2014 Report on Childhood Lead Poisoning in Wisconsin

Wisconsin
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About this Report

This report was prepared by the Wisconsin Childhood Lead Poisoning Prevention Program (WCLPPP) to present summary information, based primarily on data from 2014, on the status of childhood lead poisoning in Wisconsin. The report describes critical issues related to lead poisoning, the activities of the WCLPPP, trends in lead testing and lead poisoning in Wisconsin, and efforts to prevent lead poisoning. This report 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 concerned about lead poisoning in Wisconsin.

Introduction

Wisconsin's children are affected by lead poisoning in greater numbers than many other states (CDC 2015). Lead poisoning causes serious physical and financial harm to the children, their families, and society. Nearly all of Wisconsin's affected children are exposed to lead hazards in their own homes; yet these exposures can be prevented! The effects of lead exposure can persist throughout a lifetime, and include negative lifelong changes in 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 people poisoned by lead as children (Needleman, Schell, et al., 1990). 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 learning, behavior, and health throughout the child's life.

Lead poisoning is 100% preventable.
With enough resolve and commitment, it can be eliminated.

Definitions Used in This Report

Wisconsin Childhood Lead Poisoning Prevention Program (WCLPPP): The program targets children who have or are at risk for lead poisoning, by providing environmental intervention, care coordination, education, surveillance, and other services.

Blood Lead Level (BLL): The concentration of lead in blood, measured in micrograms of lead per deciliter of blood (µg/dL).

Lead Poisoned: For surveillance purposes Wisconsin uses the CDC reference value and considers any child identified with a BLL of 5 µg/dL or more to be lead poisoned. However, note that Wisconsin statute defines lead poisoning or lead exposure as a BLL of 10 µg/dL or more [Wis. Stat. § 254.11(9)].

Tested: The number of unduplicated children receiving a capillary or venous blood lead test during 2014. If a child had a venous test within ninety days of a capillary test, the date, address and result from the venous test was used.

Critical Lead Poisoning Issues

Key Facts about Lead: Effects of Childhood Lead Poisoning

Children exposed to lead even at levels below the CDC reference level of 5 µg/dL may be at risk for developing these adverse, long-term health effects (reviewed in NTP 2012):

As children:

- Neurological disruptions (Brubaker, Schmithorst, et al., 2009) result in lowered IQ (Bellinger, Stiles, et al., 1992), hearing loss and developmental delays in speech and language (Yuan, Holland, et al., 2006), and learning disabilities (Chandramouli, Steer, et al.,2009).
- Children show a greater likelihood of behavioral problems such as aggression, and other antisocial behavior and attention disorders such as attention-deficit/hyperactivity disorder (Nigg, Nikolas, et al., 2010).
- Children experience poor school performance. In Wisconsin, studies of schoolchildren in Milwaukee and Racine found that those with higher BLLs had significantly lower academic performance (Amato, Moore, et al., 2012; Amato, Magzamen, et al., 2013), higher suspension rates (Amato, Magzamen, et al., 2013), and poorer overall health (Magzamen, Imm, et al., 2013). Exposure to lead is a more powerful predictor of poor school performance than poverty or class size (Zahran, Mielke, et al., 2009).

As teens:

- Teens have school disciplinary problems (Denno 1990), higher rates of high school dropout, teen pregnancy and juvenile delinquency (Nevin 2000; Lane, Webster, et al., 2008).
- Teens experience poor upright balance, coordination, and motor skills, and increasing long-term injury risk (Kincl, Dietrich, et al., 2006).
- Teens are more likely to develop depression, panic attacks (Bouchard, Bellinger, et al., 2009) and kidney disease (Fadrowski, Navas-Acien, et al., 2010) in adolescence.

As adults:

- Adults more likely to be arrested for a violent crime; adults are 50% more likely to be arrested for every 5 µg/dL elevated BLL (Wright, Dietrich, et al., 2008).
- Reproductive disorders occur in both men and women who were lead poisoned as children; men can suffer from reduced libido and testicular dysfunction (Rodamilans, Osaba, et al., 1988) and women can develop hypertension during pregnancy (Yazbeck, Thiebaugeorges, et al., 2009).
- Adverse birth outcomes occur, including increased risk of spontaneous abortion and preterm delivery (Borja-Aburto, Hertz-Picciotto, et al., 1999; Jelliffe-Pawlowski, Miles, et al., 2006), low birth weight (Zhu, Fitzgerald, et al., 2010) and in utero lead poisoning (Hu, Tellez-Rojo, et al., 2006; Schnaas, Rothenberg, et al., 2006).
- Adults are more likely to develop kidney disease (Kim, Rotnitsky, et al., 1996), diabetes (Menke, Muntner, et al., 2006), cardiovascular disease (Navas-Acien, Guallar, et al., 2007), depression and panic attacks (Bouchard, Bellinger, et al., 2009), cognitive deficits such as memory loss and Alzheimer's disease (Shih, Glass, et al., 2006), and increased adult risk of death from heart attack and stroke (Lee, Tseng, et al., 2009)

Key Facts about Lead: The Role of Housing in Wisconsin

In Wisconsin, lead poisoning is primarily a housing-based disease and a statewide problem, with lead-exposed children found in all 72 counties.

- Ninety percent of children with lead poisoning from 1996 through 2006 in Wisconsin were first identified with lead exposure while living in housing built before 1950.
- Fixing housing is the primary way to protect children from exposure to lead. Abating the lead-based paint (LBP) and lead-based varnish hazards in these older homes would virtually eliminate childhood lead poisoning in Wisconsin.
- Most LBP hazards can be controlled or eliminated by stabilizing all deteriorating, cracked, chipped and peeling or flaking paint; replacing old windows, repairing roofs and other water leaks, and ensuring smooth, cleanable surfaces on windowsills and floors.
- Repainting can effectively prevent lead exposure, especially when performed on interior non-friction surfaces such as ceilings, walls, and trim. Repainting is less effective for surfaces subject to weather or to friction, impact or abrasion, such as windows, doors, floors and exterior surfaces.

Key Facts about Lead: The Costs of Lead Poisoning

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. There is strong evidence in the scientific community that the societal benefits of preventing lead poisoning vastly exceed the costs of addressing the problem (Jacobs and Nevin 2006, Gould 2009).

A report to the Wisconsin Legislature (DHS 2010), requested by 2009 Joint Senate Resolution 65, provided an estimate of the cost savings to Wisconsin if childhood lead poisoning was completely eliminated. The estimate was based on a detailed cost-benefit analysis prepared for New Jersey (Muennig and Bao 2009). As documented in that report, based on the 2010 population of 540,000 Wisconsin children aged zero to six years, a total of $28 billion in costs and earnings would be saved if no children aged zero to six years were exposed to lead: $7 billion in direct costs plus $21 billion in new earnings. The inferred costs for Wisconsin included avoided costs for medical treatment, special education, and crime and juvenile delinquency, increased high school graduation rates, the effects on lifetime ability to earn, and costs to state government.

These results drive home the fact that lead poisoning incurs significant costs. However, there is a solution to this serious and costly problem—remove LBP hazards from older homes.

Key Facts about Lead: Sources of Lead Poisoning

***Lead-Based Paint on Residential Surfaces*.** Lead-based paint is the primary source of lead exposure in children's environments. Although the sale of LBP for household use was banned in the United States in 1978, this paint is still present on the walls, windows, wood trim, doors, floors, and ceilings of many older homes. Virtually all homes built before 1950 contain LBP, as do many built between 1950 and 1978. Over time, LBP and lead-based varnish degrade and form paint chips and dust that gather on surfaces in the home and along friction surfaces such as windowsills and window troughs. The invisible dust gets on children's hands and they then ingest lead through their normal hand-to-mouth behaviors.

