

LEAD AND CHILDREN'S HEALTH

HEARING
BEFORE THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ONE HUNDRED TENTH CONGRESS
FIRST SESSION

OCTOBER 18, 2007

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ONE HUNDRED TENTH CONGRESS
FIRST SESSION

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LEAD AND CHILDREN'S HEALTH

THURSDAY, OCTOBER 18, 2007

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The full committee met, pursuant to notice, at 9:34 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the full committee) presiding.

Present: Senators Boxer, Barrasso, Bond, Cardin, Craig, Inhofe, Klobuchar, and Whitehouse.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. I want to welcome all my colleagues. I am sorry I was running 5 minutes behind schedule. We call to order the hearing on lead and children's health. I think we have some very important people to hear from on this. We will each be given 5 minutes for an opening statement, and then we will go to the witnesses.

We have known for decades that lead is highly toxic, and with every passing year more scientific studies show that lead harms our kids at even lower levels than previously believed. What does it do? Lead damages kids' brains, impairs their learning, reduces their IQs and can cause behavioral problems.

Along with millions of other parents and grandparents across the Country, I am outraged that lead still is in wide use, especially in products designed for children. I just became a grandmother for the second time. My little guy is 3 months old and he is starting to put everything into his mouth. My children are trying to follow what products are safe and what products aren't safe. But to tell you the truth, as vigilant as they are, they are very concerned, and the little one just loves all the bright colors. But you just can't help but worry is something wrong here.

There has recently been what seems like an endless stream of recalls of our children's toys, jewelry and other products containing toxic lead levels. This includes over 1.5 million Mattel toys contaminated with lead paint. These Mattel recalls included Sesame Street and Nickelodeon characters such as Elmo, Tub Sub, the Dora the Explorer backpack, and the Giggle Gabber, a toy shaped like Elmo or Cookie Monster, and many Barbie accessories.

We invited Mattel to testify at this hearing to explain why their products have been lead-contaminated and what they are doing about the problem. Mattel accepted the invitation, but then they backed out earlier this week. We intend to follow up with the com-

pany on their failure to participate in this hearing. It is important for companies like Mattel to be part of the discussion about what has caused this problem, and about the steps necessary to address the issue in the future. There is no excuse for their failure to appear before this committee today. They had nothing to fear, and they could help us understand what is happening.

Lead contamination of children's products can have extremely serious consequences. In 2006, a 4-year old child in Minnesota swallowed a heart-shaped metal charm from a bracelet that came with Reebok sneakers. Tests showed his blood lead level was three times the level that is considered a medical emergency, and the child died 6 days later. If you could just pass that around to my colleagues, I would appreciate it. We will have the staff help us do that. Three hundred thousand of these Reebok charms were recalled.

In 2003, a 4-year old in Oregon got violently ill and an x-ray showed that he had swallowed a vending machine medallion. He had surgery to remove the object, which was 39 percent lead. His blood level was 12 times the CDC lead safety level. His life was saved by a painful treatment that uses chemicals to take the lead out of the body.

In 2004, a 5-year old child in San Jose, CA was tested for lead at the suggestion of her school. Her blood lead levels were nearly three times higher than the CDC risk level. Charms that she put into her mouth were found to contain lead.

These are but a few examples of the kinds of children's products contaminated with lead. Among the other recalls are 35,000 Baby Einstein blocks contaminated with lead paint. How ironic that these very blocks that should be helping babies learn were actually contaminated with a brain toxin that could lower a child's IQ.

Thousands of Wal-Mart bibs which babies often put in their mouths that contained high lead levels were recalled. These bibs were recalled by Wal-Mart after investigation by Illinois authorities, and there they are.

Lunch boxes distributed by health officials in California and labeled "eat five a day for better health" were contaminated with excess lead. Over 1.5 million Thomas and Friends railway toys with lead paint were recalled.

In all, there have been over 60 recalls of over 9.5 million lead-contaminated products in 2007, and this is just the tip of the iceberg. With more testing comes more recalls. But these lead toys in kids' products are not the only source of lead in kids' blood. Some of the other most significant sources of lead exposure for children include deteriorating lead-based paint, lead-contaminated dust, lead-contaminated residential soil, lead in drinking water, lead in food contact surfaces such as certain dishware and pottery.

Parents are stunned. They are confused. They are terribly worried, and the Government, in my view, simply hasn't done one of its most important jobs—protecting children from harm.

The failure of the Consumer Product Safety Commission to protect the public from kids' toys has received widespread publicity recently. I sit on the Commerce Committee and I commend them, both sides of the aisle, for looking at this.

But I want to focus attention on EPA's failure to use its power, and it has the power, to protect our children from lead in products.

We will hear from a witness later today that EPA explicitly denied a petition to use the agency's authority over the Toxic Substances Control Act to address these risks. Only after a lawsuit from the Sierra Club and Improving Kids' Environment did EPA begin to act. If EPA had taken action in response to the April, 2006 petition, the agency could at least have had very useful information on quality control and other procedures of companies such as Mattel, before the massive toy recalls.

EPA's failure to act on this petition is similar to its failure to adopt strong guidelines for lead paint remediation. It also reminds me of the agency's recent announcement that EPA is considering the possibility of revoking the standard for lead in air. They are moving in the wrong direction.

I know I have gone over my time, so I will put the rest of my statement in the record, and say this. It is our moral obligation to protect our children from this devastating poison. I intend to do my best and work across the aisle to do this.

[The prepared statement of Senator Boxer follows:]

STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE
STATE OF CALIFORNIA

We have known for decades that lead is highly toxic. And with each passing year, more scientific studies show that lead harms our children at even lower levels than previously believed. Lead damages kids' brains, impairs their learning, reduces their IQs, and can cause behavioral problems.

Along with millions of other parents and grandparents across the country, I am outraged that lead still is in wide use, especially in products designed for children. This is absolutely inexcusable and unacceptable.

There has recently been what seems like an endless stream of recalls of kids' toys, jewelry, and other products containing toxic lead levels. This includes over 1.5 million Mattel toys contaminated with lead paint.

These Mattel recalls included Sesame Street and Nickelodeon characters such as the Elmo Tub Sub, the Dora the Explorer Backpack, and the Giggle Gabber, a toy shaped like Elmo or Cookie Monster, and many Barbie accessories.

We invited Mattel to testify at this hearing to explain why their products have been lead-contaminated and what they are doing about the problem. Mattel accepted the invitation, but then they backed out earlier this week. We intend to follow-up with the company on their failure to participate in this hearing. It is important for companies like Mattel to be part of the discussion about what has caused this problem, and about the steps necessary to address the issue the future. There is no excuse for their failure to appear before this Committee today.

Lead contamination of children's products can have extremely serious consequences. In 2006, a 4-year old child in Minnesota swallowed a heart-shaped metal charm from a bracelet that came with Reebok sneakers. Tests showed his blood-lead level was three times the level that's considered a medical emergency. The child died 6 days later.

300,000 of these Reebok charms were recalled. One of these charms is on the table in front of us.

In 2003, a 4-year old in Oregon got violently ill, and an x-ray showed that he had swallowed a vending machine medallion. He had surgery to remove the object, which was 39 percent lead. His blood lead level was 12 times the CDC lead safety level. His life was saved by a chelation, a painful treatment that uses chemicals to take the lead out of the body.

In 2004, a 5-year old child in San Jose, California was tested for lead at the suggestion of her school. Her blood level levels were nearly three times higher than the CDC risk level. Charms that she put into her mouth were found to contain lead.

These are but a few examples of the kinds of children's products contaminated with lead. Among the other recent recalls are:

- 35,000 Baby Einstein blocks contaminated with lead paint. How ironic that the very blocks that should be helping babies learn, were actually contaminated with a brain toxin that could lower kids' IQs.

- Thousands of bibs, which babies often put in their mouths, that contained high lead levels. These bibs were recalled by Walmart after an investigation by Illinois authorities.
- Lunch boxes, distributed by health officials in California and labeled “Eat 5 a Day for Better Health,” that were contaminated with excess lead.
- Over 1.5 million Thomas & Friends Railway toys with lead paint.

In all, there have been over 60 recalls of over 9.5 million lead-contaminated products in 2007. And this clearly is just the tip of the iceberg. With more testing come more recalls.

But these lead toys and kids’ products are not the only source of lead in kids’ blood. Some of the other most significant sources of lead exposure for children include deteriorating lead-based paint, lead-contaminated dust, lead-contaminated residential soil, lead in drinking water, and lead in food-contact surfaces such as certain dishware and pottery.

Parents are stunned, confused, and terribly worried. And the government simply has not done one of its most important jobs—protecting children from harm.

The failure of the Consumer Product Safety Commission to protect the public from kids’ toy threats has received widespread publicity recently. I want to focus attention on EPA’s failure to use its powers to help protect our children from lead in children’s products, and how EPA’s authorities can be strengthened.

We will hear from a witness later today that EPA explicitly denied a petition to use the agency’s authority under the Toxic Substances Control Act (TSCA) to address many of these risks. Only after a lawsuit from the Sierra Club and Improving Kids’ Environment did EPA begin to act.

If EPA had taken action in response to the April 17, 2006, TSCA petition, the agency could at least have had very useful information on quality control and other procedures at companies such as Mattel, before the massive toy recalls revealed this serious problem to millions of Americans.

EPA’s failure to act on this petition and use its Toxic Substances Control Act authorities to crack down on lead is similar to its failure to adopt strong guidelines for lead paint remediation. It also reminds me of the agency’s recent announcement that EPA is considering the possibility of revoking the standard for lead in air. EPA clearly needs to take lead contamination far more seriously.

The good news is that when EPA and Government agencies are doing their jobs, they can reduce children’s lead poisoning risks. From the late 1970’s through the 1990’s, EPA and other agencies took several actions including phasing out lead in gasoline and banning lead paint. According to the Centers for Disease Control and Prevention (CDC), the number of kids CDC considers lead-poisoned dropped from 13.5 million in 1978 to 310,000 children in 2002. So when agencies put their minds to it, and have the will, we can make a big difference.

But we still have a lot of work to do. According to a Work Group of independent scientists convened by the CDC in 2004, recent data show that there are adverse effects on children from lead at blood lead levels below the current CDC level of concern. The CDC agreed, but decided not to reduce the level because of their concerns about the difficulty of implementing a lower number. I think that decision needs to be reconsidered, in order to better protect our children in light of all the new data.

It is time for our government to put as high a priority on lead-poisoned children as parents do. I intend to introduce legislation to force EPA to eliminate lead in products that children use. And I plan to carefully and vigorously oversee EPA’s implementation of its other lead authorities.

It is our moral obligation to protect our children from this devastating poison. And I intend to do my best to make sure that EPA and other agencies do their part to help assure that our kids are safe.

Senator BOXER. Senator Inhofe, thank you for being here.

**OPENING STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA**

Senator INHOFE. Yes. Thank you, Madam Chairman.

I do appreciate having this hearing. I think it is very significant, but I would like to express my dismay about the fact that despite our request over and over and over again from the minority side, the Center for Disease Control wasn’t invited to testify. The National Center for Environmental Health within the CDC is the lead

agency regarding childhood lead exposure, and their testimony would certainly have been germane.

In preparation for this hearing, I sent the Director of the center a letter with several questions about their work, and would like to enter their responses into the record at this time.

Senator BOXER. Absolutely.

[The referenced document follows:]

RESPONSES BY THE CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC) TO
ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. Please describe CDC's most recent lead survey data. Can you quantify the progress has been made to date in decreasing childhood lead exposure and the rate of incidences of lead exposure-related illness? What are the trends in childhood blood lead levels?

Response. The most recent published data, the National Health and Nutritional Examination Survey (NHANES) 1999–2002, indicated that the percent of children 1–5 years old with blood lead levels 10 micrograms per deciliter (ug/dL) has declined from 4.4 percent in 1991–1994 to 1.6 percent. The largest decrease in elevated blood lead levels (BLLs) was in black non Hispanic children, from 11.2 percent to 3.1 percent. Although the 1999–2002 prevalence of elevated BLLs was higher for Non-Hispanic Blacks than for either white or Hispanic subgroups, statistical power was not sufficient to examine these differences because of the small proportions and large variability around the estimates.

Question 2. Recognizing that lead is an element of the environment and that there may be multiple exposure pathways that accumulate in children, what is the single biggest exposure pathway for children in the United States? How accurately can we pinpoint the root of the major exposure pathway? How can CDC's data be used to identify the locations where children have been exposed to lead?

Response. Residential house paint is the most common high-dose source of lead in children's environments. Paints that were sold in the 1920's and 1930's contained as much as 50 percent lead by dry weight. Lead paint can be found in most housing built before 1950 and in many houses built between 1950 and 1978. When this paint peels or is disturbed during renovation, it contaminates house dust and soil and is ingested by young children during normal hand-to-mouth activities. However, lead is a pervasive environmental contaminant found in air, water, food, and consumer products, usually at levels lower than the levels found in house paint. Children are exposed to lead from a variety of sources. Because children do not excrete lead from their bodies very well, lead from all of these sources accumulates and causes adverse health effects.

Question 3. Please explain the CDC's 10 micrograms/deciliter (ug/dl) "level of concern" for lead in children under 6. On what is it based? Is this a regulatory standard? What exactly does this standard mean? What actions are triggered when a child is found with a blood lead level (BLL) above 10 ug/dl?

Response. The CDC "level of concern" of 10 ug/dL was established in 1991 as a public health action level. It has over time become the level at which individual children are considered to have elevated BLLs that require an individualized intervention. Depending on the jurisdiction, the resources available, and the number of children with higher blood lead levels, families of children with levels greater than or equal to 10 ug/dL receive education about sources of lead and how to control or eliminate them, referral for nutritional intervention (i.e., Women, Infants, and Children [WIC]), an inspection of their home, and enforcement of regulations that require housing to be made "lead safe" if they live in a jurisdiction that has implemented such regulations. Children with blood lead levels of greater than or equal to 10 ug/dL have more frequent blood lead tests done, and siblings and housemates may also be tested to assess whether they too have elevated blood lead levels.

Some have interpreted the CDC "level of concern" to mean that CDC is not concerned about children with blood lead levels less than or equal to 10 ug/dL. However, since 1991, CDC has emphasized the need to use primary prevention of lead poisoning by controlling or eliminating lead hazards before children are poisoned. Primary prevention activities can be expected to benefit all children, particularly those living in high-risk communities. In 2005, CDC issued Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control and Prevention. This document describes strategies to institutionalize primary prevention. It outlines specific recommendations for Federal, state, and local government agencies, healthcare providers, and community-based organizations. These strategies in-

stitutionalize primary prevention and are essential to achieving the Healthy People 2010 goal of eliminating childhood lead poisoning.

The blood lead level of 10 ug/dL is not a regulatory standard for Federal agencies. In 2005, CDC recommended that Federal agencies discontinue using 10 ug/dL as a level for regulatory action, and agencies such as the U.S. Environmental Protection Agency (EPA) have begun to do this (see the recent Clean Air Standards). The blood lead level of 10 ug/dL also is not a toxicologic threshold. No toxicologic threshold or safe blood lead level for children has been identified.

Question 4. What are the demographic characteristics for children who have BLLs above 10 u/dl? What are the demographic characteristics for children who have BLLs below 10 ug/dl? Are they different?

Response. Children with blood lead levels greater or equal to 10 ug/dL are more likely to be African American, live in poverty, and live in housing built before 1950 than their counterparts with blood lead levels less than 10 ug/dL. As a result of an intense coordinated effort to control or eliminate lead sources in children's environments by government officials, healthcare and social service providers, and the communities most at risk, disparities between the percent of children with less than or equal to 10 ug/dL by race, ethnicity, or socioeconomic status have decreased significantly since the 1970's. However, disparities in level of lead exposure still exist, especially among children with BLLs less than or equal to 10 ug/dL, as seen in the mean BLLs and distribution of BLLs that continue to be higher for low-income children, non-Hispanic black children, and children living in older housing stock (built before 1950).

Question 5. There is some interest in dropping the CDC standard below 10 ug/dl. If the standard for lead was lowered, how many more cases of lead poisoning would there be? What would be the course of action that should be taken at levels below 10 ug/dl?

Response. Based on the 1999–2004 National Health and Nutritional Examination Survey estimate, 7.4 percent of U.S. children have blood lead levels greater than or equal to 5 ug/dL. Based on the U.S. census estimate of the number of children 1–5 years old (approximately 25 million), this means that approximately 1.85 million children have blood lead level greater than or equal to 5 ug/dL.

Question 6. Would an increase of the numbers of cases of lead poisoning (due to a lowering of the standard) dilute the resources available to those children we know are currently exposed at levels above 10 ug/dl?

Response. Public health agencies would continue to triage cases, prioritizing those children with the highest blood lead levels and responding to children with lower levels as resources allow. Although efforts to provide services to children with blood lead levels less than 10 ug/dL may deflect needed resources from children with higher blood lead levels, there are many more important reasons not to provide case management to children at blood lead levels less than 10 ug/dL. These include the following:

- No effective clinical or public health interventions have been identified that reliably and consistently lower blood lead levels <10 ug/dL.
- No threshold for adverse health effects has been identified; thus, lowering the level of intervention would be arbitrary and a lower level may provide a false sense of safety.
- The adverse health effects of blood lead levels less than 10 ug/dL are subtle, making it difficult to predict the impact of these levels on individual children.
- The uncertainty associated with laboratory testing is too great to ensure that a single blood lead test reliably classifies individual children at levels less than 10 ug/dL.

Question 7. Some states have, on their own, lowered their BLL levels of concern below 10 ug/dl. What is the standard for care for that segment?

Response. Services provided to children with blood lead levels less than 10 ug/dL vary by jurisdiction. In some jurisdictions, families receive a brochure in the mail that describes sources of lead and how to control or eliminate them. In other jurisdictions, families may receive a home visit and visual assessment of potential lead sources in the home.

Question 8. Given the recent spate of toy and jewelry recalls for alarming levels of lead content, how do we address imported products? Would a lowering of the level of concern have changed the outcome?

Response. In 2005, CDC recommended a systematic approach that allows the identification of lead contaminated items and prohibits their sale before children are exposed and, ultimately, that all nonessential uses of lead should be eliminated. Lowering the blood lead level at which children receive case management would not affect these recommendations, which would prevent exposure before children have elevated blood lead levels.

Question 9. As you know, in 2000–2004, many District of Columbia residents' drinking water exceeded EPA's action level of 15 ppb. What is CDC doing to examine the potential correlation between the lead contamination in DC's water and children's blood lead levels? Further, can you please explain what the data in MMWR April 2004 is depicting and what it says about blood lead levels for children in DC?

Response. CDC is analyzing blood lead surveillance data from the Washington, DC, Health Department from 1998–2006 to determine the trend in blood lead levels over time. The key message from the 2004 Morbidity and Mortality Weekly Report (MMWR) article is that because no threshold for adverse health effects in young children has been demonstrated (no safe blood level has been identified), all sources of lead exposure for children should be controlled or eliminated. Lead concentrations in drinking water should be below the EPA's action level of 15 parts per billion.

Question 10. If the Federal Government could do only one thing to prevent childhood lead exposure, what would give us the most bang for our buck?

Response. The "biggest bang for our buck" in preventing childhood lead exposures would be a coordinated effort with regard to three elements:

- Target efforts to the clearly identifiable areas where risk for lead exposure is disproportionately high. In many urban areas, the prevalence of elevated BLLs is 10–15 times higher than the national average. In 2003, 46 percent of the children reported to CDC as having elevated BLLs lived in 10 cities. Within these cities, a small number of buildings, often 1 percent or less, account for a disproportionate number of cases, as children are successively identified with elevated blood lead levels in the same or adjacent apartments. In some communities, 40 percent of this "repeat offender" housing receives a Federal subsidy or is publicly owned.

- Provide resources to address lead in all geographic areas known or presumed to be high risk. Census characteristics associated with risk for lead poisoning include a high percentage of 1950's housing, rental property, the presence of African-American residents, and children living in poverty. These indicators for exposure are distributed throughout a State in rural areas and very small towns. Addressing lead sources in remote areas will require creative and coordinated planning.

- Identify special-risk populations and control or eliminate exposure to both paint and non-paint sources of lead. Newly arrived immigrant and refugee populations often have high body burdens of lead when they come to the United States. They may also be exposed to lead as a result of cultural practices and traditional medicines. Once here, most families are not familiar with the sources of lead; thus, their children are more likely to ingest lead paint or lead-contaminated house dust or soil.

Senator BOXER. This will not come out of your time. We are having the CDC here on another hearing, and I will be happy to set aside time for you to ask any questions that you wish.

Senator INHOFE. What hearing will that be?

Senator BOXER. This will be a hearing on global warming and its impact on disease.

Senator INHOFE. Well, of course, that will be our 23d.

Senator BOXER. Yes.

Senator INHOFE. Yes.

Well, anyway, still that doesn't change. Our request was we want the Centers for Disease Control to be here to talk about this, because this is the issue that is before us. They are the ones who are responding.

Now, generally speaking, addressing lead exposure is one of the great American success stories. We have a chart here. I would you to look at it. According to the data from the CDC and others, the median concentration of lead in the blood of children 5 years old and under has declined 89 percent since the period of 1976 to 1980, to 1.6 micrograms per deciliter in 2003 and 2004.

Now, despite our success, the CDC has found that "There are some populations and geographic areas that have disproportionately higher risks of childhood lead poisoning." They recognize this and they want to address this in spite of the successes that they have had in reducing the lead in children.

Now, to get at this problem, the Department of Health and Human Services has established an ambitious goal of eliminating elevated blood lead levels in children by 2010. I recognize this problem first-hand due to my involvement in the Tar Creek Superfund site where the blood lead levels of children are the highest in the State. Although these levels have been decreasing, there is much work left to be done.

What I am saying here is in Northern Oklahoma, in our Tar Creek area, the blood lead levels of these kids is higher really than probably anyplace else in the Nation. Now, according to the CDC, the two major remaining exposure pathways for children are lead in housing and nonessential uses of lead in other products such as toys, jewelry and so forth.

Regarding the toy issue, I have 20 kids and grand kids. I know a little bit about kids. I am troubled by the recent toy recalls due to the presence of lead paint. It is a reminder to everyone that does business outside the United States to be vigilant about product quality because other countries don't share the same environmental and public health ideals as we do, as the Chairman stated.

I have some studies here to enter into the record. It is right here, if it would be all right.

Senator BOXER. Without objection.

[The referenced documents can be found on page XXX:]

Senator INHOFE. They are regarding lead in household paint manufactured outside the United States.

Now, as far as Mattel is concerned, Mattel, the company has already testified twice on the toy recalls before the House Energy and Commerce Committee and the Senate Appropriations Committee. Now, that is twice in the last month. I would just suspect, Madam Chairman, that might have something to do with their reluctance to come back and testify for a third time in a period of a month. Their absence today should not be portrayed as an unwillingness to participate. They have already participated.

I don't want the toy issue, however, to make us lose focus. According to the CDC, paint, paint dust, and paint-contaminated soil account for more than 70 percent of exposure. Additionally, it is estimated that 24 million housing units have deteriorating paint and contaminated house dust. It has been shown that poorer children who live in older housing units are disproportionately at risk for elevated levels of lead.

The extensive assistance from State and local agencies, CDC working with them, has identified housing down to the apartment number in many cases, where multiple children with high blood lead levels have been identified. These repeat offender properties should be our greatest target.

Without objection, I would like to enter into the record a study that appeared in Public Health Management Practice that developed a method for identifying and prioritizing the high-risk buildings that could be pursued for lead poisoning prevention activities.

Without objection, so ordered.

[The referenced document can be found on page XXX:]

Senator INHOFE. I appreciate the National Center for Health Housing and the National Association of Homebuilders joining us today to discuss their efforts. I know they have made efforts to ad-

dress these residential lead paint problems. The Centers for Disease Control have established a national level of concern for children whose blood lead levels are more than 10 micrograms per deciliter. This is the level at which public health action is recommended.

Compelling studies done by one of our witnesses, Dr. Lanphear, have shown adverse developmental and behavioral effects at blood lead levels below this number. Thus, there is an interest in lowering the national level of concern below the 10 micrograms that is current today.

My concern with this approach is that efforts to identify and provide services to children at levels below 10 will deflect needed resources from children who we already know have blood lead levels above 10, and are the greatest risk from exposure.

Resources are scarce at all levels of government. I believe the biggest bang for the buck comes from directing our resources at those housing units in neighborhoods where there is documented chronic lead exposure and the revolving door for kids with lead poisoning.

I am also concerned that the CDC has not identified any effective clinical or public health interventions that reliably and consistently lower blood levels that are already below 10 micrograms today. Lead poisoning is a preventable disease, and we should focus our efforts on reducing or eliminating exposures before they happen. That will benefit all children regardless of their current blood lead levels.

I look forward to hearing from our witnesses, Madam Chairman. [The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE
STATE OF OKLAHOMA

Good morning. First, I'd like to express my dismay at the fact that, despite repeated requests from the minority, the Centers for Disease Control was not invited to testify. The National Center for Environmental Health, within the CDC, is the lead agency regarding childhood lead exposure and their testimony would certainly have been germane. In preparation for this hearing, I sent the Director of the Center a letter with several questions about their work and would like to enter their response in the record.

Generally speaking, addressing lead exposure is one of the great American success stories. According to data from the CDC and others, the median concentration of lead in the blood of children 5 years old and under has declined 89 percent since the period of 1976—1980 to 1.6 micrograms per deciliter in 2003—2004. Despite our success, the CDC has found that “there are some populations and geographic areas that have disproportionately high risk of childhood lead poisoning.” To get at this problem, the Department of Health and Human Services has established an ambitious goal of eliminating elevated blood lead levels in children by 2010. I recognize this problem first hand due to my involvement in the Tar Creek Superfund Site where the blood lead levels in children are the highest in the State. Although these levels have been decreasing, there is much more work left to do.

According to the CDC, the two major remaining exposure pathways for children are lead in housing and non-essential uses of lead in other products, such as toys, jewelry, etc.

Regarding the toy issue, having 20 kids and grand kids myself, I am troubled by the recent toy recalls due to the presence of lead paint. It is a reminder to everyone that does business outside of the United States to be vigilant about product quality because other countries do not share the same environmental and public health ideals that we do. I have some studies here to enter into the record regarding lead in household paint manufactured outside of the U.S. As for Mattel, the company has already testified twice on the toy recalls, before the House Energy and Commerce Committee and the Senate Appropriations Committee. Mattel's absence today

should not be portrayed as an unwillingness to participate in the public dialog on this issue.

I don't want the toy issue, however, to make us lose focus. According to the CDC, paint, paint dust and paint-contaminated soil account for more than 70 percent of exposure. Additionally, it is estimated that 24 million housing units have deteriorating paint and contaminated house dust. It has been shown that poorer children living in older housing units are disproportionately at risk for elevated blood lead levels. With extensive assistance from State and local agencies, CDC has identified housing, down to the apartment number in many cases, where multiple children with high blood lead levels have been identified. These "repeat offender" properties should be our greatest target. Without objection, I would like to enter into the record a study that appeared in Public Health Management Practice that developed a method for identifying and prioritizing "high risk" buildings that could be pursued for lead poisoning prevention activities. I appreciate the National Center for Healthy Housing and the National Association of Home Builders joining us today to discuss their efforts to address residential lead-paint.

The Centers for Disease Control has established a national level of concern for children whose blood lead levels are more than 10 micrograms per deciliter. This is the level at which public health action is recommended. Compelling studies done by one of our witnesses, Dr. Lanphear (LAN-FEAR), have shown adverse developmental and behavioral effects at blood lead levels below this number. Thus, there is an interest in lowering the national level of concern below 10 micrograms per deciliter.

My concern with this approach is that efforts to identify and provide services to children at levels below 10 will deflect needed resources from children who we already know have blood lead levels above 10 and are the greatest risk from exposure. Resources are scarce at all levels of government and I believe the biggest bang for our buck comes from directing our resources at those housing units and neighborhoods where there is documented chronic lead exposure and a revolving door of kids with lead poisoning. I'm also concerned that CDC has not identified any "effective clinical or public health interventions that reliably and consistently lower blood lead levels that already are below 10 micrograms per deciliter."

Lead poisoning is a preventable disease and we should focus our efforts on reducing or eliminating exposures before they happen. That will benefit all children, regardless of their current blood lead level. I look forward to hearing from the witnesses.

Senator BOXER. Thank you so much, Senator. There is a lot in what you say that I totally agree with.

We are going to call on you in order of arrival, so that would be Senator Whitehouse.

**OPENING STATEMENT OF HON. SHELDON WHITEHOUSE,
U.S. SENATOR FROM THE STATE OF RHODE ISLAND**

Senator WHITEHOUSE. Thank you, Madam Chairman, for convening this hearing. Under your leadership, this Committee is focused intently on the way in which we influence our environment and how we can be better stewards of the world around us, from cleaning up pollution in our air and water to reversing the devastating damage that will be caused by global climate change.

We do this to preserve and protect, to preserve the natural resources on which we and future generations will depend, and to protect families from changes in our natural and manmade environments that can harm our lives and health.

All too often, these threats appear in places we least expect. In recent weeks, we have been reminded of another danger found where we least expect it, in our children's toys. Hundreds of thousands of toys and other merchandise have been recalled because they contain lead paint, a poison that poses a serious risk to children's health and well being. Children exposed to lead can develop learning disabilities, hearing impairments, and behavioral prob-

lems even at extremely low exposure levels. This damage cannot be reversed.

We in Rhode Island know the dangers of lead poisoning well. For years, tens of thousands of Rhode Island children have lived in homes contaminated by lead paint, exposed to lead in paint chips or dust. More than 30,000 children have been diagnosed with elevated blood lead levels in our little State. Last year alone, lead poisoning was diagnosed in an additional 500 children.

According to the Centers for Disease Control and Prevention, as many as 1.7 million children aged five and younger—five and younger—are affected by lead poisoning. Nationwide, more than 80 percent of older homes constructed before 1978 contain lead paint.

While the danger of lead poisoning is in no way restricted to Rhode Island, I am proud that our State has been a leader in the fight to raise awareness about the dangers of lead poisoning and taken strong action to reverse it. I am very pleased that our Ranking Member noted that 70 percent of the exposure comes from exposure to lead paint and dust, and that this burden falls disproportionately upon the children of America who are poor.

When I served as Rhode Island's Attorney General, we brought public nuisance action against the companies that manufactured lead-contaminated paint, an innovative approach that after several years and two trials finally resulted in a jury verdict last year that the paint companies must help abate the damage they caused. That decision was a victory for Rhode Islands and the first of its kind in the Nation.

Today, we are moving ahead on abatement plans to ensure that our homes are safe for children and families. I am proud that this Committee has turned its attention to the serious risks presented by lead contamination and I truly look forward to today's hearing.

Thank you, Madam Chair. If you will excuse me, I also have an Attorney General to talk about his future with.

Senator BOXER. I understand.

Senator WHITEHOUSE. But I will return, and I thank you for your courtesy.

Senator BOXER. We look forward to having you return.

Senator BOXER. Senator Bond.

**OPENING STATEMENT OF HON. CHRISTOPHER BOND,
U.S. SENATOR FROM THE STATE OF MISSOURI**

Senator BOND. Thank you very much, Madam Chair, and thank you for holding this hearing today on lead and children's health.

Lead poisoning, as I think we all agree, is a terrible tragedy for children who it afflicts. No child should have blood levels that hurt their ability to think and learn. For better or for worse, I have had extensive experience with lead paint poisoning in Missouri. One in three children tested in certain areas of St. Louis, Missouri in 2003 suffered from lead paint poisoning. That is 30 percent of our kids in many of the poorer neighborhoods who may not live up to their full potential and who suffer needlessly.

As we know, and it has already been said, once lead damage occurs, it cannot be reduced, but it can be prevented. And that is where we need to focus our efforts.

I was very proud to have joined over the last several years with my colleague, Barbara Mikulski from Maryland, on the Appropriations Committee to bring additional Federal help to cities like St. Louis with the worst lead paint problems. As has already been said, we know that the overwhelming cause of lead paint poisoning is the paint on window sills. Small children hold onto window sills and often chew on them. If they have lead, that may poison them.

Over the last 5 years, Congress has appropriated nearly \$250 million to HUD to remediate homes in high-risk areas inhabited by low-income families. At the same time, because the programs were not working as well as they could, I worked with a community health center, Grace Hill Neighborhood Health Center, and the children's hospitals and a broad coalition in St. Louis to design and implement a new model lead paint remediation program.

By focusing on primary prevention for pregnant women and their babies, the Grace Hill model has turned the lead paint remediation process on its head. For the first time, the objective is to find and remove lead paint problems before children are poisoned. New mothers will bring their newborns home to a lead-safe environment.

Over 3 years, I have secured over \$15 million in earmarks to flow through the Grace Hill Neighborhood Health Center to St. Louis neighborhoods with the highest incidence of lead paint poisoning.

Communities at the source of the lead chain also need attention, as our witness, Mr. Gulliford, will tell you. Some may know that Southeastern Missouri holds our Nation's primary lead reserves. Nobody believes we can tolerate lead in infant toys, but lead is used in everything from batteries, televisions, to much high-tech equipment, from medical instruments to musical instruments. To bring America the lead it needs, thousands of Missouri workers support middle class families with their jobs in lead mining and processing. Nature has allocated Missouri 90 percent of the lead in the U.S., lead which we do need.

