

WRITTEN STATEMENT OF

DAVID E. JACOBS, Ph.D., CIH

**Research Director,
National Center for Healthy Housing**

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Thank you for the opportunity to discuss recent developments in childhood lead poisoning. Today, I will present the scientific evidence demonstrating the prevalence of this entirely preventable problem and where it is most severe. I will show why housing with lead paint and the contaminated dust and soil it generates remains the main source of exposure for most children today in the U.S. Specifically, I will show how uncontrolled housing rehabilitation that disturbs lead paint and the failure to promulgate a 1992 Congressionally mandated EPA regulation have harmed millions of children in years past and why action is needed to prevent millions more from being harmed in the decades to come. Federally assisted housing has been covered by such a regulation since 1999 and such requirements can readily be extended to cover all children, not just those in federally assisted housing. I will also describe how the reappearance of new residential lead paint from Asia and Africa and other emerging exposures threaten the progress that has been made; the adequacy of existing standards and funding; and other matters. While the nation has made important progress, much more remains to be done if our children are to have a future free of lead poisoning.

I am the Director of Research at the National Center for Healthy Housing (NCHH). We have conducted numerous studies of lead hazards in housing, including the nation's largest and longest-term evaluation of residential lead hazard control, covering 3,000 housing units in 14 jurisdictions across the country. NCHH is a national technical and scientific non-profit organization dedicated to developing and promoting practical measures to protect children from residential environmental hazards while preserving affordable housing. NCHH develops scientifically valid and practical strategies to make homes safe from hazards, to alert low-income families about housing-related health risks, and to help them protect their children. Previously, I served as the Director of the Office of Healthy Homes and Lead Hazard Control at the U.S. Department of Housing and Urban Development from 1995 – 2004. I was the principal author of the first federal interagency strategy to address childhood lead poisoning for the President's Task Force on Environmental Health and Safety Risks to Children, and I have published many scientific studies on the subject. I am also an adjunct associate professor at the School of Public Health at the University of Illinois at Chicago, a faculty associate at Johns Hopkins University and a board-certified industrial hygienist.

Trends in Childhood Lead Poisoning

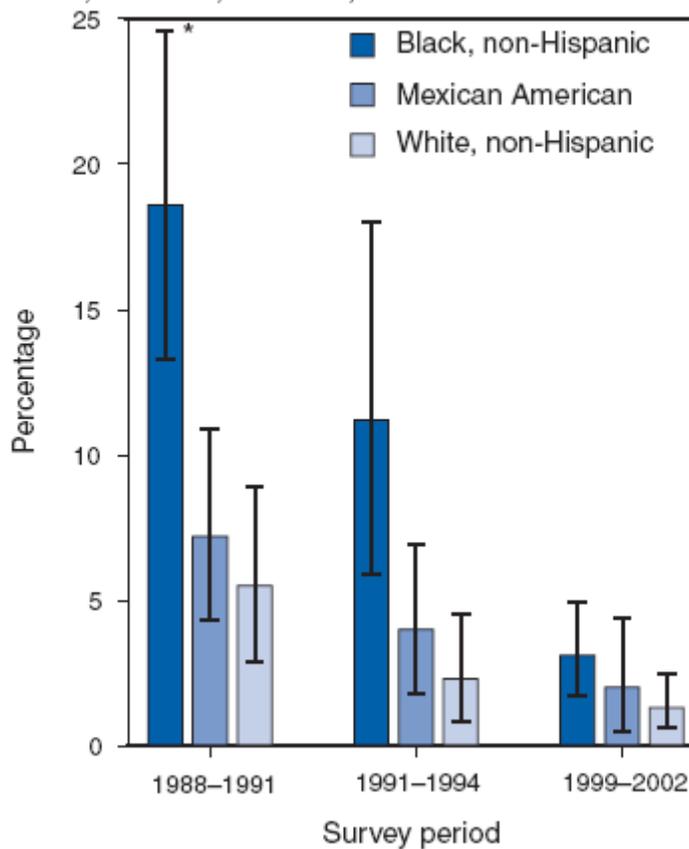
In 1991-94, the Centers for Disease Control and Prevention (CDC) estimated that 890,000 children had blood lead levels greater than 10 µg/dL (micrograms of lead per deciliter of blood).¹ The data also showed that 16% of low-income children and 21% of

¹ Centers for Disease Control and Prevention, "Update: Blood Lead Levels—United States 1991-1994," Morbidity and Mortality Weekly Report, U.S. Department of Health and Human Services/Public Health Service, Vol 46, No.7, Feb 21, 1997, p. 141-146 and erratum in vol 46, No. 26, p. 607, July 4, 1997. Also, Brody et al., Blood lead levels in the U.S. Population: Phase 1 of the third National Health and Nutrition Examination Survey, 1988 to 1991, Journal of the American Medical Association 272(4): 277-283, July 27, 1994 and Pirkle et al., The decline in blood lead levels in the United States, Journal of the American Medical Association 272(4):284-291, July 27, 1994

African-American children living in older housing where lead-based paint is most prevalent were poisoned, compared to 4.4% for the general population at the time. In December of 2000, CDC provided more recent data showing that while some counties had prevalence rates as high as 27%, the average blood lead level in young children had declined by 25% from 1996-99.² The data show that the problem is most severe in older housing in urban areas, although rural areas remain less well characterized.

