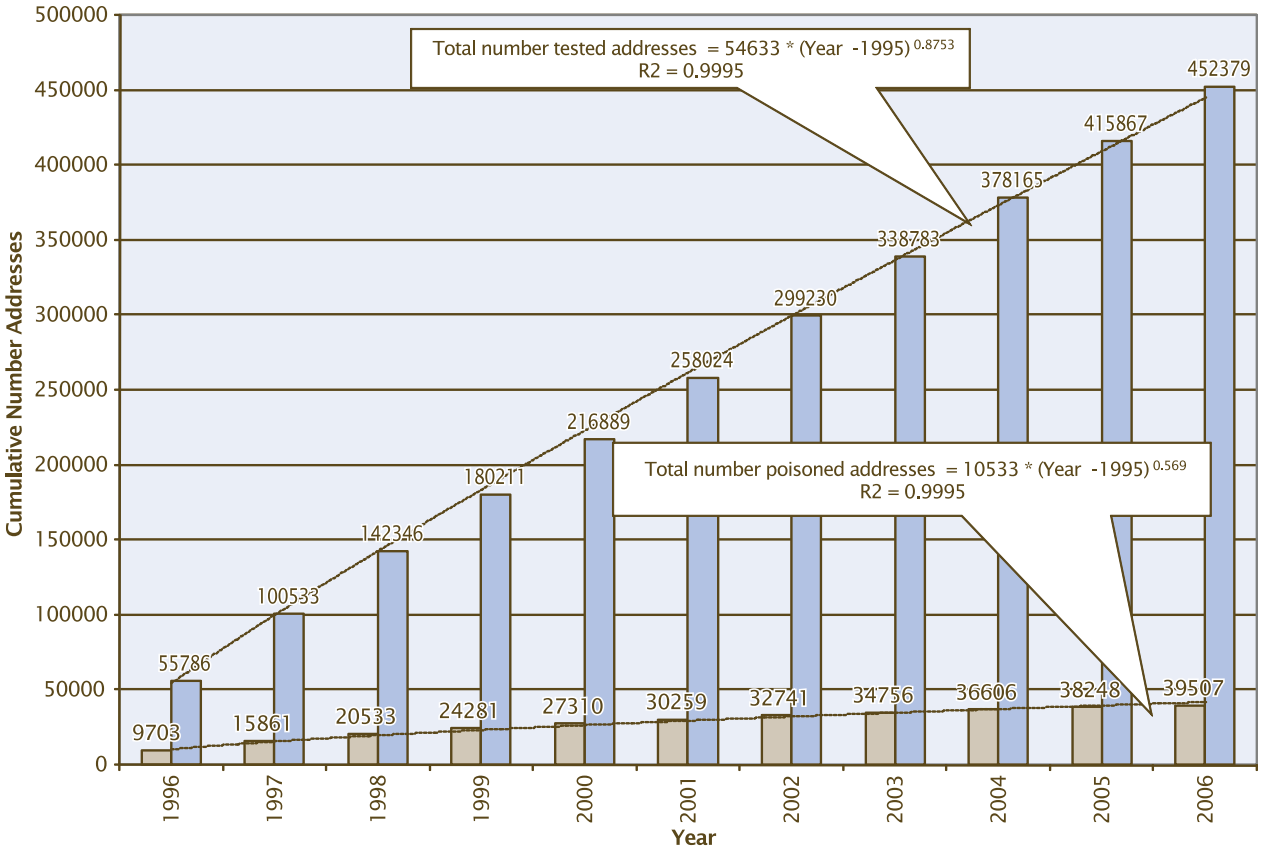


Figure B-1
Addresses Associated With Tested and Poisoned Children: 1996 through 2006 (source: WCLPPP Surveillance Data)

Figure B-1 shows the cumulative number of addresses associated with tested and poisoned children during the 11-year period from 1996 through 2006. The figure includes equations fitted to the data for addresses associated with tested children and for poisoned children. These equations may be used to estimate the total number of addresses for tested and poisoned children at any point in the future, which may help in identifying the anticipated number of properties that might require abatement.

A similar equation derived from the data on lead-poisoned children was used to predict the date of the last occurrence of childhood lead poisoning in Wisconsin. Given the observed rates for the last 11 years, the last occurrence of childhood lead poisoning is forecast to happen sometime around 2056. Using the equations from Figure B-1 to estimate the total number of housing units associated with one or more lead poisoned children (poisoned addresses) by the year 2056: nearly all of the remaining occupied housing units will have been tested, 110,000 of which will have been associated with one or more lead-poisoned children. This is a conservative analysis, since it considers newer properties that do not contain lead-based paint. However, this analysis does provide an independent estimate of the total number of addresses in Wisconsin that have been, or are likely to ever be, associated with lead-poisoned children. Identifying and fixing these 110,000 housing units as soon as possible would shorten the time needed to eliminate childhood lead poisoning by decades, and prevent hundreds, if not thousands, more children from becoming lead poisoned.