If I had my choice, I would prefer to have natural gas. I would be happy to have them drilling in my backyard if we had that rather than lead, but you have to mine for lead where you find it. When a lead smelter in Herculanum, Missouri violated ambient air quality requirements for lead, I worked with EPA and the Missouri State agencies to put pressure on the company. They, of course, needed to be treated fairly, but they also needed to meet their environmental obligations. The company made millions of dollars of plant upgrades, as they should have, and now emissions levels are back in compliance.

Moving forward, I am working to bring Federal funding for a new lead ore transport routes that avoid residential neighborhoods on the way to the plant. I hope these examples can serve as a model for other States and other areas where lead is a problem, pushing where we need to, helping where we can, and educating everywhere.

Lead paint poisoning is preventable and it must be prevented because once it occurs, the damage is done and it is unacceptable to sentence our future generations to the tragedy of lead paint poisoning. This is a crusade I am happy to pursue on a bipartisan basis in this body and anyplace else we can.

I thank the Chair.

Senator BOXER. Thank you very much, Senator Bond. You obviously have had a lot of experience in this area, and that is going to be very helpful to us.

Senator Cardin.

**OPENING STATEMENT OF HON. BENJAMIN CARDIN,
U.S. SENATOR FROM THE STATE OF MARYLAND**

Senator CARDIN. Thank you, Madam Chair. I also thank you for holding the hearing. It is encouraging to hear our colleagues talk about the commitment to tackle lead poisoning in our children.

Lead poisoning is an American tragedy. It is a tragedy for the children who suffer from lead poisoning and their families. The tragedy is compounded because this is an entirely preventable disease. During today's hearing, we will hear from a number of witnesses that will relate and tell us about some important success stories.

Since 1995, for example, the number of Baltimore City children with elevated blood levels has decreased by 92 percent. I am very pleased that Olivia Farrow, our Assistant Commissioner of Health in Baltimore, is with us today. I thank the Baltimore City Health Department for what you have been able to do in tackling the problems of lead poisoning among our children.

I am proud of the institutions in Baltimore that have been working with national leaders in trying to develop strategies to deal with preventing lead poisoning and dealing with the health consequences of those children who have elevated levels of lead in their blood. The Kennedy Krieger Institute is doing an incredible job for children, not only in Baltimore and Maryland, but around the Country. The University of Maryland at Baltimore has been a leader in dealing with the lead poisoning issues. I am proud of the role that we played.

Witnesses will tell us about the straightforward approaches they have employed to help protect children. They are identifying housing stocks where lead-based paint poses a risk and other rental units where these risks have been abated. They will tell us about excellent training programs for contractors working in the housing industry. These skilled workers are making our homes safer, while protecting themselves and their fellow workers from the dangers of lead.

Unfortunately, there will also be heartbreaking stories. In spite of all we know about the dangers of high-level lead and the effective ways to eliminate those risks, there are still more than 1,200 children in Maryland who are lead poisoned. That figure of 1,200 is based upon the health standard of 10 micrograms per deciliter. Some of the best medical people in the world at Johns Hopkins and the University of Maryland Medical School in Baltimore tell us that standard of 10 micrograms per deciliter is too high.

So we know that we have children who are poisoned today. We know that the risks are probably much greater than we even know today because the acceptable levels are probably too high. Madam Chair, we know what the problem is. We have seen great progress in reducing blood lead levels in our vulnerable children because we know how to eliminate these risks, but we need to do more.

I appreciate you bringing to our attention the problems with toys. That is just unacceptable that we allow toys to come into this Country or be sold to our families that contain lead. That has to stop, and I thank you for bringing that to our attention.

I agree with Senator Inhofe in regards to the housing issue and lead paint in our homes today is still at an unacceptable level. We need to do more to help eliminate and abate lead paint in homes.

The Federal Government needs to do more. I introduced legislation when I was in the House that dealt with one of the issues that Senator Bond raised, that is to encourage the recycling of lead, rather than having to mine more lead, because the problem is that a lot of the lead batteries get discarded in a way that produces an environmental risk. So we should be doing things to try to encourage the proper disposition of lead and recycling of lead, rather than just trying to mine more lead in our community.

The legislation also created a responsible funding source so the Federal Government could have a larger partnership working with our State and local governments to have lead abatement programs that work, that are effective, and reduce the risk to our children.

The bottom line, Madam Chairman, it is time for us to act. I thank you for holding this hearing because I think it gives us the information we need to take responsible action.

I thank the witnesses for being here today.

[The prepared statement of Senator Cardin follows:]

STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR FROM THE
STATE OF MARYLAND

Madame Chairman thank you for holding this hearing today.

Lead poisoning is an America tragedy. It is a tragedy for the children who suffer from lead poisoning and for their families. That tragedy is compounded because this is an entirely preventable disease.

During today's hearing we will hear from a number of witnesses. They will tell us about some important success stories. Since 1995, for example, the number of Baltimore City children with elevated blood lead levels has decreased by 92 percent, while childhood lead poisoning in Baltimore City has dropped by 96 percent since 1993.

The Coalition to End Childhood Lead Poisoning, based in Baltimore, has brought extraordinary national leadership to the prevention of lead poisoning in children. The Coalition's technical expertise in developing lead elimination plans has not only benefited the Baltimore area, but has aided local and State governments across the country.

We also appreciate the work of, and look forward to hearing the testimony from, Olivia Farrow, Assistant Commissioner in the city of Baltimore's Department of Health. Baltimore City's work in identifying children's jewelry with excessive levels of lead and removing such jewelry from store shelves is an example of the work being done at the local level to make conditions safer for our children.

Other witnesses will tell us about some straightforward approaches they have employed to help protect children. They are identifying housing stocks where lead-based paint poses a risk and other rental units where those risks have been abated. They will tell us about excellent training programs for contractors working in the housing industry. These skilled workers are making our homes safer while protecting themselves and their fellow workers from the dangers of lead.

Unfortunately, they will also have heart-breaking stories. In spite of all we know about the dangers of high lead levels and effective ways to eliminate those risks, there are still more than 1,200 children in Maryland who are lead poisoned. And that figure of 1,200 is based on a health standard of 10 micro-grams per deciliter. Some of the best medical people in the world work at Kennedy Krieger, Johns Hopkins, and the University of Maryland Medical School in Baltimore. These doctors tell us that the current standard of 10 micro-grams per deciliter is too high. In fact, there is probably no safe level of lead in children's blood.

Madame Chairman, we know what the problem is. We have seen great progress in reducing blood lead levels in our vulnerable children, because we know how to eliminate these risks.

We need to do more. The time to act is now.

Thank you, Madame Chairman.

Senator BOXER. Thank you, Senator.

Senator Barrasso.

**OPENING STATEMENT OF HON. JOHN BARRASSO,
U.S. SENATOR FROM THE STATE OF WYOMING**

Senator BARRASSO. Thank you very much, Madam Chairman.

This issue of child exposure to lead is a serious concern. I appreciate the progress that has been made by the EPA, as shown in Senator Inhofe's charts. But I am sure as the witnesses will testify, child exposure is down, but we can do more. It is down from where it was a decade ago.

I really understand the importance of preventive medicine. We need to protect these children from lead exposure to prevent the long-term adverse effects that they have on health care. Last year, I served in the Wyoming State Senate on the Health Committee, and we came out with a warning, actually the Department of Health did a little over a year ago, the Department of Health warned of unexpected lead dangers, with the key word being "unexpected."

The Wyoming Department of Health officials are asking parents to be aware of the dangers to children posed by items that may unexpectedly contain lead. They talked about the recall of the 300,000 heart-shaped charm bracelets, one like you passed around today, Madam Chairman, that had been provided as a free gift to children with shoe purchases. A young child died from acute lead poisoning after swallowing one of these charms, and it was because of it contained lead.

Infants and children are especially vulnerable to lead poisoning. A child who swallows large amounts of lead may develop anemia, severe stomach ache, muscle weakness, brain damage. Lead can affect a child's mental and physical growth even at very low levels of exposure.

Now, there has been actually a measurable change. I can tell you this, Madam Chairman, when I was in medical school in the late 1970's, when we studied x-rays, there would be something called lead lines on x-rays where growth had been delayed in a child and you could see it on x-ray. Just above the knees on both sides, both sides on the femurs, you would see these little lines because there had been a period of time where the growth had been delayed, development delayed. These were called lead lines. We learned that in medical school 25 years ago, or a little more. But now, I haven't seen one of those lead lines on an x-ray for years, which says we are making progress and we are making measurable progress.

We need to do more. Let's find solutions that are attainable and reasonable based on sound science. I look forward to the testimony.

Thank you, Madam Chairman.

Senator BOXER. Thank you, Senator, very much.

Senator Klobuchar.

**OPENING STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM THE STATE OF MINNESOTA**

Senator KLOBUCHAR. Thank you, Senator Boxer. Thank you for holding this important hearing.

I have been dealing with this all summer on the Commerce Committee. I think as everyone has noted, it has been hard to open a paper or to watch TV without hearing about another toy recall because of lead. As a former prosecutor and a mother, I am appalled by the number of toys. I think it is 20 million now that have been recalled. It started with Thomas the Train sets and SpongeBob SquarePants. My 12 year old daughter, Madam Chairwoman, was very embarrassed I was working on this because the toys at issue were SpongeBob SquarePants. But when it got to Barbie, she came into the kitchen and said, Mom, this is getting serious.

[Laughter.]

Senator KLOBUCHAR. One of the first products that was recalled this summer was this Thomas the Train set that I have here. One little interesting fact that I don't know if everyone knows, the RC2 Corporation, these came from China, apologized to their customers and to try to prompt them to get more trains, they actually gave them bonus gifts for their troubles. The bonus gift backfired in a big way. They then had to recall the bonus gifts after that because they realized that those also had lead in the paint. And this actually is a toy that Tamara Fucile, my great staff person on this, her child bit on this toy and it has now been recalled.

We have watched this process unfold over the summer. I think it has given American consumers a sense of why we do need good government and why we do need regulation. Senator Durbin and I have been working together to make sure that the Consumer Product Safety Commission has the money it needs, and then on the Commerce Committee, along with Senator Pryor and Senator Nelson, we have been working toward getting some new standards in place for lead in toys and other products.

Right now how it works, and I think people would be surprised to know this, there really isn't a set Federal standard. A lot of the States have standards as a voluntary guideline, and there are a lot of hoops that the Consumer Product Safety Commission has to go through to actually recall toys or other items.

So what we are trying to do instead of setting up another rule-making, which would take months, is actually put a standard in place. We have drafted a bill suggesting a .04 parts per million, with a lower standard for jewelry like they have in California at .02. I will say that the retailers, especially my hometown company of Target and others like Toys R Us have been very helpful and supportive of these efforts. I think they realize that we need to have a stronger Consumer Product Safety Commission and that also we need to have some better rules in place.

This really hit home for us in Minnesota when a little 4 year old boy swallowed a lead charm. He didn't buy it. He was given it along with a pair of tennis shoes as a free gift. He swallowed that charm and he didn't die from choking on it or some kind of other problem with the air. He died when the lead seeped into his bloodstream over a period of days. It crept into his bloodstream. He died. The charm was later tested and it tested at 99 percent lead and

it was made in China. So if that isn't enough to make people realize that we need to change the way we are doing business, I don't know what is.

So I think it is time to act. While we will continue to focus on the Commerce Committee on the Consumer Product Safety Commission, as we know, on this Committee, the Consumer Product Safety Commission cannot and should not do this alone. It doesn't have the resources or the statutory authority. I am pleased that we are taking steps to modernize the commission. Right now, there is one guy who checks toys. He sits in the back of a room. What is his name? Bob the Toy Guy, and he is retiring at the end of the year.

So we need to improve the CPSC, but I will tell you that the EPA must be a partner here. With a budget more than 10 times the size of the Consumer Product Safety Commission and with greater authority to gather information, the EPA is uniquely positioned to support the Consumer Product Safety Commission's efforts to get lead out of stores and get lead off of our shores.

I am pleased that you are holding this hearing today, Madam Chair. Thank you very much. I look forward to hearing from our witnesses.

Senator BOXER. Senator, thank you very much.
Senator Craig.

**OPENING STATEMENT OF HON. LARRY CRAIG,
U.S. SENATOR FROM THE STATE OF IDAHO**

Senator CRAIG. Madam Chairman, thank you very much.

Yesterday when we were looking through this Committee at Superfund and where we are with its administration and response, I mentioned a situation that had occurred in Idaho a good number of years ago, and I suspect all of us have those stories. While we clearly don't have the legacy of old metropolitan areas or old communities of the kind that Senator Cardin spoke of, we were the second largest producer of lead in the Nation for a century, following Missouri, as Senator Bond has spoken to.

During that time and within the Superfund side of the Coeur d'Alene basin, we had a smelter who through its filtration system broke down and for well over a couple of years, lead dust settled in over this valley. There was no question at the time that it was stopped. The children of that valley and the adults of that valley had a substantial elevated lead level. Over the course of the 1980's and the 1990's, I have worked with that valley to clean itself up. It literally is a matter of vacuuming the valley, removing the dirt from the yards, repainting the homes, vacuuming out the attics, and of course changing the whole character. And the blood lead levels have dropped dramatically.

While there are great success stories to be told, and Senator Inhofe has mentioned one that we cannot walk away from. The chart shows it. Because of the attention we have paid, this Government has paid, and therefore the marketplace has paid to lead, we have reduced those lead levels 89 percent. Senator Cardin spoke of lead levels in Baltimore down 90 percent in certain areas.

So there are tremendous success stories to be told, but it also reminds us that effective and responsive oversight ought to continue

to be done because clearly this is not a story yet that you can write its final chapter, nor should you.

And so I thank you very much today for the attention you are giving. But as we have brought down our levels here, now we have to focus offshore. That is where we have been at error, and that is what this hearing offers us. It forces the marketplace to get smart too, and they haven't been. It is pretty obvious by all of the stories told and by the millions of products recalled.

Between what we can do, what the Centers for Disease Control can do, what the Consumer Product Safety Commission can do, and what the marketplace is already doing to these toy manufacturers, there is a phenomenal economic penalty that is going on out there at this moment. That, in combination, refocuses us as it refocuses the American consumer in a way that is critically important.

So the combination of it all, Madam Chairman, your attention to it, the attention of this Committee and this Congress, is going to be very critical in continuing the writing of the next chapter in what I think is a great American success story yet unfinished, from a legacy of our industrial past where we simply did not know, to a State where we now know it today and we are doing the right things, in combination with the EPA and all of the agencies involved, and in cooperation with the marketplace and the private sector to get it right and keep it right for the American consumer.

Thank you very much.

Senator BOXER. Senator, thank you.

I think all Senators have really made a contribution. Before I call on Mr. Gulliford, I want to put something in the record. I think everyone who said that paint, on average, is the biggest source of lead is absolutely correct. And everyone who cited these statistics is absolutely correct. On average, paint is a bigger source of lead. But for kids who have lead toys like some of these here, the biggest source of lead can be a toy. So everything we are doing on paint is commendable. And by the way, there will be more we have to do, which we will be talking about.

So what I want to put in the record is a list of some of these products. I want to make a point here that the safety level of lead in paint, and correct me if I am wrong here, is 600 parts per million. Anything above that is deemed unsafe. I want to give you an example. Vinyl bibs recalled in Illinois, 1,000 ppm lead, 1,000. Remember, 600 is the level that is safe. We have some other ones here. Vinyl lunch box, the one that is in California, Spanish language, 16,000 parts per million lead; Spider Man lunch box, 1,000 parts per million; a teething toy, 900 parts per million lead; bendable toys, 10,000, et cetera, et cetera. And a jewelry chain from Claire's, it appears that one has 30,000 parts per million and there is a hair clasp with 450 parts per million. I mean, this is what we will put in the record.

[The referenced document can be found on page XXX.]

Senator BOXER. The point is, my colleagues, you are so right. This is a success story that we have had here, but it is getting ahead of us and we need to catch up to it.

Senator CRAIG. Madam Chairman.

Senator BOXER. Yes.

Senator CRAIG. Those products you have just mentioned, how many of those are manufactured offshore?

Senator BOXER. I would bet most of them. I would say the vast majority.

Senator CRAIG. Nearly 100 percent, I would guess.

Senator BOXER. Probably close to that.

Senator CRAIG. Yes. Thank you.

Senator KLOBUCHAR. And Madam Chair, all the toys recalled have been recalled from China this year.

Senator BOXER. Yes.

Senator INHOFE. Yes, but the question I was going to ask, maybe the witnesses would have this, they can be manufactured overseas, but many times that is by American companies.

Senator BOXER. That is correct.

Senator INHOFE. There, we could have some control.

Senator BOXER. Exactly.

Senator INHOFE. The question is going to be how are we going to control those that are not American companies that are made overseas.

Senator BOXER. Yes.

Senator INHOFE. That is the difficult thing.

Senator BOXER. You are exactly right. It does present a challenge, and that is why I am so happy that you are all here because together we can meet this challenge. I know that we can.

So anyway, James Gulliford, welcome. Go ahead. We will put your whole statement in the record. If you could summarize in 5 minutes, that would be great.

STATEMENT OF JAMES GULLIFORD, ASSISTANT ADMINISTRATOR FOR PESTICIDES, PREVENTION, AND TOXIC SUBSTANCES, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. GULLIFORD. Thank you. I do appreciate the fact that the statement is entered.

Good morning, Madam Chairman and Senator Inhofe and members of the Committee. Thank you for the invitation to appear before you today to discuss our efforts at the Environmental Protection Agency to prevent lead poisoning of our Nation's children.

Lead is a pervasive problem and many offices at EPA are working to protect public health and the environment from lead. My remarks this morning focus on the lead-based paint program under TSCA, which is the responsibility of my office. Due to the leadership from this Committee and the Congress, there has been, as pointed out by many of our speakers already, many of the Senators this morning, remarkable progress in significantly reducing childhood lead poisoning.

In 1978, there were 13.5 million children with elevated blood lead levels in the United States. As a result of persistent efforts by countless individuals and organizations at the community and State levels, as well as our agencies, that number has dropped by 2002 to 310,000 children. CDC is currently compiling the most recent data which will be released later this year, and we expect to see a further decline in the number of children that are lead poisoned. We thank you for your leadership in this area.

However, much work remains to be done because, as I think everybody has stated, one poisoned child is one too many. EPA is working hard toward the goal of eliminating lead poisoning in children as a major public health concern by a goal date of 2010. With that goal in mind, let me discuss our current program and the activities underway to meet that goal.

EPA's primary goal is to prevent children from being poisoned and avoid the consequences associated with childhood lead poisoning. We have an active multi-pronged program to combat the majority of the remaining cases of elevated blood lead levels in children, which are caused by lead paint and related sources in older housing.

Our lead paint program includes a national regulatory infrastructure, outreach and education programs aimed at those most at risk, and educating those who can help address the problem. The program also issues grants targeted to vulnerable populations whose children are at most risk for lead poisoning.

EPA requires the training and certification of lead-based paint professionals who conduct lead-based paint inspection, risk assessment, and abatement services in residents and child-occupied facilities such as day care centers. We require practices for lead paint abatement that assure the work is done adequately and safely. EPA, together with HUD, issued the rule that mandates lead-based paint disclosure requirements for sales and rentals of pre-1978 housing, thus ensuring that home buyers and renters are made aware of lead-based paint hazards and provides the right to a lead inspection before purchases.

Similarly, the pre-renovation education rule implements a very simple concept that all owners or tenants of pre-1978 housing should be given basic information about lead poisoning prevention before paint-disturbing renovations are started. EPA also issued a rule on the identification of hazardous levels of lead in dust and soil.

EPA is now developing a new rule, known as the Lead R&R rule, which when completed in 2008 will minimize lead hazards that result from the disturbance of lead-based paint during renovation, repair and painting work. In 2006, EPA issued this proposed rule covering renovation activities in housing. Earlier this year, EPA issued a supplemental proposal to extend these requirements to renovations in child-occupied facilities. All together, EPA received more than 250 comments on the proposed rules and held five public meetings around the Country. Our deliberations regarding the content of this final rule are underway. I can assure the members of the Committee that we are giving serious consideration to your comments, as well as to those that we receive from many other important organizations.

As I mentioned earlier, EPA is part of a broad effort in this Country to protect our children from the hazards of lead-based paint. Our Federal partners, including HUD, CPSC, and CDC also have many activities underway to eliminate these risks. States and all levels of local government have set up programs to identify and treat lead poisoning in children and to rehabilitate deteriorated housing. Parents, too, are the most important individuals who have helped greatly to reduce lead exposure to their children by cleaning

and maintaining their homes, by having their children's blood lead levels regularly checked, and by promoting proper nutrition.

So thank you for the opportunity to discuss these programs. I appreciate your support and commitment to this work to better protect our children from lead-based paint poisoning. I am pleased to answer your questions.

Thank you.

[The prepared statement of Mr. Gulliford follows:]

STATEMENT OF JAMES B. GULLIFORD ASSISTANT ADMINISTRATOR OFFICE OF
PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

INTRODUCTION

Good morning Madam Chair and members of the Committee. Thank you for the invitation to appear before you today to discuss the Agency's efforts to prevent lead-based paint poisoning of our nation's children. Lead is a pervasive problem and many offices at EPA have various activities occurring to protect public health and the environment from lead. My responsibilities focus on the lead-based paint program and its activities.

BACKGROUND

Since the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X) was enacted, the U.S. Environmental Protection Agency, together with the U.S. Departments of Housing and Urban Development (HUD), and Health and Human Services (HHS), the Consumer Products Safety Commission (CPSC), as well as our State partners, have made significant progress in eliminating childhood lead poisoning. In 1978, there were 13 and one-half million children with elevated blood lead levels in the United States. By 2002, that number had dropped to 310,000 children, and it continues to decline. We expect the Centers for Disease Control to release updated data later this year. While we still have a significant challenge, particularly in reducing the incidence of lead-poisoning in low-income children, EPA is very proud of how its Federal, State, and private sector partners have coordinated their efforts with the public to better protect our children.

The Federal Government has phased-out lead in gasoline, reduced lead in drinking water, reduced lead in industrial air pollution, and banned or limited lead used in products such as mini-blinds, food cans, glazed china and ceramic wear, crystal, and residential paint. States and municipalities have set up programs to identify and treat lead poisoning in children and to rehabilitate deteriorated housing. Parents, too, have greatly helped to reduce lead exposures to their children by cleaning and maintaining homes, having their children's blood lead levels regularly checked, and promoting proper nutrition.

CURRENT ACTIVITIES

EPA has an active, multi-pronged program to combat the majority of the remaining cases of elevated blood lead levels in children, which is caused by leaded paint and related sources in older housing. EPA's primary goal is to prevent children from being exposed to lead based paint hazards and avoid the consequences associated with it. EPA's lead-paint program includes a national regulatory infrastructure, outreach and education programs aimed at those most at risk, and educating those who can help address the problem. The program also issues grants targeted to vulnerable populations whose children are at risk for lead-poisoning.

Regulations:

- EPA requires the training and certification of lead-based paint professionals who conduct lead-based paint inspection, risk assessment and abatement services in residences and child-occupied facilities, such as day care centers. The Agency has also set work practice standards for these professionals so that lead-based paint activities are conducted safely, reliably, and effectively (TSCA §402(a)). EPA requires that trainers be accredited to ensure that training programs provide quality instruction in current and effective work practices. In addition, EPA has authorized individual States, Tribes, and Territories to develop and administer training and certification programs, thereby extending the reach of these efforts. At present, 39 States,

Puerto Rico, two Tribes, and the District of Columbia, assisted by Federal grants, are authorized to carry out this program, with EPA retaining direct authority in the remaining areas.

- EPA, together with HUD, promulgated the Residential Lead-based Paint Real Estate Disclosure Rule (Toxic Substance Control Act (TSCA) §1018). This rule mandates lead-based paint disclosure requirements for sales and rentals of pre-1978 housing, thereby helping to ensure that home buyers and renters are made aware of lead-based paint hazards before deciding on a dwelling, and, in the case of home buyers, guarantees the right to a lead inspection before purchase.

- The Pre-Renovation Education Rule implements a very simple concept: all owners/tenants of pre 1978 housing (about 15 million housing units) should be given basic information about lead-poisoning prevention before paint-disturbing renovations are started (TSCA §406(b)).

- EPA promulgated a rule on the Identification of Hazardous Levels of Lead in Dust and Soil (TSCA §403). This rule defines certain locations and conditions of lead-based paint, and specific levels of lead in dust and soil that are most likely to pose a health threat to children. These standards effect disclosure provisions, the need to use trained, certified lead workers, and control and abatement requirements for federally owned and federally assisted housing. These standards were based in part on the level of lead in blood (10 ug/dl) that CDC considers to be elevated.

- EPA is developing a Renovation, Repair, and Painting Program rulemaking. On January 10, 2006, EPA issued a proposed rule for contractors working in residences. On June 5, 2007, EPA issued a supplemental proposal to extend these requirements to renovations in child-occupied facilities. Altogether, EPA received more than 250 comments on the proposed rules, and in addition received comment at five public meetings it held around the country

- The growing concern about lead in children's toys and jewelry has resulted in close cooperation between EPA and CPSC regarding concerns about the content of lead in toy jewelry. As you aware, CPSC is currently engaged in a rulemaking effort to address lead in children's jewelry. Earlier this year, EPA notified more than 120 companies of their obligations under TSCA section 8(e), which requires manufacturers, processors and distributors of chemical substances to inform the Agency if they obtain information that a substance presents a substantial risk to health or the environment. EPA is also nearing completion on a rule under TSCA section 8(d) which will require manufacturers of lead in consumer products intended for use by children to submit existing health and safety studies to EPA. Through this rule, EPA hopes to obtain existing studies that relate to lead content in children's products or children's exposure to lead from such products.

Outreach and Education:

EPA conducts outreach with potentially affected parties in the development of regulations to assist regulated parties in complying with regulations, inform citizens of their rights under these rules, inform the public about the nature of lead-based paint hazards, and provide guidance on how to reduce risks. Our partners at HUD and CDC partially fund these activities and provide technical support. This outreach includes:

- A bilingual National Lead Information Center (1—800 424-LEAD). The Center operates a national hotline handling more than 28,000 contacts per year, distributes 2200 documents annually and operates a national clearinghouse where best practices are shared.

- Development of materials, such as brochures and sample real estate disclosure forms, needed to comply with regulatory requirements.

- Creation and distribution of educational materials and national lead awareness campaigns for parents, homeowners and renters, medical professionals, child-care professionals, renovation contractors and “do-it-yourselfers,” and others. This includes the award-winning, bilingual “Get the Lead Out” campaign to increase awareness of lead-paint hazards; and the “Keep Your MVP in the Game” campaign, with President Bush and the slogan: Lead Poisoning Can Steal Your Child's Future.

- Partnership programs with nonprofit groups and other government agencies to conduct lead awareness/education activities, particularly targeted to minority and urban populations often most at risk. This includes the “Chance of a Lifetime” campaign for Head Start Centers.

- Outreach to Spanish-speaking populations in the United States.

Grants Targeting Low-Income and Other Vulnerable Populations

- EPA has developed several grant programs targeted to populations still at risk for lead poisoning. These grants are intended to reduce the incidence of childhood lead poisoning in populations most at risk, and include grants targeted to:
 - federally recognized Indian tribes and tribal consortia: These grants support Tribal educational outreach and the establishment of baseline assessments of Tribal children's existing and potential exposure to lead-based paint and related lead-based paint hazards. These include a grant to the Houlton Band of the Maliseet Indians of Houlton, Maine. This grant includes several lead poisoning prevention workshops, such as a "Lead-free Babysitting" course for all tribal child care providers, a health fair where blood-lead screenings will be conducted, and lead risk assessments and inspections at the homes of young children.
 - Low-income communities with older housing: These grants support the partnership of national organizations with community-based organizations and local governments to improve the environmental health of a community regarding lead poisoning prevention. One example is a grant to the Alliance for Healthy Homes which will partner with several local groups to serve community members from four low income populations. Activities will include lead-awareness training, lead-safe work practices training, and to address substandard housing conditions such as lead-based paint, through ordinance development
 - Populations still at risk for elevated blood lead levels: These grants, which are intended to reduce the incidence of childhood lead poisoning in vulnerable populations, include projects to: (1) reduce lead poisoning to target communities with high incidences of elevated blood-lead levels; (2) identify and reduce lead poisoning in under-studied communities with high potential for undocumented elevated blood-lead levels; and (3) develop tools to address unique and challenging issues in lead poisoning prevention, especially tools that are replicable and scalable for other communities. One example is the grant to the Community Action Partnership of Mid-Nebraska, which supports blood-lead testing and home assessments through collaborative partnerships with Women, Infants, and Children (WIC) and Well Child public health clinics.

CONCLUSION

Thank you for the opportunity to discuss some of EPA's contributions to prevent lead-based paint poisoning. Again, I want to thank you for your support and commitment to our work to better protect children from lead based paint poisonings. We remain committed to the goal of eliminating lead poisoning in children as a major health concern by 2010. I would be pleased to address your questions.

Senator BOXER. Thank you very much.

As you know, you have gotten many letters from me and other colleagues talking about your rule for renovation. When EPA sets its cleanup standard for lead paint renovation by contractors, will the agency base its standard on the most recent scientific studies showing childhood impacts at low blood lead levels?

Mr. GULLIFORD. We appreciate what we are learning from science and what is emerging in the science area with respect to the importance of lead poisoning. We recognize that the 10 microgram per deciliter level is not a standard, but rather it is a health threshold on the part of CDC which they consider as the appropriate level at which to intervene in actions at the community level.

So we will not be basing our rule decisions on that as a level or as a threshold. Rather, we will look at our concerns for levels of lead exposure. Our rule will be designed to reduce lead exposure to children, and our goal then is to assure that children are not poisoned by activities related to lead renovation and repair.

Senator BOXER. When are you going to have this rule done? It sounds to me like you are not going to follow your science advisors. You didn't answer it that clearly. You said a lot of words, but I

didn't hear you saying that you were going to follow and go with the science advisors. When can we anticipate this rule?

Mr. GULLIFORD. Thank you, Madam Chairman. We anticipate completing the rule in the first quarter of 2008, which was our commitment to the members of this Committee.

Senator BOXER. I was told it was going to be December 2007. That is what I was told the last time. Now you are moving it to when?

Mr. GULLIFORD. Our commitment has been to the first quarter of calendar year 2008.

Senator BOXER. And you have not decided to follow your scientific advisors urging you to use this data?

Mr. GULLIFORD. In fact, we are. We are listening very carefully to the reports from CASAC.

Senator BOXER. So you will come out and reflect the science on this, because we know kids are exposed at very low levels.

Mr. GULLIFORD. Our concern is through the rule, and our goal for the rule will be to reduce exposure to lead that is involved in the rehabilitation and repainting of homes. Our goal will be to reduce lead exposure. Again, this threshold of 10 micrograms per deciliter is not, again, a part of our actual determination for our lead rule. You are correct.

Senator BOXER. Well, I think you are going to have some concern by members of this Committee, so some of us will want to weigh in with you because now you are saying it is first quarter of 2008.

OK. Are you aware that recent studies have found highly leaded jewelry with almost half of the pieces exceeding 80 percent lead by weight remains widely available in U.S. stores? And that electronic waste exported from the U.S. could be the source of that lead? Are you aware of that?

Mr. GULLIFORD. Yes, I am.

Senator BOXER. Has EPA issued or does EPA plan to issue any rule under TSCA to gather data on these exports or to control the export of such waste to ensure that this waste does not come back into this Country and threaten our children?

Mr. GULLIFORD. We are doing several things. One thing that we are doing is we have developed a concept called ePIT, which is designed to make the materials that are in computers and the electronics industry more appropriate for the actual recycling of them, again to reduce the content of—

Senator BOXER. Well, that is in the future. I am talking about now. Look at this. I am talking about now. What are you doing now to stop this from coming back into the Country, sir?

Mr. GULLIFORD. The actual programs that are in place to control the import of child toys and other materials such as you have here displayed today are under the purview of CPSC.

Senator BOXER. We understand. You have control over TSCA, and what are you doing under TSCA to gather data on these exports or to control the export of such waste to ensure that it does not come back and kill our children or harm them?

Mr. GULLIFORD. Two things that we are doing is that we have notified 120 companies of their obligation to inform EPA if they obtain information that products they manufacture for import present

a lead poisoning risk to children. This is a TSCA 8(e) action that we are taking.

Senator BOXER. So they have to inform you—I am just trying to get this right—if they obtain information, but they don't have to obtain the information? You don't tell them they must test and let you know?

Mr. GULLIFORD. That is the authority that we have under TSCA. And yes, that is their obligation.

Senator BOXER. What is their obligation?

Mr. GULLIFORD. Is to report any information to us that they have, that they are aware of the content of unsafe levels of lead poisoning risks to children.

Senator BOXER. And these are the electronic people. And then what are you doing to make sure they don't come back into the Country?

Mr. GULLIFORD. Madam Chairman, this is regarding any products that are imported that contain lead that children might be exposed to.

Senator BOXER. Look, I am very confused. I am going to repeat the question one more time and then I am going to come back to you in a minute.

Recent studies have found highly leaded jewelry with almost half of the pieces exceeding 80 percent lead by weight remains available in U.S. stores, and that electronic waste exported from the U.S. could be the source of this lead. Has EPA issued or plan to issue any rule under TSCA to deal with these exports?

Mr. GULLIFORD. The exports—

Senator BOXER. Yes or no. Could you try me with yes or no?

Mr. GULLIFORD. The exports of material for recycling are not subject to our rules. The import of any products that contain lead that children might be exposed to are under the purview of CPSC.