Lead-based paint is a particular problem in Wisconsin, due to its high prevalence of older housing stock. 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 (**Figure 1**). Due to the decline in Wisconsin's industrial base over the past decades, some older neighborhoods are left

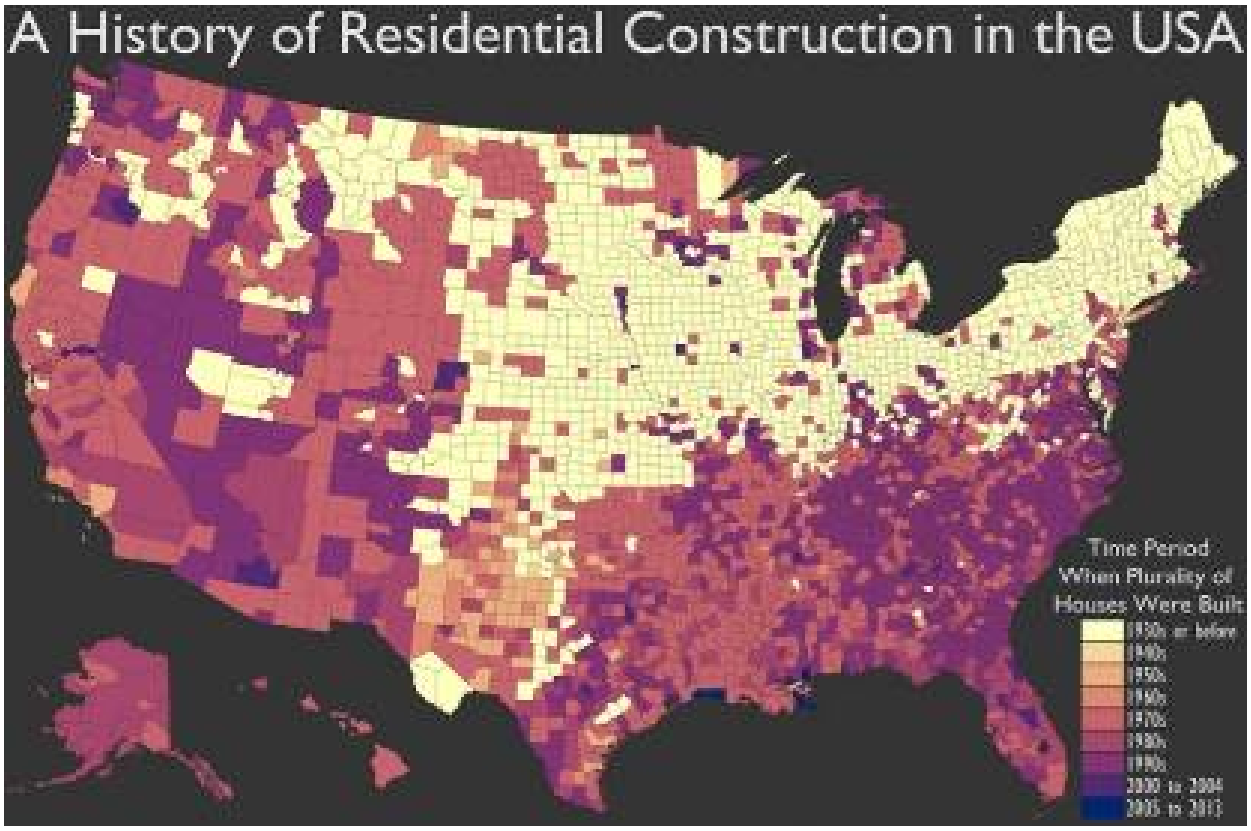


Figure 1. Map of housing stock age across the United States, Seth Kadish, Visual Statistix (Kadish 2013).

without a viable economic base, with consequent deterioration of the residential housing stock. These older, deteriorated neighborhoods and houses are home to a large number of Wisconsin families with young children, creating increased likelihood of exposure to LBP hazards. The combination of the presence of young children and old housing, along with poverty and associated socio-economic factors, contribute to the risk of childhood lead poisoning in

Wisconsin that is persistently much higher than the national average. In 2013, the prevalence of lead poisoning among children under 6 years of age tested in Wisconsin was 6.4%, compared with 4.3% for the US overall (CDC 2015).

In addition to LBP, certain areas of Wisconsin have high concentrations of lead in the soil from LBP and leaded gas emissions. The soil may be ingested by young children through normal hand-to-mouth behavior, or taken up in locally grown crops (including those from home gardens). Lead may also be present in water, due to the use of lead in making water pipes, fixtures, and solder, especially in homes built before 1986 (EPA 2015). However, LBP persists as the major contributor to lead exposure for Wisconsin children, with lead in soil or water a relatively small contributor to total exposure in this age group.

***Non-residential sources of childhood lead poisoning*.** Though currently responsible for a very small percentage of lead poisonings in Wisconsin, non-paint sources of lead hazards are becoming more visible in the public's view of childhood lead poisoning. Non-residential sources include common items such as toys, lunch boxes, children's jewelry, candies, ceramics, spices, cosmetics, and other products that are commonly imported from China, India, and elsewhere. Lead paint in excess of 0.06%, or 600 parts per million (ppm), had been banned in all toys sold in the United States since 1978. However, enforcement was irregular; consequently, the US Department of Agriculture, Consumer Product Safety Commission (CPSC) reported a large number of recalls of products containing unsafe levels of lead in 2006 through 2007. As a result of these multiple recalls, CPSC revisited the lead standard and as of August 2009, lowered the threshold from 600 ppm to 90 ppm in all toys and other products intended for children, including furniture. In addition, agreements have been put in place to limit the use of lead in toys being exported to the United States and to increase the number and frequency of inspections of factories (both domestic and overseas) that produce toys and other consumer goods. In recent years, the number of products recalled for containing high levels of lead has declined significantly.

For more information on lead in products, search for specific products in the CPSC database.

Childhood Lead Poisoning in Wisconsin

An Overview of the Problem

Collection of Blood Lead Test Reports. The WCLPPP began systematically collecting information on all blood lead tests conducted in Wisconsin in 1994. Under the requirements of Wis. Stat. § 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 (Systematic Tracking of Elevated Lead Levels and Remediation, STELLAR). The STELLAR database contains nearly 2 million records of blood lead tests conducted in Wisconsin since 1996. Because some of those results are for multiple tests for a single child, the database includes tests for more than 1 million children, living at more than 740,000 addresses in Wisconsin. This information forms the basis for analyses and surveillance activities conducted by the WCLPPP and 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 2014 show:

- More than 49,000 Wisconsin children under age 6 were identified with lead poisoning using a level of 10 mcg/dL or greater, and more than 200,000 were identified with lead poisoning using the current CDC reference level of 5 mcg/dL or greater.
- These 200,000 lead-poisoned children represent 21.1% of all children under age 6 who received a blood lead test during that time period.
- Lead-poisoned children were identified in each of Wisconsin's 72 counties.

The 200,000 lead-poisoned children were associated with nearly 169,000 addresses throughout the state. Since lead poisoning is most often associated with LBP in older housing, the majority of these 169,000 addresses represent environmental hazards that persist as threats to future generations of children. Only a fraction of the total number of children living in older housing have been tested for BLLs, thus there likely are many more properties with LBP hazards—and many more lead-poisoned children—that went unidentified.

Wisconsin Blood Lead Screening Recommendations

In 1998, the Wisconsin Blood Lead Screening Recommendations (DHS 2000) were developed based on input from a broad-based advisory committee. These guidelines recommend targeted screening of children who are at greatest risk for lead poisoning.

Children living in the cities of Milwaukee and Racine. The Wisconsin Blood Lead Screening Recommendations include universal testing of all children living in the cities of Milwaukee and Racine. Because the extremely high proportion of old housing in these communities creates an extremely high risk of lead poisoning, each child should have a blood lead test three times before the age of 3 years: around 12 months, 18 months, and 24 months. Children aged 3 through 5 years should be tested annually if they meet one or more of the following risk criteria:

1. Lives in a house built before 1950
2. Lives in a house built before 1978 with recent or ongoing renovations
3. Has a sibling or playmate with lead poisoning
4. Is enrolled in Medicaid or WIC or is uninsured
5. Has no record of a prior test

Federal Medicaid Testing Policy

Children enrolled in Medicaid are required to receive blood lead testing as part of their Early and Periodic Screening, Diagnostic and Treatment (EPSDT, i.e., Health Check) services. More specifically, "*all children enrolled in Medicaid should receive a screening blood lead test at 12 and 24 months of age … Children over the age of 24 months, up to 72 months of age, for whom no record of a previous screening blood lead test exists, should also receive a screening blood lead test*. (HCFA 1999)"