The most recent CDC published report shows a further decline. During 1999-2002, 310,000 children had blood lead levels above 10 µg/dL, down from 1.7 million in the late 1980s.³ In addition, the racial and ethnic disparities in lead poisoning have been greatly reduced (but not eliminated entirely), as shown in the Figure below.

FIGURE. Percentage of children aged 1–5 years with blood lead levels ≥ 10 µg/dL, by race/ethnicity and survey period — National Health and Nutrition Examination Surveys, United States, 1988–1991, 1991–1994, and 1999–2002



* 95% confidence interval.

² Centers for Disease Control and Prevention, Blood lead levels in young children—United States and Selected States, 1996-1999, *Morbidity and Mortality Weekly Report* 49(50): 1133-1137, December 22, 2000

³ Brody D, Brown MJ, Jones RL, Jacobs DE, Homa D, Ashley PJ, Mosby JE, Schwemberger JG and Doa MJ. *Blood Lead Levels- United States, 1999-2002*, U.S. Centers for Disease Control and Prevention, *Morbidity and Mortality Weekly Report* 54(20) 513-516, May 27, 2005.

(Figure above is reproduced from reference 3.)

The reason for this improvement is that the nation took action. Congress and government agencies mandated that lead exposures from lead solder in food and infant formula canning, gasoline and new residential and toy paint were eliminated. Lead in air emissions, occupational exposures and water all were controlled and older housing with lead paint is continually being rehabilitated, abated or demolished. Studies of the numerous (but often subtle and asymptomatic) harmful effects of lead were completed and a consensus emerged, reflected in a major report from the National Academy of Sciences.⁴ All of these actions have caused average blood lead levels to decline by over 90% since the 1980s, an achievement that ranks as one the nation's most successful public health stories. Yet if no further action is taken, the current rate of childhood lead poisoning, now numbering nearly 300,000 children each year, means that literally millions of children will be unnecessarily poisoned in the decades to come. The means and methods to solve this long-running problem are known and Congress should act.

Housing Is the Largest and Most Important Source of Childhood Lead Poisoning

The evidence is overwhelmingly clear that the major high dose source for most children in the U.S. today is existing lead-based paint in older housing and the contaminated dust and soil it generates.^{5, 6} The existing limit for lead in new residential house paint set by the Consumer Product Safety Commission in the U.S. is 600 parts per million (ppm). But older paints already coating surfaces in housing can be more than 500,000 ppm. These older paints can produce extraordinarily high levels of lead dust, exceeding 9,300 micrograms of lead per square foot ($\mu\text{g}/\text{ft}^2$) from only a single square foot of lead paint in an average sized room.⁷ This is much, much higher than the existing EPA dust lead

⁴ National Academy of Sciences. Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations, Report of the Committee on Measuring Lead in Critical Populations, Board on Environmental Studies and Toxicology, Commission on Life Sciences, National Academy of Sciences. Washington, DC: National Academy Press, 1993.

⁵ Jacobs DE. Lead-based paint as a major source of childhood lead poisoning: A review of the evidence. In: Lead in Paint, Soil and Dust: Health Risks, Exposure Studies, Control Measures and Quality Assurance (Beard ME and Iske SDA, eds). Philadelphia: ASTM STP 1226, American Society for Testing and Materials, 1995;175-187.; Also: McElvaine MD, DeUngria EG, Matte TD, Copley CG, Binder S. Prevalence of radiographic evidence of paint chip ingestion among children with moderate to severe lead poisoning, St. Louis, Missouri, 1989-90, Pediatrics 89:740-742 (1992). Also: Clark CS, Bornschein R, Succop P, Roda S, Peace B. Urban lead exposures of children in Cincinnati, Ohio, Journal of Chemical Speciation and Bioavailability, 3(3/4):163-171 (1

⁶ President's Task Force on Environmental Health Risks and Safety Risks to Children. Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead-based paint Hazards. Washington DC: U.S. Department of Housing and Urban Development and U.S. Environmental Protection Agency, February 2000.

⁷ HUD Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing. 1995. U.S. Department of Housing and Urban Development, Washington DC, Chapter 4.

standard of 40 µg/ft². And it is also why existing lead paint needs urgent attention and must be addressed with great care.

The evidence that housing with lead paint hazards is the main problem comes from several sources. Together with others, I recently published a study showing that the reduction in childhood lead poisoning from 1990 to the present can be largely explained by trends in housing demolition, window replacement and other renovation, and lead paint abatement.⁸ If housing were not the main contributor, then demolition, window replacement and abatement trends would not have tracked the trend in childhood lead poisoning as closely as it actually has.