Focusing on the Highest-Risk Housing

Criteria developed by HUD for their Lead-Based Paint Hazard Control Grant Program (HUD, 2007) was used to identify the relative risk associated with each census tract in Wisconsin. The HUD formula incorporates information about the rate of lead poisoning within each tract within a target area, as well as the number of dwellings built prior to 1978, and the percent of households considered to be low to very-low income within the target area. Points are assigned according to scoring criteria for each factor. HUD developed this model for municipalities to focus on those areas within their jurisdiction(s) that pose the greatest risk of childhood lead poisoning. However, because of the small size of individual census tracts compared to the anticipated larger size of the target zones, the scoring criteria for number of pre-1978 housing units were adjusted uniformly downward, with the tract-specific scores assigned at 1/10th of those for larger, target areas. To illustrate: HUD criteria assign a score of 1 for target areas that contain 3500 – 4999 pre-1978 units, whereas the modified criteria for use with individual census tracts assign one point for tracts containing 350-499 pre-1978 units. Because the other two factors in the HUD model are percentages, rather than numbers, they scale downward without the need to change the criteria.

Figure B-2 shows the relationship between the highest-risk neighborhoods, and the number of known lead-poisoned children who reside in those neighborhoods. This figure shows that during 2006, 66% of known lead-poisoned children live within the 133 highest-ranked (Top 10%) census tracts (those having the greatest number of indicators for childhood lead poisoning); nearly 76% of known lead-poisoned children live within the top 266 ranked (Top 20%) tracts. The top 10% and 20% of tracts contain approximately 100,000 and 200,000 pre-1950 housing units, respectively. Cleaning up all of the pre-1950 housing units within these census tracts would likely remove the vast majority of the known and anticipated hazardous housing, and would prevent most of the anticipated future poisonings.

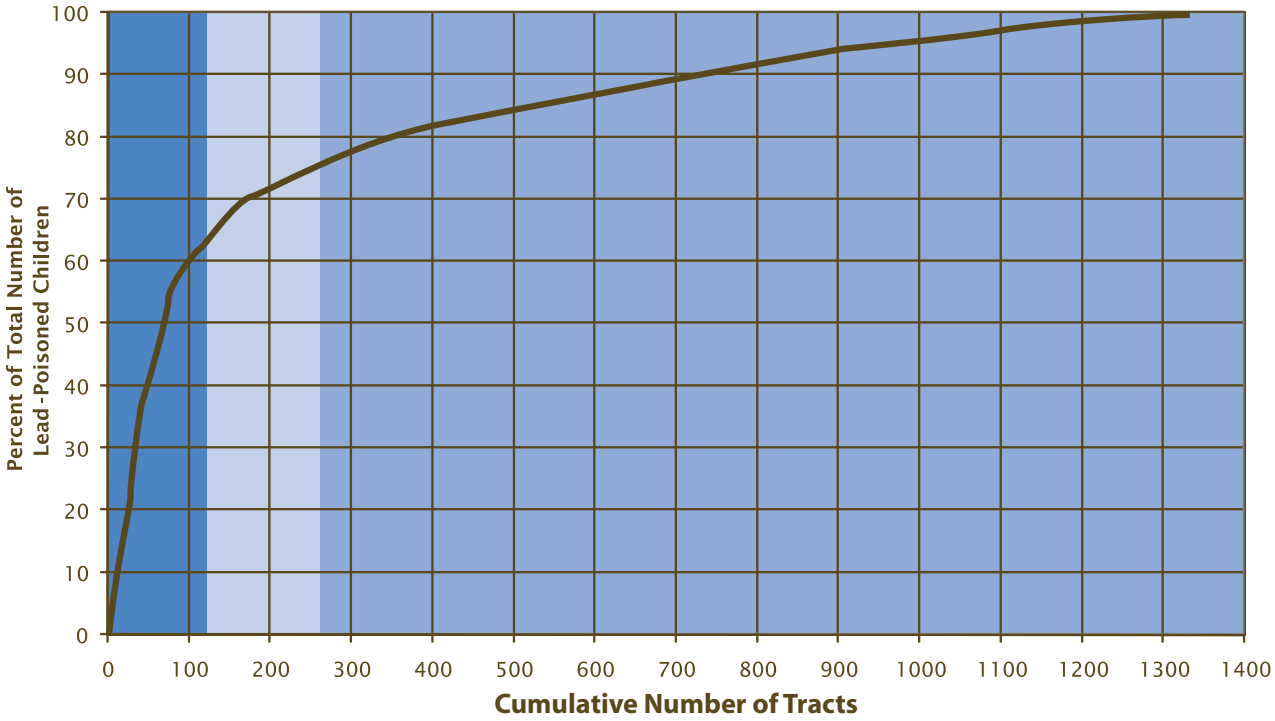


Figure B-2
Cumulative Distribution of Lead-Poisoned Children (2006) Ranked by Census Tract HUD Scores (source: WCLPPP Surveillance Data, U.S. Census Bureau, 2000 Decennial Census – SF3)

Such an approach to fixing the problem would provide optimal benefit using a coordinated, targeted effort. If future lead-poisoning trends follow those for 2006, then targeted efforts in these census tracts could yield the following results:

- The total number of pre-1950 housing units in the Top 10% of Figure B-2 includes only 15% of the total number of pre-1950 housing units in Wisconsin, yet has the potential of preventing 66% of future lead-poisonings.
- The Top 20% includes just over 30% of all pre-1950 housing units, yet prevents 76% of all future lead poisonings.