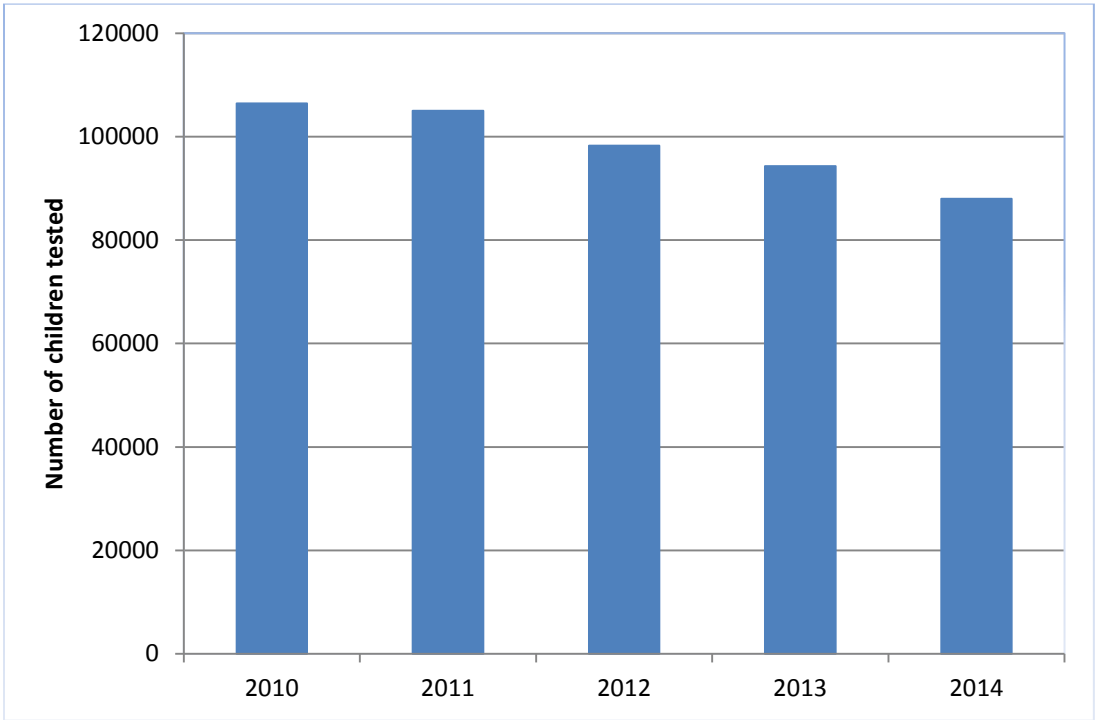
Children living outside the cities of Milwaukee and Racine. When seeing children from areas outside the cities of Milwaukee and Racine, health care providers are encouraged to use the *Four Easy Questions* below to determine whether a child is at risk for lead poisoning and needs to be tested at around 12 months and 24 months of age and between the ages of 36 and 72 months with no record of a previous test:

1. Does the child live in or visit a house built before 1950? (including child care and homes of friends or relatives)
2. Does the child live in or visit a house or building built before 1978 with recent or ongoing renovations? (including child care and homes of friends or relatives)
3. Does the child have a sibling or playmate with lead poisoning?
4. Is the child enrolled in Medicaid or WIC?

Lead Testing and Lead Poisoning in Wisconsin

Number Tested. During 2014, more than 87,000 children under 6 years of age received a blood lead test (**Figure 2**). This represents approximately 20% of children under age 6 in Wisconsin. The annual number of children tested has decreased over the past five years; nearly 20,000 fewer children were tested in 2014 than in 2010. These trends in testing are further discussed in the section entitled *Medicaid Provider Testing Reports*.

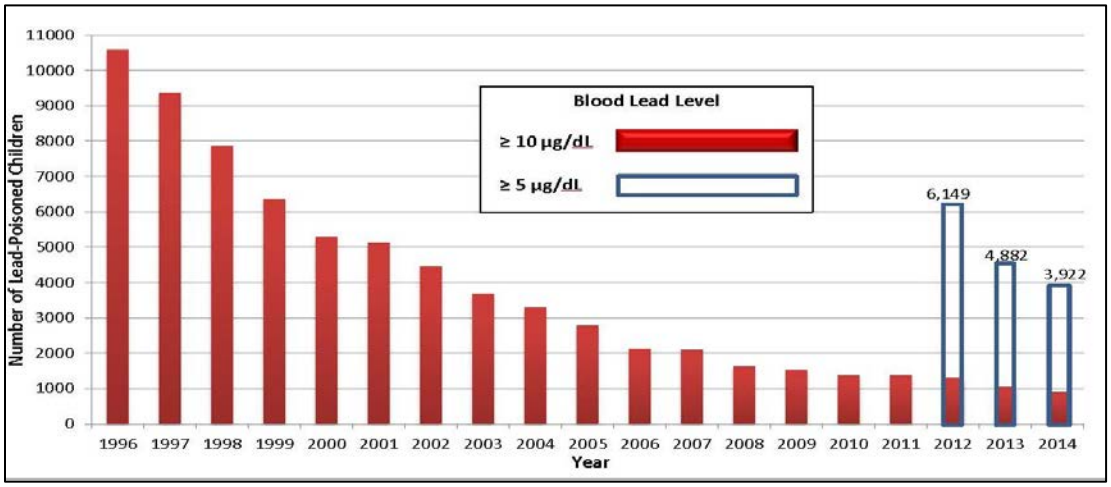
Figure 2. Number of children under 6 years of age tested in Wisconsin, 2010-2014



The annual number and rate of children known to have lead poisoning had been declining steadily since the effective start of comprehensive reporting required under Wis. Stat. § 254.13. However, in 2012 when the CDC established the blood lead reference value of 5 µg/dL (previously 10 µg/dL), the number of children considered to be lead poisoned increased dramatically (**Figure 3**).

To put the numbers in context, in 1996, more than 10,500 Wisconsin children under age 6 had lead poisoning defined as a BLL of 10 µg/dL or more, representing 16.2% of children tested. By 2014 the number of children with BLLs of 10 µg/dL or more dropped to just over 900, or 1.0% of those tested. However, in 2014 there were 3,931 children with BLLs of 5 µg/dL or more, or 4.5% of those tested.

Figure 3. Number of children under age 6 found to be lead poisoned, Wisconsin, 1996-2014



National Lead Poisoning Data Comparison. The CDC collects de-identified blood lead surveillance data from state and local health departments. Wisconsin has consistently reported some of the highest numbers of children with BLLs of 5 µg/dL or more (among the top nine states nationwide and near the top among states in the Midwest) (**Table 1**).

Among the five Midwestern states that reported complete data to the CDC in 2012, Wisconsin had the second highest number of lead-poisoned children tested under age 6, and the second highest proportion of lead-poisoned children of those tested.

Table 1. Number of children under age six tested and confirmed with BLL of ≥5 µg/dL in the Midwest by state, 2012 (includes only states with complete data reported to CDC).

State	Population less than 72 months of age[a]	Number of Children Tested	Total Confirmed BLL ≥5 µg/dL	Confirmed BLLs ≥5 µg/dL as Percent of Children Tested
Ohio	866,996	154,309	11,341	7.35%
Wisconsin	431,404	98,137	6,996	7.13%
Indiana	522,074	54,458	3,151	5.79%
Michigan	720,314	143,210	6,543	4.57%
Minnesota	427,426	92,071	2,699	2.93%

[a]Population data from 2010 census (CDC 2015)

Factors Affecting Lead Testing and Lead Poisoning

Age of Child. Research indicates that a child's BLL tends to be highest between 18 and 36 months of age. This is attributed to frequent hand-to-mouth behavior and the increase in mobility during a child's second and third years, which makes lead-containing dust more accessible to the child. 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 BLL. However, 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. Therefore, a normal blood lead test at 1 year of age does not mean the child is *not* at risk for lead poisoning later on.

Figure 4 shows that most Wisconsin children are tested only at 12 months of age. However, the incidence of lead poisoning (that is, the first identification of lead poisoning) is highest around 2 years of age. In other words, while half as many children were tested at age 2, more than twice as many were first found to be lead poisoned at age 2.