Furthermore, a HUD survey of the nation's housing stock (conducted in 2000) shows that the estimated number of homes with lead paint declined from 64 million in 1990 to 38 million in 2000, out of a total of about 100 million houses. But of the 38 million housing units with lead paint, 24 million still have significant lead hazards in the form of deteriorated lead paint, contaminated dust, or contaminated bare soil. Over five million of these houses have children under the age of 6, and 1.6 million have low-income families with children under 6, the population most at risk. Forty-one percent of low-income housing has lead paint hazards, compared to 18% of middle and upper income housing.⁹ In short, these housing data are consistent with blood lead surveillance data. The problem is well-defined and the houses likely to pose problems are well-known.

No Regulation of Housing Being Renovated or Repainted

The data also show that the problem is severe in housing undergoing rehabilitation, repair or painting that disturbs lead-based paint, creating dust and soil hazards. Consider the following tragic case study:

(The following description of the Marino case report is reproduced from the HUD Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing, Chapter 4.)

⁸ Jacobs DE and Nevin R. *Validation of a Twenty-Year Forecast of U.S. Childhood Lead Poisoning: Updated Prospects for 2010*, Environ Res 102(3) 352-364, Nov 2006.

⁹ Jacobs DE, Clickner RL, Zhou JL, Viet SM, Marker DA, Rogers JW, Zeldin DC, Broene P and W. Friedman. *The Prevalence of Lead-Based Paint Hazards in U.S. Housing*, Environ Health Perspect 110:A599-A606, Sept 13, 2002. Also see HUD, National Survey of Lead and Allergens in Housing, 2001 (available at www.hud.gov/offices/lead)

The Marino Case Report:

The Marino case report (Marino, 1990) is an example of how uncontrolled renovation work can cause lead poisoning in both adults and children. The dwelling involved was a 2-story, 19th century Victorian farmhouse with 10 rooms. Most of the wooden floors, moldings, walls, ceilings, and door frames had been painted with lead-based paint.

The renovation work included restoration of surfaces by removing the paint down to the bare surface on floors and woodwork and recoating with new varnish. Ceilings were repaired, and wallpaper and paint were removed from a number of walls. Two workers used rotary power sanders, hand sanders, scrapers, torches, heat guns, and chemical paint strippers. The family left the house during most of the renovation work, but returned after it was only partially completed. There was dust throughout the dwelling.

After one of the family's dogs started to have seizures, a veterinarian determined that the dog was lead poisoned. The mother and two children were subsequently tested. The children had blood lead levels of 104 µg/dL and 67 µg/dL, which is 5 to 10 times above the level of concern established by the Centers for Disease Control and Prevention (CDC) (10 µg/dL). The mother had a blood lead level of 56 µg/dL. All three were admitted to a local hospital where they were treated for severe lead poisoning. The mother was 8 weeks pregnant and opted for a therapeutic abortion. A babysitter who had two children of her own sometimes cared for all four children in the home. The babysitter's two children were also tested and found to have blood lead levels of 80 µg/dL and 68 µg/dL. These two children were also hospitalized and treated for severe lead poisoning.

HUD issued a regulation that controlled exposures from federally assisted housing undergoing renovation, repair or painting (as well as other forms of assistance). The regulation was issued in 1999, had a one-year phase-in period and finally took full effect in 2001.¹⁰ The experience with the HUD regulation shows that renovation and repair work can be done safely and is feasible and effective. But of course it only covers federally assisted housing, which is only a small fraction of the houses at risk. The cost of implementing that regulation in its first year was approximately \$253 million, but the benefits were a minimum of \$1.1 billion, yielding a net benefit of at least \$890 million in the first year alone.¹¹ It is worth noting that the U.S. Office of Management and Budget approved the economic analysis accompanying the HUD regulation.

There was every expectation that EPA would quickly follow suit in 2000 and regulate renovation, remodeling and painting activities in housing that does not receive federal assistance, as required by Congress in 1992.¹² Yet it is now eleven years after Congress required that this rule be passed, and neither the Clinton nor the Bush Administrations have issued a final regulation. EPA's own estimate is that the regulation would protect 1.1 million children each year.

¹⁰ 24 CFR Part 35

¹¹ Nevin R, Weitz S, Jacobs DE. *Regulatory Impact Analysis of the Proposed Rule on Lead-Based Paint Hazard Evaluation and Reduction for Federally-Supported Housing*, ICF Corporation, Washington DC, September 8, 1995, final Economic Analysis published in September, 1999.

¹² Title X of the 1992 Housing and Community Development Act

The question now before us is simply this: Why should children living in unassisted housing receive no protection, while those living in federally assisted housing are protected? All children should be able to live in homes without lead hazards.

