

## Background Paper on Childhood Lead Poisoning in Wisconsin

Prepared by the Wisconsin Childhood Lead Poisoning Prevention Program, Division of Public Health, Department of Health Services.

### **I. Wisconsin carries a heavy burden from all the lead paint used in years past.**

Wisconsin has consistently ranked among the top ten states for the number of children found to be lead poisoned.

The rate of lead poisoning among children in Wisconsin is persistently higher than the national average.

More than 46,000 children have been reported to the Wisconsin Department of Health Services as lead poisoned since 1996 and every Wisconsin county has reported children who are lead poisoned.

More than 1,500 Wisconsin children are reported with lead poisoning each year. (On average more than 4 children are lead poisoned every day!) Yet, less than half of the Wisconsin children at greatest risk for lead poisoning receive the age appropriate blood lead tests, so the actual number of lead poisoned children could be even higher.

Lead poisoning is a housing based disease. According to the US Department of Housing and Urban Development, 33% of dwellings in the Mid-West region of the United States have lead paint hazards.<sup>1</sup>

According to the 2000 U.S Census, Wisconsin has more than 1.6 million homes built before 1978 when federal law banned lead paint production (72% of all Wisconsin dwellings). Many of these homes now contain lead based paint hazards.

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, porches and stairs of many older homes. 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.

Wisconsin has an abundance of older neighborhoods and old housing built during the industrial boom that started in the 19<sup>th</sup> century. As Wisconsin has lost many industrial jobs in recent years, these older neighborhoods have also lost their economic base, and the housing is subject to increasing disrepair and deferred maintenance. Many Wisconsin families with young children live in such neighborhoods, in older homes that have lead-based paint hazards. Wisconsin's unique combination of old housing, poverty, and extreme weather conditions that cause paint to fail, contribute to a risk of childhood lead poisoning in Wisconsin that is persistently much

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<sup>1</sup> Jacobs DE, et al. The Prevalence of Lead Based Paint Hazards in U.S. Housing. Environmental Health Perspectives, Volume 110, Number 10: A599-A606.

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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<sup>2</sup>.

To learn more about the status of childhood lead poisoning in Wisconsin, read this very important report, *The Legacy of Lead: Report on Childhood Lead Poisoning in Wisconsin 2008*. It's available [online](#) or by calling the Wisconsin Childhood Lead Poisoning Prevention Program at (608) 266-5817.

## II. Effects of Lead

Lead exposure harms a child's ability to learn, to succeed in life and to stay healthy. Young children under 6 years old are at particular risk of lead poisoning for several reasons:

(1) Young children are exposed to more lead than adults because of their behavior. They crawl before they walk and lead dust accumulates on floors in dwellings where lead paint has been used. Young children engage in normal hand-to-mouth behavior to explore their world. They put everything in their mouths – pacifiers, toys, hands, fingers, and toes. This behavior is essential to learning about language, movement, spatial concepts, proximity, etc. As a result of these normal developmentally appropriate behaviors, children will take in lead if it has accumulated in their environment from lead paint and coatings breaking down into dust.

(2) Children absorb more of the lead that enters their gastro-intestinal system than adults; young children absorb more lead than adults (50% vs. 10%) and they absorb it approximately 6 times faster.

(3) Children under the age of six are most vulnerable to the effects of lead due to rapid brain development in this phase of life. A child's nervous system is going through incredibly fast, complex and extensive changes which are highly susceptible to the toxic effects of lead.

### ***Effects of Lead on Young Children***

Lead hurts children. Lead interferes with the normal development of a young child's brain resulting in lowered IQ, attention disorders, learning disabilities, hearing loss and developmental delays. A review of files of Wisconsin children who have been severely lead poisoned revealed that speech impairment is the most common developmental delay identified.