Figure 4. Lead testing (solid bars) and incidence (dashed line) of lead poisoning by age at the time of test for previously non-poisoned Wisconsin children under 6 years

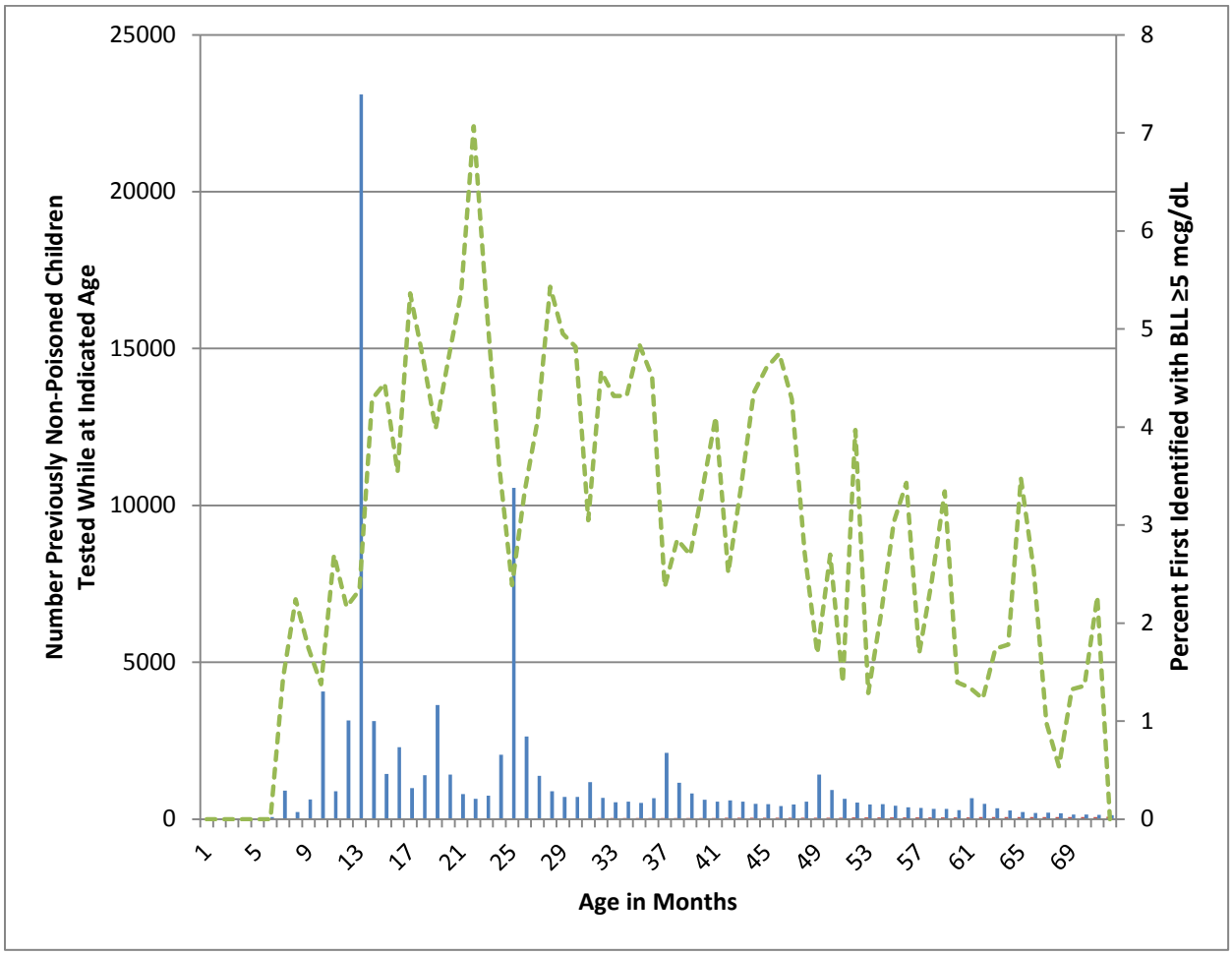


Table 2 presents information on testing and prevalence of lead poisoning (in contrast to the incidence data shown in **Figure 4**). Prevalence indicates the total burden of lead poisoning in a given timeframe, while incidence indicates new cases of lead poisoning. The prevalence of lead poisoning is highest among children aged 2 through 4 years, because lead poisoning is a chronic condition and includes children who are still poisoned from the previous year(s).

Table 2. Children under age 6, number tested and prevalence of lead poisoning, Wisconsin, 2014

Age	Estimated 2014 Wisconsin Population[a]	Total Tested	Percent Tested	Total with BLL of ≥ 5 µg/dL	BLL ≥5 µg/dL as Percent of Children Tested
Less than 6 Years	455,524	87,987	19.3	3,922	4.5
Less than 1 Year	75,125	9,688	12.9	179	1.8
1 Year	75,717	38,096	50.3	1,527	4.0
2 Years	76,132	19,612	25.8	1,037	5.3
3 Years	76,338	9,332	12.2	622	6.7
4 Years	76,729	7,438	9.7	387	5.2
5 Years	75,933	3,821	5.0	170	4.4

[a]From census.gov

Seasonality. Lead levels are known to vary seasonally for a number of reasons, including increased exposure to lead-contaminated soil, exterior LBP hazards and airborne dust during warmer months, and seasonal variation in vitamin D and calcium affecting lead kinetics (i.e., absorption, metabolism, and elimination of lead from the body). Consequently, testing a child during the winter, for example, may not capture the period of highest exposure. Testing recommendations should therefore consider both developmental stage as well as seasonality considerations (Havlena, Kanarek, et al., 2009).

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.

The Wisconsin Medicaid Program collaborates with the WCLPPP in linking program data to determine blood lead testing and lead poisoning among Medicaid-enrolled children. This data linkage has demonstrated that, despite the federal testing policy, many Wisconsin children enrolled in Medicaid are not tested at the appropriate ages (**Table 3**). In 2014, only 62% of 1-year-olds, 48% of 2-year-olds, and 16% of children aged 3-5 who were not previously tested were tested. Only 42% of Medicaid-enrolled children received the appropriate testing at both 1 and 2 years of age.

Table 3. Children under age 6 enrolled in Medicaid, tested in Wisconsin, 2014

Age	Total Eligible	Tested in Year	Percent Tested in Year
1 Year	35,944	22,261	61.93%
2 Years	34,420	16,629	48.31%
3-5 Years, not previously tested	19,581	3,116	15.91%

The data linkage also shows that Medicaid-enrolled children in Wisconsin are at three times greater risk of lead poisoning than non-Medicaid-enrolled children. In 2014, 88% of the children found to be lead poisoned were enrolled in Medicaid. If all children on Medicaid had been appropriately tested during 2014, it is likely that additional children would have been identified as lead poisoned and could have received the interventions they needed. 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 years if not previously tested.

WIC projects in Wisconsin are strong partners in assuring that children who are at risk for lead poisoning receive the blood lead testing they need. In 2014, 52.1% of Medicaid-enrolled children (under 5 years of age) who received a blood lead test were tested by a 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 and act as a safety net, testing children who might otherwise be missed.

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 5** and **Table 4** present data on the percent of children tested by racial and ethnic group, as well as the percent identified with lead poisoning. White children made up the largest proportion of children tested (44.2%), as well as the largest proportion of children under age 6 in Wisconsin (**Table 4**). However, when looking at the distribution of race and ethnicity among children identified with lead poisoning, rates are highest among Black children, followed by Hispanic and Asian children. While Black children are only one-quarter of the children tested, they represent nearly half of the children found to be lead poisoned in Wisconsin (see **Figure 5**).

Figure 5. Children under age 6, lead testing and lead poisoning (5 µg/dL or higher) by race and ethnicity, Wisconsin, 2014