Senator BOXER. OK. So EPA does not plan under TSCA, because you have been sued several times and lost in court on your point that TSCA doesn't do anything. So what you are saying is you have no plans to issue any rule under TSCA to gather data on these exports.

Mr. GULLIFORD. On the exports of electronics?

Senator BOXER. Yes.

Mr. GULLIFORD. From the United States?

Senator BOXER. Yes.

Mr. GULLIFORD. No, we have no plans to issue a rule.

Senator BOXER. Thank you for answering the question.

Senator Inhofe.

Senator INHOFE. Thank you, Madam Chairman.

I am not going to take my full time. I really wanted to get to the next panel because I am going to have to leave at noon. But let me just start off by saying, Mr. Administrator, that as the chart shows up here, we have done a good job. For those of us who are not really the experts in this area, try to simplify it for me. That is, as I said in my opening statement, 70 percent of the problem is in the paint, the things we have been talking about. We are concerned about the other 30 percent because that is what more directly affects the children.

It is kind of interesting. I am not sure what we tools we have in this Country. I know what we can do about American manufacturers who make things in China and bring them over here. I am wondering what is out there and what is the proper authority to go to do something about the toys that would be coming in that were manufactured by Chinese manufacturers. Can you draw that distinction and tell me what authorities we have we could be more aggressive with?

Mr. GULLIFORD. The strongest authorities are within the Consumer Product Safety Commission. They have an ANPR, an advanced notice for proposed rulemaking, to ban, again, the import of any products, and there is a threshold standard of lead content in those products, for products that children would be exposed to, much as the products that are again on the table in front. That is the most appropriate action that we can take.

Similarly, the U.S. Government is working on import safety activities right now. HHS Secretary Leavitt has put together a working group to address the challenges of import safety of all products, not just products containing lead, but everything from food to other products that come into commerce. One of the aspects of that initial plan, the framework that has been advanced, is to do more on the prevention side and to help people understand why these issues are of concern for us, to look for traceability in the manufacture of products.

So there are activities that are projected in those areas.

Senator INHOFE. OK. That is good. Let's go back to the 70 percent now, which we have been talking about on the rule. It is my understanding this actually was written into law back in 1992 or so, and it actually mandated a deadline for the report and for the rule itself by 1996. Am I incorrect in that?

Mr. GULLIFORD. I believe that is correct.

Senator INHOFE. I think that is, yes. This is something that we didn't do it during the Clinton administration. It is not done yet, and yet we are looking right now just down to a few weeks in having this done. So in terms of the first quarter of 2008, we will be looking at it.

I think it would be a good idea, Madam Chairman, for them to let us know between now and then of the progress so that if there is a problem in meeting that deadline that we would be able to address it.

Getting back to CASAC, we have dealt with them I remember during the previous Administration on a number of things. Do you feel that you are getting the full benefit of the advice of the Clean Air Scientific Advisory Committee?

Mr. GULLIFORD. Yes, we do. In fact, we actually took a number of issues to them for their advice with respect to this rule and we appreciated their comments. They gave us comments on other areas that have been helpful as well.

With respect to your other question, Senator, we will be happy to inform the Committee if at any point in time we project that we will not meet that first quarter goal.

Senator INHOFE. That would be good.

The last thing I wanted to ask, we have a witness on the next panel from the Homebuilders. They have been working on the ren-

ovation rule. Have you had a dialog with them? Do you feel that they are making progress in making a contribution to the ultimate rule that we will be able to adopt?

Mr. GULLIFORD. I have had an opportunity to speak with Homebuilders on this issue a number of times. They have submitted studies that they have done. They have submitted comments on the rule as proposed, like many other organizations have. We have welcomed their comments. We have welcomed the comments from the environmental community, from the health officials as well. So all of those help to inform us, as well as those comments from Members of Congress.

Senator INHOFE. Thank you very much.

Thank you, Madam Chairman.

Senator BOXER. Thank you, Senator.

Senator Klobuchar.

Senator KLOBUCHAR. Thank you, Madam Chairwoman.

In your testimony, you talked about how you have been working in close cooperation in your written testimony with the Consumer Product Safety Commission. I was speaking earlier in my opening statement about how important it is to beef up that organization. I wanted to know, beyond notifying companies of their statutory obligations under the Toxic Substance Control Act, what specific actions has the EPA taken to coordinate with the CPSC in light of this crisis we are seeing with lead in toys.

Mr. GULLIFORD. Thank you, Senator, for your question.

Let me mention two other very specific things that we did. We did send a letter to CPSC expressing our concern for lead in toys, our concern that is again a very unfortunate, but pervasive opportunity or exposure pathway for children to be exposed. And second, then, we also have initiated a rulemaking at EPA. We did this in discussion with them, and notified CPSC about that, that will require any companies with studies on existing health and safety studies on lead in children's products, not just toys, but all products, to make that data available to us. So there would be a requirement for that. Any failure to do so, then, would be subject to enforcement action on our part.

Senator KLOBUCHAR. And when do you expect to deliberate on that rule?

Mr. GULLIFORD. That rule, we project to have that rule about a year from now.

Senator KLOBUCHAR. And when do you think you can have it done?

Mr. GULLIFORD. Fall, late fall of 2008.

Senator KLOBUCHAR. You know, I talked about Bob the Toy Guy in the back room in the CPSC. Are there other ways that the EPA, when you have a budget 10 times bigger than the CPSC, can assist them in working with them in testing these products and trying to find a way to make this work?

Mr. GULLIFORD. One of the things that we try not to do is duplicate the actions or the authorities of other agencies. So CPSC has worked on the issue of toy imports, children's products that are imported. We are really focusing on the lead in homes.

Also in other programs of EPA such as the Superfund program, as you heard Senator Bond refer to, we have a number of cleanups

of areas where, again, children are exposed to lead that is in their yards. So we are working in the areas that are clearly within our identified authorities. We want to be supportive of the other agencies, and we do that by again exchanging information as we become aware of it related to health issues. But again, we do not try and duplicate their functions.

Senator KLOBUCHAR. To get into that area that you have been focusing on, and that is the questions that Senator Boxer was asking you about the EPA regulation, the status of it, to protect children and others. HUD issued their rule for assisted housing I think it was back in 1998, and it took effect in 2001. I think people had expected that the EPA would quickly follow suit right after this was issued in 1998. What took so long? It has been 11 years after Congress required that the rule be passed, and there is still not a final. I know she asked you about the timing. I just don't understand why it could take so long when HUD was able to do this back in 1998. I think it is something like 1.1 million kids could be protected who are potentially exposed to lead.

Mr. GULLIFORD. Senator, I came to this position in July of last year with a commitment to this Committee to implement, to finalize and complete this rule. I am committed to do that. I also come with a strong concern for the safety of children with respect to lead because of my experience in the region where we had, as the Senator indicated, a lead smelter. We have the largest cleanup Superfund site from the actions of the past, an historic smelter. So my commitment is to what I can do.

Senator KLOBUCHAR. I know. But do you know why, in your current position have you heard why it took so long when HUD was able to do it? We are just trying to make it better going forward. I am new at this, but I come in and I find out that it takes this many years to get something done. It doesn't make any sense to me.

Mr. GULLIFORD. I can speak to my actions and my commitment to completing the rule. I am not aware of the history.

Senator KLOBUCHAR. OK.

The other thing I wanted to ask about was the standard that you have, because we are working on the Commerce Committee as we speak. In the next 2 weeks, we would like to get the bill done here and we are working to get a web standard in there for these toys. As Senator Boxer mentioned, there is a voluntary standard right now and it is not a strict standard, but it is 600 parts per million. A lot of States have that, but we don't have any set standard on the Federal level. So we were looking at this 400 parts per million. Part of that was the standard that you use for soil in children's play areas. Do you know what this standard is based on, the 400 parts per million?

Mr. GULLIFORD. Yes. That is not a hard and fast standard, but it is a cleanup standard that is used. It is a cleanup guideline. Actually, in cases where lead cleanups of soil are done, an effort is made to—while that may be a working point to take off from, an effort is made to determine the bioavailability that may be in those soils which may require a more strict cleanup standard or a less strict cleanup standard. But the goal is to develop a cleanup threshold that clearly is protective for children.

Senator KLOBUCHAR. And does the EPA use the same technology as the CPSC to test for this lead? It is not a trick question. I don't know the answer. I am just trying to figure it out as we go forward here.

Mr. GULLIFORD. I don't know the answer to that. I know that we have equipment that measures the existence of lead in soils, and contractors use that equipment in the field regularly. Lead is actually then collected for analysis to determine the bioavailability of it. There is a test, I believe we always refer to it in the field as the pig test, because somehow there is some exposure. It is an animal test. I apologize for that, but it is designed to determine the bioavailability of that lead, and we can then transfer that to the potential for children to be exposed from just that lead.

So there are a number of tests with respect to lead important to the health industry, but also important even just to the recognition. I am sorry.

Senator BOXER. I am so sorry to interrupt. We found out we have a vote that is starting at around noon, so we are going to have to move on.

Senator KLOBUCHAR. OK. That is fine.

Senator BOXER. We will leave the record open.

I did have just one more follow up to you, and I will be quick if I can.

In April, 2006, the Sierra Club petitioned EPA to require manufacturers or importers of toy jewelry with .06 percent lead to notify the EPA prior to manufacturing or importing these articles. That would have been a huge step forward if you had done something. I don't mean you personally, the agency.

In July, 2006, EPA denied this petition because, "These actions are not petitionable under TSCA Section 21." Our attorneys believe under Section 5 the EPA does have this authority. What is your opinion?

Mr. GULLIFORD. Those actions that we have taken as a result of that petition and as a result of a lawsuit that followed up with that, we believe are consistent with the TSCA authorities, and those are the three things that I have described that we have taken since, again, that initial petition by the Sierra Club, again to request information on existing health studies, to inform companies of their obligation to disclosure, and also though to express our concern to CPSC for again the import of products.

Senator BOXER. OK. Well, you haven't issued a rule on this. Do you plan to do that?

Mr. GULLIFORD. Pardon?

Senator BOXER. Do you plan to issue a rule on that?

Mr. GULLIFORD. We at this point do not plan to. We are preparing, yes, a rule again that requires any companies that import products, they are aware of health studies related to those products to disclose them. Yes.

Senator BOXER. What if they are not aware?

Mr. GULLIFORD. Pardon?

Senator BOXER. What if they are not aware? I mean, that is the weakest thing I have ever heard, but let me move on.

In April, 2006, Sierra Club petitioned EPA to issue quality control orders if EPA found companies producing toy jewelry that pre-

sents an unreasonable risk. Do you know what EPA said? "Information suggests there may be numerous instances where toy jewelry containing lead is still available in the marketplace." They refused to do it because the problem was so widespread. I mean, this is outrageous. And you know, I have to say, just because we need to move on, sir. I respect that you are trying to do your best, but I have to say you just tell a parent, oh, that was the Consumer Product Safety job, not my job. I will let them do it. People don't get it out there. This is America. We are one national Government. We are supposed to protect our kids.

So I just want to give you a little encouragement to be stronger than the agency has been in the past. Because I will tell you why, Senator Inhofe is 100 percent correct on the great progress we have made with lead paint. This is a new problem, and he is also right to say the vast majority is coming from abroad. Some of these products are assembled in America, however, and all of them have American toy company labels, pretty much.

So you have more jurisdiction than you are stepping up to the plate to handle. So we don't have enough time to debate this anymore today, but I think you get the sense that although we might disagree on how to move forward, I think all of us on this Committee really want to address this matter. We think it is something we can do together. So if you could go back and talk to your lawyers and folks. We are going to follow some of your progress. I think Senator Inhofe is right on that. Keep us informed on how the rule is coming, the remodeling rule. We will stay in close touch with you.

Thank you very much, sir.

Mr. GULLIFORD. Thank you.

Senator BOXER. If I could ask the next panel to come up. Because of time, do it fast as you can. Get the lead out of your feet. Where did that come from?

[Laughter.]

Senator BOXER. Because I know Senator Inhofe is particularly interested in the homebuilding perspective, we are going to start with that witness first.

OK. We are also going to ask our friends on the panel to go from 5 minutes to 4 minutes, so do your best.

The vote hasn't been set yet, Senator, so that is good news.

OK. We can go back to 5 minutes.

Let's see. Let's start with Mr. Nagel, because I think you represent the National Association of Homebuilders, and I think Senator Inhofe had asked that you go first, sir. Go right ahead.

Mr. NAGEL. Thank you.

Senator BOXER. And you have 5 minutes.

STATEMENT OF MIKE NAGEL, CGR, CAPS, REMODELONE-DESIGN/BUILD CONSTRUCTION, ON BEHALF OF THE NATIONAL ASSOCIATION OF HOMEBUILDERS, REMODELER'S COUNCIL

Mr. NAGEL. Madam Chair, Ranking Member Inhofe, and distinguished members of the Committee, my name is Mike Nagel. I am a professional remodeler from Chicago, Illinois, and Chairman of the NAHB Remodelers, a 14,000 member organization within the Association of Homebuilders, the federation representing 235,000

members in the homebuilding, remodeling, multifamily, and light commercial construction industry.

I appreciate the opportunity to testify on behalf of professional remodelers using lead-safe renovation and repair practices and reducing lead levels in older homes and helping to eliminate instances of lead exposure. I will also discuss ways that Congress can encourage lead-safe remodeling and training for contractors and enhanced public awareness of the danger of lead hazards in do-it-yourself projects in older homes.

Despite decades of effort, lead poisoning remains a critical problem facing young children living in older homes and housing units. The CDC estimates that nearly 40 percent, or 38 million homes, in the U.S. may contain lead-based paint, but those built after 1960 only make up about 2 percent, according to HUD research. In 1978, strict limitations were imposed on the use of lead paint, but the Nation's housing stock continues to age and deteriorate, creating pathways for exposure. For young children, lead exposure usually comes from ingesting peeling paint, chewing or mouthing painted surfaces, or hand to mouth exposure from dust.

Thus, with limited resources, it is crucial to focus attention on pre-1960 privately owned housing units, which are disproportionately inhabited by lower-income residents and where young children are more likely to reside. The challenge is to find the best way to improve the conditions of older homes and to maximize the public and private sectors' resources in reducing childhood lead exposure.

NAHB Remodelers have responded to this challenge by implementing extensive training and public awareness programs, and have worked cooperatively with the EPA and other advocacy groups to promote voluntary programs for lead-safe work practices.

Because we are dedicated to lead-safe remodeling, NAHB commissioned an extensive research project in 2006 to carefully analyze remodeling and renovation work as it is performed in the field. The project collected air and surface samples from unoccupied homes that contain lead-based paint in the areas of the home where the remodeling work was conducted. In all, 342 air samples and 407 surface dust samples were collected from five homes in the Northeast and Midwest. My written testimony details more specifics about the research, but the results confirmed that lead-safe work practices substantially reduced lead dust loadings after remodeling work, and did not create new hazards either on surfaces or in the air.

Furthermore, the research showed that the additional control and cleanup methods can deliver even better results. Unquestionably, lead-safe remodeling improves conditions in older homes, but only if it is performed by professional remodelers who are well trained and use specialized equipment. If they are subject to additional regulations, inevitably some homeowners, particularly lower-income households, will find it cost-prohibitive to hire professionals, resulting in homeowners either undertaking the work alone or, worse yet, doing nothing at all, thus completely undercutting efforts by both the Government and our members to eradicate childhood lead poisoning.

As I have explained, our industry is undertaking a comprehensive approach to educate, train and inform both consumers and contractors about the necessity of lead-safe work practices not only in lower-income households, but for all pre-1978 homes. However, we need Congress to help coordinate and combine resources of the Federal agencies working on these issues, specifically, EPA, HUD and OSHA, and target pre-1960 homes where young children reside.

Furthermore, Congress should support the use of lead-safe work practices for owners of multifamily properties and remodelers who work in pre-1978 housing. NAHB also urges Congress to fully fund the training requirements of HUD and EPA lead-based paint regulations so they are functional and operate as Congress intended.

Finally, Congress should ensure that professional lead-safe remodeling is encouraged, and not saddled with costly regulatory requirements that could pose a further disincentive for homeowners to undertake necessary repair and renovation work.

I thank you for the opportunity to testify today about the progress the our members are making in the fight against childhood lead poisoning. We share the common goal of eradicating it entirely and professional remodelers are committed to helping homeowners create a lead-safe environment for their children.

[The prepared statement of Mr. Nagel follows:]

STATEMENT OF MIKE NAGEL, CGR, CAPS, REMODELONE-DESIGN/BUILD CONSTRUCTION, ON BEHALF OF THE NATIONAL ASSOCIATION OF HOMEBUILDERS REMODELER'S COUNCIL

This written statement is respectfully submitted on behalf of the National Association of Home Builders (NAHB) on the issue of children's health and lead. NAHB is a national federation representing more than 235,000 members involved in single family and multifamily home building, remodeling, light commercial construction and housing finance. This testimony, as presented by Mike Nagel, a professional remodeler from Chicago, Illinois, and the current Chairman of the NAHB Remodelers, a 14,000-member organization within NAHB, details facts about the strides that are being made by professionally trained remodelers to reduce lead exposure for children living in older homes throughout the United States.

INTRODUCTION

Despite decades of effort and more than 10 years of continually declining lead levels, lead poisoning remains an important problem facing some of our nation's youth. According to the Centers for Disease Control and Prevention (CDC), as reported by the U.S. Environmental Protection Agency (EPA), approximately 40 percent of all U.S. housing units (about 38 million homes) have some lead-based paint.¹ For the most part, older homes are more likely to have lead-based paint hazards because of the use of lead as a primary ingredient in many oil-based interior and exterior house paints used throughout the 1940's and 1950's.² Though the Consumer Product Safety Commission (CPSC) finally imposed strict limitations on the use of lead in paint for toys, residences, and public areas in 1978, the nation's stock of pre-1980 housing continues to age and deteriorate, and the deteriorated paint creates pathways for lead exposure to the residents in our homes who are the most easily susceptible to the damaging effects of lead poisoning—children.³

Children are more sensitive to health problems from lead exposure, often attributable to contact with lead in their home. Young children are the most affected by lead in the home, first because they are more likely to ingest contaminants and other toxics by virtue of hand-to-mouth contact, and second, because their central

¹U.S. EPA, 2006. Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule. Chapter 3.2.3, page 10.

²Ibid., Chapter 3.1.1, page 1.

³Ibid., Chapter 3.1.1, page 1.

nervous system is still developing. The most likely source is ingestion from peeling or cracking paint, paint chips, chewing, mouthing painted surfaces, or through leaded dust on the hands. Additionally, outside the home, lead can arrive on the property through airborne emissions from lead smelting, battery manufacturing, solid waste incineration,⁴ or even transportation. In whatever instance it occurs, children with elevated blood lead levels are reported to have lower IQ scores and face other challenges in mental and intellectual development. Therefore, it is imperative that something be done to address childhood lead exposure in older homes that may be in disrepair, or that may contain lead-based paint.

Following passage in 1992 of Title X Lead-Based Paint Hazard Reduction Act,⁵ three Federal agencies—U.S. EPA, Department of Housing and Urban Development (HUD), and OSHA and one Presidential taskforce⁶ conducted research, developed policies and regulations, and made recommendations on how to reduce the risks of childhood lead-based paint poisonings from deteriorated lead-based paint. Some important findings came from national surveys for lead-based paint in housing conducted in 1990 and again in 2001 by HUD. For example, HUD's surveys found only 2 percent of the homes built after 1960 were likely to contain any deteriorated lead-based paint, however that percentage increased to 25 percent for homes built between 1940 and 1959, and finally increased to 56 percent for homes built before 1940.⁷

Armed with this data, it makes sense for Federal agencies to target their control strategies on housing and areas of the country where the greatest risks are known to exist. HUD's findings, coupled with numerous government and university studies, confirm that the focus should clearly rest on addressing the housing of primary concern. As identified in extensive research by CDC, HUD, and the President's Task Force on Lead-Based Paint: "The program (elimination of [Lead-Based Paint] poisoning in children) should continue to emphasize control of lead paint hazards in pre-1960 low-income privately owned housing units where young children are expected to reside."⁸

Thus, the challenge before us today is to recommend the best way to leverage the combined resources of private and government sectors to focus on those residential structures (pre-1960) that pose the most significant risks of lead-based paint exposure to children while still providing an adequate level of protection for children across all income levels in all housing built before 1980. NAHB's response to this challenge is to ensure that all contractors and homeowners are aware of lead-safe work practices and to recommend that Federal and State agencies continue to focus their limited resources on finding and eradicating lead hazards in child-occupied housing built prior to 1960.

PROFESSIONAL REMODELING IMPROVES LEAD HAZARDS

Extensive public debate has already taken place about who should ultimately be held responsible for children's exposure to lead-based paint in homes. While this debate goes on, NAHB Remodelers are improving the conditions of our nation's older homes by renovating, repairing, and repainting with lead-safe work practices performed by trained remodeling professionals. Furthermore, NAHB members continue to educate consumers about the dangers of lead hazards in homes and the potential consequences of unprofessional or unsafe do-it-yourself remodeling activities that can exacerbate lead hazards and actually create more health problems in the long term.

In 2006, NAHB commissioned a substantial research project to measure the amount of lead dust generated by home improvement contractors using typical renovation/remodeling activities and to assess whether these routine activities increased lead dust levels in the work area and the property. This research was conducted by Atrium Environmental Health and Safety Services, LLC (Atrium), an environmental research services firm that employs a staff of Certified Industrial Hy-

⁴U.S. EPA. 2006. Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule.

⁵Title X (pronounced Title Ten) of the Lead-Based Paint Hazard Reduction Act of 1992, P.L. 102—550

⁶Presidential Task Force Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards, February 2000.

⁷U.S. Department of Housing and Urban Development, National Survey of Lead & Allergens in Housing: Final Report, Volume I: Analysis of Lead Hazards. Office of Lead Hazards Control, Washington, DC, Page(s) 4—6 and 4—7, April 18, 2001.

⁸President's Task Force on Environmental Health Risks & Safety Risks to Children, Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards, Washington, DC, Page 29. February 2000.

gienists and environmental and health safety specialists who evaluate, develop, and implement programs to minimize hazards and comply with current environmental, health and safety regulations, standards and guidelines.

The Atrium project consisted of onsite field data collection from actual homes containing lead-based paint in the Northeast and Midwest. During the data collection phase, 342 air samples and 407 surface dust samples were collected during 60 typical R&R activities in five separate, unoccupied residential properties located in Roselle, Illinois; Wallingford, Connecticut; Farmington, Connecticut; Cheshire, Connecticut; and Milwaukee, Wisconsin. The project was designed to evaluate routine remodeling and renovation activities that normally occur in the marketplace and that represent the most common jobs performed by renovation and remodeling firms. Lead dust loadings were measured on the surfaces and in the air both before and after the work took place. The remodeling and renovation work itself was performed by trained and licensed professional renovation and remodeling contractors in each of the areas where the property was located and the final survey data was reviewed by the National Center for Healthy Housing (NCHH) as a means of quality control, in which NCHH conducted statistical analyses of the sampling results.⁹

The results of the research showed a clear improvement in the amount of lead dust loadings from nearly every type of typical remodeling activity with the exception of mechanized sanding events.¹⁰ The Atrium project data revealed that renovation and remodeling activities did not create new lead hazards and in all properties except one (Farmington, Connecticut, where an unshrouded power sander was used extensively), the lead dust loadings on surfaces were lower after the remodeling contractors completed the work than when they arrived. As for air exposure, the results also showed a trend of reductions in airborne lead based on personal breathing zone air sample results.

In addition to these results, the Atrium project data also demonstrated that several practices, associated with lead-safe remodeling and renovation generally, produced remarkable reductions in overall lead dust loadings. For example, misting surfaces with water during the renovation work showed a significant reduction in airborne lead dust levels when compared to events where no misting was used. Furthermore, the use of a HEPA filter-equipped vacuum cleaner, combined with either wet wiping or Swiffer mops during post-work clean-up showed the greatest effect on reducing lead loading in surface dust. Combining these two activities could reap even greater benefits for reducing lead dust and further improving pre-work conditions in lead-affected homes.

The overall conclusions of the Atrium project reinforce what has been commonly believed among remodelers for a long time: lead-safe remodeling and renovation activities performed by a trained professional can remarkably improve lead dust loadings in older homes. It is also our belief that it can improve the health and welfare of the home's residents, particularly young children. Ultimately, lead-safe professional remodeling is one of the best lines of defense for reducing lead exposure for children living in older homes and it should be encouraged. The CDC agrees that the "use of lead safe work practices during renovation can advance the goal of primary prevention of lead poisoning."¹¹ As leaders in the fight to reduce lead hazards in homes, and reduce pathways to childhood lead poisoning, we applaud the work of professional remodelers and the substantial improvements they make to older homes.

THE DANGERS OF DO-IT-YOURSELF AND LEAD

In the U.S. today, there are approximately 120 million existing homes that embody the full range of structural and environmental soundness. Many of these homes and older housing units need serious renovation and repair work, but often this work cannot be undertaken due to cost limitations, especially for lower-income households. To their own detriment, some individuals attempt to undertake this work via untrained contractors or do-it-yourself projects, and consequently dramatically increase instances of lead exposure for the home's residents. In this regard, Congress has a real opportunity to protect the health, safety, and welfare of its citi-

⁹Attached is a copy of the Executive Summary of the Atrium survey project. NAHB is happy to provide the entire Atrium report, which is a comprehensive and substantive analysis detailing the entire work project including all recordable data collection results.

¹⁰Additionally, work practices identified by HUD as "prohibited"—including open-flame burning, torching, or the use of volatile paint strippers in an enclosed space—were explicitly avoided in this project.

¹¹U.S. EPA, 2006. Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule. Chapter 3.2.3, page 10.

zens by prescribing methods by which professional remodeling using lead-safe work practices becomes the viable alternative to any potentially harmful do-it-yourself venture, or worse, the hiring of cheap contractors who are not adequately trained to undertake the work.

Unfortunately, there are many cases in which lead poisoning has resulted from home renovation activities undertaken by well-intentioned homeowners who simply want, or need, to save some money. In reality, hiring a professional trained in lead-safe work practices usually costs more than doing it alone, or contracting an untrained handyman. Professionals are more careful, which increases the length of time of the project; require specialized equipment (respirators, HEPA vacuums, etc.); and often employ highly skilled laborers. For homeowners who want to be frugal, or that want to complete a project in a faster timeframe, it may seem infeasible or less desirable to hire a professional. The option of choosing the untrained contractor, or undertaking dangerous work alone, can become a real, albeit worrisome, alternative because it appears to be more affordable.

In light of this situation, there are a number of regulatory factors that need careful consideration for addressing childhood lead poisoning in older homes. For example, the EPA will soon issue new regulations for contractors conducting renovations, repair, and painting for pre-1978 homes. Initial drafts of these proposed regulations have included a mandatory testing requirement called a "clearance test," or third-party verification requirement. This clearance test will supposedly demonstrate that the contractor took the necessary steps to ensure that the home is below abatement-level lead levels after remodeling and renovation activities are completed. NAHB has substantive concerns with the concept of a "clearance test," as well as the impacts of such a test's cost on consumer decision making when remodeling their home.

A clearance test is basically designed to prove an elimination of the presence of lead in the home, which is technically the task of abatement work not remodeling. The law already deals separately with abatement regulations. Because clearance testing cannot distinguish between lead from remodeling versus lead that may have blown in the window, been tracked in from outdoors on someone's shoes, or is present in the house from some other source, the requirement seems inappropriate in a remodeling context. The results of a clearance test depend on the entire history of the house and its neighborhood, and a remodeler simply is not responsible for having this breadth of information.

Compliance with clearance test requirements will only be enforced upon trained remodeling professionals, the very people who are most likely to do the work safely. Unlike these individuals, the law does not apply to homeowners who do the work themselves or to untrained contractors. Neither of these two groups has the adequate knowledge, equipment, nor training to undertake lead-safe work practices, nor will they be required to verify or confirm that the presence of lead in the home has been eliminated. This is an incredibly important distinction because clearance testing will add additional costs only for the professionally trained remodeler. So, choosing a professional, in this instance, who will be subject to clearance testing requirements is even less affordable to consumers who may already have cost constraints.

It has been established that lead-safe remodeling activities performed by professionally trained remodelers improve the condition of the home, in terms of lead exposure. This should be good for the health and quality of life for the home's occupants, especially children. If the government imposes a regulatory requirement like a clearance test on professional remodelers that further increases costs of hiring them, it could create a real disincentive for residents to get lead-safe remodeling in the homes with the most critical repair and renovation needs. Specifically, lower-income households that lack the financial resources to pay for lead-safe professional remodeling are disproportionately the ones who live in homes that are in the greatest need of repair.

Potentially, the higher cost could create an incentive for low-income consumers to do nothing at all, which further undercuts the broader goal of eradicating childhood exposure to lead.

RECOMMENDATIONS—EDUCATION AND TRAINING PROGRAMS

There is clear benefit to the safety of children and proven reductions in lead exposures in older homes from professional remodeling. NAHB recommends that a combined public and private education and training program for home buyers, homeowners, remodelers and home improvement contractors would help increase public awareness of the dangers of lead exposure in older homes. This effort has already begun in the remodeling industry, but additional help is needed.

At the national level, NAHB has taken several steps in the last 20 years to increase consumer education on lead-safe work practices. NAHB has distributed materials to all its members about training and lead-safe work practices from HUD, the U.S. EPA, and OSHA. In 1993, NAHB began distributing its own publication *What Remodelers Need to Know and Do About Lead* regarding the dangers of prohibited practices (torching, belt-sanding, scraping) and the importance of proper post-work clean-up techniques that minimize lead dust exposure in both the work area and the property. NAHB began a public/private partnership with EPA in the late 1990's to establish a voluntary program to address lead-based paint issues during remodeling and renovation and has continually supported robust training programs for remodelers and renovators that work in pre-1978 homes.

NAHB also sponsors education courses for builders and remodelers at its annual International Builders Show, and in other conference settings. In fact, many NAHB Remodeler members teach courses in lead-safe work training and mastering lead-safe work techniques. Education and training has been incredibly successful and continues to highlight the importance of having adequately trained and knowledgeable remodeling professionals to perform renovation and repair work in older homes.

In addition to the efforts noted above, NAHB urges Congress to do the following:

- Instruct and ensure that HUD and the U.S. EPA target the limited resources and enforcement assets concerning mandatory lead hazard evaluation and reduction toward those units constructed prior to 1960 and likely to be occupied by a child under the age of six.
- Support the development and use of voluntary training and lead-safe work practices for owners of multifamily properties and remodelers who work in residential properties built from 1960—1978 and are believed to contain lead-based paint.
- Direct HUD, the U.S. EPA, and OSHA to work together to reconcile the differences in work practices and allow reciprocity for training and certification requirements for remodelers and multifamily property owners to facilitate achieving the goals of eliminating childhood lead poisoning in the most efficient and cost-effective manner.
- Fully fund the training requirements in the HUD and U.S. EPA lead-based paint regulations so that they can operate and function as Congress intended.

CONCLUSIONS

Professional remodeling, renovation, and repair work, performed by knowledgeable, trained contractors, can serve as an agent against spreading lead hazards in older homes and further endangering the health and welfare of our nation's children. NAHB urges Congress to work with the relevant Federal agencies (HUD, U.S. EPA, and OSHA) to coordinate efforts, to fully fund important lead-safe training programs, and to effectively use the combined resources in a way that maximizes outcomes. NAHB cautions against imposing inappropriate and costly regulatory burdens on professional remodelers that would be cost-prohibitive for consumers to hire trained professionals or that could lead to further proliferation of potentially harmful do-it-yourself projects. NAHB is working hard to promote the value of lead-safe work practices and the benefits of professional remodeling for older homes and encourages effort by Congress.

NAHB Remodelers are working hard to educate consumers, train professionals, and perform lead-safe work practices. Research data confirms that lead-safe remodeling and renovation improves lead levels in older homes, and that new hazards are not created when typical remodeling and renovation activities are undertaken by trained professionals. NAHB has invested significant resources in both education and research about the benefits of lead-safe work practices and looks forward to working with Congress to expand on efforts like these in the future.

LEAD-SAFE WORK PRACTICES SURVEY PROJECT REPORT

November 2006

Prepared for



1201 15th St NW
Washington, D.C. 20005

November 9, 2006

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EXECUTIVE SUMMARY

The National Association of Home Builders (NAHB) has conducted an assessment of renovation/ remodeling (R&R) activities to measure levels of lead dust generated by home improvement contractors. The objective of this project was to measure the amount of lead dust generated during typical R&R activities and assess whether routine R&R activities increased lead dust levels in the work area and property.

In conducting this project, 342 air samples and 407 surface dust wipe samples were collected during 60 typical R&R activities conducted in five separate residential properties in Roselle, IL, Wallingford, CT, Farmington, CT, Cheshire, CT and Milwaukee, WI. This project evaluated complete renovation and remodeling (R&R) activities as they would occur in the marketplace. The activities evaluated during this project were selected in consultation with remodeling contractors, and represent the most common jobs performed by renovation and remodeling firms. The R&R work was performed by professional renovation and remodeling contractors from each of the areas where the properties were located.

Field data collection was performed by Atrium Environmental Health and Safety Services, LLC (Atrium). The National Center for Healthy Housing (NCHH) reviewed the data, conducted a quality control review of field activities, and conducted statistical analyses of the sampling results.