Lead poisoning is associated with a greater likelihood of behavior problems like aggression and hyperactivity<sup>3, 4</sup>. A lead-poisoned child is more likely to experience problems in school due to learning difficulties, poor reading skills<sup>5</sup> and shortened attention span. A 2007 study<sup>6</sup>

<sup>2</sup> *Legacy of Lead: Report on Childhood Lead Poisoning In Wisconsin 2008*, Department of Health Services.

<sup>3</sup> Delinquency and hyperactivity (1979). Offord DR et al; *Journal of Nervous Mental Disorders*, 167: 734-741.

<sup>4</sup> Confirmation and Extension of Association of Blood Lead with Attention-Deficit/Hyperactivity Disorder (ADHD) and ADHD symptom Domains at Population-Typical Exposure Levels (2010). Nigg JT et al; *Journal of Child Psychiatry*, 51(1): 58-65.

<sup>5</sup> Low level exposure and children's IQ: A meta-analysis and search for a threshold (1994). Schwartz J; *Environmental Research*.

<sup>6</sup> The relationship between early childhood blood lead levels and performance on end-of-grade tests (2007). Miranda ML et al; *Environmental Health Perspectives*, 115(8): 1242-1247.

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demonstrated that children who are lead poisoned on average score 14% lower on reading and mathematical performance tests in 3<sup>rd</sup> grade.

There is no safe level of lead in the human body. In extreme cases lead poisoning can cause coma, seizures or death. Most children with lead poisoning show no dramatic or obvious immediate signs of being poisoned. The way to diagnose lead poisoning is through a blood lead test.

When an individual's body goes through a period of stress that releases calcium from the bones such as pregnancy or bone fracture, lead stored in the bones from a childhood exposure can be released back into the blood stream where the lead in plasma crosses the placental barrier and exposes the developing fetus. Thus there are children who experience brain damage during the critical early stages of brain development while still in the womb. A 2006 study<sup>7</sup> pinpointed prenatal lead exposure as a greater risk to offspring brain development than childhood exposure. A study released in 2009 demonstrated that prenatal lead exposure influences a child's genetic programming and susceptibility to disease throughout the life course<sup>8</sup>.

### ***Effects of Lead on Teenagers Who were Lead Poisoned as Children***

Children who are lead poisoned are more likely to have problems as teens with their upright balance that may result in falls or discourage their participation in sports. Lead affects the development of the central nervous system affecting children's long-term injury risk by harming their balance, coordination and other neuromuscular skills<sup>9</sup>. A 2009 study showed that children who were lead poisoned are also more likely to develop kidney disease<sup>10</sup>.

Lead poisoning continues to affect learning ability as a child ages and is a powerful predictor of school disciplinary problems. Studies show that lead exposure causes depression and panic attacks in adolescents<sup>11</sup> and higher rates of high school dropout, teen pregnancy, and juvenile delinquency<sup>12</sup>. Teenagers who were lead-poisoned as children are close to 5 times more likely to use tobacco in their teen years.<sup>13</sup> Research posits that early lead exposure may increase sensitivity to tobacco addiction and contribute to continued tobacco use.

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<sup>7</sup> Reduced intellectual development in children with prenatal lead exposure (2006). Schnass L et al; *Environmental Health Perspectives*, 114(5): 791-7.

<sup>8</sup> Influence of Prenatal Lead Exposure on Genomic Methylation of Cord Blood DNA (2009). Pilsner JR et al; *Environmental Health Perspectives*, 117(9): 1466-71.

<sup>9</sup> Injury trends for adolescents with early childhood lead exposure (2006). Kincl LD et al; *Journal of Adolescent Health*, Vol. 39, Issue 4, pp. 604-606.

<sup>10</sup> Blood lead level and kidney function in US adolescents (2010). Fadrowski JJ et al; *Archives of Internal Medicine*, Vol. 170(1): 75-82.

<sup>11</sup> Blood lead levels and major depressive disorder, panic disorder and generalized anxiety disorder in US young adults (2000). Bouchard MF et al; *Archives of General Psychiatry*, Vol. 66(12): 1313-9.