The net economic benefits of EPA's regulation are even larger than those associated with the HUD regulation, because the EPA regulation covers more housing units. The current estimates are that the EPA regulation achieves net benefits of between \$2.6 billion to \$7.5 billion annually.¹³ In short, the EPA regulation makes both good policy and good economic sense.

The evidence that uncontrolled housing renovation, repair and painting activities cause lead poisoning is overwhelming. NCHH and others have reviewed this extensive evidence base in earlier testimony provided to EPA.¹⁴ The administration did finally propose a regulation covering these activities nearly two years ago, but only after bipartisan pressure from Congress. However, the proposed regulation is badly flawed. The proposed regulation would allow dangerous methods of removing lead paint, such as power sanding, abrasive blasting, and burning. All of these methods are now prohibited in federally assisted housing and in many local jurisdictions, because they create extraordinarily high levels of lead dust that is virtually impossible to clean up and pose large exposures to workers (one of my studies showed that workers engaged in these activities have exposures to lead of 11,000 micrograms per cubic meter, well above the OSHA limit of 50 micrograms per cubic meter).¹⁵ When these practices are permitted, the cost of cleaning up a single house has been shown to be nearly \$200,000.¹⁶ The cost of doing this work safely is a tiny fraction of that.

The proposed regulation would also implement cleaning methods that research has found to be ineffective¹⁷ and an entirely unproven lead dust testing method at the end of the job to ensure the dwelling is safe for children to occupy. There are established cleaning and

¹³ Economic Analysis for the Renovation, Repair and Painting Proposed Rule. Feb 2006. http://www.epa.gov/lead/pubs/rrp_nprm_ea_revised.pdf

¹⁴ National Center for Healthy Housing, Comments Regarding Dangerous Work Practices in EPA's Proposed Regulation on Renovation, Repair and Painting. EPA Docket EPA-HQ-OPPT-2005-0049, March 24, 2006. Available at: http://www.nchh.org/NCHH_Comment_Dangerous_Work_Practices_Final_3_24_06.pdf

¹⁵ Jacobs DE. Occupational Exposures to Lead-Based Paint in Structural Steel Demolition and Residential Renovation, International Journal of Environment and Pollution 9:1 126-139, Inderscience Enterprises, United Nations Educational, Scientific and Cultural Organization, Switzerland, 1998.

¹⁶ Jacobs DE, Mielke H, Pavur N. The High Cost of Improper Lead-Based Paint Removal, Env Health Perspectives 111:185-186, 2003.

¹⁷ Comments from NCHH on Two New Studies in the EPA Docket, April 16, 2007. Available at: http://www.nchh.org/Comment_on_EPA_and_NAHB_Studies_Final_4-15-07.pdf

lead dust testing procedures¹⁸ that are known to achieve very low dust lead levels, up to six years following the repairs.¹⁹ In particular, dust testing after the work has been completed is essential to ensuring that cleaning has been adequate. Without dust testing, many houses will contain high levels of lead dust, which is not necessarily visible to the naked eye. The absence of dust testing places children unnecessary risk.

Recently, the National Center for Healthy Housing worked with the National Association of Home Builders to once again prove that uncontrolled methods of paint removal and housing renovation result in very high dust lead levels.²⁰ The evidence is clear that renovation, repair and painting can produce high dust lead levels. The Administration should quickly promulgate a final, responsible regulation to eliminate excessive exposures caused by lead from housing renovation, repair and painting and should follow the procedures already in place in the HUD regulation.

The EPA regulation would also cover weatherization programs. These programs often disturb lead-based paint and create lead dust hazards. NCHH, in collaboration with Oak Ridge National Laboratories, recently completed a study for the Department of Energy. The study showed that between 29% and 70% of the floors in the nearly 60 houses studied had higher dust lead levels following weatherization than before the work began or were above the existing EPA dust lead standards after the work was completed.²¹ This means that improved cleanup measures and dust testing after the work has been completed are needed (DOE does not currently require lead dust testing after the work is finished, unlike the other federal programs). Families receiving weatherization assistance should not have their children inadvertently poisoned in the process.

Incomplete HUD Regulation

It is worth noting that the HUD regulation remains incomplete. Only one HUD housing program remains that did not incorporate modern lead hazard control methods and was not covered in 1999, but it is an important one--the single family mortgage insurance program. A section of the HUD regulation is reserved for final action for this program (24 CFR Part 35, Subpart E), but no such action has been forthcoming since 1999. Why should children who live in housing with multi-family mortgage insurance be covered, while children who live in housing with single-family mortgage insurance

¹⁸ HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Department of Housing and Urban Development, Washington DC, 1995

¹⁹ Wilson J, Pivetz T, Ashley PJ, Strauss W, Jacobs DE, Menkedick J, Dixon S, Tsai HC, and V. Brown, Evaluation of HUD-Funded Lead Hazard Control Treatments at Six Years Post-Intervention, Environ Res. 102(2) 237-48 Oct 2006.