1. The properties included in this study had higher lead levels than is typical for housing containing LBP. Many of the R&R activities assessed were on surfaces and fixtures that contained lead levels of more than 9.9 mg/cm². While the lead content of the paint was relatively high, pre-work surface dust levels measured on floors and window sills in the work areas of these properties were within the ranges of surface dust levels measured in occupied dwellings during a similar HUD-funded study.
2. Fewer events where EPA/HUD LSWP were used were evaluated than events where Routine or Modified (Mod) LSWP were used.
3. The air and surface dust sampling data values were widely distributed.
4. Based on the data collected during this project, EPA/HUD Lead Safe Work Practices (LSWP) took approximately twice the labor effort to implement when compared to routine work practices.

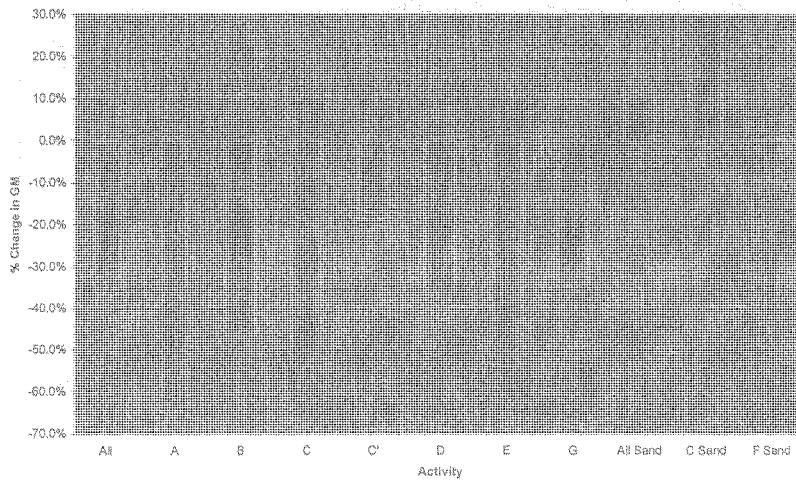
Responses to three fundamental questions that formulated the objectives of this project are offered as follows:

1. Do typical renovation and remodeling activities create lead hazards?

Renovation and remodeling activities evaluated during this project did not create new lead dust hazards.

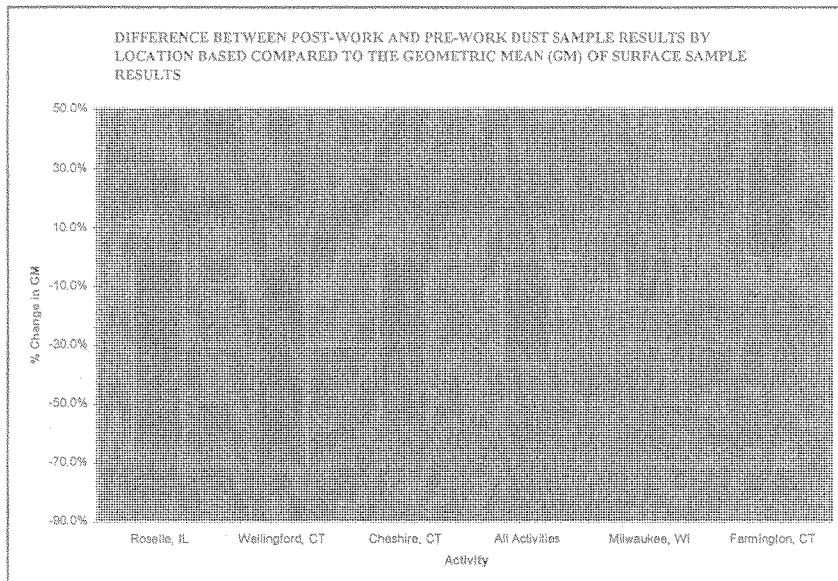
In all of the properties tested, pre-work (baseline) testing identified surface dust levels that exceeded current HUD/EPA criteria for floors and window sills. When considering R&R activities where no sanding was performed, the post-work samples collected from all surfaces were lower than the pre-work dust samples in all of the activities evaluated.

DIFFERENCE BETWEEN POST-WORK AND PRE-WORK DUST SAMPLES BY ACTIVITY BASED ON THE GEOMETRIC MEAN (GM) OF ALL SURFACES SAMPLED



Activity Label Legend	
Label	Activity
A	Wall and Ceiling Removal
B	Wall and Ceiling Modification
C	Window Replacement (no sanding involved)
C'	Window Alteration (no sanding involved)
D	Kitchen and Bath Work
E	Floor Covering Removal
G	Sawing into Wood & Plaster Covered by LBP
All Sand	All Sanding Events
C Sand	Window and Door Replacement, Removal or Alteration (sanding events)
F Sand	Surface Preparation (sanding)

When considering lead dust loading on surfaces throughout a single property, results showed that overall all but one of the properties evaluated (Farmington, CT) showed lower levels of lead dust when the R&R contractors completed the work than when they arrived.

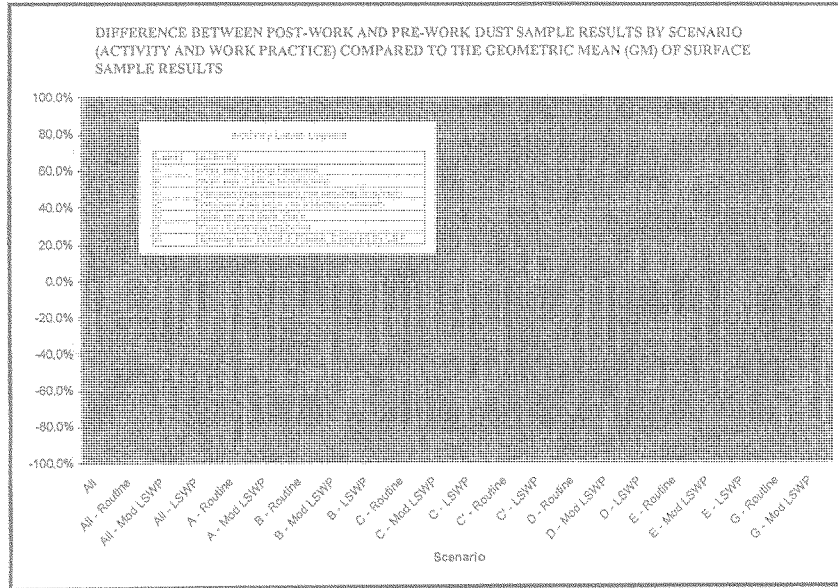


2. When applying EPA's lead-safe work practices to a set of typical renovation and remodeling activities, are surface lead hazards ($>40 \mu\text{g}/\text{ft}^2$ on floors, $>250 \mu\text{g}/\text{ft}^2$ on window sills), or airborne hazards ($> 50 \mu\text{g}/\text{m}^3$ in the air) created?

In reviewing the results from all activities and all work practices, the trend was a reduction in both lead loading in surface dust as well as airborne lead based on the personal breathing zone (PBZ) air sample results. These results demonstrate that in most cases, no new hazards were created as a result of the renovation and remodeling activities conducted.

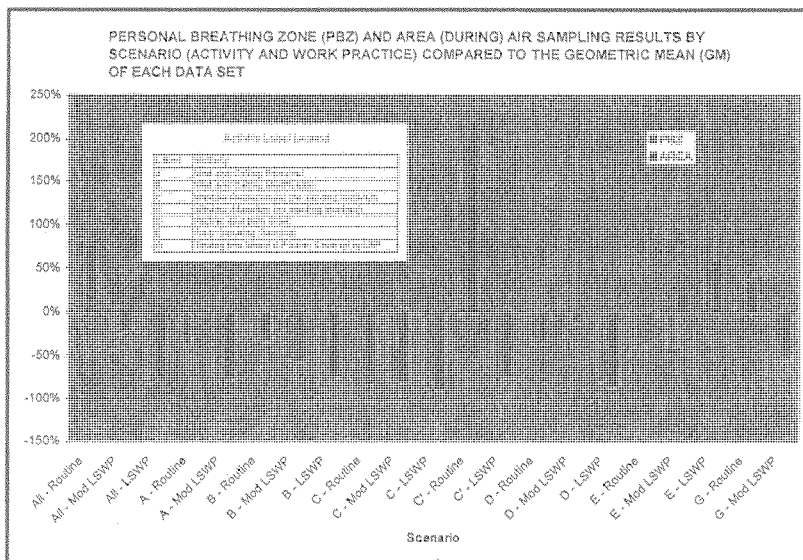
Based on the results of the wipe samples collected during this project, pre-work surface dust loading results already exceeded $40 \mu\text{g}/\text{ft}^2$ on floors and $250 \mu\text{g}/\text{ft}^2$ on window sills for all activities and all work practices employed – Routine, Mod LSWP, and LSWP.

There are several work practices that were demonstrated to have obvious benefits. Misting surfaces with water during work appears to significantly reduce airborne lead dust. Events where misting was used showed a significant reduction in airborne lead dust levels when compared to events where no misting was used.



Airborne lead dust levels were substantially lower when only hand tools or only hand sanding were used when compared to events where one or more power tools were used. Ventilated (shrouded) tools connected to HEPA filter-equipped vacuum cleaners showed a reduction when compared to sanding using non-shrouded orbital sanders and belt sanders, respectively.

For surface dust, reductions in the lead loading were observed when either re-useable drop cloths or disposable drop cloths were used. However, a more substantial reduction was shown in events where disposable drop cloths were used. The use of HEPA filter-equipped vacuum cleaners combined with either wet wiping or Swiffer® mops during post-work clean-up showed the greatest effect on reducing lead loading in surface dust.



3. Do modified lead-safe work practices reduce lead exposures below the PEL?

The PBZ samples collected during this project represented 35 workers' 8-hour TWA exposures. Twenty-six of the calculated 8-hour TWA exposures were less than the OSHA Action Level of $30 \mu\text{g}/\text{m}^3$; and 29 were below the PEL of $50 \mu\text{g}/\text{m}^3$.

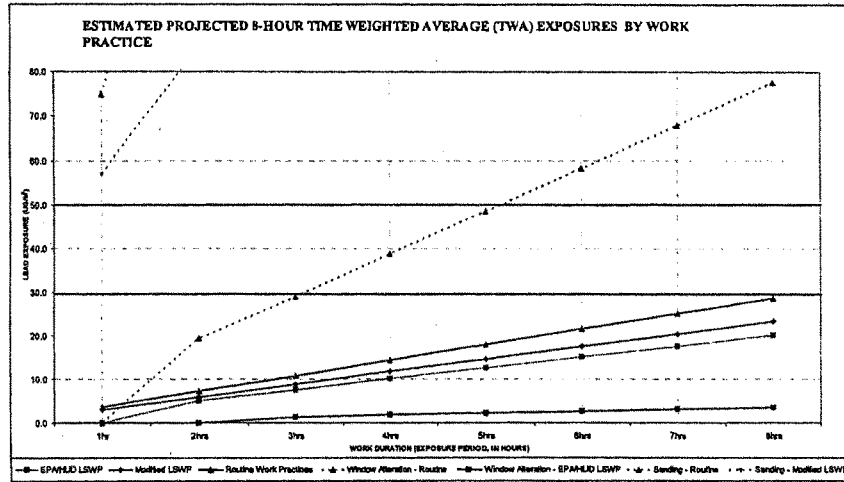
Estimating 8-hour TWA exposures by activity, regardless of work practice, showed that the following tasks can likely be performed for an entire work shift without exceeding the OSHA Action Level:

- o Wall and ceiling demolition;
- o Wall and ceiling modification;
- o Window replacement with no sanding;
- o Cabinet removal; and,
- o Baseboard removal.

It is likely that window alterations with no sanding involved may be conducted using routine practices for shorter periods of time (e.g. less than 5 hours during a shift) without exceeding the OSHA PEL. Activities involving sanding resulted in projected 8-hour TWA exposures that exceeded the OSHA Action Level and PEL.

In most instances, those employees' whose 8-hour TWA exposures exceeded the action level performed some type of sanding activity during their work day. Using ventilated (shrouded) tools connected to HEPA filter-equipped vacuum cleaners and other dust

control measures during sanding reduced airborne concentrations of lead dust, in most cases. During window and door alterations where sanding was conducted, employing some degree of dust control showed a reduction in airborne dust levels, in most cases, when compared to sanding with no controls. Performing surface preparation activities using dust control devices or techniques also showed a reduction over uncontrolled sanding during surface preparation.



RESPONSES BY MIKE NAGEL TO ADDITIONAL QUESTIONS
FROM SENATOR INHOFE

Question 1. How do we avoid creating a disincentive for individual homeowners to take matters into their own hands and repair and inadvertently increase the lead hazards to their children?

Response. The best way to avoid consumer disincentives is to ensure that professional remodeling remains affordable to those who live in target housing. This is accomplished by reducing unnecessary or excessive costs from training, extensive recordkeeping, cleaning verification (third party abatement-style clearance testing as suggested by some health advocates) and maintaining liability insurance. The economic analysis EPA prepared for the Lead: Renovation, Repair and Paint (RRP) rule addresses the first three of these cost centers.¹

- a. The benefits of the rule shown in EPA's economic analysis can only be actualized if a professional remodeler performs the work. In as much as the benefits from the rule scarcely outweigh the costs, there are little benefits if a homeowner or black-market contractor does the RRP project and no benefit if nothing is done.
- b. Cleaning verification, or the more arduous dust-wipe clearance testing provides very little benefit to achieve the desired outcome.
 - i. EPA's economic analysis states that clearance testing only adds a 2 percent benefit to the proposed rule and that 98 percent of the benefit is achieved by cleaning to a level of no visible dust and debris.²
 - ii. In a survey done by NAHB, 81 percent of consumers, who were fully aware of the dangers of lead, were not willing to pay \$200 extra on a remodeling project for a clearance test. This amount is a far cry from the actual costs of clearance testing.³
 - iii. This unwillingness to pay for clearance testing marks a crucial disincentive for homeowners. Along with the requirement to disclose "the presence of any known lead-based paint" (40 CFR§745.100), these disincentives provide strong motivation for homeowners to avoid complying with the rule and performing the renovations themselves.
- c. Some training costs are unavoidable as training in lead-safe work practices is essential to the performance of proper procedures in renovating target housing. However, the proposed rule imposes a training regime that is unnecessarily costly because of its inflexibility, inconsistency and authorizing states, territories and tribes to establish their own training programs.
 - i. Inflexible—the 8-hour training requires 2 hours of hands-on training, which eliminates the option of distance learning, video, or internet training.
 - ii. Inconsistent—individuals, renovation firms, and trainers are working on different timelines for re-certification. Individuals and firms re-certify every 3 years; training course re-accreditation occurs every 4 years. If training courses need to be updated every 4 years, then renovator refresher and firm re-certification should follow the same timeline.
 - iii. Grandfathering—remodelers who have already taken the approved HUD/EPA "Lead Safety for RRP" is not addressed in the rule.
 - iv. State/Local Program—Under EPA's proposed rule, either states or EPA can provide certification to remodeling firms. However, remodeling firms that work in metropolitan areas bordering multiple states (e.g., Chicago, IL, New York City, NY, Washington DC, St. Louis, etc.) face multiple State licensing fees to comply with the same Federal requirement. Therefore, training program accreditation should remain with EPA alone. By retaining responsibility for training accreditation, the rule can avoid an unnecessary patchwork of differing State requirements.

Considering the monumental task of training a sufficient professional base, EPA estimates in its economic analysis that a minimum of 311,000 certified renovators, expanding opportunities for training, 'grandfathering' and consistency are required.⁴

¹U.S. Environmental Protection Agency, Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule, (February 2006).

²U.S. Environmental Protection Agency, Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule, ch. 7, p. 19 (February 2006).

³National Association of Home Builders, Report on Lead Paint Test Survey (April 2007) (NAHB Report).

⁴U.S. Environmental Protection Agency, Economic Analysis for the Renovation, Repair, and Painting Program Proposed Rule Table 4—14 (February 2006).

d. The recordkeeping requirements for the proposed rule are onerous and unrealistic.

i. The rule does not tie the record of the remodeling event to the property, where it would be accessible for subsequent purchasers or clientele of a child occupied facility.

ii. They require meticulous detail concerning every procedure—remodeling, cleaning, waste-handling, certification, the posting of signs, even copies of certified renovators training certificates, etc.

iii. Certain document retention is unrealistic. For example, “documentation of compliance” can be defined as requiring the firm to keep dust wipes on file for 3 years after a project. In a filing cabinet, those dust wipes are subject to contamination from sources foreign to the project it is representing, rendering the wipes invalid and subjecting the firm and renovator to noncompliance and the liability associated with it.

Moreover, the excessive paperwork generated by the recordkeeping requirements violates the principles of the Paperwork Reduction Act. A simple checklist that identifies which renovation activities were undertaken, lists certified renovators’ registration numbers and a simple statement of compliance that begins “Under penalty of law. . .” could remedy the recordkeeping difficulties.

e. There is a lack of available liability insurance for remodelers who disturb or might disturb lead-based paint. Most policies contain “absolute pollution exclusions” which exclude coverage for claims from RRP projects generating presumed pollutants, including lead. There is also no regulatory “safe harbor” for remodelers who perform RRP. In 1992, the Senate requested the feasibility of standards for a “safe harbor” that exempted owners and lenders from liability if particular procedures and demonstrable compliance were achieved.⁵ Remodelers working in target housing should be given similar consideration.

Anecdotally, an NAHB remodeler member in Rhode Island recently had liability coverage canceled by the insurer after the company realized the member was working in homes, which may be contaminated with lead.

Question 2. What is the likelihood that remodelers will just avoid performing renovations of homes built prior to 1978, therefore keeping older housing in a state of continual deterioration?

Response. The likelihood that many remodelers will avoid working in pre-1978 houses is extremely high, as a means to avoid non-compliance with the proposed rule, as expressed in the response to Question 1. Avoiding the repair or remodeling of a home is the worst-case scenario for the nation’s older housing stock. A 2003 study acknowledged that simply cleaning dust and debris without addressing potential sources of lead dust is “unlikely to result in significant and sustained reductions in dust lead loadings.”⁶ Similarly, remodeling done by the homeowner or untrained contractor is also hazardous and does not lower dust lead loadings, but in fact increases dust lead loading levels and increases the potential for childhood lead poisoning (1999 U. of Iowa & 1999 EPA Wisconsin studies). Moreover, in situations where untrained do-it-yourself renovations occur, children may be underfoot, the children’s eagerness to help tragically endangering their own health. Likewise, in renovations done by untrained contractors, work areas not cordoned off and left exposed pose sure risks for lead poisoning.

Response. Studies by EPA/Battelle (2007), NAHB (2006), and the New Jersey School of Medicine (2004) all established that professional remodeling reduces lead dust loading levels from their pre-construction levels. These studies also demonstrated which practices should be prohibited and identified instances in which extra care needs to be taken, i.e., cleaning rough surfaces.

Question 3. Are you concerned that contractors may be held responsible for lead that remains in the home after the work is completed, even when the lead condition is drastically improved?

Response. Yes, NAHB Remodelers are concerned with potential liability for lead sources left in homes after remodeling activities are completed. Both Congress and

⁵U.S. Senate Committee on Banking, Housing & Urban Affairs, Senate Report P.L. 102—550, Housing and Community Development Act of 1992, S. Rep. No. 102—332, p. 12 (July 23, 1992)

⁶Tohn, E.R., et al., “An Evaluation of One-time Professional Cleaning in Homes with Lead-based Paint Hazards.” Applied Occupational and Environmental Hygiene, 18 no.2, 138—143 (2003).

the EPA have recognized that abatement and renovation are separate activities.⁷ 40 C.F.R. §745.83 states:

Response. Renovation means the modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223). The term renovation includes (but is not limited to): the removal or modification of painted surfaces or painted components (e.g., modification of painted doors, surface preparation activity (such as sanding, scraping, or other such activities that may generate paint dust)); the removal of large structures (e.g., walls, ceiling, large surface replastering, major re-plumbing); and window replacement.

and 40 C.F.R. §745.223 reads:

Abatement does not include renovation, remodeling, landscaping or other activities, when such activities are not designed to permanently eliminate lead-based paint hazards, but, instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards. Furthermore, abatement does not include interim controls, operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce lead-based paint hazards.

Any removal of lead sources during renovation activities is strictly coincidental and remodeling does not require the complete removal of all sources of lead. As stated in response #1, there is no “safe harbor” for remodelers who use lead-safe work practices and demonstrate compliance with the proposed rule. The Senate Committee said,

The task force would, in particular, consider the efficacy of adopting measures to reduce the liability of lenders and owners of multifamily housing by clarifying standards of care or adopting a statutory “safe harbor”. The Committee expects that the task force would consider whether it makes sense to develop a set of standards that, if followed by owners and lenders, would adequately protect building residents from exposure to lead-based paint. Owners or lenders who could demonstrate compliance with such standards would be exempted from liability for harm that resulted in spite of their exercise of “due care.”⁸

These thoughts were expressed during deliberation of Title X. While the quote addresses owners and lenders, at this time the same consideration should be afforded the remodeler who legitimately complies with the proposed rule. Current insurance products contain “absolute pollution exclusions” for contaminants including lead. The proposed RRP rule exposes remodelers to potentially excessive legal responsibilities with no statute of limitations and no relief for those complying with the rule.

In homes with significantly deteriorated surfaces, such as degraded wood floors and windowsills, several studies have shown that although lead-safe work practices significantly reduced dust loadings, the degraded surfaces still did not meet abatement clearance standards (40 ug/sq. ft. on floors, 250 ug/sq. ft. on sills).⁹ While the Yiin 2004 study stated that “extra care may be necessary on rough surfaces,” the core of the study proved clearance was achieved only 95 percent—98 percent using LSWP cleaning techniques. Additionally, in an Environmental and Occupational Health Sciences Institute study on carpets, there were no significant reductions in lead dust loadings when using either a standard vacuum or a HEPA-filtered vacuum.¹⁰ These are instances where remodelers are potentially liable for lead dust not generated by RRP activities, but which simply exist in the conditions prevalent in the dwelling and for which they bear no responsibility.

RESPONSE BY MIKE NAGEL TO AN ADDITIONAL QUESTION
FROM SENATOR BOXER

Question. EPA recently proposed to include certain child occupied facilities in its lead paint renovation rulemaking.

Does the National Association of Homebuilders support this expansion of the rule?

⁷15 USC §2682(c)

⁸Supra n. 5, S. Rep. No. 102—332 at—(1992).

⁹National Association of Home Builders, Lead-Safe Work Practices Survey Project Report (November 9, 2006). U.S. Environmental Protection Agency, Characterization of Dust Lead Levels after renovation, Repair and Painting Activities (January 2007). Yiin, L. et al., Evaluation of Cleaning Methods in Home Environments after Renovation and Remodeling, Environmental Research, 96 no. 2, 156—162 (2004).

¹⁰Yiin, L., et al., “Comparison of Techniques to Reduce Residential Lead Dust on Carpet and Upholstery: The New Jersey Assessment of Cleaning Techniques Trial.” Environmental Health Perspectives, 110 no. 12, 1233—1237 (2002).

Response. NAHB does support the expansion of this rule to child occupied facilities (COF) and NAHB has stated its support in the most recent comments to the Supplemental Notice of Proposed Rulemaking (SNPRM).¹¹ NAHB believes this expansion can help meet the goal of eradicating childhood lead poisoning. However, there are some concerns that the COF only closes a minor 'loophole' in reaching that goal. The major problem is that it does not include do-it-yourself property owners in target housing.

Unfortunately, regardless of whether or not EPA decides to apply the proposed rule to COF, the majority of renovations covered under the proposed rule (above the two-square feet *de minimis* disturbance) will never be affected.¹² Homeowners, who are not covered by the proposed rule, perform the vast majority of these projects. This homeowner exclusion is the single largest loophole under EPA's proposed rule. While NAHB is not aware of any national data that attempts to quantify this gap in coverage, the Harvard University's Joint Center for Housing Studies estimated in 2007 that approximately half of all of the "major" remodeling work (defined with a monetary value of \$5,000 or more) was performed by do-it-yourself-ers.¹³ Given these facts, NAHB believes the current loophole allowing untrained homeowners to perform renovations means that the vast majority of activities that disrupt lead-based paint in target housing will never be covered by EPA's proposed RRP rule.

Additionally, the expansion in the supplemental notice to include COF has many of the same pitfalls of the original proposed rule and poses additional concerns.

- a. The definition of COF is vague. The formula for deciphering what is a COF is confusing and certainly, a more straightforward method to determine a COF should be established.¹⁴
- b. The notification requirements for the COF provision are problematic. The SNPRM requires remodelers to inform clients of the COF about the RRP activities. The remodeler has no contractual connection to the COF client, as he or she is a "subcontractor" of the facility's proprietor. These requirements would expose remodelers to further potential tort claims.
- c. Owners and lessees of COF have a disincentive to call on professional remodelers because of increased costs that a remodeler would have to absorb from the rule. Peer-reviewed research has documented that "do-it-yourself-ers" and untrained personnel leave facilities dirtier (with a higher lead dust loading level) than before the renovation was done. A comparison of the Yiin 2004 study to a University of Iowa 1999 study show that professional remodelers clean work areas better than homeowners and landlords.¹⁵
- d. There are no "safe harbors" for remodelers who comply with the rule and remodelers are open to tort claims well after renovations are complete. The SNPRM did not address these liabilities and lack of insurance products available to professional remodelers working in COF with lead paint and the expansion of any claims to clients of the COF.
- e. Cleaning verification or clearance testing blurs the line Congress established between renovation and abatement.

Senator BOXER. Thank you, sir, for your testimony.

Now, we are in fact going to have a vote at noon, so we are going to have to go back to our 4 minutes.

Dr. Lanphear, we welcome you. You are a doctor. You are Director of Cincinnati Children's Environmental Health Center, Professor of Pediatrics and Environmental Health. Go ahead, sir.

Senator BOXER. Thank you, sir, for your testimony.

Now, we are in fact going to have a vote at noon, so we are going to have to go back to our 4 minutes.

¹¹U.S. Environmental Protection Agency, Lead; Renovation, Repair and Painting Program, 72 Fed. Reg. 31022 (supplemental notice June 5, 2007).

¹²U.S. Environmental Protection Agency, Lead; Renovation, Repair, and Painting Program, 71 Fed. Reg. 1588, 1628 (proposed Jan. 10, 2006) (to be codified at 40 C.F.R. Part 745), see proposed 40 C.F.R. §745.82

¹³Joint Center for Housing Studies, Foundations for Future Growth in the Remodeling Industry (Harvard University Press, 2007).

¹⁴72 Fed. Reg. 31022.

¹⁵Yiin, 2004; Erte, LA, et al., An Evaluation of Effectiveness of Lead Paint Hazard Reduction when Conducted by Homeowners and Landlords, Applied Occupational and Environmental Hygiene, 14 no. 8, 522—525 (1999).

Dr. Lanphear, we welcome you. You are a doctor. You are Director of Cincinnati Children's Environmental Health Center, Professor of Pediatrics and Environmental Health. Go ahead, sir.

STATEMENT OF BRUCE P. LANPHEAR, M.D., MPH, DIRECTOR, CINCINNATI CHILDREN'S ENVIRONMENTAL HEALTH CENTER; PROFESSOR OF PEDIATRICS AND ENVIRONMENTAL HEALTH

Dr. LANPHEAR. Thank you very much, Senator Boxer, Senator Inhofe.

Despite the dramatic decline in children's blood lead concentrations, which were unquestionably due to the dramatic reductions in environmental lead exposure, rather than educational efforts, which we continue to rely on for children who have blood lead levels less than 10 micrograms per deciliter, lead toxicity remains a major public health problem.

Exceedingly low levels of exposure to environmental lead have been associated with an increased risk of diminished intellectual ability, reading problems, ADHD, school failure, and even criminal behavior in children and young adults.

Moreover, there is no evidence of a threshold for the adverse consequences of lead exposure. Indeed, studies show that the detriments in children's intellectual abilities are, for a given increase in blood lead concentration, greater at blood lead levels less than 10 micrograms per deciliter than for the same level of exposure at blood leads above 10.

On average, there is an estimated two to three IQ point decline for children whose blood lead levels increase from 10 to 20 micrograms per deciliter, but there is an estimated decline of four to seven IQ points at blood lead levels below 10 micrograms per deciliter.

Thus, if we continue to rely on the 10 microgram per deciliter cutoff, which all of us continue to refer to here today, we will fail to protect children. Indeed, we will fail to protect the vast majority of children, over 90 percent of children, who are adversely affected by lead exposure.

But scientists and pediatricians are finding that the affects on intellectual abilities are only the tip of the iceberg. Overall, 8.7 percent of U.S. children are estimated to have ADHD. In a nationwide survey, we found that children were four times more likely to have doctor-diagnosed ADHD and to take ADHD medication if they had blood lead levels above two micrograms per deciliter. We estimated that one in five children's cases of doctor-diagnosed ADHD can be attributed to low-level lead exposure.

There is increasing evidence linking lead exposure with conduct disorders, delinquency and criminal behaviors even at levels considerably lower than the 10 microgram per deciliter action level set by CDC. But lead's effects extend beyond childhood. In adults, lead exposure has been associated with some of the most prevalent diseases of industrialized society—cardiovascular disease, miscarriage, chronic kidney disease, and accelerated cognitive decline—at levels commonly observed throughout the United States population.

Consistent with research on childhood lead exposure, there is emerging evidence indicating that the risk for death from heart at-

tacks and stroke, as well as the risk for chronic kidney disease, increase at blood lead levels considerably lower than 10 micrograms per deciliter.

The key to prevention is to eliminate environmental lead exposure. Federal agencies use a variety of standards for unacceptable lead content. It is critical to recognize that all of the existing standards were promulgated long before the research demonstrated the harmful effects at blood lead levels below 10 micrograms per deciliter.

The recommendations that I have are, first, the U.S. EPA should request the National Academy of Sciences to update the report on protecting infants, children and pregnant women. This report should review and synthesize the existing evidence about sources of lead intake. They should evaluate the adverse affects of lead at blood lead levels below 10 micrograms per deciliter; review and synthesize existing evidence about the primary prevention of lead exposure; and make recommendations about the primary prevention of lead exposure.

The U.S. EPA should heed the advice of the Clean Air Scientific Advisory Committee and lower the national ambient air quality standard for lead to a level no greater than 0.2 microgram per meter cubed. As recommended by the Clean Air Scientific Advisory Committee, the U.S. EPA should reduce the existing residential dust lead standards, which are insufficient to protect children at blood lead levels of 10 micrograms per deciliter, let alone children below that value.

Finally, as recommended by the American Academy of Pediatrics and other groups, Federal agencies should require all products intended for use by or in connection with children to contain no more than trace amounts of lead.

Thank you.

[The prepared statement of Mr. Lanphear follows:]

STATEMENT OF BRUCE P. LANPHEAR, M.D., MPH, DIRECTOR, CINCINNATI CHILDREN'S ENVIRONMENTAL HEALTH CENTER; PROFESSOR OF PEDIATRICS AND ENVIRONMENTAL HEALTH

Prior to 1970, lead poisoning was defined by a blood lead concentration of 60 ug/dL or higher—a level often associated with overt signs or symptoms such as abdominal colic, encephalopathy or death (1). Since then, the blood lead concentration for defining lead toxicity has gradually been reduced from 60 ug/dL to 40 ug/dL in 1971, to 30 ug/dL in 1978, and to 25 ug/dL in 1985. In 1991, the Centers for Disease Control further reduced the definition of undue lead exposure to a blood lead concentration of > 10 ug/dL (1).

Children's blood lead concentrations have declined dramatically over the past 30 years. In the 1970's, 88 percent of U.S. children younger than 6 years were estimated to have a blood lead concentration > 10 ug/dL (2). When lead was at long last banned from paint, lead solder in canned foods and phased out of gasoline, children's blood lead levels plummeted (2). By the early 1990's, fewer than 5 percent of children younger than 6 years were estimated to have blood lead concentrations > 10 ug/dL (3).

Despite the dramatic decline in children's blood lead concentrations, lead toxicity remains a major public health problem. Exceedingly low-levels of exposure to environmental lead have been associated with an increased risk for reading problems, ADHD, school failure, delinquency and criminal behavior in children and adolescents (4—9). Moreover, there is no evidence of a threshold for the adverse consequences of lead exposure (10—13). Indeed, studies show that the decrements in intellectual function are, for a given increase in blood lead concentration, greater at blood lead levels < 10ug/dL (10—13), the level considered acceptable by the Centers for Disease Control. On average, there is an estimated decline of 2 to 3 IQ points

for children whose blood lead levels rise from 10 to 20 ug/dL, but there is an estimated decline of 4 to 7 IQ points for children whose blood lead levels rise from 1 ug/dL to 10 ug/dL (10—11).

Lead's effects extend beyond childhood. In adults, lead exposure has been associated with some of the most prevalent diseases of industrialized society: cardiovascular disease (14—15), miscarriage (16), renal disease (17—18) and cognitive decline (19). Consistent with research on childhood lead exposure, there is emerging evidence indicating that the risk for death from heart attacks and stroke, as well as the risk for chronic kidney disease, occur at blood lead levels considerably lower than 10 ug/dL.

The key to primary prevention is to eliminate environmental lead exposure. Federal agencies use a variety of standards for unacceptable lead content. It is critical to recognize that all of these standards were promulgated long before research demonstrated the harmful effects of lead at blood lead levels below 10 ug/dL. Because there is no known safe level of lead exposure, exposure to lead below these existing standards should not be considered "safe."