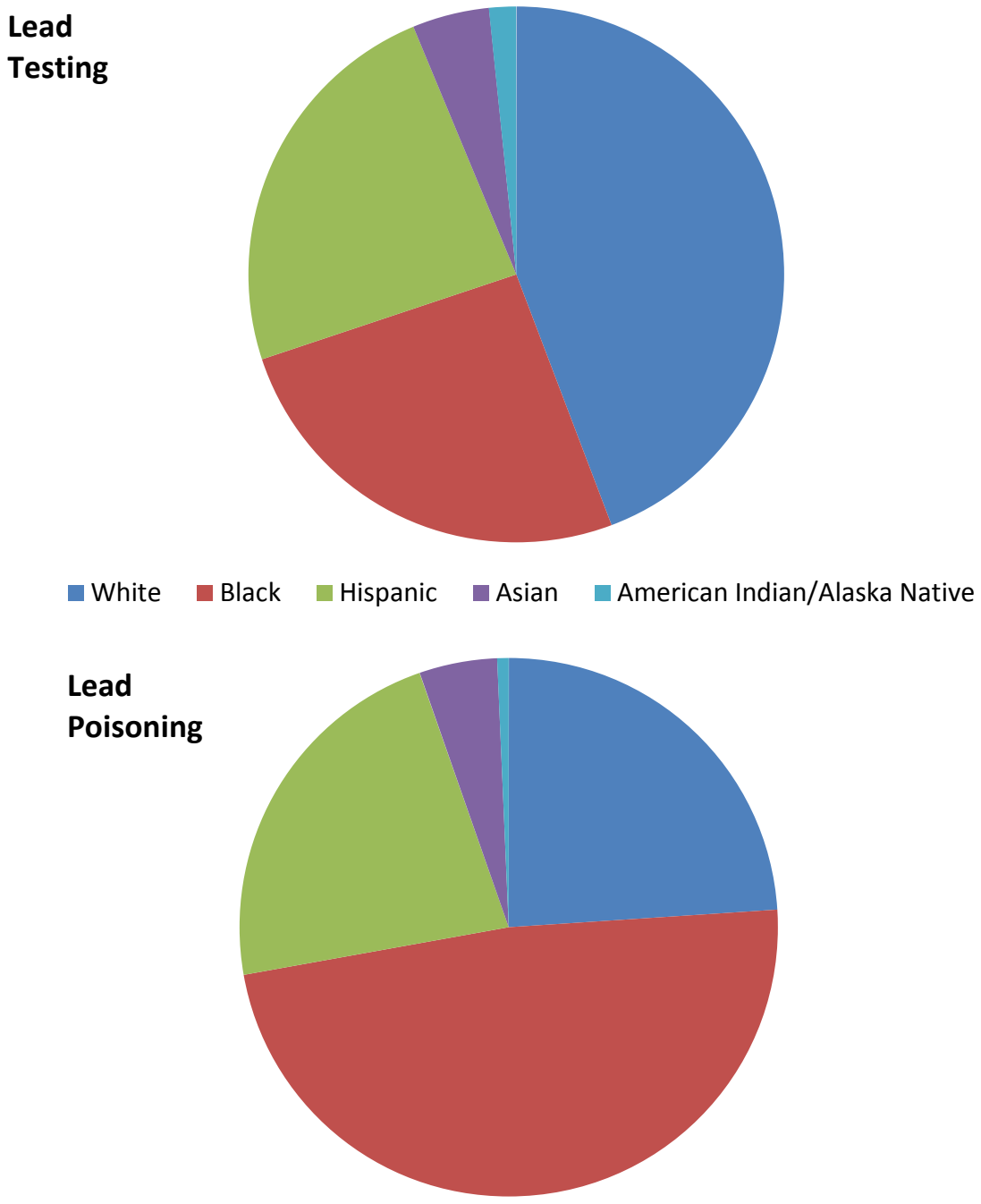


Table 4. Children under age 6, by race/ethnicity, tested in Wisconsin, 2014

Race/Ethnicity[a]	Total Tested	Total with BLL of ≥5 µg/dL	BLL ≥5 µg/dL as % of Children Tested	Percent of All Children under Age 6
White	27,984	803	2.9%	72.0%
Black	16,221	1,616	10.0%	10.61%
Hispanic	15,096	753	5.0%	12.18%
Asian	2,942	157	5.3%	3.92%
American Indian/Alaska Native	1,030	23	2.2%	1.33%

[a]As reported to the WCLPPP. All categories of race/ethnicity are non-Hispanic unless otherwise noted. Note that in 2014, there were 22,244 children with unknown/unreported race/ethnicity (25.3% of total tested). Race-specific population counts are from NCHS 2013 bridged race estimates (CDC 2015) and therefore are not exactly the same as those shown elsewhere.

Age of Housing. National data have shown that children who live in old housing, where LBP 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 a previous analysis found that 90% of children first identified with lead poisoning from 1996–2006 lived in homes that were built before 1950 (DHS 2008). That analysis matched addresses in tax assessor files from 16 Wisconsin cities with addresses of children who had received blood lead tests, and found that 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 (DHS 2008).

Pockets of Risk. While lead poisoning is a risk statewide, significantly higher rates are seen in certain communities or parts of communities with higher prevalence of older housing and other risk factors for lead poisoning. The local health department (LHD) jurisdictions (**Table 5**) with the top 10 highest rates are the four cities of Menasha, Milwaukee, Racine, and Watertown, and the six counties of Buffalo, Green Lake, Pepin, Richland, Rock, and Sheboygan. The prevalence rates of lead poisoning in these jurisdictions range from 5.1% to 8.6% and are considerably higher than the 2014 statewide rate of 4.5% (see **Appendix C** for a full listing of prevalence rates for all LHDs). These prevalence rates are for the entire LHD jurisdiction; smaller geographical areas such as individual neighborhoods and census tracts may have much higher rates of poisoning.

Table 5. Local health department jurisdictions with the 10 highest prevalence rates for lead poisoning in children under age 6 tested in Wisconsin, 2014

Local Health Department[a]	Total Tested[b]	Total with BLL of 5 µg/dL or more[c]	BLL ≥5 µg/dL as Percent of Children Tested
City of Milwaukee	26,097	2,244	8.6%
City of Watertown	535	45	8.4%
Buffalo County	178	13	7.3%
Sheboygan County	1,215	76	6.3%
City of Racine	2,467	153	6.2%
Rock County	2,354	142	6.0%
Green Lake County	250	14	5.6%
Pepin County	90	5	5.6%
City of Menasha	254	14	5.5%
Richland County	175	9	5.1%
Statewide	87,987	3,922	4.5%

[a]Children were assigned to a local health department jurisdiction based on the address of residence at the time of the blood lead test as reported to WCLPPP.
[b]Tested: Number of unduplicated children receiving a capillary or venous blood lead test during 2014.
[c]Number of unduplicated children who had a capillary or venous blood lead level of 5 µg/dL or more. If a child had a venous test within ninety days of a capillary test, the date, address and result from the venous test was used.

Children Entering the School System. In the kindergarten class of 2014 (that is, children born in 2009, when the prevalence rate of lead poisoning was higher than it is today), *8.5% have* been lead poisoned (ever had a BLL of 5 µg/dL or greater), or roughly two students in every classroom in the state. This lead exposure has consequences for later school performance—for example, data from Milwaukee show that among children taking the fourth-grade Wisconsin Knowledge and Concepts Exam, those with BLLs of 10-19 µg/dL (from testing performed at 3 years of age or earlier) had significantly lower scores in all five sub-test areas compared to children with BLLs <5 µg/dL (Amato, Moore, et al., 2012). In addition, these students were three times more likely to be suspended from and fail fourth grade (Amato, et al., 2012, 2013) and also reported poorer overall health (Magzamen, et al., 2013). These students may need special education or other special attention throughout elementary school and beyond, due to the learning disabilities and behavioral issues associated with lead poisoning. These interventions are further discussed in the section entitled *Educational Interventions for Children Affected by Lead* (CDC 2015).

Eliminating Childhood Lead Poisoning in Wisconsin

Eliminating the Routes of Exposure

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 LBP in their homes, to 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 LBP in homes.

As noted above, in 2012, the Advisory Committee on Childhood Lead Poisoning Prevention recommended to CDC that the action level for intervention be lowered from a BLL of 10 µg/dL to 5 µg/dL. Its decision was based on the overwhelming body of evidence that even low levels of lead interfere with the development and function of every body system and have lasting negative health and behavior effects over the lifespan. At the same time as making that recommendation, the advisory committee also renewed the call for primary prevention.

In the Executive Summary of its report, the advisory committee recommended "to shift priorities to implement primary prevention strategies and provide guidance to respond to children with BLLs < 10 µg/dL" (CDC 2012). One strategy is for pediatric primary care physicians to counsel patients, even prenatally when possible, on primary prevention actions the family can take before the child is born, including environmental assessments of homes *prior* to screening for lead exposure if the children live in high-risk housing. Primary care providers should also assess at-risk children and assure they receive adequate dietary nutrition and iron or treat these deficiencies.

The committee also found that "additional investment is needed to reduce lead hazards in older homes…," and recommended that housing policies "target the highest-risk housing for priority action, ensure that lead-safe work practices are followed during renovation, repair and painting of pre-1978 homes, and to prohibit LBP hazards, including deteriorated paint, in pre-1978 homes" (CDC 2012). Specifically, local and state governments should:

1. Share data between health and housing agencies.
2. Enact and enforce preventive lead-safe housing standards for rental and owner-occupied housing.
3. Identify financing for lead hazard remediation.
4. Provide families with the information needed to protect children from lead hazards.

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 BLLs and limit the damage to individual children after they have already become lead 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 LBP contain LBP hazards. Houses built before 1950, before the widespread use of lead-free latex paint, are considered to have the greatest potential for containing LBP hazards. In many of these older homes, LBP 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 LBP 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 2014 American Community Survey housing data shows that:

- There were approximately 2,648,342 occupied housing units (33.4% renter-occupied) in Wisconsin.
- Overall, 25.6% of occupied housing units in Wisconsin were built before 1950. Among renter-occupied housing units, the proportion was 27.3%.
- The pre-1950 houses are located throughout the state, with pockets of predominantly older housing found in most towns, villages, and cities.

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 previous analysis performed by the WCLPPP had found that 66% of all known lead-poisoned

children (using a BLL of 10 µg/dL or more) lived within the 133 highest-risk (top 10%) census tracts, containing approximately 100,000 pre-1950 housing units, and that nearly 76% of known lead-poisoned children lived within the 266 highest-risk (top 20%) census tracts, containing approximately 200,000 pre-1950 housing units (DHS 2008). 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 future childhood lead poisonings.