<sup>12</sup> How lead exposure relates to temporal changes in IQ, violent crime, and unwed pregnancy (2000). Nevin R; *Environmental Research Section A*, 83: 1-22.

<sup>13</sup> Environmental injustice: childhood lead poisoning, teen pregnancy and tobacco (2008), Lane, SD et al; *Journal of Adolescent Health*, Vol. 42, Issue 1, pp 43-49.

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Recent research<sup>14</sup> may explain these outcomes. Lead interferes with the normal development of the brain, resulting in a reduction in volume of the frontal lobe. This is the region of the brain that reasons, judges, solves problems and controls impulses and emotional responses.

#### ***Effects of Lead on Adults Who were Lead Poisoned as Children***

Lead poisoning continues to predict negative outcomes for adults poisoned as children. Violent crimes committed by adults are strongly associated with prenatal and childhood lead poisoning; a 2008 study<sup>15</sup> found that for each increase of 5 micrograms per deciliter of lead in blood as a child, an individual's risk of being arrested for a crime as an adult increases by 50%.

Lead in the body can negatively impact health throughout the lifespan. Childhood lead poisoning increases the risk of death from stroke and heart attack as adults<sup>16</sup>. Studies have also shown that childhood lead exposure is linked to adult kidney disease, diabetes, depression, panic attacks and cognitive deficits such as memory loss and Alzheimer's disease.

Lead can cause reproductive problems in both men and women. Adverse birth outcomes such as increased risk of spontaneous abortion<sup>17</sup>, preterm delivery<sup>18</sup> and infant low birth weight<sup>19</sup> and developing hypertension when pregnant<sup>20</sup> as adults are related to childhood lead poisoning.

### **III. Costs of Lead Poisoning and Benefits from Protecting Children from Lead Exposure**

#### ***Childhood Lead Poisoning is Costly to Our Community and Society as a Whole.***

Costs for lead poisoning are estimated at \$45,000 per child. This includes lost wages for the child over the lifetime and financial costs for special education, juvenile delinquency and medical care.

Based on a review of the scientific literature<sup>21</sup>, the estimated minimum health benefits of preventing lead poisoning are:

\$21,195	Present value of lost lifetime earnings
1,163	Avoided neonatal mortality
55	Avoided direct medical care
12,833	Avoided special education

<sup>14</sup> Decreased brain volume in adults with childhood lead exposure (2008). Cecil KM et al; *PLoS Medicine* 5(5):e112. doi:10.371/journal.pmed.0050112.

<sup>15</sup> Association of prenatal and childhood blood lead concentrations with criminal arrests in early adulthood (2008). Wright JP et al; *PLoS Medicine* 5(5): e101. doi:10.1371/journal.pmed.0050101.

<sup>16</sup> The weight of lead: Effects add up in adults (2007). Angela Spivey, *Environmental Health Perspectives*, 115 (1).

<sup>17</sup> Blood lead levels measured prospectively and risk of spontaneous abortion (1999). Borja-Aburto VH et al; *American Journal of Epidemiology*, 150(6): 590-7.

<sup>18</sup> Effect of magnitude and timing of maternal pregnancy blood lead (Pb) levels on birth outcomes (2006). Jelliffe-Pawlowski LL et al; *Journal of Perinatology*, 26(3): 154-62.

<sup>19</sup> Decrease in birth weight in relation to maternal bone-lead burden (1997). Gonzalez-Cossio T et al; *Pediatrics*, 100(5): 856-62.

<sup>20</sup> Maternal blood lead levels and the risk of pregnancy-induced hypertension: The EDEN cohort study (2009). Yazbeck C et al; *Environmental Health Perspectives*, 117(10): 1526-30.

<sup>21</sup> Benefits and costs of residential lead paint hazard control and window replacement in Wisconsin (2006). Prepared for the Wisconsin Department of Health and Family Services by David E. Jacobs, *National Center for Healthy Housing*, and Rick Nevin, *ICF Consulting*.