Prevention of lead toxicity will, first and foremost, require a declaration of the full scope of the problem. Thus, the CDC's level of concern should be lowered to a blood lead level < 5 ug/dL because society cannot respond to a threat until it first acknowledges it. It will require the revision of regulations to further reduce airborne lead exposure; screening of high-risk, older housing units to identify lead hazards before a child is exposed—before occupancy, after renovation or abatement; reductions in allowable levels of lead in water; and stricter regulations and enforcement on the allowable levels of lead in toys, jewelry and other consumer products. Finally, protecting children will require eliminating all non-essential uses of lead.

RECOMMENDATIONS:

1. The US EPA should request the National Academies of Science to update the Report on Protecting Infants, Children and Pregnant Women. This Report should review and synthesize the existing evidence about sources of lead intake; evaluate the adverse effects of lead at blood lead levels < 10 ug/dL; review and synthesize existing evidence about primary prevention of lead exposure and; make recommendations about the primary prevention of lead exposure.

2. The US EPA should heed the advice of the Clean Air Scientific Advisory Committee and lower the National Ambient Air Quality Standard (NAAQS) for Lead to a level no greater than 0.2 ug/m³.

3. As recommended by the Clean Air Scientific Advisory Committee, the U.S. EPA should review the existing residential dust standards to ensure that they are sufficiently low to protect children.

4. The US EPA should review the water lead standard to ensure that it is sufficiently low to protect children.

5. As recommended by the American Academy of Pediatrics, the Federal Government should require all products intended for use by or in connection with children to contain no more than trace amounts of lead.

6. As recommended by the American Academy of Pediatrics, the US EPA should define a "trace" amount of lead in consumer products as no more than 40 ppm, the upper range of lead in uncontaminated soil.

7. As recommended by the American Academy of Pediatrics, "children's product" should be defined to ensure it will cover the wide range of products used by or for children under the age of 12 years.

8. As recommended by the American Academy of Pediatrics, the limit on lead content must apply to all components of the item or jewelry or other small parts that could be swallowed, not just the surface covering.

9. As recommended by the American Academy of Pediatrics, legislation or regulations should limit the overall lead content of an item, rather than only limiting lead content of its components.

RESPONSES BY BRUCE P. LANPHEAR TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. Have you been involved in reviewing EPA's scientific documents dealing with the agency's lead paint renovation rulemaking and clean air protection against lead exposures?

Response. I have served as a member of the Clean Air Scientific Advisory Committee for the "National Ambient Air Quality Standard for Lead" and the "Lead Repair, Renovation and Paint Rule".

Could you please give me your opinion on whether the EPA is moving in the right direction, or the wrong direction, in these regulatory processes by using recent scientific studies to protect children's health from lead exposure?

I was pleased with the deliberations and advice of the Clean Air Scientific Advisory Committee about the National Ambient Air Quality Standard for Lead. I was equally satisfied with the recommendations of EPA Staff on Lead NAAQS, which were remarkably consistent with the CASAC's advice. In contrast, I was disappointed and troubled by the EPA's Advance Notice of Proposed Rulemaking (ANPR).

The ANPR showed surprising disregard for scientific evidence, the NAAQS review process and the mandate to protect public health. After citing the scientifically based advice and recommendations of the CASAC and Agency staff, the ANPR made it clear that options which had already been examined and dismissed on scientific grounds by both CASAC and EPA staff would be considered for the primary lead standard. Based on the scientific evidence and the review process, the ANPR should have retained lead as a criteria air pollutant and indicated that the lead standard would be dramatically lowered from its current value of 1.5 ug/m³—established over 30 years ago when blood lead levels lower than 30 ug/dL were considered acceptable for children—to a value less than 0.2 ug/m³, as recommended by CASAC and EPA Agency Staff.

I was especially concerned that the ANPR consistently selected options that underestimated the adverse effects of lead, diminished the benefits of reducing the lead standard and failed to provide an adequate margin of safety. As a key example, the ANPR contemplated using the Centers for Disease Control and Prevention (CDC) level of concern for lead in blood of 10 ug/dL as an acceptable risk level by the EPA Administrator. It is clear that the adverse effects of lead occur at demonstrably lower levels, with consistent evidence indicating that the effects of lead persist at blood lead levels lower than 5 ug/dL. Any suggestion that the U.S. EPA would use the CDC's level of concern as a starting point for risk assessment is particularly troubling. This approach—which ignores both the CDC and CASAC determinations that there are adverse health effects at lower blood lead levels—would fail to protect public health with an adequate margin of safety as required by the Clean Air Act.

I was also pleased with the deliberations and advice of the Clean Air Scientific Advisory Committee about the Lead Repair, Renovation and Paint Rule. In contrast, my perception is that the US EPA was intent on selecting inexpensive and unproven methods to minimally comply with the congressional mandate to protect children from lead hazards generated by renovation, repair and painting. For example, the qualitative and simplistic method proposed by the U.S. EPA to verify the effectiveness of these cleaning procedures—i.e., the “white glove” or “white cloth verification tests”—is unproven and did not yield consistently reliable results, thus leading to an inaccurate assessment of cleaning efficiency after repair and renovation activities. This was especially troubling because there is a reliable, proven and inexpensive method (dust wipe sampling method) used by environmental technicians to comply with existing standards promulgated by the US EPA and US Department of Housing and Urban Development. In my opinion, it would be irresponsible to propose using a new method until further research is conducted to validate that it is superior or at least comparable to the existing dust wipe sampling method. (See additional comments about LRRP in my response to question 3.)

Question 2. While other Federal agencies can recall dangerous products, EPA has strong authorities to control the use of lead ? to stop dangerous exposures before they happen. Can you please describe the importance to public health of preventing dangerous lead exposures before they happen?

Response. Primary prevention of childhood lead poisoning is critical. In spite dramatic reductions in childhood lead exposure (1), levels of lead exposure previously thought to be safe or inconsequential only two decades ago have consistently been shown to be risk factors for reading problems, intellectual delays, school failure, ADHD and criminal behaviors (2—13). There is no evidence for a threshold for the adverse effects of lead exposure; indeed, there is compelling evidence that lead-associated decrements in intellectual function are proportionately greater at blood lead <10 ug/dL (8—13). On average, there is an estimated decline of 2 to 3 IQ points for children whose blood lead levels rise from 10 to 20 ug/dL, whereas there is an estimated decline of 4 to 7 IQ points for children whose blood lead levels rise from 1 ug/dL to 10 ug/dL (7—8).

The key to primary prevention is to require the promulgation of regulations to further reduce environmental lead exposure; screening of high-risk, older housing units to identify lead hazards before a child is exposed—before occupancy, after renovation or abatement—and reducing lead in drinking water, consumer products and

industrial emissions. These reductions in exposure will only occur with stricter regulations and enforcement on the allowable levels of lead in air, house-dust, water and consumer products.

Question 3. Are there studies that demonstrate cleaning up indoor dust from lead paint to low levels is feasible? Has EPA incorporated these studies in its current rulemaking on lead paint renovation activities? Please provide a copy of any such study.

Response. There is considerable evidence that cleaning after lead hazard controls can result in dramatic reductions in dust lead loading. In one EPA-funded study, dust lead levels immediately following abatement were 8.5 ug/ft², 8 ug/ft² and 21 ug/ft² for floors, interior windowsills and window troughs, respectively—representing reductions of over 80 percent compared with pre-abatement levels (14). In a large, national study of over 2600 housing units, post-abatement dust lead levels were 12 ug/ft², 31 ug/ft² and 32 ug/ft² for floors, windowsills and window troughs, respectively (15).

In unpublished data from our ongoing US EPA/NIEHS-funded HOME Study, we found that we could consistently achieve dust lead levels following lead hazard controls below 5 ug/ft², 50 ug/ft² and 400 ug/ft² for floors, interior windowsills and window troughs, respectively. Indeed, we achieved these dust lead levels in over 98 percent of 165 housing units that underwent lead hazard controls. Although 41 (25 percent) housing units required 3 or more cleanings to achieve these lower levels, we have shown that it is feasible to consistently achieve levels below 5 ug/ft², 50 ug/ft² and 400 ug/ft² for floors, interior windowsills and window troughs, respectively.

The EPA proposes to use obsolete dust lead standards of 40 ug/ft² for floors and 250 ug/ft² for window sills for the proposed Rule. These dust lead levels have consistently been shown to be associated with about 15 percent to 20 percent of children having a blood lead level exceeding 10 ug/dL (16–20). Moreover, research indicating that adverse health effects are found in children who have blood lead lower than 5 ug/dL provides additional justification for further lowering the dust lead standards (7–13). Existing studies thus indicate that it is necessary to achieve dust lead levels < 15 ug/ft² and < 50 ug/ft² on floors and interior window sills after renovation and repair activities to adequately protect children (14–21). The results of these studies have not been incorporated into current rulemaking on lead paint renovation activities.

Senator BOXER. Thank you, sir.

Tom Neltner, on behalf of Improving Kids' Environment, Sierra Club, and Concerned Clergy of Greater Indianapolis.

Welcome, sir.

STATEMENT OF THOMAS G. NELTNER, ON BEHALF OF IMPROVING KIDS' ENVIRONMENT, SIERRA CLUB, AND CONCERNED CLERGY OF GREATER INDIANAPOLIS

Mr. NELTNER. Thank you for the opportunity to talk to you today. I was the lead attorney on the Sierra Club lawsuit against EPA that forced those three actions that EPA described.

What we have effectively is lead becoming the poster child for the breakdown in our Consumer Product Safety Commission and our consumer product safety network. A lot of times we hear about it being CPSC's responsibility, but EPA has a clear responsibility and they have not fulfilled that role.

As a result of EPA's denial of the petition and a clear reluctance to move ahead, people have lost faith in the Federal Government's ability to protect people from lead in consumer products. They went out and tested products. They used lead-check swabs. They used Niton XRFs. And they found it. It is a lot better than finding like the Reebok charm. A child died finding the lead in a Reebok charm.

A grandmother in Bloomington, Indiana was showing people how to use a swab. She grabbed one of the toys that they used to give to kids when they read well. She rubbed the swab on the bendable

toy and it came out red. That was a product that the Consumer Product Safety Commission would not quickly recall—Indiana went ahead and did the recall.

There are other toys that you see up in front of you that you entered into the exhibits that included ones that were just bought 2 days ago. One is a snorkel. It is about 1000 parts per million on the mouthpiece. There is a baby teething ring with about 1,000 parts per million of lead in it. Those are products that were just purchased. There is a vinyl lunch box with 12,000 parts per million on the surfaces. So there are still products out there. They are still a problem, and we don't have systematic corrections.

What we asked EPA to do in our petition and lawsuit was to use its authority to go to the companies and require that they submit their quality control procedures. EPA basically said, you can't make us do that; you can't make us because of a glitch in TSCA; you can make us issue a rule, but you can't make us issue an order. If EPA had issued an order to these companies, EPA and CPSC would have had the information so that they could have proactively dealt with this problem. Instead of being behind the curve on this case-by-case basis, the EPA could have used its authority and gotten ahead of the curve.

On the RRP rule, the renovation, repair and painting rule, I am glad to hear it will be coming out soon. It was promised actually in January 2007. The problem is that rule relies heavily on EPA and the Federal Government to enforce it. We need a rule that allows the consumers and the contractors to identify problems, make informed decisions, and to resolve those problems. EPA did not do that in its proposal. We are asking them to do that as well.

Two quick comments. The Assistant Administrator pointed out that 400 ppm of lead in soil is not a hard and fast standard. In fact, it is when it comes to bare soil around housing. The standard is not part of the Superfund cleanup. It is a hard and fast standard for play areas for children. And I was surprised to learn, and I was the lead attorney on the settlement negotiations, that it will be another year or so until that rule goes into effect requiring reporting by companies of measurable levels of lead. We were under the impression it would be done in June 2008. I have no idea why the delay has occurred. We have been asking about it without luck.

Thank you. I appreciate the opportunity to testify.

[The prepared statement of Mr. Neltner follows:]

STATEMENT OF THOMAS G. NELTNER, ON BEHALF OF IMPROVING KIDS' ENVIRONMENT, SIERRA CLUB, AND CONCERNED CLERGY OF GREATER INDIANAPOLIS

THE SITUATION:

Sixty-two recalls of more than 9.5 million items in 2007 with 10 weeks to go before the end of the year. There were 43 recalls by the Consumer Product Safety Commission (CPSC) in the previous 3 years.¹

The public is dazed and confused. The CPSC is overwhelmed and left to triage recalls based on the magnitude of the danger. In the absence of Federal leadership, State and local legislators scramble to adopt laws to fill gaps. State and local childhood lead poisoning prevention programs struggle with calls from the public. These calls draw their limited resources away from their core mission to protect children from the primary source of lead poisoning lead-based paint in housing. By all accounts, product retailers and importers of children's products are faring little better.

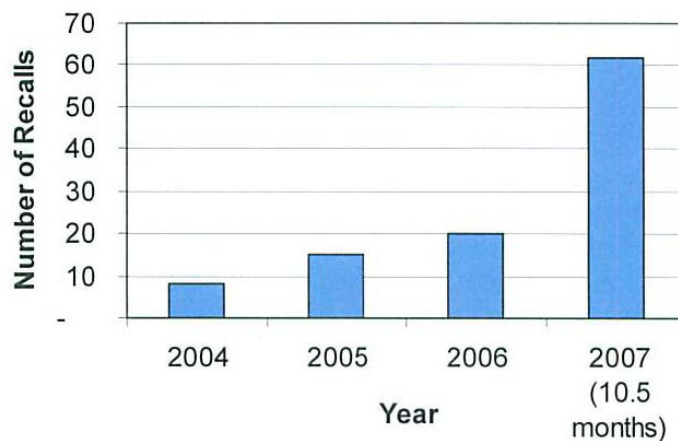
¹See www.cpsc.gov/cpscpub/prerel/prerel.html.

WHAT IS HAPPENING?

Put simply, parents, local health departments, and children's health advocates have lost faith in the Federal Government's ability and commitment to protect children from lead poisoning.

The Minnesota child's death in February 2006 laid bare the tattered network designed to protect children from toxic chemicals in consumer products.² As a result, citizens took matters into their own hands and started testing products. They used low-cost swabs that change color when the swabs contacted lead.³ They used expensive x-ray fluorescent (XRF) devices designed for lead-based paint to measure lead levels in plastic, metal, and coatings on toys.⁴

Figure 1
CPSC Recalls for Lead Contamination By Year



When they found lead, they filed complaints forcing action. When the Federal Government was slow to act, they went to their elected officials. California, Illinois, and Baltimore adopted laws.⁵ Indiana, New York and Illinois issued their own recalls.

Despite these efforts, the problem remains. At the Indiana Black Expo's Health Fair in August 2007, the Concerned Clergy of Greater Indianapolis and Improving Kids' Environment found that 62 percent of almost 400 children's metal jewelry items and 32 percent of 85 plastic jewelry items contained more than 600 parts per million of lead—CPSC's screening level.⁶ The Indiana Pacer's cheerleaders were passing out mardi Gras beads containing 1400 ppm of lead. Children were wearing this jewelry and some were mouthing it!

²U.S. Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Dispatch, March 23, 2006 / 55(Dispatch);1—2.

³National Center for Healthy Housing, Testing for Lead in Consumer Products for Children, August 14, 2007. See www.centerforhealthyhousing.org/factsheet-leadtestconprod.pdf

⁴Id.

⁵California Statutes 2006, Chapter 415, Article 10.1.1 Lead Containing Jewelry. Illinois Public Act—4—0879: The Lead Poisoning Prevention Act of 2006. Baltimore City, Maryland regulations at www.baltimorehealth.org/jewelry.html.

⁶See Attachment 5. "Results of Lead Content Screening of Children's Jewelry Indiana Black Expo, July 20—22, 2007" by Improving Kids' Environment.

EPA'S COMPLICITY

While the focus has been on CPSC's shortcomings, the U.S. Environmental Protection Agency (EPA) has been complicit. EPA refused to use its authority under the Toxic Substances Control Act (TSCA) to support CPSC's effort. Only after a lawsuit from the Sierra Club and Improving Kids' Environment forced its hand did EPA act. The delay has cost us dearly.

If EPA had responded constructively to the Sierra Club's April 17, 2006, TSCA Section 21 petition⁷, EPA could have had the quality control procedures of companies such as Mattel in its hand 1 year before the failings of those procedures became painfully apparent. EPA could have identified the problems and taken steps to fix them. Instead of putting CPSC in a reactive mode triaging complaints Congress gave EPA the statutory authority to take action. EPA refused to exercise that authority.

Instead of acting immediately, EPA chose to take advantage of a loophole in the law claiming that Sierra Club could not force a regulation on quality control procedures without EPA first issuing orders to the companies. EPA refused to issue the orders—even to those companies who already had recalls. Sierra Club maintained that a recall was ample evidence that a company's quality control procedures had failed. Unfortunately, many of these companies had additional recalls after EPA denied the Sierra Club's petition.

In denying the petition, EPA said it planned to work "in coordination with CPSC to understand the scope of the problem."⁸ EPA claimed that a "holistic and proactive approach may be more effective and less resource intensive than the case-by-case approach provided for under section 6(b)."⁹ Eighteen months and 72 recalls have passed and there is no tangible evidence that EPA has found that "holistic and proactive approach."

As a result, parents must work through complicated websites and conflicting guidance as they make decisions on Holiday presents for their children. Retailers must resort to testing products on their shelves to restore consumer confidence. And CPSC is left to issue repeated recalls on a case-by-case basis.

Acting a year earlier would not necessarily have avoided the recalls. But it would have given EPA and CPSC the opportunity to proactively address the situation in a systematic method. This proactive approach would have reassured the public and saved hundreds of thousands of dollars in wasted resources, especially at the State and local level.

While CPSC might have been able to take action on its own, the failure of CPSC and EPA to work together and leverage EPA's more powerful information gathering authorities was a lost opportunity.

EPA's failure is not limited to consumer products. Congress mandated that EPA adopted rules regarding the renovation, repair and painting of housing and child-occupied facilities by 1996.¹⁰ EPA issued a proposed rule on January 10, 2006 under pressure from a lawsuit by the Public Employees for Environmental Responsibility (PEER) and others.¹¹ It committed to finalizing the rule by January 2007 and is now hoping for March 2008.

Public confidence is going to take another hit if EPA finalizes this rule as proposed. In the proposed rule, EPA rejected the use of lead dust wipes to verify that contractors did not create lead hazards. Lead dust wipes had been repeatedly validated as the most reliable method to determine whether lead hazards were present or not. EPA's own rules relied on this method.¹²

EPA's proposed rule was virtually unenforceable. Contractors would have little documentation that they did or did not comply with the rules. Instead of empowering consumers with information and the means they needed to act, EPA proposed leaving consumers in the dark with generic pamphlets instead of actual information on the work that was done. Consumers who later tested their home would have to plead with an understaffed EPA Office of Enforcement and Compliance Assurance (OECA) to "recall" contractors to the home to clean up lead hazards left behind.

The situation would be a repeat of the children's products recalls of 2007 but instead of dealing with hundreds of importers, consumers would be left with hundreds of thousands of contractors.

⁷See Attachment 6. Sierra Club's, April 17, 2006 Section 21 Petition to EPA and CPSC

⁸EPA's July 20, 2006 Denial of Sierra Club's Section 21 Petition. See page 1.

⁹Id. See page 2.

¹⁰Toxic Substances Control Act, Section 402(c)(3).

¹¹January 10, 2006 Federal Register. Page 1587. See www.epa.gov/lead/pubs/renovation.htm.

¹²40 CFR Part 745, Subpart D. See www.epa.gov/fedrgstr/EPA-TOX/2001/January/Day-05/t84.pdf.

WHAT GOES AROUND, COMES AROUND

In the Pollution Prevention Act of 1990, Congress declared “it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.”¹³

This pollution prevention hierarchy makes clear that our top priority should be to keep lead out of products. Recycling is a second choice.

Congress’ foresight was made starkly clear by research by Dr. Jeffrey Weidenhamer of Ashland University in Ohio¹⁴ and an investigation by the Wall Street Journal.¹⁵ They found that much of the lead in toy metal jewelry from China was apparently recycled electronic waste such as circuit boards from the West. Instead of recycling the lead from electronic waste, it appears that it may have been easier to remove the mixture of lead, copper and tin from the waste, melt it up, pour it into the jewelry mold to be shipped back to the United States for our children to use.

In the late 1990’s, EPA had taken a leading role in working with electronics makers to phase lead out of their products. In June 2001, EPA published the “Electronics: A New Opportunity for Waste Prevention, Reuse, and Recycling.”¹⁶ Since 2001, EPA’s focus on prevention appears to have shifted from a balanced approach that emphasizes prevention to a recycling focus. The industry may very well have continued the prevention focus to engineer out lead. The lead that is found in metal toy jewelry may also be a relic of circuit boards from long ago. But EPA appears to have lost its leadership role on the issue.

Under the Resource Conservation Recovery Act, EPA is responsible for the broad management of solid wastes. Yet it has been silent on the issue of the management and disposal of the recalled products. CPSC apparently requires companies with recalls to follow Federal, State and Federal law.¹⁷ Many organizations, including the Sierra Club, are concerned that the lead-contaminated recalled product will be shipped overseas to a country with lower standards, resold in the U.S. on the second-hand market, or disposed of improperly.

The Los Angeles Times investigated the issue.¹⁸ It contacted many of the companies with recent recalls. Most refused to return the call or answer the question. Mattel said “Mattel said it planned to recycle as many components of its returned toys as possible, including selling or reusing zinc and some of the resins used to make the toys.”¹⁹

Once again, State and local elected officials stepped up when the Federal Government was silent. On August 16, 2007, Connecticut Attorney General Richard Blumenthal sent letters to Mattel’s Chief Executive Officer and its Senior Counsel for Regulatory Affairs asking for a response to detailed questions regarding the disposition of the recalled products.²⁰ Sierra Club applauds the leadership of Attorney General Blumenthal.

Mattel’s response was due September 16, 2007. As of October 4, Sierra Club understands that Mattel has not responded to the request.

RECOMMENDATIONS:

Regarding the EPA’s Renovation, Repair and Painting Rule, Congress should:

- Direct EPA to finalize the rule by January 2008 or prepare a detailed explanation for its delay. January 2008 is 2 years after the date of its initial proposal. The status report should describe EPA’s plans to finalize the rule and explain the delays in finalizing the rule.

¹³Pollution Prevention Act of 1990, 40 USC 13101(b)

¹⁴Jeffrey D. Weidenhamer and Michael L. Clement. 2007. Widespread lead contamination of imported low-cost jewelry in the U.S. *Chemosphere* 67 961-965.

¹⁵Gordon Fairclough, Wall Street Journal, “Lead Toxins Take a Global Round Trip ‘E-Waste’ From Computers Discarded in West Turns Up In China’s Exported Trinkets,” July, 12, 2007, <http://online.wsj.com/article/SB118420563548864306.html>

¹⁶EPA 530-F-01-006. See www.epa.gov/osw/elec-fs.pdf

¹⁷In addition, there is no emphasis on using the Federal pollution prevention hierarchy to require strict quality control programs to ensure that lead is kept out of future products manufactured or imported.

¹⁸Abigail Goldman, Los Angeles Times, “Disposal a murky issue in recall of lead-tainted items; State law holds sway, but there’s no uniform procedure in place.” October 8, 2007.

¹⁹Id.

²⁰See Attachment 9.

- Direct EPA to prepare a report when the rule is finalized that explains:
- How the rule will be enforced to achieve at least 75 percent compliance;
- How the rule empowers citizens to:
- Identify compliance problems that leave lead hazards in their residence; and
- Force contractors to clean-up lead hazards contractors create without having to engage the Federal Government in the resolution of the problem;
- How EPA will assess compliance with the rule and report results to Congress and the public on an ongoing basis.

Regarding lead in consumer products, Congress should revise the Toxic Substances Control Act to direct EPA to:

- Ban lead from children's products unless it can be affirmatively demonstrated that the expected use of the product will not expose a child to lead;
- Routinely issue Section 6(b) quality control orders to companies that have recalls to determine whether their quality control procedures are adequate to exclude toxics from children's products;
- Issue a Section 6(b)(2) rule establishing specific and effective quality control standards for all manufacturers and importers;
- Finalize the Section 8(d) rule as recommended by the Interagency Testing Committee before the end of November 2008;
- Send a letter, in cooperation with the CPSC, to all importers and manufacturers of children's products:
 - Explaining the company's responsibilities to comply with the new Section 8(d) rule;
 - Reminding the company of its long-standing obligations under Section 8(e) to submit 8(e) notices of recalls;
 - Identifying the factories that have produced lead contaminated children's products and encouraging the companies to check all of their products for lead if they used the factories.

FINALLY CONGRESS NEEDS TO:

- Adequately fund EPA and CPSC to address lead in children's products in particular and toxic chemicals in consumer products in general.
- Build institutional links between CPSC and EPA so that CPSC relies on EPA for its toxicological expertise and waste management expertise and does not use its limited funding to duplicate this expertise.
- State that the level of concern for lead in children is any measureable level of lead. The current level of concern of 10 micrograms of lead per deciliter of blood should be reclassified as the level for individual case management.

On behalf of the Sierra Club, Improving Kids' Environment and Concerned Clergy of Greater Indianapolis, I greatly appreciate this opportunity to describe the situation to the Senate Committee on Environment and Public Works and make recommendations to the Committee for tangible action to protect children.

Attachment 1

Background on Tom Neltner and Organizations

Tom Neltner is a chemical engineer with a Bachelors of Science from the University of Cincinnati. He is an attorney licensed to practice law in Indiana and Washington, DC. He is also a Certified Hazardous Materials Manager. His positions include:

- Co-chair of Sierra Club's National Toxics Committee since 2005
- Director of Training and Education for the National Center for Healthy Housing since 2005
- Executive Director and Founder of Improving Kids' Environment from 1999 to 2005
- Chair of the Environmental Committee for the Concerned Clergy of Greater Indianapolis from 2001 to 2005
- Adjunct Professor for Indiana University School of Public and Environmental Affairs from 1991 to 1994 and 2000 to 2004
- Assistant Commissioner for the Office of Pollution Prevention and Technical Assistance for the Indiana Department of Environmental Management from 1993 to 1999
- Vice-President for the Environmental Management Institute from 1990 to 1993
- Co-Founder and President of Indiana Recycling Coalition from 1990 to 1993
- Policy Analyst for the Indianapolis Center for Advanced Research from 1988 to 1990
- Engineer for Eli Lilly and Company from 1982 to 1988
- Coop Engineer for Dow Corning from 1979 to 1981

Sierra Club:

Tom Neltner is co-chair of the National Toxics Committee of the Sierra Club. Sierra Club is America's oldest, largest and most influential grassroots environmental organization. It has 1.3 million members. Inspired by nature, the Sierra Club works together to protect our communities and the planet. For more information, see www.sierraclub.org/lead.

Improving Kids' Environment:

Tom Neltner founded Improving Kids' Environment in 1999. He served as its executive director from 1999 to 2005. IKE is a non-profit, advocacy coalition based in Indianapolis dedicated to improving children's health through reductions in environmental threats to children. For more information, see www.ikecoalition.org.

Concerned Clergy of Greater Indianapolis:

Tom Neltner served as the chair of the Concerned Clergy's Environmental Committee from 2001 to 2005. The Concerned Clergy is a faith-based organization dedicated to promoting civil justice in Indianapolis. It was founded in the early 1960s.

Attachment 2

**Timeline of Key Events Regarding Lead in Consumer Products
and Lead-Based Paint During Previous 24 Months**

Date	Event	CPSC Actions	EPA Actions
Nov. 2005	EPA's National Pollution Prevention and Toxics Advisory Committee (NPPTAC) submits formal recommendations to EPA regarding lead poisoning prevention from sources other than lead-based paint.		
Dec. 2005	PEER and others sue EPA to issue Renovation, Repair & Painting (RRP) rule		
Jan. 2006			Proposes Renovation, Repair & Painting Rule on 1/10/06
Feb. 2006	Child dies of lead poisoning from Reebok charm	1 recall / 0.03 million items	Holds RRP Public meetings
March 2006	CDC publishes analysis of child's death in 3/23/06 Morbidity & Mortality Weekly Report	5 recalls / 1.1 million items	Proposes Lead Paint Test Kit and Revised Consumer Booklet
April 2006	Sierra Club petitions EPA and CPSC under TSCA Section 21	1 recall / 0.06 million items	
May 2006		2 recalls / 0.7 million items	Dismisses part of Sierra Club's petition.
June 2006	Illinois prohibits lead in children's products with more than 600 ppm lead.		
July 2006			Denies remainder of Sierra Club petition
Aug. 2006		1 recalls / 0.3 million items	
Sept. 2006	Sierra Club and IKE sue EPA for denying petition.	1 recall / 0.03 million items	
Oct. 2006			
Nov. 2006	Association of Battery Recyclers intervenes in lawsuit.	3 recalls / 0.3 million items	
Dec. 2006	Baltimore bans lead in metal toy jewelry over 1200 ppm	6 recalls / 0.3 million recalls	
Jan. 2007	California Legislature enacts Proposition 65 settlement by the attorney general, Center for Env. Health and retailers regarding phase-out of lead in costume jewelry.	2 recalls / 0.1 million items Publishes ANPR on metal toy jewelry	

Attachment 2

**Timeline of Key Events Regarding Lead in Consumer Products
and Lead-Based Paint During Previous 24 Months**

Date	Event	CPSC Actions	EPA Actions
Feb. 2007		5 recalls / 0.5 million items	
March 2007		5 recalls / 0.1 million items	Publishes two new RRP studies.
April 2007	Sierra Club, IKE, and Assoc. of Battery Recyclers settle lawsuit	2 recalls / 1.3 million items	<ul style="list-style-type: none"> • Reaches settlement on lead in consumer products lawsuit • Sends letter to CPSC • Sends letter on TSCA Section 8(e) to companies with recalls or settlements on lead.
May 2007	Federal Interagency Testing Committee publishes 60 th Report recommending EPA to require reporting of all measureable lead results by importers of children's products excluding metal toy jewelry.	9 recalls / 0.8 million items	
June 2007		3 recalls / 1.5 million items	Modifies proposed rule to include child-occupied facilities.
July 2007	Sierra Club files notice of intent to sue 10 companies for 8(e) notices	2 recalls / 0.1 million items	Publishes notice of ITC report on 7/27/07
Aug. 2007	Sierra Club files notice of intent to sue Mattel	8 recalls / 1.6 million items	
Sept. 2007	<ul style="list-style-type: none"> • California prohibits sales of lead-tainted children's jewelry • House Subcommittee on Commerce, Trade, and Consumer Products holds Hearing • Baltimore bans lead in metal toy jewelry over 600 ppm. 	10 recalls / 1.4 million items	Announces grant decisions on Rural Ed
Oct. 2007	Sierra Club, Env. Law Foundation and Center for Env. Health file Prop 65 notices with selected recall companies Senate Committee Hearing	16 recalls / 2.2 million items	Issue 8(d) Reporting rule for children's products?

Attachment 3

Sierra Club's Section 21 Petition to EPA and Subsequent Litigation

- On April 17, 2006, Sierra Club filed a petition under Section 21 of the Toxic Substances Control Act (TSCA).
- On May 26, 2006, EPA dismissed two requests in the petition.
- On July 19, 2006, EPA dismissed the remaining two requests in the petition.
- On September 14, 2006, Sierra Club and Improving Kids' Environment sued EPA challenging its denial of the petition.
- On November 29, 2006, the Association of Battery Recyclers intervened in lawsuit.
- On April 13, 2007, the parties signed a settlement to the lawsuit. See www.epa.gov/lead/pubs/toyjewelry.htm.
- On June 26, 2007, the court dismissed the case.

Outcome of Sierra Club and IKE's Lawsuit Against EPA Regarding Consumer Products

Sierra Club Request	EPA Decision	Settlement Outcome
Pursuant to TSCA Section 8(d.), (15 USC 2607(d)) EPA should require manufacturers, importers, and processors of lead and its salts that are reasonably likely to be incorporated into consumer products to provide EPA with lists and/or copies of ongoing and completed unpublished health and safety studies related to the six factors identified by CPSC as critical to determine the lead-safety of a product.	Denied on 7/19/06. EPA claimed that it would not gain significant new information.	<p>The Interagency Test Committee stated that "EPA needs the following information to assess the extent and degree of exposure and potential hazard associated with these substances:</p> <ul style="list-style-type: none"> • Studies that relate to the lead content of consumer products that are intended for use by children (includes studies showing any measurable lead content), and/or • Studies that assess children's exposure to lead from such products (including studies of bioavailability). • With regards to grade or purity, studies showing any measurable lead content in such products are of interest." <p>EPA posted the proposal for public comment in July 27, 2007 <i>Federal Register</i>. EPA received one comment – from the Association of Battery Recycling – supporting the proposal as written. EPA should finalize the proposal in the Fall 2007 with reporting due in June 2008.</p>

Outcome of Sierra Club and IKE's Lawsuit Against EPA Regarding Consumer Products

Sierra Club Request	EPA Decision	Settlement Outcome
Pursuant to TSCA Section 9, (15 USC 2608) formally report to CPSC that CPSC should undertake rulemaking to ban lead in toy jewelry and, if CPSC fails to act within the statutory timelines, take action under TSCA Section 6 on its own.	Denied on May 26, 2006 without considering merits of request determining it was not eligible under Section 21.	EPA agreed to send letter to CPSC encouraging CPSC to address quality control issues. EPA sent letter on April 30, 2007.
Pursuant to TSCA Section 5, (15 USC 2604) issue a significant new use restriction to require companies to notify EPA if they manufacture or import toy jewelry containing lead.	Denied on May 26, 2006 without considering merits of request determining it was not eligible under Section 21.	No action.
Pursuant to TSCA Section 6(b), (15 USC 2605(b)) require manufacturers, importers, and processors to submit their quality control procedures regarding lead and, if those procedures are inadequate, require upgrades to address problems.	Denied on July 19, 2007 citing burden of case-by-case method and lack of authority to require rulemaking without EPA issuing order.	EPA agreed to send letter to companies with recalls or settlements involving lead contamination regarding their obligations to submit TSCA Section 8(e) notices. EPA sent letters on April 30, 2007.