The challenge, however, will be to accurately identify and prioritize at-risk housing, and then provide the funding and concerted effort to effectively and efficiently remove all LBP hazards. Additional considerations to help prioritize housing could include: the number of lead-poisoned children associated with an address; the maximum BLL of any child who resided at an address; the age of the housing unit; the type of construction and overall condition of the housing unit; whether the housing unit is renter-occupied or owner-occupied; and the socioeconomic status of the tenant and neighborhood. These factors provide additional insight into identifying the individual addresses that are considered to be at greatest risk.

Primary Prevention, Step Two: Fixing the Highest-Risk Housing

Evaluate the Hazards. The next step in primary prevention is to have a certified lead investigator (lead hazard investigator or lead risk assessor) investigate the high-risk properties to evaluate potential lead hazards. To do this, surface coatings, e.g., paint or varnish, can be assumed to contain lead or they can be tested by the certified lead investigator to determine lead content in the coatings. 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 (see **Figure 6**). Any deteriorated surfaces and building components, as well as coated friction surfaces, become the priorities for corrective action.

Figure 6. Picture of an old window with deteriorating lead-based paint in the window trough

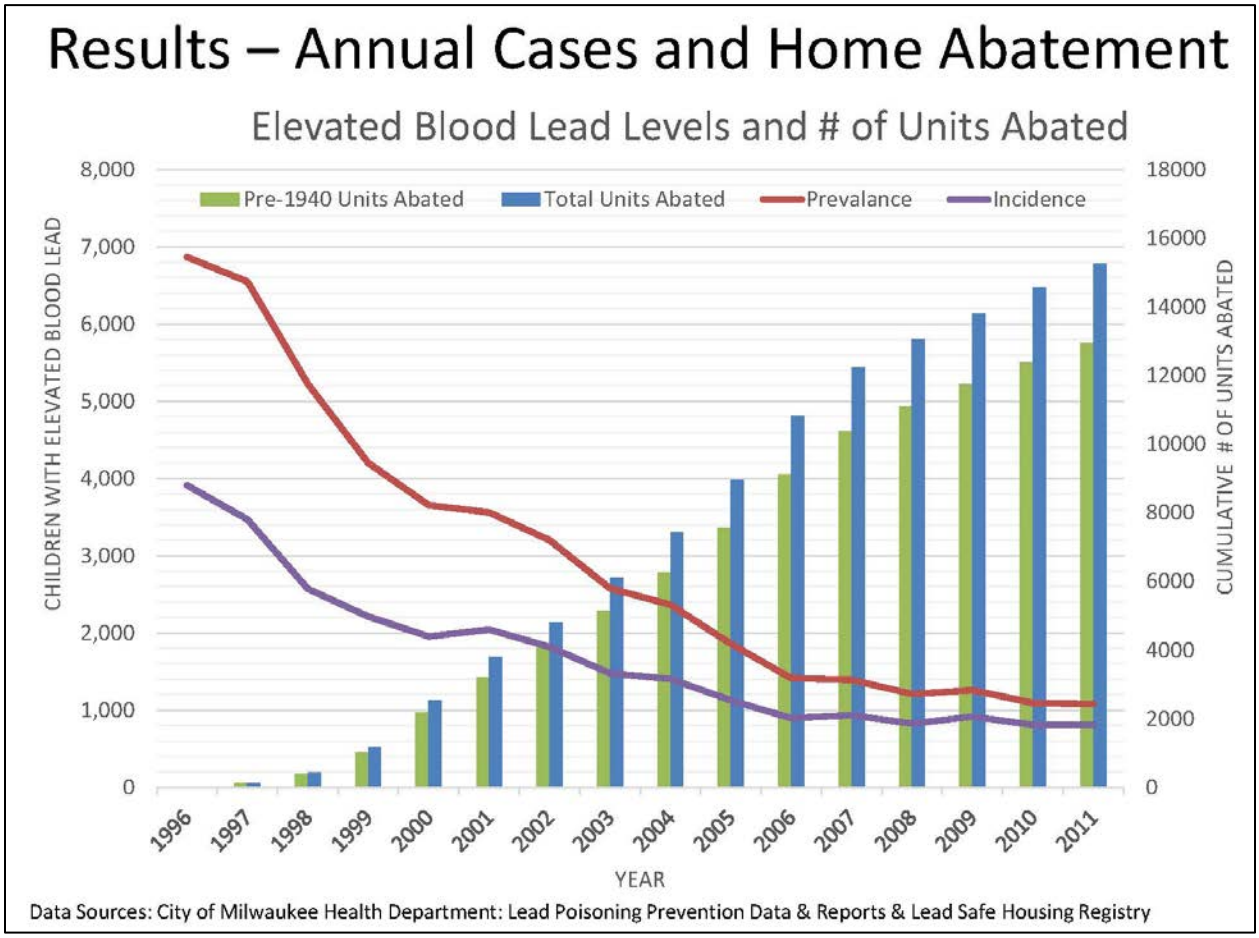
Control the Hazards. Once all deteriorated and friction surface coatings have been inventoried and lead is either assumed or proven through testing to be present, lead hazard remediation plans need to be developed to repair or replace building components and remove or stabilize and repaint deteriorated surface coatings. The work choices made will depend on the overall condition of the property, and how much money is available to the owner. Some hazard control work, such as window replacement, is abatement and requires a certified lead abatement contractor to conduct the work; while other work, such as paint stabilization, may be conducted by lead-safe certified contractors.

An excellent way to control lead hazards is to replace old windows and doors. For many other building components, repainting may 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 LBP 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.

A very effective strategy for exteriors is to install new siding over the old and wrap trim. For most houses, a combination of replacing windows, repainting interior surfaces and re-siding the exterior will effectively prevent lead poisoning. Average cost estimates for these approaches range from $5,000 to $13,000 per dwelling unit. A reasonable midrange 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://www.doa.state.wi.us/Divisions/Housing/CDBG-Housing.

A recent study was conducted in the City of Milwaukee, which has the largest share of the highest-risk housing in the state. Researchers wanted to determine the impact of lead-abated homes over time on the pattern of lead poisoning associated with those homes (Hart Smith K, et al., 2014). The homes were abated through both primary prevention strategies and via secondary intervention when children were found to be lead poisoned and their home required environmental intervention. **Figure 7** shows the time trend of abated homes overlaid with the declining number of lead poisoning cases (confirmed BLL of 10 µg/dL or more) in the City of Milwaukee (Smith 2015).

Figure 7. Reduction in cases of lead poisoning (confirmed BLL 10 µg/dL or more) compared to the increasing number of housing units being lead-abated, Milwaukee, 1996 – 2011



Additional Considerations to Help Focus Primary Prevention Efforts The ACCLPP has recommended primary lead poisoning prevention actions (CDC 2012), which can be implemented at the federal, state and local levels. These recommendations help focus primary prevention efforts and include:

1. Target actions in pre-1978 properties according to known risk factors, since the extent of risk varies from property to property.
2. Establish institutional linkages between public health programs and housing code enforcement agencies to prioritize rental properties based on previous code violations and reported BLLs above the reference value.
3. Enact preventive housing standards and policies for rental housing (multifamily and single-family) that mandate routine inspections and attention to lead hazards at unit turnover, with clearance testing and visual inspection to ensure housing is lead-safe.
4. Provide loans, grants, and other financial incentives for lead hazard remediation.
5. Assist families in taking protective actions such as learning basic tactics in visual inspection and proper maintenance.

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; community action and weatherization program participants; construction trades, and rental property owner organizations. Some of the key approaches include:

- Educating current and expectant parents and caregivers about lead poisoning risks, prevention measures, and screening recommendations so they can take the right protective and corrective actions.
- Collaborating among local public health agencies and community organizations to educate their communities and policymakers about how to prevent lead poisoning.
- Holding press conferences and media events to alert the general public about the dangers of lead in home environments and steps families can take to reduce the threat of lead poisoning to their children.

Evidence-Based Community Program

The Sixteenth Street Community Health Center's Lead Outreach Program operates on the south side of the city of Milwaukee. This door-to-door program works with parents of young children to assure that children are tested for lead, and that potential lead hazards in the home are proactively addressed (Schlenker, Baxmann, et al., 2001). The program has been very successful, reducing the prevalence of BLLs equal to or greater than 10 µg/dL from 36% to 1.8% in its service area between 1997 and 2015.