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2,362	Avoided medical expense for Attention Deficit Hyperactivity Disorder
+ 8,000	Avoided juvenile delinquency expense
\$45,608	Total average health benefit per child

For the 46,000 children known to be lead-poisoned since 1996, those costs add up to more than \$2 billion for Wisconsin.

Only about one in five children under the age of 6 are tested for lead poisoning so the actual cost of childhood lead poisoning to Wisconsin could be much higher.

A new study<sup>22</sup> released in 2009 estimates that eliminating lead exposure to young children could save between \$17 to \$221 for every dollar spent on lead hazard control. The benefits accrue from reduced health care costs, reduced criminal activity, increased IQ, higher lifetime earnings, increased tax revenue and less spending on special education.

***Burden on Wisconsin’s Educational System***

Approximately one of every 20 third graders in the Wisconsin school system in 2009 was known to have been lead poisoned. Children who are lead poisoned on average score 14% lower on reading and mathematical performance tests in third grade.<sup>23</sup> Lead poisoning is associated with a greater chance that a child will experience problems in school due to learning difficulties and failure. These students may need special education due to the learning disabilities associated with lead poisoning.

Total federal, state and local spending for Wisconsin elementary and secondary school students was more than \$10,000 per student in 2006-2007<sup>24</sup>. Wisconsin taxpayers consistently spend over \$300 million per year on special education programs alone<sup>25</sup>.

Wisconsin has not yet specifically evaluated the costs to educational systems attributable to lead poisoning, Wisconsin could better determine the value of future preventive efforts to benefit children, families, school districts, and to all Wisconsin taxpayers if Wisconsin state and local agencies were to conduct studies to measure the excess costs attributable to this preventable condition, lead poisoning.

Similarly, Wisconsin spent over \$746 million in 2000 for direct correctional activities<sup>26</sup>. **If Wisconsin DHS and the state and county criminal justice agencies were to carry out studies to evaluate the association between lead poisoning and the probability of criminal behavior, Wisconsin could better evaluate the need for additional lead poisoning prevention initiatives. Is this okay in a background paper?**

<sup>22</sup> Childhood lead poisoning: Conservative estimates of the social and economic benefits of lead hazard control (2009). Gould E; *Environmental Health Perspectives*, 117(7): 1162-67.

<sup>23</sup> The relationship between early childhood blood lead levels and performance on end-of-grade tests (2007). Miranda, ML et al; *Environmental Health Perspectives*, Vol. 115, Number 8, pp. 1242-1247.

<sup>24</sup> US Census Bureau, Public Education Finances, 2007.

<sup>25</sup> <http://www.legis.state.wi.us/lfb/informationalpapers/27.pdf>

<sup>26</sup> Sourcebook of Criminal Justice Statistics Online, <http://www.albany.edu/sourcebook/csv/t110.csv>

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Lead poisoning is preventable. By fixing our old houses with lead paint hazards, the most common source of lead poisoning, there is no doubt that we can reduce the burden carried by our children and by our educational and criminal justice systems. **Wisconsin needs sound data reflecting local and statewide conditions and costs to determine what level of investment is appropriate to eliminate childhood lead poisoning.** Is this okay in a background paper?

#### IV. Current efforts to prevent lead poisoning

##### *State*

Wisconsin Legislative Initiatives. In 1994, the Wisconsin Legislature took a step forward to prevent childhood lead poisoning by enacting 1993 Wisconsin Act 450, which required: (1) the Department develop and implement a comprehensive statewide lead poisoning prevention and treatment program; (2) the Department award grants to fund educational programs, lead screening, care coordination and follow-up services, and administration or enforcement of responsibilities; 3) laboratories and health care providers report all blood lead test results to the Wisconsin Childhood Lead Poisoning Prevention Program. In 2000 the Legislature enacted 1999 Wisconsin Act 113, requiring the Department conduct lead hazard investigations of the primary residence and pertinent secondary dwellings, such as child care centers, associated with children who have elevated blood lead levels. The Legislature also approved HFS 163 to oversee the certification of contractors who are trained as lead abatement supervisors making them eligible to correct lead hazards in properties associated with children who are lead poisoned. In October 2009, that authority was extended to require contractor training for those who will do renovation of child-occupied facilities built before 1978 (new Wisconsin Lead-Safe Renovation rule).