Attachment 4

Sierra Club's Actions Against Companies

Pursuant to the settlement, EPA sent letters to more than 100 companies on April 30, 2007 regarding their responsibilities pursuant to TSCA Section 8(e). The companies were those subject to the California Costume Jewelry Proposition 65 Settlement, CPSC Recalls, and various state recalls.

In June, Sierra Club learned that EPA has not received any TSCA 8(e) notices in response to the April 30, 2007 letter from EPA. Therefore, Sierra Club issued Notices of Intent to Sue eleven companies pursuant to Section 20 of TSCA for failure to comply with TSCA. The companies had multiple CPSC recalls. The following is the status of the Notices of Intent to Sue. Sierra Club is preparing lawsuits based on the responses.

Company	Date Mailed	Status as of 10/16/07
Mattel	8/4/2007	No Response
US Toy	7/24/2007	Phone discussion
Target	7/24/2007	10/1/07 Letter
Samara	7/24/2007	Apparently out of business
Dollar General	7/24/2007	Submitted 8(e) Notice per phone discussion
Oriental Trading	7/24/2007	Refused to comply per 9/24/07 letter
A&A Global	7/24/2007	Submitted 8(e) Notice per 8/14/07 Letter
Cardinal	7/24/2007	Submitted 8(e) Notice per 8/23/07 Letter
RC2	7/24/2007	Submitted 8(e) Notice per 9/21/07 Letter
Rhode Island Novelty	7/24/2007	Phone discussion
Atico	7/24/2007	Phone discussion

On October 17, Sierra Club joined with Environmental Law Foundation and Center for Environmental Health to file Notices of Violation pursuant to the California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) against more than twelve importers and retailers for failure to properly label the lead content of their products.

Attachment 5

**Results of Lead Content Screening of Children's Jewelry
Indiana Black Expo, July 20-22, 2007**

Executive Summary – Improving Kids Environment (IKE) coordinated a booth to screen children's jewelry for lead content at the Indiana Black Expo. Thermo Scientific donated the use of two NITON XRF Analyzers and travel costs for an operator. Several hundred items were analyzed. Of the 396 metal jewelry items screened, 62% had a lead content above 600 ppm. Of the 85 plastic items tested, 33% had a lead content above 600 ppm. No separate analysis was performed on paint and coatings.

Methodology – Screening of lead content in jewelry was performed by Bill Radosevich, acting as a volunteer. Two Thermo Scientific NITON XRF Analyzers were used during the event – a NITON XLt 797 and a NITON XLp 300. Both test stand and free-standing analysis was performed in the booth. Rental costs for the NITON XRF Analyzers and travel costs for Mr. Radosevich were donated by Thermo Scientific. In accordance with Thermo Scientific policy, brand names are omitted from this report.

The instruments perform a self calibration check, in addition comparison checks against known standards (multi-element in PVC, lead in tin) were performed at the start and end of each screening session and at about 2 hour intervals.

Parents passing the booth were invited to have their children's or their own jewelry tested for lead content. Some participants received t-shirts with an IBE lead-safe message in exchange for participation.

Please note that the sample pool was not random for the following reasons: Duplication of items (i.e. both earrings), self-selection of jewelry (reluctance to hand Mr. Radosevich gold or diamonds), self-selection of volunteers, or variation in incentives (t-shirt availability).

Results – During the three day event, analysis was performed on 481 items.

	Total # analyzed	Items with lead content above 600 ppm	Percent > 600ppm
Metal	396	246	62%
Plastic	85	28	33%
Total	481	274	57%

A trend emerged during the screening event. Many of the items with the highest lead content were purchased at a nationwide accessory retailer chain focusing on the babysitter demographic.

One item of note was the *mardi gras* beads being handed out by a local sport team's cheerleaders. Results indicate that the dark blue beads contained up to 1,400 ppm lead, and other colors generally contained over 600 ppm lead. Despite being notified of the lead content, the team continued to distribute the items.

Respectfully submitted by Bill Radosevich, October 8, 2007.

RESPONSE BY THOMAS G. NELTNER TO AN ADDITIONAL QUESTION
FROM SENATOR INHOFE

Question. In your testimony you noted that Congress instructed EPA to issue rules regarding renovation and remodeling by 1996. Do you know why the previous administration did not comply?

Response. EPA is in the best position to answer that question fully. I was not privy to EPA's reasoning and deliberations. But I will provide my best answers to the question based on the public record and my understanding of the situation.

In 1992, Congress set a rigorous rulemaking schedule for EPA to address renovation and remodeling activities. See Table 1 for specific deadlines and EPA's progress in meeting those deadlines. It is clear that EPA quickly fell behind the deadlines. The gap increased over the years despite consistent progress.

In the mid and late 1990's, EPA's progress was stymied by three new hurdles that Congress established in the rulemaking process. In 1995 and 1996, Congress enacted three laws that established significant requirements for agencies adopting major new rules. They are:

- National Technology Transfer and Advancement Act of 1995, Section 12;
- Unfunded Mandates Reform Act (UMRA) of 1995, Title II; and
- Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, Section 609.

These new laws, especially SBREFA, forced the Federal Government to retool its rulemaking process resulting in delays for major new rules. The laws also imposed significant new burdens on the agencies for major new rules.

With an estimate annual economic impact of \$500 million in costs and almost ten times that much in annual economic benefits, the renovation and remodeling rule was definitely a major new rule. There is no indication that EPA under the previous administration received additional time or resources to comply with the new requirements. As a result, the renovation and remodeling was further delayed. When the retooling was complete, EPA convened the SBREFA panel in 1999 and published the SBREFA report in 2000.

After 2000, it appears that all work on the rule stopped until EPA resumed work in 2005.¹ EPA published the proposed rule 3 weeks after being sued by ten organizations and individuals for failure to meet the 1996 statutory deadline.²

Table 1
EPA Schedule of Activities for Renovation and Remodeling Rule

Activity	Section	Deadline	Completed
Issue Training and Certification Rule	15 USC 2682(a)	1994	1996
Publish Guidelines for Renovation and Remodeling	15 USC 2682(c)(1)	1994	1995 (HUD issued guidelines)
Complete Study of Lead Exposure During Renovation and Remodeling	15 USC 2682(c)(2)	1995	1997
Consult with Stakeholders / Advisory Committee	15 USC 2682(c)(3)	After study published but before rule proposed. ³	1998 & 1999
Convene Small Business Advocacy Review Panel and Publish Report ⁴	SBREFA Section 609(b)	Before rule proposed.	1999 & 2000
Make determination of contractors who will not be covered by rule.	15 USC 2682(c)(3)	Before rule proposed.	2007
Finalize Renovation and Remodeling Rule	15 USC 2682(c)(3)	1996	<ul style="list-style-type: none"> ▪ Proposed 2006³ ▪ Revised 2007⁶ ▪ Planned 3/2008

¹On December 13, 2004, EPA stated in a Federal Register notice that it was pursuing a voluntary program for renovation and remodeling activities. It withdrew this plan in a May 16, 2005 Federal Register notice.

²On December 20, 2005, the Public Employees for Environmental Responsibility (PEER) and nine other plaintiffs sued EPA for failing to meet the deadline. EPA published the proposed Renovation, Repair and Painting Activities (RRP)2 rule a few weeks later on January 10, 2006. Note that on October 26, 2006, EPA moved to dismiss the lawsuit on the basis that the plaintiffs waited too long to sue EPA for failing to comply with the law. EPA's position makes it clear that concerned citizens should not be too patient with EPA.

³The statute only requires that these activities be completed. In the transcript of the first meeting of the stakeholder meeting on December 7, 1998, EPA clearly interpreted the statute as requiring that the consultation occur before the rule was proposed. This approach ensures more effective public participation. See www.epa.gov/lead/pubs/rmeet.pdf.

⁴In 1996, Congress passed the Small Business Regulatory Enforcement Fairness (SBREFA) Act. This law required EPA's Small Business Advocacy Chairperson to convene a Small Business Advocacy Review Panel before proceeding with significant rulemaking. EPA convened the panel on November 23, 1999 and published the report on March 3, 2000.

⁵In December 1998 and March 1999, it held two meetings to fulfill the requirement that it consult with key stakeholders. In the March 1999 meeting, EPA stated that it anticipated publishing a proposed rule before the end of 1999. See www.epa.gov/lead/pubs/3-8-99.pdf at page 8 for comments by EPA's Mark Henshall.

⁶In its supplement to the proposed rule in the June 5, 2007 Federal Register, EPA finally made the long delayed determination that it would exempt contractors working in public and commercial buildings that were not child-occupied facilities. In 1992, Congress specifically, directed EPA to address three areas: target housing, public buildings constructed before 1978, and commercial buildings that create lead-based paint hazards. EPA's initial proposal on January 10, 2006 addressed only target housing.

RESPONSES BY THOMAS G. NELTER TO ADDITIONAL QUESTIONS
FROM SENATOR BOXER

Question 1. How would you assess EPA's response to your petition that urged the agency to use its authorities under the Toxic Substances Control Act to address threats from dangerous levels of lead in consumer products?

Response. I have been involved in three petitions to EPA since 2006. We submitted these petitions pursuant to Section 21 of the Toxic Substances Control Act (TSCA). They are:

- Lead in Consumer Products: Filed by Sierra Club and Improving Kids' Environment in April 2006. EPA denied the petition in July 2006. The petitioners filed a lawsuit challenging the decision in September 2006. The parties reached a settlement in April 2007 and agreed to dismiss the case in June 2007.⁷
- Nonylphenol Ethoxylates: Filed by Sierra Club, the Environmental Law and Policy Center, Physicians for Social Responsibility, UNITE HERE! and the Pacific Coast Federation of Fishermen's Associations, and the Washington Toxics Coalition in June 2007. EPA partially denied the petition in August 2007. Five of the petitioners filed a lawsuit challenging the denial in October 2007. The case is still in litigation.⁸
- Air Fresheners: Filed by Sierra Club, National Center for Healthy Housing, Alliance for Healthy Homes and the Natural Resources Defense Council in September 2007. EPA denied the petition in December 2007. EPA issued letters to the seven major manufacturers of air fresheners asking that they voluntarily submit a list of chemicals in their products, the range of concentrations for each chemical, the chemical's function, and total annual amount used. The petitioners are considering their legal option.⁹

In December 2007, I also attended a stakeholder meeting convened by EPA as a follow-up to its denial of a petition by Ecology Center of Ann Arbor, Michigan in 2005 to ban the sale of leaded wheel weights.¹⁰ These weights are used to balance tires. More than 50 million pounds of leaded wheel weights are sold each year with a significant portion ending up in the environment. EPA rejected rulemaking options to protect children from the danger of lead in these wheel weights and was pursuing voluntary options. At this meeting, the manufacturers of the wheel weights and their retailers expressed a willingness to move to more costly substitutes but said regulations would be needed. They called for regulations and EPA indicated it was unable to follow through despite clear statutory authority.

The common theme running through EPA's responses to these petitions is that EPA will do whatever is necessary to deny the petition. EPA does not appear to be seeking to respond to important questions about threats to public health. The sole

⁷See www.sierraclub.org/environmentallaw/lawsuits/0322.asp.

⁸See www.sierraclub.org/toxics/.

⁹See www.sierraclub.org/toxics/.

¹⁰See www.leadfreewheels.org.

exception is EPA's letter to air freshener manufacturers. But these letters essentially mooted a straightforward claim that would have been resolved in subsequent litigation.

EPA does not appear to seriously consider actions that it cannot be compelled to undertake without litigation. For example, regarding:

- Lead in Jewelry, EPA refused to send a request to CPSC asking CPSC to undertake rulemaking regarding lead in jewelry pursuant to Section 9 of the Toxic Substances Control Act (TSCA). This action is a critical first step to taking action under TSCA. EPA's failure to make the request has been used as an excuse to taking subsequent action.

- Lead in Recalled Jewelry, EPA refused to issue orders pursuant to Section 6(b) of TSCA. These orders would have required companies that had recalled products to submit their quality control procedures. With these procedures, EPA could have identified in 2006 the quality control problems that became apparent in 2007. EPA has the authority to issue rules to require improvements in quality control procedures. Due to convoluted language in TSCA, citizens cannot force EPA to issue a quality control rule unless it first issues quality control orders. By not issuing orders, EPA can block the citizen petitions. To the best of my knowledge, EPA has never issued a quality control order.

- Air Freshener Allegations, EPA refused to ask manufacturers of air fresheners to report allegations by consumers of problems with their products. Manufacturers and importers are required to track these allegations pursuant to TSCA Section 8(c) and report them to EPA if EPA requests them. In a narrow interpretation of TSCA, EPA concluded that citizen's could not petition it to make an 8(c) request. It could have made the request anyway, but apparently rejected that option.

- Air Freshener Health and Safety Studies, EPA refused to ask manufacturers of air fresheners to submit unpublished health and safety studies regarding their products. EPA made this decision despite petitioners clearly meeting the TSCA "B" exposure findings with more than 10,000 people in the general public receiving significant exposures. EPA could have worked with the Interagency Testing Committee (ITC) pursuant to Section 4 of TSCA and, if the ITC agreed, issue a direct final rule requiring the submission of the studies. This was the approach the EPA took as part of its settlement with Sierra Club on lead in consumer products. It involves very little resources and time.

- Lead Wheel Weights, EPA denied the petition to ban lead in wheel weights. In its denial, EPA identified eight areas where it needed information to undertake a ban. EPA could have used its information gathering authorities under TSCA to fill those gaps. But it did not. Instead EPA undertook a voluntary program to get lead wheel weights off of the market that had stakeholders scratching their heads wondering if EPA understands market dynamics and the important role that regulation plays in protection children from lead poisoning.

Given EPA's "deny-if-at-all-possible" approach to citizen petitions, citizens are left with the option of litigating EPA's decisions. Litigation is a time-consuming and inefficient method to protect public health.

Question 2. Does EPA have authorities under the Toxic Substances Control Act that it can use, if the agency chooses, to address lead threats in children's toys?

Response. Yes, EPA seems reluctant to exercise its authorities under TSCA regarding lead in consumer products. Based on its testimony at the Senate Committee on Environment and Public Works and its handling of other petitions, EPA seems particularly reluctant to act regarding consumer products.

Specifically, EPA could undertake the following actions to protect our nation's children from being poisoned or killed from dangerous lead exposures:

- Issue final Renovation, Repair and Painting Rule that is no less stringent than HUD's standards.

- Make it standard practice to order any importer or manufacturer that has a recall by CPSC involving a toxic chemical to submit to EPA their quality control procedures designed to prevent future recalls. TSCA Section 6(b)(1)

- Order paint retailers to submit to EPA their quality control procedures to ensure that imported paint does not violate the U.S. standards for lead-based paint. TSCA Section 6(b)(1)

- Order firms that handle electronic waste for recycling to submit to EPA their quality control procedures to ensure that the lead from the electronic waste does not get added to children's products. TSCA Section 6(b)(1)

- Undertake rulemaking to establish quality control procedures for children's products importers to ensure that lead is not present in those products except in trace amounts. TSCA Section 6(b)(2)

- Investigate any company that has had a recall to determine whether they properly notified EPA of substantial risks posed by the lead contamination. TSCA Section 8(e)

- Identify the overseas factories or companies that produced products subject to a recall for lead contamination. TSCA 8(e) Follow-up

- Implement the recommendations of the Interagency Testing Committee regarding lead and lead compounds so that importers must report by the statutory deadline of June 14, 2007 12 months after receiving the recommendations. TSCA Section 4 and 8(d)

- Send a letter to importers of children's products alerting them to their obligation to report pursuant to the ITC recommendations and to check their products if they used any of the overseas factories or companies that produced products subject to a recall for lead contamination.

- Adopt a testing rule requiring the lead manufacturers to fund a National Institute for Health study evaluating the health implications of lead to children at levels below five micrograms per deciliter. TSCA Section 4

- Adopt rules requiring companies to notify public and businesses that distribute these lead contaminated products of such threats and to replace or repurchase ? and prohibit the reselling of such products in the U.S. TSCA Section 4 and 6.

- Issue an order that requires facilities that export electronic waste to businesses that make or distribute lead-contaminated substances used in children's products sold in the United States to notify EPA of such exports. TSCA Sections 4 and 12.

- Work with the Secretary of the Treasury to prohibit the importation of products that fail to comply with the protections described above. TSCA Section 13.

Question 3. Please provide the committee with a list of the lead-contaminated children's items that were before the committee during the hearing. Please include a description of the lead testing results for each item.

All measurements were made using a Thermo Niton X-ray Fluorescent (XRF) device.

- Reebok Charms: Two sets of charms. These charms have been recalled. They are similar to the charm that killed the child in Minnesota in 2006 though they have much lower levels of lead. The lead levels in the Reebok charms varied dramatically. One charm was over CPSC's screening level. The Chicago Health Department provided them.

- Vinyl Bibs: One set of baby bibs with vinyl backing. The State of Illinois recalled these bibs. CPSC refused to recall them. The vinyl on the back has 1000 ppm lead. It was purchased from WalMart. The Chicago Health Department provided them.

- CA Vinyl Lunchbox: Two sets of vinyl lunchboxes. One has English text. The other has Spanish text. These items were recalled. They were distributed to children in California by the California Department of Public Health. The vinyl on the English version is 900 ppm. The Spanish language one is 16,000 ppm (1.6 percent) lead. Alameda County Lead Poisoning Prevention Program provided them. The Center for Environmental Health originally found the problem.

- Spiderman Lunch Box: A vinyl lunchbox. The vinyl inside is 1000 ppm. The Chicago Department of Health provided the lunchbox and reported that 14 micrograms of lead could be wiped off the surface per square foot of vinyl.

- Teething Toy: A vinyl teething toy for babies in the shape of an ear of corn. It was purchased at a store in Omaha, Nebraska. It has 900 ppm lead. It has not been recalled yet.

- Snorkel: A plastic snorkel for children with a vinyl mouthpiece. It was purchased at a store in Omaha, Nebraska. The mouthpiece is 2000 ppm lead. It has not been recalled yet.

- Math Blocks in Bag: A bag of painted plastic blocks in a vinyl bag. It was purchased at a store in Omaha, Nebraska. Two of the blocks are at 1500 ppm and 4000 ppm lead. It has not been recalled yet.

- Baby Einstein Blocks: A fabric and vinyl cushion in the shape of block intended for young children. It has painted symbols on several sides. CPSC has recalled the blocks. It was purchased in Nebraska block. It has well over 600 ppm lead on the white paint on the belly of the turtle.

- Bendable Toys: Three plastic figures about 5" tall of different characters. The paint on the dog is 10,000 ppm lead. It is 10,000 ppm on the cat and 30,000 ppm on the snowman. These were found in Indiana. Libraries were giving them away to children who did well in reading. A Grandmother of a lead poisoned child was teaching kids about lead. She used a LeadCheck swab to show how the work and was shocked to find it came out positive. Indiana Department of Health recalled the items when CPSC was slow to act. CPSC later recalled them.

- Mardis Gras Beads: A chain of colorful beads commonly passed out during Mardis Gras to children and adults. The beads are 600 ppm lead. It was purchased in Minneapolis.
- Hush Toy Ring: The small ring sold in vending machines. Commonly referred to as a hush toy in the vending machine industry. The ring has 1300 ppm lead. It was purchased in Minneapolis.
- Jewelry: A chain of jewelry purchased from Claires. It appears that the solder is 30,000 ppm.
- Hair clasp: A clasp for a child's hair. It has 450,000 ppm lead—about 45 percent lead.
- LeadCheck Swabs: A package of nine swabs commonly used to qualitatively determine if wipable lead is present on a toy. They are about \$1.50 a piece. The vinyl bibs and bendable toys were found with this type of swabs.

Senator BOXER. Thank you very much.

When I get a chance, I want to talk more about how we can help speed that up.

Mr. NELTNER. Thank you.

Senator BOXER. OK.

Mr. Jacobs.

STATEMENT OF DAVID E. JACOBS, PH.D., CIH, DIRECTOR OF RESEARCH, NATIONAL CENTER FOR HEALTHY HOUSING

Mr. JACOBS. Thank you.

Much has been said in this hearing already about housing issues, so I don't want to belabor the statistics. But I do want to take my time with you this morning to raise a warning flag about a new emerging lead-based paint threat to our children, and also to explore some of the lessons that we have learned in how we dealt with the lead problem in housing and their implications for other lead poisoning prevention efforts.

If we don't do more on the housing front, there will be literally millions, and I am not exaggerating, millions of children who will be poisoned in the decades to come. We are currently running at about a clip of 300,000 children a year who are poisoned, mostly from lead in housing stock. While we have made tremendous progress, much, much more remains to be done.

In my written testimony, I give you the statistics on housing, but I do want to make the point that we know how to fix houses. The intervention effectiveness has been shown. I helped to design the Nation's largest study on residential lead hazard control covering 3,000 housing units in 14 jurisdictions across the country. Those kids had average blood lead levels around 10 micrograms per deciliter. We were able to reduce those blood lead levels by 38 percent over a 2-year period, so this works.

If we don't do this properly, however, we can make matters worse. If you take a single square foot of lead paint in a house at the minimum regulatory level, and sand it, turn it into dust, spread it over a 10 foot by 10 foot room, the resulting dust level is 9,300 micrograms per square foot. The current EPA standard is 40 micrograms per square foot. In other words, a great deal of lead-contaminated dust can be released from only a small amount of lead paint. In my written testimony, I give some data that show why the current EPA dust lead standard should be and can be reduced now.

When I was at HUD, we put a regulation in place to stop those sorts of dangerous renovation and remodeling activities. We thought, frankly, that EPA would quickly follow suit, but there is

still not a final EPA regulation. I have served with the Federal Government. I can tell you this sort of regulation can be done much more rapidly than has happened in this case. EPA should pass the final rule. It should not include the dangerous methods of paint removal that are allowed in the proposed regulation and it should require dust lead testing after the work has been completed to make sure the house is safe for children to occupy.

Furthermore, HUD also needs to complete its own regulation for federally assisted housing. Right now, the single family mortgage insurance program is not covered. Does it make any sense for children who are living in non-HUD assisted housing to get no protection, while children who do live in HUD housing get adequate protection? That makes no sense to me.

The low-income housing tax credit program has no lead paint requirements. Why should taxpayers be asked to subsidize houses that poison kids?

I helped write the first Federal interagency strategy in 2000. Neither the Clinton nor the Bush administration has ever funded the program adequately. We provided monetary estimates on what it would take to clean up the Nation's housing stock. Thankfully, a bipartisan consensus in the Congress with Senator Bond, Senator Mikulski, Senator Boxer, Senator Inhofe and many, many others, such as Senator Jack Reed have helped to restore those funding levels, but it is still well below the necessary level.

Finally, I mentioned an emerging threat. I have with me some paint samples from India, China and Nigeria that were provided to me by my colleague, Dr. Scott Clark and Dr. Sandy Roda of the University of Cincinnati and Drs. Eugenious and Clement Adebamowo. This is new residential paint that is being manufactured. This sample is from India. It has 131,000 parts per million of lead in it, a huge level. Remember, the limit in the U.S. is 600 parts per million. This is a Nigerian paint sample, which has 38,000 parts per million of lead in it.

Now, it is bad enough that these countries are contaminating their own housing stock, but given our global economy it is only a matter of time before this paint starts washing up on our own shores and then we will be faced with the task of having to once again cleanup our Nation's housing stock.

So if there is a single lesson to be learned from the lead paint experience, it is that once we allow the uses of lead to be entered into commerce and issued in a dispersed form, whether it is gasoline or food canning or paint or toy jewelry, it is going to cost the Nation far more to manage it after the fact. There is really just no good reason to allow lead into these products in the first place.

Thank you very much.

[The prepared statement of Mr. Jacobs follows:]

STATEMENT OF DAVID E. JACOBS, PH.D., CIH, DIRECTOR OF RESEARCH, NATIONAL CENTER FOR HEALTHY HOUSING

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 ug/dL (micrograms of lead per deciliter of blood).¹ The data also showed that 16 percent of low-income children and 21 percent of African-American children living in older housing where lead-based paint is most prevalent were poisoned, compared to 4.4 percent for the general population at the time. In December 2000, CDC provided more recent data showing that while some counties had prevalence rates as high as 27 percent, the average blood lead level in young children had declined by 25 percent 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 ug/dL, down from 1.7 million in the late 1980's.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.

¹Centers 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.

²Centers 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.

³Brody 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.

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.

(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 percent since the 1980's, 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 (.g/ft²) 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 standard of 40 .g/ft². And it is also

⁴National 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.

⁵Jacobs 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).

⁶President'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.

⁷HUD 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.

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.

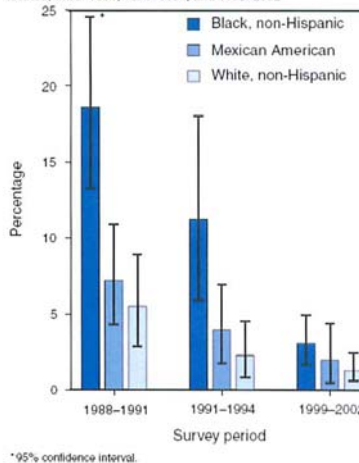
Furthermore, a HUD survey of the nation's housing stock (conducted in 2000) shows that the estimated number of homes with lead paint declined from 64 million in 1990 to 38 million in 2000, out of a total of about 100 million houses. But of the 38 million housing units with lead paint, 24 million still 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 percent 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.)

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



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 1-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

⁸Jacobs 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.

⁹Jacobs 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 Alurgens in Housing, 2001 (available at www.hud.gov/offices/lead).

¹⁰24 CFR Part 35

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 11 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.

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 2 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 lead dust testing procedures¹⁸ that are known to achieve very low dust lead levels, up to 6 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

¹¹Nevin 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.

¹²Title X of the 1992 Housing and Community Development Act.

¹³Economic Analysis for the Renovation, Repair and Painting Proposed Rule. Feb 2006. <http://www.epa.gov/lead/pubs/rrp-nprm-ea-revised.pdf>.

¹⁴National 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>.

¹⁵Jacobs 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.

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

¹⁷Comments 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>.

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

¹⁹Wilson 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.

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 percent and 70 percent 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 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.

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>.

²¹National 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>.

²²Jacobs 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.

²³Eliminating 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>.

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.

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 percent of children from developing a blood lead level equal or greater than 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 equal or less than 15 $\mu\text{g}/\text{ft}^2$ achieved the highest specificity and sensitivity (77 percent and 58 percent, 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 percent of homes had dust lead levels 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 6 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 1990's), 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 $\mu\text{g}/\text{ft}^2$ 1 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 equal or less than 15 $\mu\text{g}/\text{ft}^2$ is feasible.

²⁴Lanphear 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.

²⁵42 CFR Part 35 (HUD) and 42 CFR Part 745 (EPA).

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

²⁷Jacobs 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.

²⁸Wilson 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.

²⁹National 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.

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 .g per sample, so HUD and EPA stated that a standard of 40 .g/ft² 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 .g/sample.³⁰

Together, this evidence shows that lead dust loadings at the existing Federal standard for floors of equal or less than 40 .g/ft² 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 equal or less than 40 .g/ft² to equal or less than 15 .g/ft², the percentage of children who would be protected from developing a blood lead level equal or greater than 15 .g/dL would be cut in half, from 4.7 percent to 2.1 percent. 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 equal or less than 200 .g/sq ft.³¹ EPA issued guidance in 1995 lowering the floor dust lead standard to equal or less than 100 .g/sq ft.³² And in 1999–2001, HUD and EPA promulgated a floor dust lead standard of equal or less than 40 .g/ft² 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 .g/ft² 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 equal or greater than 10 .g/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 .g/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 .g/dL to 30 .g/dL to 25 .g/dL to the current level of 10 .g/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 .g/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 expo-

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

³¹Maryland Annotated Code 26.02.07.

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

³³Preventing 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>.

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

³⁵Canfield, 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 .g/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.

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

sure) is much more important than adherence to a medical approach that is limited to treating children only after they 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 $\mu\text{g/dL}$ or 5 $\mu\text{g/dL}$ is “normal” or “safe,” CDC and other medical authorities might consider labeling blood lead levels between 2 and 10 $\mu\text{g/dL}$ 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. 1Lead-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 10 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 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.

³⁷Jacobs 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.

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

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

⁴⁰Adebamowo 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.

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

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 N	Mean (SD)	Median N	Mean (SD)	Median N	Mean (SD)	Median N	Mean (SD)	Median N	Mean (SD)
Yellow	40,515 4	42,271 (5393)	114,968 4	124,892 (46,235)	61,582 14	57,553 (54,500)	9,2 8	498 (1222)	73,446 1	73,440 -
Red	24,457 4	23,744 (15,877)	6804 3	36,993 (55,094)	25,992 8	30,227 (3364)	273 4	469 (626)	30,725 2	30,725 (869)
Green	12,216 3	15,976 (9410)	39,155 3	31,780 (13,041)	33,372 4	38,556 (33,810)	13,2 4	15,2 (17,9)	6037 1	6037 -
White	4110 5	3035 (1864)	1562 1	1562 -	124 1	124 -	3,1 2	3,1 (4,3)	185 1	185 -
Blue	3615 5	3457 (1729)	3366 1	3367 -	2053 3	2485 (2574)	48 1	48 -	- -	- -

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.

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.

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

David E. Jacobs¹

**LEAD-BASED PAINT AS A MAJOR SOURCE OF CHILDHOOD LEAD
POISONING: A REVIEW OF THE EVIDENCE**

REFERENCE: Jacobs, D. E., "Lead-Based Paint As A Major Source of Childhood Lead Poisoning: A Review of the Evidence," Lead In Paint, Soil and Dust: Health Risks, Exposure Studies, Control Measures and Quality Assurance ASTM STP 1226, Michael E. Beard and S.D. Allen Iske, Eds, American Society for Testing and Materials, Philadelphia, 1995.

ABSTRACT: The current and historical evidence that lead-based paint constitutes a major source of lead poisoning in young children in the United States today is reviewed. Lead-based paint was recognized as a proximate cause of childhood lead poisoning before the turn of the century in Australia. Evidence continued to accumulate in this country that lead-based paint was associated with lead poisoning in residences. Congress attempted to correct this problem by passing the 1971 Lead-Based Paint Poisoning Prevention Act. Recent case studies, studies of environmental correlates of blood lead in children, and stable isotope ratio studies have all indicated that old deteriorated lead-based paint still in residences contributes significantly to levels of lead found in house dust and soil, especially during routine renovation and inadequate abatement activity. There is now evidence that the principal pathway of childhood lead exposure is from lead in paint and soil to house dust to hand dust to ingestion through normal childhood hand-to-mouth contact. There is also some evidence that direct ingestion of lead paint chips through pica behavior is responsible for some cases of lead poisoning. This body of historical, epidemiological and analytical evidence is contrasted with an unsubstantiated theoretical approach which argues that lead-based paint cannot be a major source of childhood lead poisoning. The current weight of the scientific evidence indicates that failure to control lead-based paint in older dwellings will result in continued exposure to lead for a large number of children.

KEYWORDS: lead, lead poisoning, lead-based paint, childhood lead poisoning, history

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HISTORY OF POISONING FROM LEAD-BASED PAINT

The evidence that old deteriorated residential lead-based paint is a principal cause of childhood lead poisoning now spans a century. Nearly one hundred years ago, Australian researchers diagnosed lead poisoning in children [1] and identified lead-based paint as the source [2]. Gibson and his colleagues published several papers explaining how other potential sources of lead had been eliminated in those cases [3, 4, 5, 6]. In October 1991, the U.S. Centers for Disease Control indicated that "lead-based paint remains the major source of high-dose lead poisoning in the United States" [7]. The clinical literature of the last 60 years is replete with case reports documenting severe lead poisoning through evidence of lead in blood, paint chips in the gastrointestinal tract, and no indication of other environmental sources of lead exposure [8, 9].

The first reported U.S. case of childhood lead poisoning due to lead-based paint was a fatality [10]. The case bears some striking similarities to current conditions, where the patient is returned to an environment where the source of lead exposure remains uncontrolled. The boy was admitted to the hospital comatose and with seizures, treated, and released to the same home environment, only to return with the same symptoms five months later. The physicians' report states that "We were much puzzled as to the source of the lead, until he was found with his mouth covered with white lead paint which he had bitten from the railings of his crib."