Secondary Prevention: Testing

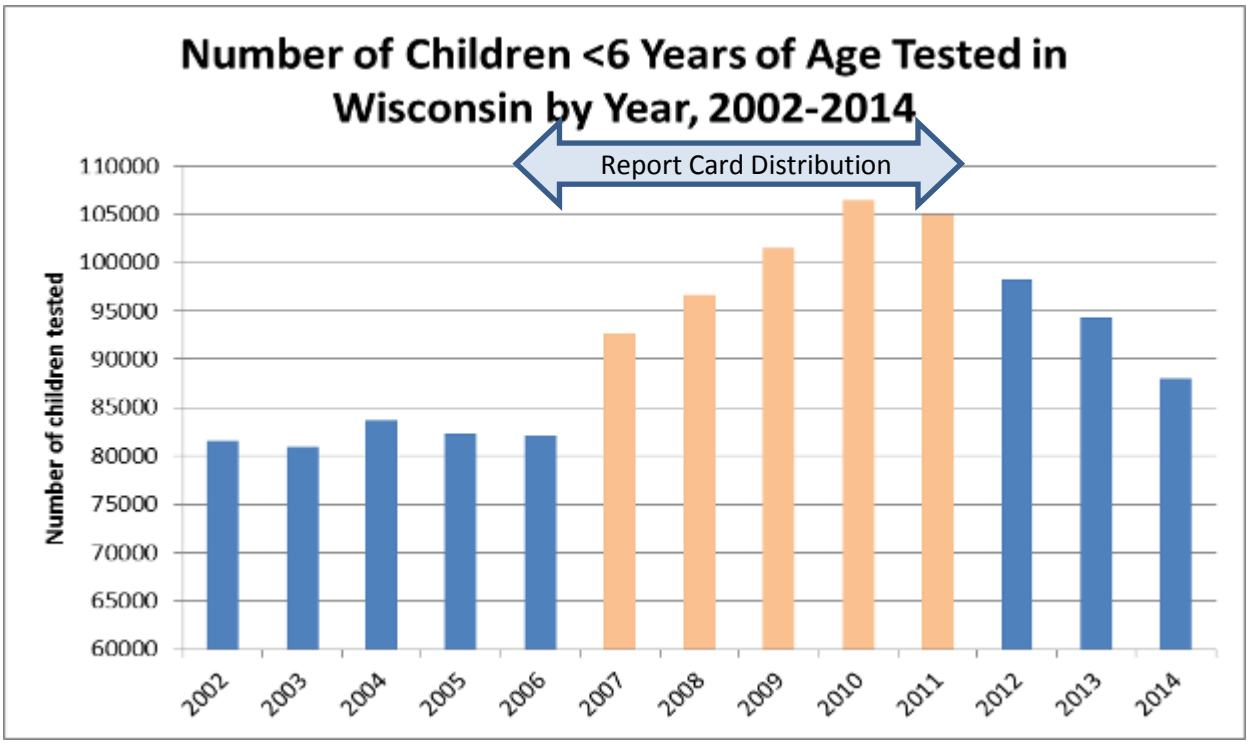
Many children are never tested for lead, including those at high risk for lead exposure. Consequently, many lead-poisoned children are never identified and do not receive treatment, increasing their risk for the myriad health, educational, and social problems associated with prolonged exposure to lead. As described above, children receiving Medicaid benefits are required to be tested at 1 and 2 years of age in association with their Early and Periodic Screening, Diagnostic and Treatment (EPSDT; i.e., HealthCheck) visits. Children receiving Medicaid benefits who have not been tested before their third birthday are required to have one test by 72 months of age. However, as mentioned in the discussion on testing rates, only 62% of 1-year-olds and 48% of 2-year-olds enrolled in Medicaid in Wisconsin were tested during 2014; only 16% of Medicaid-enrolled 3-5-year-olds with no previous test received a blood lead test in 2014.

Although the reasons for not receiving required testing have not been fully identified, they likely include one or more of the following:

- A mistaken belief that the child is not at risk or has been tested elsewhere.
- Lack of awareness of the testing requirement.
- A decision by parents/guardians not to have their child tested.
- Logistical barriers (e.g., the health care provider refers the child outside the provider's office or clinic for a blood draw).

Medicaid Provider Testing Reports. From 2006 through 2011, the WCLPPP distributed nearly 2,000 individualized blood lead testing reports each year to Medicaid providers who saw 25 or more Medicaid-enrolled children during the previous year. These reports presented testing numbers and rates so individual providers could track their testing performance. Lists of children who had not received the appropriate blood lead tests were sent with the testing report. Analysis of the effectiveness of these report cards indicates a significant increase in the number of children tested beginning in 2007, the year after the first report cards were sent. Testing overall increased from 81,834 in 2006 to a high of 106,448 in 2010 (**Figure 8**).

Figure 8. Number of children under age 6 tested in Wisconsin, by year



These Medicaid Provider Testing Reports were 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. The reports were discontinued after 2011, due to the loss of federal grant funding for the project. As a result, the number of children tested has consistently decreased each year since 2010, dropping to 87,987 in 2014.

Point-of-care Lead Analyzing Devices. Wis. Stat. § 254.13 mandates that laboratories provide the WCLPPP with the results and specified demographic information associated with all blood lead tests. In recent years, health care providers have begun to test children's lead levels using portable point-of-care lead testing devices (such as the Lead Care II). The ease in collecting blood samples and the speed of analyzing the samples make these devices an attractive option for providers.

However, because there is no software available that automatically transmits these results to the WCLPPP, results obtained using these devices may not be reported as required. WCLPPP staff has attempted to overcome this challenge by working with the company that manufactures and distributes the Lead Care II device to maintain a list of current device users, and to inform purchasers of Lead Care II devices of the reporting requirements and procedures for Wisconsin. However, challenges remain in obtaining complete and timely reporting of results from these clinics. As clinic staff turns over and newly hired staff are oriented to the device, reporting requirements may not be discussed. Also, clinics may purchase Lead Care II devices from a second party, and reporting requirements normally shared at time of purchase from the manufacturer are not transferred to the new owner.

Wisconsin Blood Lead Registry. The WCLPPP collaborated with the Wisconsin Immunization Program to develop the Wisconsin Blood Lead Registry (WBLR). The WBLR is a web-based database that links with the Wisconsin Immunization Registry and allows private and public health care providers and public school districts secure online access to a child's complete blood lead test history, regardless of where the child was tested. The WCLPPP uploads new blood lead test records to the WBLR on a weekly basis.

Secondary Prevention: Interventions

When a child is identified with lead poisoning (BLL of ≥5 µg/dL), responses may vary by local health department (LHD). A 2014 survey administered by the WCLPPP found that almost every LHD is providing some level of intervention for children with BLLs of 5 µg/dL or more, but in order to appropriately manage resources, many are setting priorities for intervention. These priority considerations include the child's BLL, whether the BLL is rising over time, age of the child, and the age and condition of housing where the child resides.

Public Health Interventions. Local health department interventions include telephone calls or home visits by a public health nurse, monitoring the child's BLL, and coordinating follow-up care with the primary care provider and other service providers, e.g., Birth to Three. In determining intervention strategies, it is useful to consider the results of a 2007 study that evaluated the effectiveness of three different interventions for families of children with elevated BLLs, in which half of the families were located in Wisconsin (Whitehead and Leiker 2007). The interventions were: sending a letter to the parents, making a telephone call to a parent, or conducting a home visit. The home visit was the most effective in reducing a child's BLL (**Table 6**), with an average decrease of nearly 2 µg/dL.

Table 6. Comparison of interventions and later increase or decrease in BLL, data from (Whitehead and Leiker 2007).

Type of Intervention	Number (Percent) Receiving Service	Change in Venous Blood Lead (µg/dL) within next 3 to 12 months
Mailed information	1,383 (65%)	+1.2
Telephone call	262 (12%)	-0.7
Home visit	464 (22%)	-1.96

The environmental health specialist investigates the child's home environment to determine the source(s) of lead exposure. When lead hazards are identified, the LHD may order lead hazard reduction measures to be taken by property owners. For communities without a local ordinance, Wis. Stat. ch. 254 provides several enforcement options to the LHD when property owners are not compliant with orders to correct human health hazards (including lead hazards). These statutory options include posting notices on the property, the ability for the LHD to pay for the correction of human health hazards and then seek repayment from the property owner through local municipal property taxes, and the ability to fine and/or imprison property owners who maintain a human health hazard under Wis. Stat. § 254.58. If the property owner does not comply with orders to correct lead hazards, the LHD may also report the violation to the district attorney of the county in which the property is located. Property owners are then subject to civil or criminal penalties under Wis. Stat. § 254.30.