²⁰Comments from NCHH on Two New Studies in the EPA Docket, April 16, 2007. Available at: http://www.nchh.org/Comment_on_EPA_and_NAHB_Studies_Final_4-15-07.pdf

²¹ National Center for Healthy Housing, Analysis of Lead-Safe Weatherization Practices and the Presence of Lead in Weatherized Homes, March 14, 2007. Available at: http://www.nchh.org/html/doe_study.htm

remain unprotected? HUD should finalize its regulation so that all children in federally assisted housing are protected.

The Low-Income Housing Tax Credit Program

Furthermore, the Low Income Housing Tax Credit program, which is perhaps the federal government's largest housing construction and rehabilitation program, does not have explicit lead-based paint requirements. This means that approximately 14,000 housing units are rehabilitated each year without regard to lead-based paint hazards.²²

Taxpayers should not be subsidizing housing rehabilitation that could poison children.

Funding

In 2000, the federal government estimated that a minimum of \$2.4 billion would be needed to address lead paint hazards in housing. To date, less than half of that amount has actually appropriated. Indeed, although housing remains the most important source of exposure to lead for most children today in the U.S., major funding reductions have been proposed for the past several years by this Administration. For example, last year the President proposed only \$115 million for HUD's lead hazard control and healthy homes program, well below the \$175 million appropriated in recent years, out of a total HUD budget of over \$30 billion. A long-standing bipartisan Congressional coalition has consistently resisted these reductions and restored some of the funding. Yet funding still remains well below the levels needed to eliminate the problem by 2010, a goal that has been embraced in theory by this Administration and previous ones.²³ Neither the Bush nor Clinton Administrations have ever proposed full funding of the federal government's lead poisoning prevention activities in housing.

Furthermore, there have been reductions in funding for important lead poisoning prevention programs at CDC and EPA, which are also hampering the nation's efforts to address the problem.

The federal programs need to be fully funded if they are to be effective in protecting the nation's children.

²² Jacobs DE. *The Low Income Housing Tax Credit and Childhood Lead Poisoning Prevention Final Report*, Prepared for the Centers for Disease Control and Prevention, Contract 200-2006-M-18771, April 15, 2007.

²³ *Eliminating Childhood Lead Poisoning: A Federal Strategy*, President's Task Force on Children's Environmental Health Risks and Safety Risks, Washington DC (March 2000). Available at: <http://www.hud.gov/offices/lead/reports/fedstrategy.cfm>

Existing Standards

Lead Dust

Lead-contaminated settled dust is known to be a major exposure pathway and its effect on children's blood lead has been demonstrated in numerous studies that have been analyzed elsewhere.²⁴ In 1999 and 2001 respectively, the U.S. Department of Housing and Urban Development and the U.S. Environmental Protection Agency established lead dust standards for the home environment.²⁵ Generally, the standards were based on three criteria:

- Health and the relationship between dust lead and children's blood lead;
- Feasibility of meeting and maintaining compliance with the standards; and
- Laboratory detection (reporting) limit capabilities.

Below, I present new evidence for each of these three considerations, which suggests the dust lead standards can and should be lowered.

The EPA and HUD standard for dust lead on floors was set to protect 95% of children from developing a blood lead level ≥ 15 $\mu\text{g}/\text{dL}$ (the environmental intervention level established by CDC in 1991), holding all other measured exposures (e.g., soil, dust, water) to their national averages (blood lead levels are discussed further below). The EPA and HUD floor dust lead standard is 40 micrograms of lead per square foot of floor ($\mu\text{g}/\text{ft}^2$).

After the HUD and EPA standards were promulgated, we published a study showing that a floor dust lead level ≤ 15 $\mu\text{g}/\text{ft}^2$ achieved the highest specificity and sensitivity (77% and 58%, respectively), suggesting that such a standard would be both most protective of health and at the same time be least likely to produce false cause for concern.²⁶

Furthermore, new evidence has emerged that a lower dust lead level is feasible in today's housing. New national estimates of the prevalence of lead dust in US housing were published in 2002.²⁷ That study showed that only 5% of homes had dust lead levels

²⁴ Lanphear et al. Lanphear BP, Matte TD, Rogers J, Clickner RP, Dietz B, Bornschein RL, Succop P, Mahaffey KR, Dixon S, Galke W, Rabinowitz M, Farfel M, Rohde C, Schwartz J, Ashley P, Jacobs DE. The Contribution of Lead-Contaminated House Dust and Residential Soil to Children's Blood Lead Levels: A Pooled Analysis of 12 Epidemiologic Studies, *Env. Research*, 79:51-68, 1998

²⁵ 24 CFR Part 35 (HUD) and 42 CFR Part 745 (EPA)

²⁶ National Center for Healthy Housing, Study of HUD's Risk Assessment Methodology in Three US Communities, Final Report, June 30, 2006.