Other case reports appeared in the early part of this century, usually prompted by fatalities [11, 12, 13, 14]. By 1926, 15 separate U.S. medical publications described lead-based paint as a major source of childhood lead poisoning [15]. Similar reports appeared in other countries and many of them adopted regulations to control lead exposures for both children and industrial workers. Austria specifically banned the use of white lead in domestic interiors around 1910 [16] and a number of governments ratified a ban of white lead paint prepared by the International Labour Organization [17]. The governments ratifying the ban included Austria, Belgium, Bulgaria, Chile, Czechoslovakia, Estonia, France, Latvia, Poland, Romania, Spain, and Sweden. In the 1920's, other governments either banned the use of lead paint indoors or severely restricted children's contact with, including Great Britain, Tunisia, Cuba, Yugoslavia, and Greece [15]. However, in the U.S., the National Paint, Oil, and Varnish Association opposed it, and the US never ratified the ban. The result was that lead-based paint continued to be widely used for residential purposes, mostly up to 1950 - 1960; residential lead paint was not fully banned until 1978.

Despite these reports of adverse health effects, the use of lead paint for residential purposes was promoted by both industry and government due to its durability, washability, and aesthetic appearance. Government agencies recommending lead-based paint for residential purposes included the National Bureau of Standards, Federal Security Agency, U.S. Housing Authority, the Public Works Administration [15] and the US Department of Commerce [18]. By the late 1920's the number of lead poisoning cases received the attention of at least one insurance company and the US Bureau of Labor Statistics began to track the incidence of lead poisoning in both children and adult workers [19, 20].

Although the concentration of lead in paint started to decline in the 1940's and 1950's, reports of widespread childhood lead poisoning became more prevalent as physicians became more adept

at diagnosing the illness. Studies of numerous cases of lead-based paint poisoning were conducted in Baltimore [21, 22], Boston [23], New York City [24], and Chicago [25]. By the end of the fifties, over 6,000 cases had been reported.

Finally recognizing the hazard associated with the use of residential lead-based paint and lead-based paint on children's toys, the American National Standards Institute adopted a voluntary standard limiting the lead content in surface coatings to 1% [26]. However, the standard was unenforceable and no standards addressing old lead-based paint already applied to dwellings were developed. Throughout the fifties the concentration of lead in new paint declined as new materials such as titanium gradually replaced the use of lead in residential paint [15, 27].

In 1970, the issue of lead-based paint was addressed by Congress. At that time, it was estimated that 200 children died each year from lead poisoning, and of the 12,000 - 16,000 children who did not die, half were left mentally retarded. Further, it was estimated that 6 - 28% of urban children had blood lead levels greater than 50 µg/dl [28].

CURRENT EVIDENCE OF LEAD POISONING FROM LEAD-BASED PAINT

Throughout the seventies and eighties, the paint and gasoline industries pointed fingers at each other and suggested that the other was responsible for the large numbers of children with lead poisoning. The vice-president of the International Lead Zinc Research Organization stated that childhood lead poisoning is caused by "old lead-based paint which poor children eat either in the form of paint dust or chips." [29] A paint chemist associated with Sherwin Williams argued that "the excessive lead in the blood of small children derives at least 90% from vapor, dust, and soil spewed out from gasoline combustion and less than 10 percent from historic lead in old paint." [30]. Both groups argued that solutions were simple: "Simple, vigorous, periodic scrubbing of floors, sills, walls of inner home surfaces...can reduce dramatically and sufficiently the perceived and persistent lead now detected in homes of children.... 'Cleanliness is next to Godliness' was practiced by those legendary Dutch housewives who vigorously scrubbed their homes [and is] now needed above all other aspects of the lead-in-child[ren] problem..." [30].

It is now clear that the phase down of lead content in gasoline has been accompanied by a significant decline in average population blood lead levels [31]. However, it is also clear that large numbers of children still have blood lead levels associated with adverse health effects. In 1984, the Agency for Toxic Substances and Disease Registry estimated that 17% of all American pre-school children had blood lead levels above 15 µg/dl [32]. Although it is likely that average blood levels have continued to decline over the past decade, large numbers of children are still believed to have blood lead levels above 10 µg/dl, the current threshold of concern. Lead poisoning remains the most common childhood environmental disease [33] and can be prevented by controlling sources of lead in old paint, and the contaminated dust and soil it generates.

What exactly is the current evidence that old lead-based paint remains the major source of lead poisoning, especially for those populations at greatest risk? There are three types of studies that yield insights into this question: Case study reports of the effect of disturbing or abating lead-based paint, studies of environmental correlates of blood lead levels in children, and analytical source identification studies through use of stable isotope ratio techniques.

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Case Reports

First, there have been a number of case reports indicating that when old lead-based paint is disturbed in the course of ordinary housing rehabilitation, repainting or in the course of improper abatement activities, large quantities of lead dust are generated and often result in elevated blood lead levels. Rabinowitz et al. reported that mean blood lead correlated significantly with the amount of lead in indoor paint ($p < 0.01$) and that refinishing activity in homes with lead paint was associated with an average 69 percent increase in blood lead level in the 249 infants studied [34]. Shannon and Graef reported that in a study of 370 newly lead-poisoned children, sources of lead poisoning included household renovation and paint chip ingestion ($p < 0.0001$) [35]. Other researchers have reported cases where remodeling or renovation activity resulted in elevated blood lead levels [36, 37].

Inadequate cleanup and abatement of lead-based paint have also been associated with increases in blood lead levels. Amitai et al. reported that abatement measures involving dry scraping of lead-based paint resulted in a statistically significant increase of blood lead levels from a mean of 36.4 $\mu\text{g}/\text{dl}$ to 42.1 $\mu\text{g}/\text{dl}$ ($p < 0.001$) in a cohort of 114 preschool children. However, when abatement was accomplished by covering or replacement of building components (i.e., minimizing the abrasion of the lead-based paint), blood lead levels declined by 2.25 $\mu\text{g}/\text{dl}$ ($p < 0.005$). In both cases, the long-term effect of abating lead-based paint was a decrease in blood lead levels from 36 $\mu\text{g}/\text{dl}$ to 26 $\mu\text{g}/\text{dl}$ ($p < 0.001$) [38]. Farfel et al. found that improved abatement techniques resulted in lower blood lead levels than did so-called "traditional" abatement measures, which included torching and sanding of lead-based paint, although this result could not be detected over a long period of time [39]. He also demonstrated that "traditional" abatement actually increased blood lead levels in many cases. Charney demonstrated that post-abatement dust lead cleaning is important in reducing blood lead levels [40].

Environmental Correlate Studies

A number of recent studies have also examined the environmental correlates of children's blood lead levels. Rabinowitz reported that the blood lead level of 249 newborns in a two-year longitudinal study were highly correlated with lead in dust ($r = 0.4$, $p < 0.01$), soil ($r = 0.3$, $p < 0.001$) and paint ($r = 0.2$, $p < 0.01$). Furthermore, refinishing activity in the presence of lead paint was also significantly correlated with blood lead level [41]. Interestingly, total dust was not predictive of blood lead levels, suggesting that the quality of housekeeping may be less important than suggested by industry spokesmen such as Weaver.

Paint lead levels were also correlated with blood lead levels in a prospective study in Cincinnati, as was hand dust lead and interior dust lead. The correlation coefficients between paint lead and blood lead were between 0.3 and 0.4 for children aged 6 to 24 months and was significant ($p < 0.0001$). Interior dust loading (mg/m^2) was also correlated with blood lead, with a range of correlation coefficients from 0.37 to 0.48 for ages 12-42 months, also significant at $p = 0.0001$ [27]. This same group also demonstrated that housing that had been rehabilitated (i.e., housing which had most of the lead paint removed) had lower dust lead levels and lower blood lead levels than did private non-rehabilitated housing that still contained lead-based paint and that

was deteriorated and dilapidated. The highest blood lead levels were found in children living in deteriorated pre-WWII housing where lead paint concentrations were highest. Importantly, the general location of the rehabilitated housing and the dilapidated private housing was the same [42]. If it were true that exposures were due primarily to historic deposition of lead gasoline particulate into soil and not lead-based paint, there should have been no difference in blood lead levels between these two groups of children living in areas with similar traffic patterns. Furthermore, in the EPA three cities study, soil removal resulted in a very small decline in blood lead levels only when baseline soil lead levels were approximately 2,000 $\mu\text{g/g}$ [43].

Chisolm et al. also found that there were statistically significant differences in blood lead levels for those children who had been treated for lead poisoning and released to "lead-free" public housing (average blood lead level = 28.8 $\mu\text{g/dl}$) and gut rehabilitated housing (average blood lead level = 28.7 $\mu\text{g/dl}$) on the one hand and older homes that had been "traditionally" abated and still contained some lead-based paint (average blood lead level = 38.5 $\mu\text{g/dl}$) [44].

In 1990, the Department of Housing and Urban Development released the results of a major national survey of the extent of lead-based paint and leaded dust in private housing. The study found that a dwelling was 4 times more likely to have dust lead levels above HUD clearance standards if lead-based paint was present than if the dwelling contained no lead-based paint. Seventeen percent of occupied housing with lead-based paint had excessive dust lead levels, while only 4 percent of the houses without any lead based paint had high dust lead levels. Similarly, the chance of exterior soil containing lead levels greater than EPA guidelines was 4 to 5 times greater if there was exterior lead-based paint [45].

Data on the prevalence of lead paint in 80,000 Chicago housing units and blood lead levels in children showed a relative risk of approximately 15 for lead toxicity for children who reside in homes with lead-based paint [48, 49].

Taken as a group, these environmental correlate studies indicate that the most likely route of exposure is from lead-based paint to dust and soil to hand lead to blood lead. Some portion of the soil and exterior dust lead is also likely to be due to deposition of lead from past use of gasoline, nearby demolition activity and industrial point sources. Table 1 summarizes a number of studies showing that lead in paint contributes substantially to lead in dust and soil.

Source Identification Studies

There is one additional source of evidence that lead-based paint is a major source of lead poisoning in children today. Yaffe et al. have reported that the isotopic ratios of lead in the blood of a small group of children in California were close to the average lead ratios of paint from exterior walls and the ratios of lead in soil. The study concluded that the lead in the soil was derived mainly from weathering of lead-based exterior paints and that the lead-contaminated soil was the proximate source of lead in the blood of children [46].

TABLE 1 -- Studies of the Contribution of Leaded Paint to Lead in Dusts and Soils

Study Site	Study Design	Results	References
Lead-painted frame and brick homes, Detroit, Mich. area	Soil lead vs. distance from test buildings (N=18 each type)	Lead in soil 2 ft. away was 5 times higher than in samples 10 ft. away.	Ter Haar and Aronow, 1974 [53]
Lead-painted rural barns and urban homes with leaded paint	Soil lead vs. distance from two painted building types	Similar soil lead content for both building types	Ter Haar and Aronow, 1974 [53]
Outside areas around homes in small town	Dust lead samples, curbside vs. at building flue; electron microscopic chemical and surface analysis with element markers	24-85% of dwelling-line lead particles were from paint flakes	Linton et al., 1980 [54]
House dust from homes, Christchurch, New Zealand	House dust lead as function of home age and type; painted surfaces, brick, etc.	In homes with leaded paint in interiors, paint lead adds 45% to total dust lead content	Ferguson and Schroeder, 1985 [55]
Neighboring soils, bridges in Mystic, Conn.	Distance-stratified soil lead (1-cm layer) from bridge during and after lead paint removal	Soil lead 8,127 µg/g at bridges; 3,272 µg/g up to 3 m away; 457 µg/g 30-80 m away; and 197 µg/g 100 m away	Landrigan et al., 1982 [56]

TABLE 1 (continued) -- Studies of the Contribution of Leaded Paint to Lead in Dusts and Soils

Study Site	Study Design	Results	References
Variable-quality housing, Cincinnati, Ohio	Dust lead (internal and external) and dust fall rate vs. house age, paint lead, and condition	All measures much higher in poor housing with paint lead	Clark et al., 1985 [42]
Variable-quality housing, Cincinnati, Ohio	Statistical analysis (structural equation modelling) of lead pathway in 18-month-olds	Paint lead and external-dust lead explain 52% of dust-lead variation; paint lead correlated with external-dust lead	Bornschein et al., 1987 [57]
Various residential areas and homes undergoing deledding	Analysis of housedust lead or child blood lead from paint dust generated during and after paint lead removal	Such dust formation has substantial effect on child exposure and blood lead	Rey-Alvarez and Menke-Hargrave, 1987 [58]; Amilal et al., 1987 [59]; Farfel and Chisolm, 1987 [32]; Rabinowitz et al., 1985 [41]; Charney et al., 1983 [40]
Playground areas at schools undergoing lead-paint removal and repainting	279 schools in London, England, tested for play-area dust lead before, during and after removal of old paint	Substantial increases in play-area dust lead after old-paint removal	Schwar and Alexander, 1988 [60]

SOURCE: "Measuring Lead Exposure in Infants, Children and other Sensitive Populations," National Research Council, National Academy Press, Washington DC, 1993.

ARGUMENTS THAT LEAD IN PAINT IS NOT A MAJOR SOURCE

A few other arguments are sometimes advanced to support the idea that in spite of all the evidence to the contrary, lead-based paint cannot be responsible for childhood lead poisoning. The first is that we are "overwhelmed" by larger amounts of lead from gasoline, since much more lead was used in gasoline than in paint [30]. However, a tabulation of industry data indicates that about seven million tons of lead have been used in the US for white lead paint, with a roughly equal amount used for leaded gasoline [47,27]. This does not include about 400,000 additional tons of red lead that may have been used in residential lead paint. In short, the data show that similar amounts of lead were used in both paint and gasoline and that gasoline could not "overwhelm" paint as a significant source.

Another argument the idea that lead in paint is in an intact or "bound" form and therefore not available to young children. However, it should be fairly obvious that intact paint does not stay that way. In fact, there are a number of deteriorated paint conditions formally used by the painting and decorating industries to describe routine paint failures [50]. These include "alligatoring, blistering, checking, cracking, flaking, chalking and peeling." The idea that old lead-based paint will remain intact forever and not become available for ingestion, especially in dilapidated housing, is naive at best. In fact, it is more likely that most houses exhibit at least some deteriorated paint routinely. Additionally, there is evidence that a significant proportion of children exhibit pica behavior, i.e., direct ingestion of non-food items, in this case deteriorated lead-based paint that is removed from a surface or has fallen to the floor or the soil. Estimates of pica behavior among children range from 6% in some populations [51] to as much as 30% to 50% in others [52].

CONCLUSION

There is a substantial body of historical, epidemiological, and analytical evidence indicating that lead-based paint is the major source of lead poisoning in children in the United States today. The main pathway of exposure appears to be from lead in paint to lead in house dust and soil to lead hand dust to blood lead through normal hand to mouth contact. Another important pathway is through direct ingestion of paint chips. The current weight of the scientific evidence indicates that failure to control lead-based paint in older dwellings will result in continued exposure to lead for a large number of children.

Soil also contains some lead from previous use of leaded gasoline, from industrial point sources in some locations, and from paint during demolition and repainting activities.

While exposures conceivably can be interrupted at any step along these pathways (e.g., by controlling dust and soil and deteriorated paint only), lead-based paint will eventually deteriorate or be removed through renovation and repainting activities and re-enter the pathways, presenting an immediate hazard. The removal of lead from gasoline produced enormous public health benefits and is instructive as an example of effective source control through removal. However, wholesale removal of all lead-based paint in housing is unlikely in the near term, given the existing crisis in affordable housing and the difficult (though not impossible) engineering problems associated with dust control during removal. Nevertheless, this review should make it

clear that it was a serious error to permit lead-based paint to be used in housing in the first place. The cost of this error will be borne over the next century by more costly housing renovations, increased repainting safety practices, the on-going costs of vigilant management controls to ensure that intact lead-based paint does not deteriorate and become an immediate hazard, and, of course, the continuing costs incurred by lead-poisoned children. Further research is needed to quantify the rate of entry of lead from paint into the various exposure pathways to provide better guidance on the type and extent of the management and maintenance controls needed.

In spite of these substantial costs, there are signs that the nation is struggling to achieve the proper balance. Lead-based paint is no longer being ignored as an important source of lead exposure. Exposures in the nation's public housing program are being controlled through a reasonable combination of abatement and interim control efforts. The Residential Lead Hazard Reduction Act of 1992 provides a means of bringing major control efforts to most federally-supported housing and also provides a means for formal disclosure of lead-based paint hazards in all private housing. The Act also provides for some important research endeavors that should provide insights on the most cost-effective means of treating lead-based paint hazards. These are all important steps forward in the twin efforts to provide lead-safe housing and eliminate childhood lead poisoning.

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RESPONSES BY DAVID E. JACOBS TO ADDITIONAL QUESTIONS
FROM SENATOR INHOFE

Question 1. Dr. Jacobs, there is a statement by the CDC that said, “Efforts to identify and provide services to children with blood lead levels less than 10 micrograms per deciliter may deflect needed resources from children with higher blood levels who are likely to benefit most from individualized intervention.” I guess what I would like to know, and this would be fine to do for the record, do you agree with the statement? And then, should we focus or should we not focus our resources on those kids with the greatest risk? That would be one.

Response. A long-standing public health principle is that those with the worst conditions should be treated first and most intensively, which means that resources should be focused on those with the greatest need. Our public health workforce has become adept at triage to accomplish this. However, a medical approach where treatment is triggered by a clinical blood lead test is not effective for the vast majority of children today, because the key is to prevent blood lead levels from increasing in the first place. Of course, for some children who have very high blood lead levels, rapid medical intervention is needed and CDC has established guidance for those medical procedures at various blood lead levels. In short, there is no single “CDC level.”

Environmental interventions, such as controlling lead paint hazards in a child’s home, are entirely different than medical treatment. CDC’s position clearly calls for “a systematic and society wide effort to control or eliminate lead hazards in children’s environments before they are exposed and is clearly the foremost action”¹ It is noteworthy that this statement applies to all children, not only to children with a certain blood lead level. Together with Dr. Pat McLaine from the National Center for Healthy Housing and others, I worked with CDC to publish an official statement on the importance of primary prevention in housing.² A part of this exposure prevention effort ensures that homes undergoing renovation, repair or painting do not create lead exposures in the process. The idea that the long-delayed EPA regulation covering these activities would inadvertently create more incentives for do-it-yourselfers to do the work unsafely, instead of trained and regulated construction workers is without merit. Similar fears were expressed when HUD promulgated its regulation covering renovation in federally assisted housing. Despite fears expressed by homebuilders and others, there is no evidence that the HUD regulation caused an increase in unsafe work by do-it-yourselfers.

The CDC level of concern of 10 ug/dL was not established to be a “safe” or “normal” level or a level below which nothing needs to be done, although some have erroneously used it in this fashion. As early as 1991, CDC reported that adverse health effects could be seen at blood lead levels below 10 ug/dL.³ More recent evidence from multiple studies, reviewed by CDC itself as recently as 2005,⁴ has confirmed again the 1991 CDC Statement that no safe level of lead exposure has been found.⁵ A further review of this evidence is unlikely to yield any new fresh insights.

In recent years, a few physicians and other medical professionals have suggested that CDC should lower its current blood lead level of concern. While this level has declined over the years from 60 ug/dL to 30 ug/dL to 25 ug/dL to the current level of 10 ug/dL, 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 ug/dL (or any other level), the Nation 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. This is consistent with CDC’s position. The idea that CDC recommends no action at blood lead levels below 10 ug/dL is incorrect. In fact,

¹Preventing Lead Poisoning In Young Children: A Statement by the Centers for Disease Control and Prevention, August 2005. Available at: <http://www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf>

²Preventing Lead Exposure in Young Children: A Housing-Based Approach to Primary Prevention, October 2004. Available at: <http://www.cdc.gov/nceh/lead/publications/Primarypercent20Preventionpercent20Document.pdf>

³Preventing 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>

⁴Preventing Lead Poisoning In Young Children: A Statement by the Centers for Disease Control and Prevention, August 2005. Available at: <http://www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf>

⁵Canfield, 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 ug/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.

CDC has recently published guidance on what actions need to be taken at blood lead levels below 10 ug/dL.⁶ 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 have been harmed. We should not use children as detectors of lead problems and we must not wait until children's blood lead levels increase. Instead, the Nation should be testing and abating houses and other sources of lead to prevent exposure, and focusing resources on where the exposures are greatest.

Question 2. Dr. Jacobs, you have conducted numerous studies that suggest housing is the biggest source of childhood lead exposure in your testimony, you say that the nation should be testing and abating houses to identify lead problems. Is focusing on the housing problem the best way to get the biggest bang for our buck? If we could do one thing inside of a home to reduce lead paint exposure, what would it be?

Response. In my written testimony, I have provided references to numerous studies demonstrating that for most children in the U.S. today, exposure to residential lead-based paint hazards constitutes the greatest threat of lead poisoning. Most housing still remains untested and unabated in this country. For individual children, of course, exposures to other sources of lead, some of which can be quite severe and even fatal, are critically important and therefore must be promptly addressed. Generally speaking, focusing on housing with lead paint does remain the best way to get the biggest bang for our buck, because that is where most exposures to lead are the greatest. We must focus on housing, while also retaining and expanding the public health capacity to respond to other important lead exposure sources. Within housing, lead-safe window replacement is likely to be the best one thing we could do to reduce lead paint exposure.¹

Question 3. The CDC has stated that "Efforts to identify and provide services to children with blood lead levels less than 10 micrograms per deciliter may deflect needed resources from children with higher blood lead levels who are likely to benefit most from individualized interventions." Do you agree with this statement? Shouldn't we focus our resources on those kids with greatest risk?

Response. The CDC level of 10 ug/dL was not established to be a "safe" or "normal" level, although some have used it in this fashion. In fact, CDC, together with the American Academy of Pediatrics, has recently published new guidance on what actions should be taken at blood lead levels less than 10 ug/dL.² Sound public health practice requires that those with the highest exposures or worst conditions be treated first, as any visitor to a hospital emergency room knows. Yes, resources must be focused on children at greatest risk and we should provide additional resources so that no child is placed at excessive risk. The essential point is that 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 ug/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 have been harmed. The nation should be testing and abating houses and other sources to prevent exposure, not just use children as detectors of a lead problem.

Question 4. Does CDC suggest that blood lead levels below 10 are acceptable?

Response. No, CDC does not in fact suggest that blood lead levels below 10 ug/dL are "acceptable" or "normal." In fact, CDC recommends that clinicians and others take specific actions when blood lead levels are below 10 ug/dL.³ If such blood lead levels were in fact "acceptable," CDC would not recommend specific interventions.

⁶Binns HJ, Campbell C, Brown MJ, Interpreting and Managing Blood Lead Levels of Less Than 10 ug/dL in Children and Reducing Childhood Exposure to Lead: Recommendations of the Centers For Disease Control and Prevention Advisory Committee on Childhood Lead Poisoning Prevention. *Pediatrics* 120 (3) e1285-e1298. Nov 2007.

¹Nevin R, Jacobs DE, Berg M, Cohen J. Monetary benefits of preventing childhood lead poisoning with lead-safe window replacement, *Environ Res*, (Accepted Sept 6, 2007, Available on line. doi: 10.1016/j.envres.2007.09.003).

²Binns HJ, et al. 2007. Interpreting and Managing Blood Lead Levels Less Than 10 ug/dL in Children and Reducing Childhood Exposure to Lead. *Pediatrics* 120; e1285-e-1298. Available at: <http://www.pediatrics.org/cgi/content/full/120/5/e1285>

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RESPONSE BY DAVID E. JACOBS TO AN ADDITIONAL QUESTION
FROM SENATOR BOXER

Question. Please describe whether you believe that EPA's lead paint renovation rulemaking makes adequate use of recent scientific studies that demonstrate risks to children's health from blood lead levels below 10 micrograms per deciliter?

Response. The EPA proposed regulation on renovation, repairs and painting estimated the large net benefits of such a regulation to children with blood lead levels both above and below 10 ug/dL using recent scientific studies, although the economic benefits estimated by EPA are likely to greatly underestimate the true benefits. The proposed regulation is not triggered by a child with a particular blood lead level, which I believe is the correct approach. Instead, the proposed regulation is properly triggered by certain events in housing that could disturb existing lead-based paint, regardless of blood lead level. But, EPA has not used available scientific studies in the proposed regulation that show certain paint removal methods, such as open flame burning and power sanding, must not be used; HUD has already banned these paint removal methods in federally assisted housing in 1999.¹ EPA has also not used available scientific studies demonstrating that dust lead testing following cleanup, i.e., clearance testing, must be done to ensure the housing is safe at the conclusion of the work. Finally, EPA has not used the available scientific studies to modernize its lead dust standard, which of course is the subject of a separate, but related regulation. EPA should not establish a regulation based solely on a blood lead level of 10 ug/dL.

Senator BOXER. That was very powerful testimony.
Ms. Farrow.

**STATEMENT OF OLIVIA FARROW, ASSISTANT COMMISSIONER,
CITY OF BALTIMORE DEPARTMENT OF HEALTH**

Ms. FARROW. Good morning, Madam Chairman, Ranking Member Inhofe and members of the Committee. On behalf of the Baltimore City Health Department, I would like to thank you for this opportunity to testify. My name is Olivia Farrow. I am the Assistant Commissioner for Environmental Health for the Baltimore City Health Department.

The Centers for Disease Control State on their website that there is no threshold below which adverse effects are not experienced. There is no safe level for a child. As we have worked diligently to reduce the hazards associated with lead-based paint exposure, the lead-containing consumer products are a growing concern nationwide and represent a major challenge for local jurisdictions. Following are our attempts at the local level to prevent poisoning from two consumer products.

In response to the tragic event in Minneapolis in 2006, the Baltimore City Health Department began testing samples of children's jewelry sold within its jurisdiction. Our tests found excessive levels of lead in children's jewelry in Baltimore. The products were being sold in stores that operate throughout the Country, including Claire's and Wal-Mart. To respond under the authority of the Commissioner of Health, the Baltimore City Health Department proposed and then promulgated regulations on children's jewelry in December 2006. This city regulation requires that the Health Department collect monthly samples of children's jewelry and test for lead content.

Since we have banned the children's jewelry at the level of 600 parts per million, which went into effect September 1, 2007, part of that regulation is that no product can contain an excessive amount of lead. A violation notice is issued if a jewelry product is

¹24 CFR Part 35.140

found to have more than 600 parts per million. The notice declares all items of the same style and from the same manufacturer to be a nuisance and order the retailer to stop sale within 24 hours.

The city began the mandatory monthly testing of children's jewelry in February of this year, and out of the 8 months we have tested, we have found excessive levels of lead in four of those months. Furthermore, the majority of the samples of jewelry that are found to be poisonous are ones that are sold for \$1 or less.

In March, 2007, three rings that were manufactured in India and sold for only 25 cents each in a city vending machine tested approximately 5 percent lead by weight. These rings were previously subject to a product recall in July, 2004 by the Consumer Product Safety Commission. In August, our Health Department discovered that a Spiderman ring, which I have here now, a Spiderman III ring which sold for \$1 contained 128,000 parts per million of lead by weight.

Other products that present a potential and real hazard to children, in September 2006, we were notified by the Maryland Department of the Environment that two children under the age of two in different areas of the State had been lead-poisoned by a product known as kohl, which I have here today. Each child had a blood lead level greater than 20 micrograms per deciliter, and the family had purchased the product at a small Pakistani store in the city of Baltimore. Kohl, also known as surma, jajal or al-kahl, is a black powdered substance applied around the eyes of small children to improve health, according to its packaging. As translated from the package, it is "especially prepared for newborn children. This product at the store was tested and two samples revealed lead levels of 39 percent and 45 percent lead by weight.

To respond, under the authority of the Health Commissioner, the department identified the product as a health hazard and issued a notice and order prohibiting the sale of any cosmetic products containing Kohl within the city of Baltimore. We immediately contacted the Food and Drug Administration's Imports Operations Division. It resulted in an import bulletin being issued and an updated import alert for products coming from the identified vendors.

Our experience in Baltimore City has proven that many of these imported products are not adequately regulated by the Federal Government. The failure of the CPSC product recall system exemplifies the Federal Government's failure to protect the public from imported good. As I previously stated, the CPSC recalled three rings in July, 2004 because of high lead content, yet almost 3 years later, Baltimore City finds that these rings are still available for sale to the public.

In the case of the Kohl poisonings, the Food and Drug Administration issued an import alert for automatic detention for eye cosmetics containing Kohl back in 1996, yet the product continues to make it into the United States for retail sale.

The Environmental Protection Agency also has a role in protecting the health of children with its authority to provide oversight of toxic substances, including lead, and a local jurisdiction's authority can only extend so far. Federal agencies need to aggressively take the lead in preventing the sale of these contaminated

products, and current Federal regulations are obviously insufficient in protecting children from lead in imported products.

[The prepared statement of Ms. Farrow follows:]

STATEMENT OF OLIVIA FARROW, ASSISTANCE COMMISSIONER, CITY OF BALTIMORE
DEPARTMENT OF HEALTH

Madame Chairman, Ranking Member Inhofe and members of the Committee, on behalf of the Baltimore City Health Department, I would like to thank you for this opportunity to testify on the risks to children from lead and mechanisms for addressing and preventing childhood lead exposure. My name is Olivia Farrow and I am the Assistant Commissioner of the Environmental Health Division of the Baltimore City Health Department.

Lead poisoning is the most common environmental hazard facing American children today. It is also one of the most preventable. Children are frequently exposed to lead by ingesting lead dust from deteriorating lead-based paint. Exposure may also come from soil that contains lead, drinking water or lead-tainted consumer products such as food, jewelry and even cosmetics. The Centers for Disease Control states on their website that there is no "threshold below which adverse effects are not experienced." There is no safe lead level for a child.

As we have worked diligently to reduce the hazards associated with lead-based paint exposure, the lead-containing consumer products are a growing concern nationwide and represent a major challenge for local jurisdictions. Following are our attempts at the local level to prevent poisonings from two consumer products.

On March 23, 2006, a 4-year-old child in Minneapolis died from lead intoxication after swallowing a piece of children's jewelry that was sold with a new pair of shoes. In response to this tragic event, the Baltimore City Health Department began testing samples of children's jewelry sold within its jurisdiction. Our tests found excessive levels of lead in children's jewelry in Baltimore. The products were being sold in stores that operate throughout the country, including Claire's and Wal-Mart (Attached are the lab results).

To respond, under the authority of the Commissioner of Health, the Baltimore City Health Department proposed and then promulgated regulations on children's jewelry on December 7, 2006. (Attached is the final regulation).

The City regulation requires that the Health Department collect monthly samples of children's jewelry and test for lead content. In order to give City retailers an opportunity to come into compliance, the regulation initially banned children's jewelry containing more than 1200 parts per million. Effective September 1, 2007, we further reduced the

acceptable level of lead, banning all children's jewelry with metal components containing in excess of 600 parts per million of total lead. Once a product is found to contain an excessive amount of lead, a violation notice is issued. The notice declares all items of the same style and from the same manufacturer to be a nuisance and orders the retailer to stop sale within twenty-four hours. An owner can be charged with multiple misdemeanor offenses and fined should he or she fail to comply with the notice.

The City began the mandatory monthly testing of children's jewelry in February of this year. Out of the 8 months we have tested, we have found excessive lead levels in four of those months. Our testing has revealed that the majority of the products found with excessive levels of lead are sold in discount stores that cater to a lower-income clientele. Furthermore, the majority of the samples of jewelry that are found to be poisonous are ones that are sold for a dollar or less.

For an example, in March 2007, three rings that were manufactured in India and sold for only 25 cents each in a City vending machine operated by Cardinal Novelty tested approximately 5 percent lead by weight. These rings were previously subject to a product recall in July 2004 by the Consumer Product Safety Commission (CPSC).

In August, our Health Department discovered that a Spiderman 3 ring, which sold for one dollar, contained 12.8 percent lead by weight. This ring was sold at a Dollar Tree and was imported from China.

Turning to other products that present a potential and real hazard to children, in September of 2006, we were notified by our State Department of the Environment that two children, under the age of two, in different areas of the State had been lead poisoned by a product known as Kohl. Each child had a blood lead level of 20 µg/dl or higher. One family purchased the product at a small Pakistani grocery store in Baltimore City.

Kohl, also known as Surma, Kajal or Al-Kahl, is a black powdered substance applied around the eyes of small children to improve health, according to its packaging. As translated from the package it is “especially prepared for new-born children. . . .”

The product at the store was tested and the two samples revealed lead levels of 39 percent and 45 percent lead by weight. The limit for lead paint is 0.06 percent lead by weight. To respond, under the authority of the Commissioner of Health, the Baltimore City Health Department immediately identified the product as a health hazard and issued a Notice and

Order to Remove Health Nuisance, prohibiting the sale of any cosmetic products containing Kohl within the city of Baltimore. We immediately contacted the Food and Drug Administration’s Imports Operations Division. FDA conducted its own investigation tracing the product back to the importer and manufacturer resulting in Import Bulletin being issued and an updated Import Alert for products coming from the identified vendors. Our experience in Baltimore City has proven that many of these imported products are not adequately regulated by the Federal Government. The failure of the CPSC product recall system exemplifies the Federal Government’s failure to protect the public from imported goods.

As I previously stated, the CPSC recalled three rings in July 2004 because of high lead content. Yet, almost 3 years later, Baltimore City finds that these rings are still available for sale to the public. Cardinal Novelty would have been free to continue to redistribute this poisonous product had Baltimore City not enacted its regulations.

In the case of the Kohl poisonings, the Food and Drug Administration issued an Import Alert for automatic detention for eye cosmetics containing Kohl back in 1996, yet the product continues to make it into the United States for retail sale.

The Environmental Protection Agency also has a role in protecting the health of children with its authority to provide oversight of toxic substances, including lead.