In addition to these enforcement options provided by state statute, many communities have established local housing ordinances to expedite the resolution of cases involving noncompliant property owners. Local ordinances may be more efficient and effective, both because the parties may be more familiar with each other and because communities where

Connecting Outstanding Work Orders to Property Title

The City of Racine Health Department found that properties with identified lead hazards frequently changed ownership without disclosure of outstanding lead orders. The new owner is then responsible for complying with the orders and their associated costs without prior knowledge. *Lis pendens*, Latin for "a suit pending," is a written document that the city of Racine now files against the property title, including notice of outstanding lead orders, to inform prospective buyers.

public awareness about lead poisoning is great enough to support passage of an ordinance also tend to be better educated about lead and the threat it poses to children's health.

Educational Interventions for Children Affected by Lead. Apart from remediating lead hazards, educational interventions are also important to mitigate negative impacts of lead exposure in children. In 2015, the CDC released a guidance document titled *Educational Interventions for Children Affected by Lead* (CDC 2015). In many cases, the effects of lead exposure are not manifest until a child is older (e.g., school age); consequently, the CDC recommends that children exposed to lead in early life have a neuropsychological assessment at key educational transition points: first grade (learning to read), fourth grade (reading to learn about new subjects), and sixth or seventh grades (accomplishing a complex project). Educators and others can use this new tool to advocate that these tests be made available for students who have a history of elevated BLLs, even if the BLL is only slightly elevated.

Wisconsin is making significant progress in protecting children from the harmful lasting effects of lead poisoning, but much work remains to eliminate childhood lead poisoning forever.

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Appendix A - Technical Information

WCLPPP Lead Testing Database

The WCLPPP maintains a statewide database of reported blood lead tests for all Wisconsin children tested since 1996, using the CDC's Systematic Tracking of Lead Levels and Remediation (STELLAR) database management system. The database includes information on the blood lead test (date, blood sample type, provider, result), along with the child's name, birthdate, and address associated with each blood lead test. The child's address at the time of the blood lead test is the address of residence as reported to the WCLPPP. The Milwaukee and Racine health departments maintain their own STELLAR databases, and provide the WCLPPP with their data files on a weekly basis. Data are received both electronically (from analytical laboratories, about two-thirds of records) and via FAX or surface mail.

Data Integrity and Quality

The WCLPPP uses a series of quality assurance computer routines to evaluate the data within the statewide STELLAR database on a weekly basis. These routines include checks for duplicated values (duplicate children, addresses, lead tests); children tracked by more than one STELLAR database (e.g., both Milwaukee and the WCLPPP); typos and incorrectly spelled city and county names; and invalid test dates and/or birthdates (e.g., test date occurring before date of birth).

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 testing those children at highest risk of lead poisoning.

Medicaid data are merged with WCLPPP data each month to identify enrolled children who have received blood lead tests. This process uses a multi-step matching procedure that accounts for data anomalies such as typos, misspellings, hyphenated, and truncated names.

Blood lead test records are linked with the Wisconsin Immunization Registry each week via the Wisconsin Blood Lead Registry.

Appendix B - Online Resources

The DHS Lead-Safe Wisconsin website has information on the status of lead poisoning in Wisconsin, ways to treat and ways to prevent the disease. Data, facts, information pamphlets, and much more can be found at www.dhs.wisconsin.gov/lead.

Wisconsin Childhood Lead Poisoning Prevention and Control Handbook for Local Health Departments: www.dhs.wisconsin.gov/lead/publichealthinterventions.htm

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
- National Center for Healthy Housing: http://www.nchh.org

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

Appendix C – Lead Testing and Poisoning Prevalence by Local Health Department Jurisdiction

Table. Children under age 6 tested in Wisconsin, by local health department jurisdiction, 2014

[a]Children were assigned to a local health department jurisdiction based on the address of residence at the time of the blood lead test as reported to WCLPPP.

[b]Number of unduplicated children receiving a capillary or venous blood lead test during 2014.

[c]Number of unduplicated children who had a capillary or venous blood lead level of 5 µg/dL or more. If a child had a venous test within ninety days of a capillary test, the date, address and result from the venous test was used.

Local Health Department[a]	Total Tested[b]	Total with BLL ≥ 5 µg/dL[c]	BLL ≥5 µg/dL as % of Children Tested
Adams County	165	3	1.8
Appleton City	981	22	2.2
Ashland County	334	13	3.9
Barron County	438	9	2.1
Bayfield County	189	5	2.6
Brown County	3,799	49	1. 3
Buffalo County	178	13	7.3
Burnett County	133	1	0. 8
Calumet County	156	3	1.9
Central Racine County	1,348	27	2
Chippewa County	693	18	2.6
Clark County	327	9	2.8
Columbia County	695	24	3.5
Crawford County	143	2	1.4
Cudahy City	364	10	2.7
De Pere City	502	1	0.2
Dodge County	927	46	5
Door County	336	6	1.8
Douglas County	703	5	0.7
Dunn County	307	6	2
Eau Claire City/County	1,372	16	1.2
Florence County	25	1	4
Fond du Lac County	1,395	56	4
Forest County	114	0	0
Franklin City	475	6	1.3
Grant County	436	16	3.7
Green County	401	19	4.7
Green Lake County	250	14	5.6

Table. Children under age 6 tested in Wisconsin, by local health department jurisdiction, 2014

[a]Children were assigned to a local health department jurisdiction based on the address of residence at the time of the blood lead test as reported to WCLPPP.

[b]Number of unduplicated children receiving a capillary or venous blood lead test during 2014.

[c]Number of unduplicated children who had a capillary or venous blood lead level of 5 µg/dL or more. If a child had a venous test within ninety days of a capillary test, the date, address and result from the venous test was used.

Local Health Department[a]	Total Tested[b]	Total with BLL ≥ 5 µg/dL[c]	BLL ≥5 µg/dL as % of Children Tested
Greendale City	208	1	0.5
Greenfield City	762	10	1.3
Hales Corners City	97	1	1
Iowa County	159	1	0.6
Iron County	70	1	1.4
Jackson County	220	7	3.2
Jefferson County	794	29	3.7
Juneau County	388	13	3.4
Kenosha County	2,348	92	3.9
Kewaunee County	194	2	1
La Crosse County	1,371	28	2
Lafayette County	163	7	4.3
Langlade County	208	2	1
Lincoln County	378	5	1.3
Madison/Dane County	5,186	58	1.1
Manitowoc County	1,030	44	4.3
Marathon County	1,476	33	2.2
Marinette County	473	10	2.1
Marquette County	189	3	1.6
Menasha City	254	14	5.5
Milwaukee City	26,097	2,244	8.6
Monroe County	695	22	3.2
North Shore Cities	732	16	2.2
Oak Creek City	534	6	1.1
Oconto County	376	14	3.7
Oneida County	341	3	0.9
Outagamie County	647	14	2.2
Ozaukee County	758	16	2.1
Pepin County	90	5	5.6
Pierce County	412	6	1.5
Polk County	421	5	1.2

Table. Children under age 6 tested in Wisconsin, by local health department jurisdiction, 2014

[a]Children were assigned to a local health department jurisdiction based on the address of residence at the time of the blood lead test as reported to WCLPPP.

[b]Number of unduplicated children receiving a capillary or venous blood lead test during 2014.

[c]Number of unduplicated children who had a capillary or venous blood lead level of 5 µg/dL or more. If a child had a venous test within ninety days of a capillary test, the date, address and result from the venous test was used.

Local Health Department[a]	Total Tested[b]	Total with BLL ≥ 5 µg/dL[c]	BLL ≥5 µg/dL as % of Children Tested
Portage County	859	19	2.2
Price County	150	0	0
Racine City	2,467	153	6.2
Richland County	175	9	5.1
Rock County	2,354	142	6
Rusk County	163	4	2.5
Sauk County	721	12	1.7
Sawyer County	198	0	0
Shawano-Menominee Counties	561	11	2
Sheboygan County	1,215	76	6.3
South Milwaukee City	363	14	3.9
St Croix County	664	11	1.7
St Francis City	151	1	0.7
Taylor County	168	5	3
Trempealeau County	494	13	2.6
Vernon County	322	11	3.4
Vilas County	299	1	0.3
Walworth County	1,255	30	2.4
Washburn County	155	2	1.3
Washington County	751	17	2.3
Watertown City	535	45	8.4
Waukesha County	4,334	69	1.6
Waupaca County	412	18	4.4
Waushara County	302	6	2
Wauwatosa City	913	25	2.7
West Allis City	1,489	53	3.6
Winnebago County	1,231	53	4.3
Wood County	1,029	10	1
STATEWIDE	**87,987**	**3,922**	**4.5**

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