New Wisconsin Lead-Safe Renovation Rule. Recently, Wisconsin became the first state to win EPA approval of its Lead-Safe Renovation Rule. The Environmental Protection Agency published a new rule called the Renovation, Repair and Painting (RR&P) Rule. Wisconsin is the first state to administer this new program. [Wisconsin's Lead Renovation Rule](#) was published on October 19, 2009 and goes fully into effect April 22, 2010, the same day that the federal rule goes into effect.

The rule applies to renovation projects that disturb paint in residential properties and child-occupied facilities, including schools, built before 1978. The rule requires that a contractor must be trained and certified in lead-safe renovation and conduct the work in a lead-safe manner. Wisconsin trainers have begun offering Wisconsin-accredited Lead-Safe Renovation courses and contractors have begun applying to the Department of Health Services (DHS) for Lead-Safe Renovator and Lead-Safe Company certifications.

The new rule will affect many people who never before thought about lead hazards or lead poisoning. As examples of the wide scope of the new rule, consider the following:

According to the 2000 U.S. Census, more than 1.6 million Wisconsin homes were built before 1978 (72% of all Wisconsin homes). Most Wisconsin families with children under the age of six live in homes built before 1978. Approximately 9,000 Wisconsin child care centers are located in homes, churches, schools, etc., many of which were built before 1978. There are more than 3,000

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Wisconsin schools, many with 4- and 5-year-old kindergarten classes, and many were built before 1978. Approximately 15,000 building contractors registered with the Wisconsin Department of Commerce are now affected by this rule. Clearly, the scope of this new rule is broad.

*Buildings Subject to the New Wisconsin Lead-Safe Renovation Rule.* Buildings subject to this rule include housing built before 1978 and child-occupied facilities built before 1978 that are regularly visited by children under age six. Child-occupied facilities may include day care centers and preschools located in churches, commercial buildings, office buildings or stand-alone buildings, and schools with kindergartens or that house children under age six. Hospitals or inpatient treatment facilities housing children under age six are also included.

*Workers Affected by this New Wisconsin Rule.* Anyone who is paid to perform work that disturbs paint in housing and child-occupied facilities built before 1978 must follow the requirements of this rule. Workers affected may include, but are not limited to:

- Residential rental property owners and their employees.
- General contractors who remodel, renovate, or rehabilitate buildings, or replace windows.
- Special trades contractors such as painters, plumbers, carpenters, electricians and flooring refinishers.
- Facility repair and maintenance personnel who disturb more than minimum amounts of paint per room or area (generally work that disturbs more than 6 square feet of paint in an interior room or 20 square feet of paint on the exterior).

Starting immediately, before beginning renovation work, renovation contractors must distribute the EPA “Renovate Right” pamphlet to the owners and occupants of housing and other child-occupied facilities, and obtain a signature of receipt. The renovator must keep the receipt for three years. In addition, the renovation contractor must post information about the renovation project to notify parents of children in child-occupied facilities and make the “Renovate Right” pamphlet available for review.

*Work Practices That Protect Occupants From Lead Exposure.* Lead-Safe Renovators are required by the new Wisconsin rule to provide on-the-job training to uncertified workers on the lead-safe work practices they will use. Certain work practices are prohibited such as power-washing, dry sweeping, and open flame burning. Renovators are to prevent distribution of dust and debris, contain and restrict access to the work area, clean the area daily, use HEPA filtered vacuums and manage waste. When all the work is completed, final cleaning is conducted and cleaning verification must be done with a wet disposable pad and an EPA verification comparison card.