The challenges are two-fold: (1) accurately identify and prioritize individual properties that pose the greatest risk within a census tract; and (2) provide the funding and effort to effectively and efficiently remove all lead-based paint hazards.

Appendix C
Medicaid Provider Report

Blood Lead Testing of Medicaid-Enrolled Children:

Report for Individual Medicaid Providers
for the period July 1, 2005 through June 30, 2006

Provider: COUNTY HEALTH
729 STREET
CITY, WI 50000

ID: 00000000

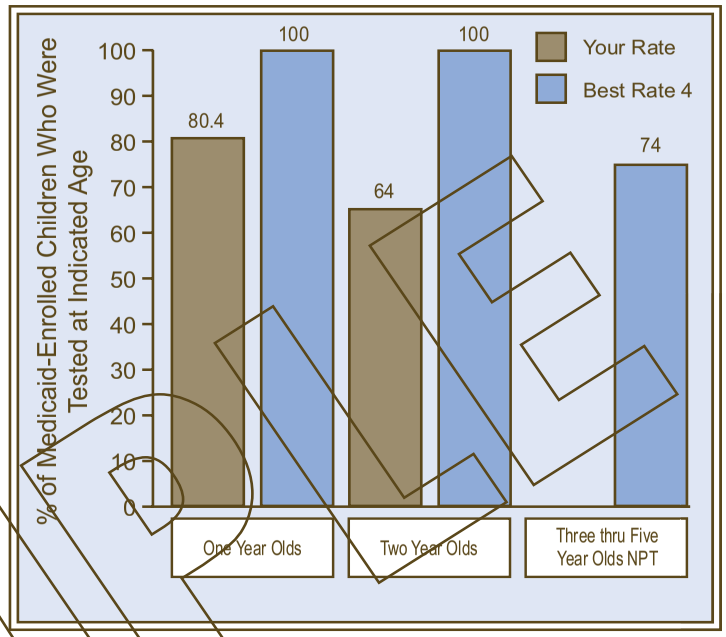
Your Testing Rate: 70.4%

Your Testing Rate Information

Testing Numbers and Rates Among Medicaid-Enrolled Children	One Year Olds	Two Year Olds	Three-thru-Five Year Olds NPT[3]
Number Children Seen	51	25	24
Number Children Tested	41	16	0
Testing Rate % [1]	80.4	64.0	0.0
Number Children Seen But Not Tested [2]	10	9	5

Explanation:

1. Percent of Medicaid children who have been seen by your practice and who received a blood lead test(s) during the indicated age by your practice or elsewhere
2. Number of children who were seen by your practice but were not tested during he indicated age.
3. This represents only 3-5 year olds Not Previously Tested (NPT). The total number of 3-5 year olds you saw in SFY 2005 was 5
4. Best testing rate of all Medicaid Providers in the State who saw 25 or more children in that age group.



- Federal rules require that all children who are enrolled in Medicaid receive a blood lead test at:
  - 12 months of age; and
  - 24 months of age;
  - 3-5 years if not previously tested.
- There were 3,285 children identified with lead poisoning (>=10 mcg/dL) in Wisconsin during 2004.
- 82% of children with lead poisoning in Wisconsin are enrolled in Medicaid
- Nearly two thirds of Medicaid children entering school this Fall have NOT been appropriately tested for lead poisoning.

Appendix D
On-Line Resources

The Department of Health and Family Services Lead-Safe Wisconsin website has information on the status of lead poisoning in Wisconsin, ways to treat and ways to prevent the disease. Data, maps, facts, information pamphlets, and much more can be found at http://dhfs.wisconsin.gov/lead.

Other websites with lead poisoning prevention information:

- Centers for Disease Control and Prevention - www.cdc.gov/nceh/lead.
- U.S. Department of Housing and Urban Development Office of Healthy Homes and Lead Hazard Control - www.hud.gov/offices/lead/
- U. S. Environmental Protection Agency - www.epa.gov/lead & www.epa.gov/safewater/lead/index.html
- Alliance for Healthy Housing: http://www.afhh.org/dah/dah_primary_prevention.htm
- National Center for Healthy Housing: http://www.centerforhealthyhousing.org/

For more information on education materials for preventing lead poisoning, contact the Wisconsin Childhood Lead Poisoning Prevention Program at (608) 266-5817.

Acknowledgements

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