²⁷ Jacobs DE, Clickner RL, Zhou JY, Viet SM, Marker DA, Rogers JW, Zeldin DC, Broene P and Friedman W. The Prevalence of Lead-Based Paint Hazards in U.S. Housing, *Environ Health Perspect* 110:A599-A606, Sept 13, 2002. And: U.S. Department of Housing and Urban Development, National Survey of Lead and Allergens, Volume 1, Analysis of Lead Hazards, Prepared by Westat, Oct 31, 2002 Jacobs EHP and HUD report

above 13 $\mu\text{g}/\text{ft}^2$ and the geometric mean was only 1 $\mu\text{g}/\text{ft}^2$. In addition, new data from high-risk houses that were examined six years after hazard control was completed showed that dust lead levels on floors continued to decline, reaching a geometric mean of only 4.8 $\mu\text{g}/\text{sq ft}$.²⁸ In high-risk houses enrolled in the large-scale Evaluation of the HUD Lead Hazard Control Grant program (which was conducted in the mid-to-late 1990s), the median dust lead level immediately following lead hazard control work was 17 $\mu\text{g}/\text{ft}^2$, which declined to a median level of 14 $\mu\text{g}/\text{ft}^2$ one year later.²⁹ In the preamble to its regulations, HUD and EPA stated that this demonstrated the feasibility of both meeting and continuing to maintain compliance with a floor lead dust standard of 40 $\mu\text{g}/\text{ft}^2$.

But the new data now show that this standard is obviously well above the average level in high risk homes, and also greatly above the average level in all U.S. housing. Together, these data demonstrate that a dust lead standard of $\leq 15 \mu\text{g}/\text{ft}^2$ is feasible.

The final issue is whether or not a lower floor dust lead level can be measured reliably. A method detection limit used by laboratories should be lower than a regulatory standard to ensure measurement reliability and avoid the possibility that a level above the standard is due to laboratory or sampling error and not actual non-compliance with the standard. At the time the HUD and EPA standards were promulgated, many analytical laboratories used a method detection limit of 25 μg per sample, so HUD and EPA stated that a standard of 40 $\mu\text{g}/\text{ft}^2$ could be measured reliably, since laboratories could measure levels well below the standard. Laboratories have since improved and most laboratories today use a detection limit of only 3-5 $\mu\text{g}/\text{sample}$.³⁰

Together, this evidence shows that lead dust loadings at the existing Federal standard for floors of $\leq 40 \mu\text{g}/\text{ft}^2$ produces harm in too many children and that lower levels are both feasible and can be reliably measured as new research and technology have advanced in the years since the 1999 HUD and 2001 EPA standards were promulgated. By reducing the allowable floor dust lead loading from $\leq 40 \mu\text{g}/\text{ft}^2$ to $\leq 15 \mu\text{g}/\text{ft}^2$, the percentage of children who would be protected from developing a blood lead level $\geq 15 \mu\text{g}/\text{dL}$ would be cut in half, from 4.7% to 2.1%. Because no safe level of exposure to lead has been established, dust lead levels should be kept as low as possible.

Historically, allowable dust lead standards have been reduced, as research has progressed. In the early 1990's, Maryland enacted a floor lead dust standard of $\leq 200 \mu\text{g}/\text{sq ft}$.³¹ EPA

²⁸ Wilson J, Pivetz T, Ashley PJ, Strauss W, Jacobs DE, Menkedick J, Dixon S, Tsai HC, and Brown V. Evaluation of HUD-Funded Lead Hazard Control Treatments at Six Years Post-Intervention, Environ Res. 102(2) 237-48 with Oct 2006.

²⁹ National Center for Healthy Housing. 2004. Evaluation of the HUD Lead Hazard Control Grant Program, Final Report, National Center for Healthy Housing and University of Cincinnati, Columbia, MD

³⁰ Personal Communication, S. Roda, University of Cincinnati Lead Reference Laboratory, 2007

³¹ Maryland Annotated Code 26.02.07

issued guidance in 1995 lowering the floor dust lead standard to $\leq 100 \mu\text{g}/\text{sq ft}$.³² And in 1999-2001, HUD and EPA promulgated a floor dust lead standard of $\leq 40 \mu\text{g}/\text{ft}^2$ which has since remained unchanged.

In short, the evidence supports a further reduction in the lead dust standard. The evidence shows that a standard of $15 \mu\text{g}/\text{ft}^2$ or lower for floors will reduce harm to children significantly and is both feasible and measurable.

Blood Lead Levels

The preceding discussion of dust lead standards is based on protecting children from developing a blood lead level that would require an intervention under current CDC Guidelines and HUD regulations, which were developed in 1991 and 1999, respectively. It should be noted that the federal environmental intervention level is above the CDC level of concern, which is $\geq 10 \mu\text{g}/\text{dL}$.