Wisconsin can be proud to be the first state to implement this new federal rule. It will contribute to a growing public awareness of the importance of preventing lead poisoning. For more information about Wisconsin training providers visit the [DHS website](#) or Google: “WI Lead.” The WI-DHS Asbestos and Lead Section may be reached at (608) 261-6876.

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Other Wisconsin Department of Health Services Initiatives - The Wisconsin Childhood Lead Poisoning Elimination Plan. In 2004, a broad-based task force was convened to establish a strategic plan to eliminate childhood lead poisoning in Wisconsin. 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](#) 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, an advisory committee, called the Implementation and Oversight Committee (IOC), was formed. This committee of 50 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 two co-chairs, one from the private sector and one from the public sector, who meet with the chairs of the Education, Targeted Blood Lead Testing, and Housing and Resources Subcommittees 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.

### ***Federal***

The federal government offers competitive grants for preventing lead poisoning. Wisconsin regularly seeks and obtains funding from the US Department of Housing and Urban Development (HUD), the US Environmental Protection Agency (EPA), and the Centers for Disease Control and Prevention (CDC).

Seek Federal Funding Using the State Funding as Proof of Commitment. Wisconsin has been very successful at bringing in federal funds to prevent lead poisoning. Since 2000 alone, Wisconsin has provided \$9 million in state funds and brought in roughly \$59 million in federal funding (six federal dollars for every state dollar provided for lead poisoning prevention and lead hazard reduction).

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Federal funding for childhood lead poisoning prevention to Wisconsin since 2000:

- HUD - \$43 million
- CDC - \$13 million
- EPA – \$3 million

If additional state support were available, Wisconsin could leverage these new state funds to obtain additional federal funds.

### ***International Level - Ban on Lead in Paint***

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. Legislation was passed in 2009 that raises fines, increases funding for the Consumer Product Safety Commission to conduct investigations, and requires independent testing of certain consumer products that might contain lead in paint. That same legislation reduced the allowable limit of lead in paint to 90 ppm. The Chinese government promised implementation of a comprehensive plan to eliminate the use of lead-based paint in toys manufactured in China that are exported to the United States, and to increase the number and frequency of inspections of factories that produce toys and other consumer goods.

While developed countries have implemented standards to regulate the use of lead in paint, much of the paint currently sold for residential use in many countries contains high levels of lead. A recent [study](#)<sup>27</sup> examining lead concentrations in the paint of 10 developing countries demonstrates that 68 % of the new paints tested exceed the U.S. standard of 90 ppm. Published [studies](#)<sup>28</sup> conducted in India, China, and other countries have had similar findings. **How can the Wisconsin Legislature act to strengthen federal efforts to protect Wisconsin residents from unsafe imports? I'm pretty sure this is not okay in a background paper.**

### **Cost of Fixing the Houses in Wisconsin is Enormous but Necessary**

In 2006, more than 466,000 homes in Wisconsin built before 1950 are estimated<sup>29</sup> to contain lead paint hazards. The U.S. Department of Housing and Urban Development estimates it takes \$8,000 per home on average to fix the lead paint hazards. The total needed to fix these Wisconsin homes with lead paint hazards is \$3.7 billion. At the current rate of progress of fixing lead paint hazards in Wisconsin housing, it will take more than 40 years to fix all these homes during which time, thousands of new children will be lead poisoned. Wisconsin needs to find ways to increase the pace of fixing our old homes. We can't wait 40 more years to protect our children!

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<sup>27</sup> Global Study to Determine Lead in New Decorative Paints in 10 Countries (2010), Occupational Knowledge International.

<sup>28</sup> Lead Content in Household Paints in India (2008). Kumar and Gottsfeld, *Science of the Total Environment*, 407: 333–7.

<sup>29</sup> Benefits and Costs of Residential Lead Paint Hazard Control and Window Replacement in Wisconsin (2006). Prepared for the Wisconsin Department of Health and Family Services by David E. Jacobs, National Center for Healthy Housing, and Rick Nevin, ICF Consulting.

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