Importantly, the CDC level of concern was not established to be a “safe” or “normal” level, although some have used it in this fashion. As early as 1991, CDC reported that adverse health effects could be seen at blood lead levels below $10 \mu\text{g}/\text{dL}$.³³ More recent evidence from multiple studies, reviewed by CDC itself, has confirmed the 1991 CDC Statement that no safe level of lead exposure has been found.^{34 35}

Physicians and other medical professionals have in recent years suggested that CDC should lower its current blood lead level of concern. While the level of concern has declined over the years from $60 \mu\text{g}/\text{dL}$ to $30 \mu\text{g}/\text{dL}$ to $25 \mu\text{g}/\text{dL}$ to the current level of $10 \mu\text{g}/\text{dL}$, I believe that further reductions are unlikely to actually help prevent exposures. This is because blood lead levels should not be used to trigger exposure prevention. Instead of waiting for a child to produce a blood lead level of 2, 5, 10, or $15 \mu\text{g}/\text{dL}$ (or any other level), we should eliminate exposures *before* harm occurs. Quite simply, this means that we should not wait for a child’s blood lead level to increase before taking action. Primary prevention (taking action to prevent exposure) is much more important than adherence to a medical approach that is limited to treating children only after they

³² U.S. Environmental Protection Agency. Guidance on Identification of Lead-Based Paint Hazards; Notice. Federal Register Vol 60 No. 175 Sept 11, 1995 p. 47248

³³ Preventing Lead Poisoning In Young Children: A Statement by the Centers for Disease Control and Prevention, October 1991. Available at: <http://www.cdc.gov/nceh/lead/publications/books/plpyc/contents.htm>

³⁴ A Review of the Evidence of Health Effects of Blood Lead Levels $\leq 10 \mu\text{g}/\text{dL}$, Feb 23, 2004. Available at: <http://www.cdc.gov/nceh/lead/ACCLPP/meetingMinutes/lessThan10MtgMAR04.pdf>

³⁵ Canfield, Richard L., Christopher R. Henderson, Deborah Cory-Slechta, C. Cox, Todd A. Jusko, and Bruce P. Lanphear 2003. Intellectual impairment in children with blood lead levels below $10 \mu\text{g}/\text{dL}$. The New England Journal of Medicine, 348, 1517-1522 and Lanphear et al. 2005. Low-level environmental lead exposure and children’s intellectual function: An international pooled analysis Env Health Perspectives 113:894-899.

have been harmed. The nation should be testing and abating houses and other sources to prevent exposure, not just use children as detectors of lead problems. In order to avoid the perception that a blood lead level of 10 µg/dL or 5 µg/dL is “normal” or “safe,” CDC and other medical authorities might considering labeling blood lead levels between 2 and 10 µg/dL what they really are: “above average.”

The important point is that all exposures should be kept as low as possible, because no safe level of exposure to lead has been established.

Lead-Safe Window Replacement

Together with colleagues, I have recently published a study showing that window replacement is particularly important. Specifically, replacing single-pane windows in older housing (nearly all such windows are known to have lead paint) will achieve net benefits of at least \$67 billion over ten years.³⁶ Window replacement has emerged as a major form of controlling lead-based paint hazards, because more than any other building component, windows are known to contain the highest levels of lead paint and lead-contaminated dust.³⁷ The benefits come from reduced childhood lead poisoning, lower utility bills from heating and cooling, and increased market value. Yet energy conservation professionals often fail to recommend window replacement with energy-efficient windows, and lead hazard control programs are often unable to afford this expense in light of reduced funding. In short, a lead-safe window replacement incentive can make a major impact on preventing childhood lead poisoning, while also achieving improved energy conservation and increased home value--all at the same time.³⁸

Federal energy, environmental, and housing policies, together with local utility programs and policies should be modified to encourage homeowners and others to replace lead contaminated windows with new energy-efficient ones.

Emerging Threats

The nation is now faced with emerging exposures that threaten the progress we have made. New residential lead-based paint is now being manufactured in several Asian countries³⁹ and in Nigeria⁴⁰ and likely elsewhere. The concentrations of lead in these

³⁶ Nevin R, Jacobs DE, Berg M, Cohen J. Monetary benefits of preventing childhood lead poisoning with lead-safe window replacement, Environ Res (accepted, in press)

³⁷ Jacobs DE, Clickner RL, Zhou JL, Viet SM, Marker DA, Rogers JW, Zeldin DC, Broene P and W. Friedman. The Prevalence of Lead-Based Paint Hazards in U.S. Housing, Environ Health Perspect 110:A599-A606, Sept 13, 2002.

³⁸ Nevin R and Jacobs DE. Windows of Opportunity: Lead Poisoning Prevention, Housing Affordability and Energy Conservation, Housing Policy Debate 17(1): 185-207, 2006.

³⁹ Clark CS, et al. 2006. The lead content of currently available residential paint in several Asian countries. Environ Res 102: 9-12

paints is enormous, exceeding 100,000 parts per million (ppm). By comparison, the existing US standard for lead in residential paint is 600 ppm.

It is bad enough that these countries are contaminating their own houses and putting their own workers and children at great risk. But in today's global economy, it is only a matter of time before these products appear in the U.S., re-contaminating the very houses that taxpayers and parents have already spent billions cleaning up.

The table below presents some of the recent data collected by my colleague, Dr. Scott Clark from the University of Cincinnati, and his co-workers. The table is reproduced from reference 39.

Lead level in parts per million of different colors of paint sold in Nigerian and selected Asian countries, Ibadan, 2007

| Color | Country | | | | | | | | | |
|--------|---------|----------|---------|----------|----------|----------|-----------|--------|--------|--------|
| | Nigeria | | India | | Malaysia | | Singapore | | China | |
| | Median | Mean | Median | Mean | Median | Mean | Median | Mean | Median | Mean |
| | N | (SD) | N | (SD) | N | (SD) | N | (SD) | N | (SD) |
| Yellow | 40,515 | 42,271 | 114,968 | 124,892 | 61,582 | 57,553 | 9.2 | 498 | 73,440 | 73,440 |
| | 4 | (5393) | 4 | (46,235) | 14 | (54,500) | 8 | (1222) | 1 | – |
| Red | 24,457 | 23,744 | 6804 | 36,993 | 25,992 | 30,227 | 273 | 469 | 30,725 | 30,725 |
| | 4 | (15,877) | 3 | (55,094) | 8 | (3364) | 4 | (626) | 2 | (869) |
| Green | 12,216 | 15,976 | 39,155 | 31,780 | 33,372 | 38,556 | 13.2 | 15.2 | 6037 | 6037 |
| | 3 | (9410) | 3 | (13,041) | 4 | (33,810) | 4 | (17.9) | 1 | – |
| White | 4110 | 3035 | 1562 | 1562 | 124 | 124 | 3.1 | 3.1 | 185 | 185 |
| | 5 | (1864) | 1 | – | 1 | – | 2 | (4.3) | 1 | – |
| Blue | 3615 | 3457 | 3366 | 3367 | 2033 | 2485 | 48 | 48 | – | – |
| | 5 | (1729) | 1 | – | 3 | (2574) | 1 | – | – | – |

These emerging threats are not limited to paint. Lead contaminated toy jewelry has already caused deaths in at least one child⁴¹ and has likely exposed many others. There is no reason for lead to be used in any children's product, including plastic toys. Other non-toxic stabilizers and additives can and should be used, as has been done in house paint here in the U.S.

This does not mean that all uses of lead should be eliminated. Some applications have important uses and can be properly managed. Shielding around X-ray machines and use in batteries that are required to be recycled are two such examples.

Conclusion

Lead paint in housing remains the largest and most significant source of exposure for U.S. children today. Programs to address this problem should be fully funded and regulations should be promulgated to prevent exposures from housing renovation, repair and painting.

⁴⁰ Adebamowo EB, et al. 2007. Lead content of dried films of domestic paint currently sold in Nigeria. Science of the Total Environ. Article in Press. Available on line at www.sciencedirect.com

⁴¹ KK Berg et al. 2006. Death of a child after ingestion of a metallic charm. Morbidity and Mortality Weekly Report 55(12) 340-341

If there is one lesson from the nation's experience with lead poisoning, it is simply this:

Once non-essential uses of lead are permitted to enter commerce in dispersed forms such as paint, gasoline, food canning, toys and others, it is very difficult to prevent exposure or to manage it after the fact. It is far more costly to clean up the contamination than to prevent it at the outset. Government policies should prevent all non-essential uses of lead, especially the emerging use of lead in new house paint from other countries.

Recommendations

1. Require EPA to promulgate a responsible and effective regulation to prevent lead exposures from housing renovation, repair, painting and weatherization without further delay. Authorize a program to stimulate the replacement of old single-pane windows in older housing, which will achieve net benefits of at least \$67 billion over 10 years in lead poisoning prevention, reduced energy consumption, and increased home market value.
2. For the first time, fully fund federal lead poisoning prevention programs at EPA, CDC and HUD. These programs have been proven to work. The Administration's repeated attempt to reduce funding in recent years has been rebuffed by a bi-partisan consensus in Congress, but funding still remains well below the recognized need.
3. Mandate that the Consumer Product Safety Commission and other agencies with regulatory authority over international trade take steps to prevent new residential lead-based paint and other lead-contaminated consumer products from being manufactured for U.S corporations or imported. Provide the CPSC and other agencies with adequate resources to carry this out.
4. Initiate actions to eliminate all non-essential uses of lead.
5. Require HUD to complete its lead regulations by modernizing its lead requirements for single family housing mortgage insurance (24 CFR Part 35, Subpart E.)
6. Require EPA to reduce the floor dust lead standard to 15 $\mu\text{g}/\text{ft}^2$ or less. Such a reduction will protect more children, is feasible, and is measurable.
7. Require the Department of Energy to improve cleaning methods and to conduct clearance dust lead testing after weatherization work that disturbs lead-based paint.