A local jurisdiction’s authority can only extend so far. Federal agencies need to aggressively take the lead in preventing the sale of these contaminated products. Current Federal regulations are obviously insufficient in protecting children from lead in imported products.

I would like to conclude by stating that this country has made tremendous progress in the fight to eliminate childhood lead poisoning. But even one child poisoned is one child too many. Stricter Federal regulation on products for children is urgently needed.

On behalf of Baltimore City’s Health Department and Mayor Sheila Dixon, I thank you for the opportunity to offer comments today.

CHILDREN'S JEWELRY LEAD RESULTS 2006 Results						
Business Name	Business Address	Inspection Date	Product	Cost	Manufacturer or Distributor	Lab results
Claire's	300 E. Pratt	7/5/06	Claire's Club - The Princess Collection jewelry set (3 pieces)	\$4.50		
			pearl ring - back of ring band, clasp area			68,071.00
			ring band			7,106.60
			ring band			176.30
			pearl setting with paint			24,305.50
			ring band			179.90
			ring band			168.40
			pearl necklace			
			pearl bracelet			
			girl connections fairy necklace w/ pink gem wings & 3 rings			
Wal-Mart	2700 Port Covington Dr	8/2/06	girl connections fairy necklace w/ pink gem wings & 3 rings	\$3.82	Wal-Mart	183.00
			ring w/ pink flower			
			fairy necklace w/ pink gem wings			86.60
			fairy w/ pink wings			118.00
			silver chain w/ clasp			244.00
			pink glitter ring			3,540.00
silver ring w/ 4 hearts						

CHILDREN'S JEWELRY LEAD RESULTS February 2007							
No.	Business Name	Business Address	Inspection Date	Tested Product	Price	Manufacturer or Distributor	Lab results mg/kg (ppm)
1	Dollar Tree Stores, Inc	3842 E. Lombard Street	1/16/07	Happily Ever After "Princess" necklace and clasp	\$1.00	Greenbrier International, Inc.	34.9
2				Happily Ever After - magic wand bracelet - charm and clasp	\$1.00	Greenbrier International, Inc.	29.9
3				Happily Ever After - princess earrings	\$1.00	Greenbrier International, Inc.	
				princess earrings (average of 2)			30.1
				earring hooks			267.2
4				Bearly Cute - 2 sets of earrings	\$1.00	Greenbrier International, Inc.	
4a				pink crystals - studs			12,890.0
4b				Bear earrings (hooks)			207.4
5				Happily Ever After - fairy princess necklace	\$2.00	Greenbrier International, Inc.	
				necklace			69.3
				pendant			24.1
6	Totally Kids	321 W. Lexington St.	1/16/07	Gold chain - vending machine	\$0.50		28.1
7				Essential for Kids: 3 piece set	\$1.00		
7a				necklace charm and clasp			24,810.0
7b				stud earrings and links			124.9
7c				bracelet - charm and clasp			24,000.0
8				Hillary Duff hairpiece - teardrop bangles and chains	\$1.99	Silver Goose, Inc.	73.7
9	Accessories Plus	230 N. Eutaw Street	1/16/07	"gold" bangle	\$1.99	Nam Yang Trading	97.8
10				"silver" bangle	\$1.99	Nam Yang Trading	231.4
11	Party More Party	4560 Edmondson Ave.	1/16/07	Pendant A Day	\$1.00		
11a				Monday - heart			66.1
11b				Tuesday - circle with rhinestone			81.0
11c				Wednesday - ying yang			85.1
11d				Thursday - mushroom			72.1
11e				Friday - peace sign			96.7
11f				Saturday - dolphins			88.8
11g				Sunday - butterfly			117.1
11h				Chain			56.9
12	Claire's	200 E. Pratt Street.	1/18/07	Walt Disney Princess - 5 rings	\$5.50	Disney - Hanover Accessories, Inc.	
12a				Sleeping Beauty			175.7
12b				Rose			73.3
12c				Belle			143.8
12d				Cinderella			140.8
12e				Crown			79.4
13				Walt Disney Princess - Belle necklace - charm and clasp	\$4.50	Disney - High InterCity Corp.	57.1
14				Disney - Snow White clip-on earrings (average of 2)	\$3.50	Disney - H.E.R. Accessories	448.3
15	The Children's Place	200 E. Pratt Street.	1/18/07	2 heart barrettes	\$3.50	The Children's Place	
				barrette #1			1,893.0
				barrette #2			2,525.0
16	Claire's	200 E. Pratt Street.	1/18/07	Hello Kitty earrings (average of 2)	\$3.50	Sannio - Fantas-Eyes	89.8

CHILDREN'S JEWELRY LEAD RESULTS March Results							
No.	Business Name	Business Address	Inspection Date	Tested Product	Price	Manufacturer or Distributor	Lab results mg/kg (ppm)
1	Family Dollar	5900 Reisterstown Road	2/23/07	Kidz by Rachael Rose hair clips	\$1.00		
1a				2 blue			36.27
1b				2 green			38.32
2				Guardian Angel necklace	\$2.00	BuyRite Designs	
2a				angel charm			42.48
2b				silver chain			69.59
3				Kidz by Rachael Rose - 4 ring set	\$1.00		
3a				ring with pink paint			38.12
3b				ring with magenta stone			433.40
3c				ring with blue paint			674.40
3d				ring with purple paint			41.48
4	Food-A-Rama	3801 Eastern Avenue		vending machine ring with pink dice	\$0.25	Cardinal Novelty	50,390.00
5				vending machine ring with dice (no color)	\$0.25	Cardinal Novelty	55,190.00
6				vending machine - bracelet with words "brat"	\$0.25	Cardinal Novelty	ND
7				vending machine ring with horse shoe	\$0.25	Cardinal Novelty	47,420.00

CHILDREN'S JEWELRY LEAD RESULTS April Results							
No.	Business Name	Business Address	Inspection Date	Tasted Product	Price	Manufacturer or Distributor	Lab results - mg/kg (ppm)
1	BI-Rite	5950 Belair Rd	4/5/07	Handcuff Keychain	\$0.25	Cardinal Vending	14.9
1a				handcuff			
1b				key ring and chain			47.5
2				Turquoise Bead Ring	\$0.25	Cardinal Vending	
2a				ring without plastic bead			45,390.0
3	Safeway	4401 Harford Rd	4/5/07	17.5" Silver Chain	\$0.25	n/a	63.5
4	Giant Food Store	601 E. 33rd St	4/5/07	Silver Key with Chain Necklace	\$0.50	n/a	
4a				silver key			32.8
4b				silver chain			47.7
5	Dollar General	2311 E. Northern Pkwy	4/5/07	Suave Kids Snap Clips (20ct) 5 sent for testing	\$1.00	Almar Sales Co.	
5a				pink/purple barrettes (2)			63.5
5b				green/gold barrettes (2)			52.3
5c				blue barrette			63.4
6	Claire's	200 E. Pratt St	3/26/07	Best Friends Necklace- Dolphin w/ blue marble "best" "friends" "forever" on blue cord	\$9.50	CBI Distributing Corp.	
6a				small silver dolphin charm			101.0
6b				large dolphin charm without bead			143.0
6c				chain section with clasps			127.0

CHILDREN'S JEWELRY LEAD RESULTS July Results								
No.	Business Name	Business Address	Sample Date	Tested Product	Price	Manufacturer or Distributor	Lab results - mg/kg (ppm)	
1	Dollar Tree	2445 Frederick Avenue	7/24/07	Spiderman 3 flashing ring	\$1.00	Greenbrier International, Inc.		
1a				spiderman 3 - silver band from ring			17,400.0	
1b				spiderman insignia from ring			128,000.0	
2				Vending machine necklace with silver cross (border around cross)	\$0.25	unknown	76.1	
3	Citi Trends	2493 Frederick Avenue	7/25/07	Bling ring with pink jewel (silver band)	\$1.99	JA-RU	604.0	
4				Bling dog tag "The King"	\$1.49	JA-RU		
4a				The king- silver chain necklace			211.0	
4b				The king - dog tag from necklace			27.4	
5	Family Dollar	4530 Edmondson Avenue	7/25/07	Nick Jr. Dora the Explorer locket	\$2.00	H.E.R. Accessories		
5a				Dora the Explorer - pink chain			60.5	
5b				Dora the Explorer - pink heart charm			170.0	
6	Suprfrfresh	2495 Frederick Avenue	7/24/07	vending machine necklace with silver "S"	\$0.50	unknown	325.0	
7				vending machine necklace with copper cross	\$0.25	unknown	59.4	
8				vending machine necklace with silver cross	\$0.25	unknown	52.7	
9	Murry's	1418 Edmondson Avenue	7/25/07	vending machine necklace with silver cross (figurate)	\$0.25	unknown	29.9	

Regulatory Action on Lead in Children's Jewelry

Baltimore City Health Department

December 7, 2006

I. SUMMARY

The Commissioner of Health of Baltimore City is declaring metal components in children's jewelry with excess levels of lead to be a nuisance to public health.

II. BACKGROUND

A. Legal Authority

The Health Commissioner has the legal authority to regulate health nuisances pursuant to two sections of the Baltimore City Health Code. Title 2 of the Health Code relates generally to the Department of Health, while Title 5 relates more specifically to nuisance control. *See* Health Code §§ 2-101, *et seq.* and §§ 5-101, *et seq.* Title 2 provides that the Commissioner is responsible for "enforcing all laws for the preservation of the health of the inhabitants of the City" and preventing disease and nuisances affecting public health. Health Code § 2-104. It is the duty of the Commissioner "to remove and abate nuisances...." Health Code § 2-105(5). Title 5 of the Health Code sets forth examples of nuisances and states that nuisance "includes...any other health or safety hazard." Health Code § 5-101(b). Excessive levels of lead in children's jewelry are clearly a health hazard, as described below in the fatal case of a child ingesting jewelry with excessive levels of lead. Pursuant to Title 5, "[t]he Commissioner of Health is responsible for...requiring the removal of all nuisances...." Health Code § 5-102. Thus, Titles 2 and 5 of the City Health Code provide the legal authority by which the Health Department and Health Commissioner can regulate health nuisances in the City.

B. Lead in Children's Jewelry Threatens Children's Health

The nuisance addressed by this proposed regulation is lead poisoning from lead-containing children's jewelry.

Lead is a heavy metal and potent toxin that can cause life-threatening poisoning at high doses and insidious damage at low doses. The Agency for Toxic Substances and Disease Registry of the U.S. Department of Health and Human Services has found that lead causes a range of significant adverse effects in children and adults.¹

Lead is especially toxic to the brains of young children. According to the Agency for Toxic Substances and Disease Registry, high doses of lead – which are associated with blood lead levels above 70 micrograms per deciliter – can cause children to suffer life-threatening encephalopathy and "lasting neurologic and behavioral damage."²

¹Agency for Toxic Substances & Disease Registry, *Case Studies in Environmental Medicine: Lead Toxicity* (October 2000).

² *Id.*

Exposure to low doses of lead has been linked to lower IQ scores, school failure, attention deficit hyperactivity disorder, and deficits in vocabulary, fine motor skills, reaction time, and hand-eye coordination.³ There is no known lower threshold for the adverse effects of lead on children's development.⁴

The Centers for Disease Control and Prevention (CDC) has determined that an important source of lead exposure for children are consumer products. According to CDC, in some areas of the country, as many as one-third of children with lead poisoning are exposed to items containing lead that can be brought into the home. As a result, CDC recommends "restriction or elimination of nonessential uses of lead in consumer products" as part of a "proactive strategy that prevents exposure to these products and is preferable to relying on case finding to identify lead exposure hazards."⁵

Children's jewelry is among the most prominent consumer products that can expose children to unacceptable levels of lead. Exposure can happen via contact with the hands, direct oral contact, or ingestion.

In June 2004, CDC reported the case of a child who suffered lead poisoning from ingesting a toy necklace.⁶ On March 23, 2006, the Reebok Corporation announced that a four-year-old child in Minneapolis died from lead intoxication after swallowing a piece of children's jewelry that was distributed with a new pair of shoes.⁷

According CDC, the four-year-old patient was brought to a hospital in Minneapolis, Minnesota for vomiting. He developed abdominal pain, dehydration, and listlessness before suffering a severe seizure and requiring mechanical ventilation. He then suffered severe brain swelling that required emergency neurosurgery. On the fourth day of hospitalization, he had no brain activity and was removed from life support. Upon autopsy, a heart-shaped pendant bearing the name "Reebok" was removed from his

³ *Id.*; American Academy of Pediatrics, *Lead Exposure in Children: Prevention, Detection and Management*, Pediatrics, 1036-1048 (October 2005).

⁴ Centers for Disease Control and Prevention, *Preventing Lead Poisoning in Young Children* (August 2005).

⁵ Centers for Disease Control and Prevention, *Death of a Child After Ingestion of a Metallic Charm – Minnesota, 2006*, Morbidity and Mortality Weekly Reports (Mar. 23, 2006).

⁶ Centers for Disease Control and Prevention, *Brief Report: Lead Poisoning from Ingestion of a Toy Necklace --- Oregon, 2003*, Morbidity and Mortality Weekly Reports, 509-511 (June 18, 2004).

⁷ Reebok, *Reebok Recalls Bracelet Linked to Child's Lead Poisoning Death* (Mar. 23, 2006).

stomach. Testing revealed the pendant to be 99.1% lead.⁸ Reebok subsequently recalled of 300,000 pieces of the jewelry.⁹

The recall was one of at least 15 recalls of children's jewelry because of dangerous levels of lead in the past four years:

- On May 10, 2006, Liz Claiborne Inc, of North Bergen, New Jersey recalled about 2,800 pieces of Juicy Couture Children's Jewelry with phrases including "Viva La Juicy" printed on the front.¹⁰
- On April 27, 2006, Selected Trading Corp. of Miami, Florida recalled about 55,000 choker-style necklaces with the phrase "in style" printed on the front.¹¹
- On March 30, 2006, American Girl Children's Jewelry of Middleton, Wisconsin recalled 180,000 American Girl necklaces, bracelets, earrings, and hair accessories for girls.¹²
- On March 23, 2006, Dollar Tree Distribution Inc. of Chesapeake, Virginia, recalled about 580,000 necklaces and rings in a variety of designs with a toy "gem" in the center. Among the designs were "mood rings" and "glow in the dark" necklaces.¹³

⁸ Centers for Disease Control and Prevention, *Death of a Child After Ingestion of a Metallic Charm – Minnesota, 2006*, Morbidity and Mortality Weekly Reports (Mar. 23, 2006).

⁹ Consumer Product Safety Commission, *Reebok Recalls Bracelet Linked to Child's Lead Poisoning Death* (Mar. 23, 2006) (online at <http://www.cpsc.gov/cpscpub/prerel/prhtml06/06119.html>).

¹⁰ Consumer Product Safety Commission, *Juicy Couture Children's Jewelry Recalled for Lead Poisoning Hazard* (May 10, 2006)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml06/06160.html>).

¹¹ Consumer Product Safety Commission, *Children's Necklaces Recalled for Lead Poisoning Hazard* (Apr. 27, 2006)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml06/06150.html>).

¹² Consumer Product Safety Commission, *Children's Jewelry Sold at American Girl Stores Recalled for Lead Poisoning Hazard* (Mar. 30, 2006) (online at <http://www.cpsc.gov/cpscpub/prerel/prhtml06/06123.html>).

¹³ Consumer Product Safety Commission, *Dollar Tree Stores Inc. Toy jewelry Recalled for Lead Poisoning Hazard to Children* (Mar. 23, 2006) (online at <http://www.cpsc.gov/cpscpub/prerel/prhtml06/06118.html>).

- On March 23, 2006, Oriental Trading Company Inc. of Omaha, Nebraska, recalled about 25,000 beaded photo charm bracelets.¹⁴
- On February 23, 2006, Provo Craft & Novelty Inc. of Spanish Fork, Utah recalled about 29,000 metal charms, including some in the shape of pumpkins.¹⁵
- On November 30, 2005, Stravina Operating Co., LLC, Of Chatsworth California recalled about 6 million metal necklaces and zipper pulls, each bearing a child's name.¹⁶
- On September 22, 2005, Dollar General Corporation of Goodlettsville, Tennessee recalled about 455,000 necklace and earring sets with floral designs.¹⁷
- On September 22, 2005, Monogram International Inc., of Pinellas Park, Florida recalled about 145,000 Disney Princess bracelet keyrings.¹⁸
- On May 12, 2005, Dollar General Corp of Goodlettsville, Tennessee recalled about 80,000 pendants shaped as hearts.¹⁹
- On January 11, 2005, Riviera Trading Inc. of New York, New York recalled about 7,1000 metallic costume bracelets with phrases including "I like movies" and "I like sports" printed on them.²⁰

¹⁴ Consumer Product Safety Commission, *Lead Poisoning Hazard Prompts Recall of Metal Charm Bracelets* (Mar. 23, 2006) (one at <http://www.cpsc.gov/cpscpub/prerele/prhtml06/06538.html>).

¹⁵ Consumer Product Safety Commission, *Metal Charms Recalled for Lead Poisoning Hazard to Children* (Mar. 23, 2006) (online at <http://www.cpsc.gov/cpscpub/prerele/prhtml06/06093.html>).

¹⁶ Consumer Product Safety Commission, *CPSC, Stravina Operating Co. Announce Recall of Children's Metal Necklaces and Zipper Pulls* (Mar. 23, 2006) (online at <http://www.cpsc.gov/cpscpub/prerele/prhtml06/06042.html>).

¹⁷ Consumer Product Safety Commission, *CPSC, Dollar General Corp. Announce Recall of Costume Jewelry* (Sept. 22, 2005) (online at <http://www.cpsc.gov/cpscpub/prerele/prhtml05/05278.html>).

¹⁸ Consumer Product Safety Commission, *CPSC, Monogram International Inc. Announce Recall of Bracelet Keyrings* (Sept. 22, 2005)(online at <http://www.cpsc.gov/cpscpub/prerele/prhtml05/05277.html>).

¹⁹ Consumer Product Safety Commission, *CPSC, Dollar General Corp. Announce Recall of Metal Heart-Shaped Pendants* (May 12, 2005)(online at <http://www.cpsc.gov/cpscpub/prerele/prhtml05/05171.html>).

- On December 17, 2004, Raymond Geddes Co. Inc. of Baltimore, Maryland recalled about 155,000 necklaces depicting frogs, dolphins and a “sunshine smiley face.”²¹
- On July 8, 2004, four children’s jewelry importers recalled 150 million pieces of children’s jewelry sold in vending machines across America. The four firms were A&A Global Industries, Inc. of Cockeysville, Maryland; Brand Imports, LLC of Scottsdale, Arizona, Cardinal Distributing Company of Baltimore, Maryland, and L.M. Becker & Co. Inc., of Kimberly, Wisconsin. The children’s jewelry was sold between January 2002 and June 2004, at a cost of between \$0.25 and \$0.75 per item.
- On March 2, 2004, Brand Imports LLC of Scottsdale, Arizona recalled 1 million children’s rings in designs featuring hearts and stars.²²
- On Sept. 10, 2003, L.M. Becker & Co. of Kimberly, Wisconsin recalled 1.4 million toy necklaces with assorted symbols.²³

C. Action by Baltimore City Is Necessary To Protect Children

The Consumer Product Safety Commission (CPSC) is responsible for protecting children from lead poisoning from children’s jewelry. However, CPSC has failed to do so. CPSC has in place a weak policy that permits unacceptable levels of lead to be present in children’s jewelry. Action by Baltimore City is necessary to protect children from harm.

Two federal statutes address the lead content of toys. Under the Consumer Product Safety Act, regulations ban paint containing lead in a concentration of greater than 600 parts per million.²⁴ The Federal Hazardous Substances Act bans products that

²⁰ Consumer Product Safety Commission, *CPSC, Riviera Trading Inc. Announce Recall of Children’s Costume Bracelets* (Jan. 11, 2005)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml05/05082.html>).

²¹ Consumer Product Safety Commission, *CPSC, Raymond Geddes Co. Announce Recall of Children’s Necklaces* (Dec. 17, 2004) (online at <http://www.cpsc.gov/cpscpub/prerel/prhtml05/05072.html>).

²² Consumer Product Safety Commission, *CPSC, Brand Imports, LLC Announce Recall of Children’s Rings* (Mar. 2, 2004)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml04/04090.html>).

²³ Consumer Product Safety Commission, *CPSC, L.M. Becker & Co. Inc. Announce Recall of Toy Necklaces* (Sept. 10, 2003)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml03/03178.html>).

²⁴ 16 CFR 1303.

expose children to “hazardous substances” through routine handling or reasonably foreseeable use, including ingestion.”²⁵

CPSC has the authority to implement these statutes. The agency could establish clear standards for lead content and testing to minimize the likelihood that hazardous products are ever sold. However, CPSC has not done so. Instead, it has provided wide latitude to the industry in conducting testing prior to marketing, with the result that the standardized testing can be grossly inadequate. The agency has also issued a weak and ineffective policy on the acceptable levels of lead in children’s jewelry.

Industry testing standards for toys, published by the American Society of Testing and Materials, only include a single test for lead.²⁶ This test involves bathing a scraping of the outer surface of the toy in a weak hydrochloric acid solution and assessing the lead content of the solution. It does not require an assessment of products without an outer coating. Nor does it require an assessment of the overall lead content of the product. On January 13, 2005, Congressman Henry A. Waxman wrote CPSC summarizing concerns with the industry’s testing standard.²⁷

On February 3, 2005, CPSC announced a new policy addressing lead in children’s metal jewelry.²⁸ The new policy is premised on the claim that the “scientific community generally recognizes a level of 10 micrograms of lead per deciliter of blood ... as a threshold level of concern with respect to lead poisoning.”²⁹ This claim is wrong. CDC has concluded that “no ‘safe’ threshold for blood lead levels ... in young children has been identified.”³⁰ In fact, CDC has specifically rejected the regulatory approach used by the CPSC of modeling risk based on blood lead levels over 10 micrograms per deciliter.³¹

After starting from a false premise, CPSC’s policy sets out a weak and ineffectual approach to protecting children from lead in children’s jewelry.

²⁵ 15 USC 1261-1278.

²⁶ American Society of Testing and Materials, *Standard Consumer Safety Specification for Toy Safety* (2003).

²⁷ Letter from Congressman Henry A. Waxman to Chairman of the Consumer Product Safety Commission Hal Stratton (Jan. 13, 2005).

²⁸ Consumer Product Safety Commission, *CPSC Announces New Policy Addressing Lead in Children’s Metal Jewelry* (Feb. 3, 2005)(online at <http://www.cpsc.gov/cpscpub/prerel/prhtml05/05097.html>).

²⁹ Consumer Product Safety Commission, *Interim Enforcement Policy for Children’s Metal Jewelry Containing Lead* (Feb. 3, 2005).

³⁰ Centers for Disease Control and Prevention, *Preventing Lead Poisoning in Young Children* (Aug. 2005).

³¹ *Id.*

Under the new policy, CPSC staff first conducts a screening test to determine the “lead content of each type of component in a piece of jewelry.” If the lead content is less than or equal to 600 parts per million, then “no corrective action will be sought.”

If a piece of the jewelry exceeds the 600 parts per million threshold, then CPSC proceeds to the second step: testing using an acid extraction method. If the acid extraction yields less than or equal to 175 micrograms of accessible lead, then “no corrective action will be sought.”

If, however, a piece of the product yields more than 175 micrograms of accessible lead, then CPSC moves to the third step. In this step, staff “decides whether to pursue a corrective action on a case-by-case basis.”³² According to the CPSC policy, “[s]taff will consider ... the age” of the children who are most likely to wear the jewelry, “the level of accessible lead,” the size and shape of the jewelry components, “the probable routes of exposure” and other factors.³³

CPSC’s policy fails to protect children from harm. It explicitly permits an unsafe amount of lead – 175 micrograms – to be present in any single component of a single piece of children’s jewelry. As a result, a single piece of jewelry could contain significantly more than 175 micrograms. It also establishes no clear level for enforcement. A manufacturer can believe that even children’s jewelry with high levels of lead will not face any regulatory action.

Citing the failure of CPSC’s policy, Congressman Waxman and Senator Barack Obama have introduced legislation to ban lead from children’s products.³⁴ This legislation has been endorsed by the American Academy of Pediatrics.

Since the CPSC policy announcement, there have been at least 11 recalls of approximately 7 million pieces of children’s jewelry because of the threat of lead exposure and one known death.

Because of the ongoing risk to children from lead in children’s jewelry, and because of the inadequacy of action by CPSC to protect children, the Baltimore City Commissioner of Health proposes to declare children’s jewelry with excess levels of lead to be a nuisance. For the purpose of this regulatory action, “excess levels of lead” would mean any piece of children’s jewelry in which any metal component part has a lead concentration exceeding 1200 parts per million prior to September 1, 2007, or 600 parts per million on or after September 1, 2007. This phased in standard imposes a reasonable and attainable safety standard that is consistent with a recent settlement between the state

³² Consumer Product Safety Commission, Interim Enforcement Policy for Children’s Metal Jewelry Containing Lead (Feb. 3, 2005).

³³ *Id.*

³⁴ H.R. 668 and S. 2048.

of California and 71 major retailers and distributors in January 2006.³⁵ The 600 parts per million standard, in effect as of September 1, 2007, mirrors the federal standard for lead in paint, which was set to be protective of children's health.³⁶

The Centers for Disease Control and Prevention has stated "alternatives to lead are available" for children's jewelry.³⁷ Referring to lead in candy and other consumer products, the chief of the Lead Poisoning Prevention Branch of CDC has stated, "It is ... important to think about why is lead in any of those products, and if it doesn't need to be there, let's get it out."³⁸

If one item of children's jewelry is found to contain excess lead, there is a high likelihood of other items having excess lead. As a result, the Commissioner of Health will deem children's jewelry of the same style and from the same manufacturer or distributor a nuisance to the public health.

III. RESPONSES TO COMMENTS

The Baltimore City Health Commissioner accepted comments on the Proposed Regulations during the comment period from August 14, 2006 through September 29, 2006. Responses were received from: the Maryland Lead Poisoning Prevention Commission, Claire's Stores, Inc., and the Fashion Jewelry Trade Association.

The following is the Baltimore City Health Department's (Department) comments based on the responses received.

- Maryland Lead Poisoning Prevention Commission.

The response from the Maryland Lead Poisoning Prevention Commission provided support for the proposed regulation. The organization is comprised of appointed officials from both public and private sector that states its mission as "providing oversight for the implementation of the statewide plan to eliminate childhood head poisoning..."

³⁵ *People of the State of California vs. Burlington Coat Factory Warehouse Corporation, et al.*, Case RG 04-162075 (2006)(online at http://ag.ca.gov/newsalerts/cms06/06-009_0a.pdf?PHPSESSID=9e493493a321a5b072cf5baf0f2ed3e8).

³⁶ 16 CFR 1303.

³⁷ Centers for Disease Control and Prevention, *Death of a Child After Ingestion of a Metallic Charm – Minnesota, 2006*, Morbidity and Mortality Weekly Reports (Mar. 23, 2006).

³⁸ *Bill Would Ban Lead in Candy Wrappers*, Orange County Register (Mar. 28, 2005).

The Commission agreed that governmental regulatory action is necessary to protect children from not only traditional sources of lead poisoning, but also from sources in consumer products. The Commission applauded the Department's efforts in an area where there has been a lack of federal intervention.

- Claire's Stores, Inc.

Claire's is a national retailer of products for children and teens. The response from Claire's Stores, Inc. (Claire's), while providing support to legislation for the health and safety of children, enumerated several positions of opposition to the Proposed Regulation.

Claire's first objection to the Proposed Regulation is that the Department "incorrectly states that the proposed action seeks to implement the same standard agreed to in a settlement between the state of California and 71 major retailers and distributors." Claire's states that the standard for glass and crystal and the definition for "children's jewelry" is not the same as is defined in the settlement in California, also known as the Proposition 65 settlement.

After reviewing the issues and in response to these stated concerns, the Department is focusing the regulation on metal components of children's jewelry. Based on the Department's review of this issue, significant amounts of lead do not leach from glass products. The Department takes this action in recognition that many of the recent recalls for children's jewelry, and the cases of harm to children have involved metal components of the jewelry. The Department's 600 ppm standard for metal components is the same as that adopted in the California settlement and passed in recent California legislation.

The second objection is that the testing required by the regulation "fails to include a detailed protocol or methodology." The methodology described in Proposition 65 uses EPA methods 3050B or 3051. Those methods are, by EPA's own documents, for the determination of lead, and other elements, in sludges, soils and sediments. The Department has determined that the Consumer Product Safety Commission methodology, Standard Operating Procedure for Determining Lead and Its Availability in Children's Metal Jewelry, methodology that is designed specifically for the analysis of metal, is adequate to perform the basic testing to identify the hazards in metal components for children's jewelry. The full details of the protocol and methodology will be incorporated into the regulation.

Claire's third objection is that in comparison to the Proposition 65 settlement, the Department's regulation is too dissimilar and thus creates a "patchwork quilt of regulations in the United States, and will not uniformly safeguard the children these regulations are designed to protect." With the revisions made by the Department, as it applies to the components tested, the Department believes that the regulation does not overreach the Proposition 65 settlement and thus does not conflict with the implementation of Prop 65.

Claire's fourth objection is that the regulation fails to provide a means for an adequate due process mechanism. The Department agrees that a hearing process will now be incorporated in the regulations so that due process is afforded to retailers.

Fifth, Claire's finds the regulation language vague as it relates to the "similarly constructed and packaged" verbiage. The Department agrees that the language is better stated as "from the same style and from the same manufacturer." This change is made to specifically help the retailer and manufacturer identify which jewelry product style will be affected once piece of jewelry with excessive lead levels is identified.

Sixth, Claire's states that the regulation fails to report a compliance date. The date of compliance for the 600 ppm standard is September 1, 2006, in California. The Department will establish the following implementation timeline, which provides a two-fold margin for an period of interim compliance: As of the effective date of this regulation, no person shall offer for retail sale children's jewelry with metal components in excess of 1200 ppm of total lead. As of September 1, 2007, no person shall offer for retail sale, children's jewelry with metal components in excess of 600 ppm of total lead.

- Fashion Jewelry Trade Association (FJTA).

The FJTA is a trade association of vendors of costume jewelry. Its comments are specific to certain language used in the regulation.

The principal objection of the FJTA is that of the "similarly constructed and packaged items from the same manufacturer..." language. The FJTA states that supplies of metal for jewelry often comes from a variety of sources and that each individual style should be tested before being deemed a nuisance. As stated earlier, the Department agrees that the language is better stated as "from the same style and from the same manufacturer." This change is made to specifically assist the retailer and manufacturer identify which jewelry style should be pulled from the market upon a showing of an elevated lead level in a piece of children's jewelry.

Based on the comments received and a rigorous review of the issues, the Department puts forth the following revised and final regulations.

IV. REGULATION

A. Children's Jewelry Defined

1. Definition. "Children's jewelry" means jewelry that is made for, marketed for use by, or marketed to, children. "Children's jewelry" includes, but is not limited to, jewelry that meets any of the following conditions:

- a) Represented in its packaging, display, or advertising, as appropriate for use by children;
- b) Sold in conjunction with, attached to, or packaged together with other products that are packaged, displayed, or advertised as appropriate for use by children;
- c) Sized for children and not intended for use by adults; and
- d) Sold in any of the following:
 - (1) A vending machine; or
 - (2) Retail store, catalog, or online Web site, in which a person exclusively offers for sale products that are packaged, displayed, or advertised as appropriate for use by children; or
 - (3) A discrete portion of a retail store, catalog, or online Web site, in which a person offers for sale products that are packaged, displayed, or advertised as appropriate for use by children.

B. Standards

- 1. The Commissioner of Health has determined that any piece of children's jewelry in which any metal component part has a lead concentration exceeding 600 parts per million contains dangerous levels of lead. While any level of lead may be unsafe if ingested by children, the Commissioner of Health issues the following standard in order to reach a reasonable and attainable safety standard.
 - a) The Department issues the following phased-in standards:
 - (1) As of the effective date of this regulation, no person shall offer for retail sale children's jewelry with metal components that contain in excess of 1200 ppm of total lead.
 - (2) As of September 1, 2007, no person shall offer for retail sale, children's jewelry with metal components that contain in excess of 600 ppm of total lead.

2. The Commissioner of Health has determined that any piece of children's jewelry, with any metal component part containing lead levels that exceed the standard set forth in section (1), is a health hazard and a nuisance.
3. If an item of children's jewelry is found to contain any metal component with lead levels exceeding the standards set forth in section (1), the Commissioner of Health will deem all items of the same style and from the same manufacturer a health hazard and a nuisance.

C. Testing

1. The Baltimore City Health Department shall conduct random testing of children's jewelry sold in the City for a period of at least six months. The testing will assess the lead concentration of metal component parts of children's jewelry according to the laboratory method defined by the Consumer Product Safety Commission ("CPSC"). The CPSC methodology – Standard Operating Procedure for Determining Lead (Pb) and Its Availability in Children's Metal Jewelry, dated February 3, 2005, is attached hereto as Appendix A and is hereby incorporated as part of this regulation.
2. At least monthly, the Health Department will release the results of its testing to the public.

D. Notice

1. If a testing result reveals a concentration of 1200 ppm before September 1, 2007, or 600 ppm on or after September 1, 2007, in any metal component part of a piece of children's jewelry, the Health Department will take the following steps:
 - a) The Health Commissioner may issue a written notice to the owner, operator, or resident agent for the retail establishment at which the children's jewelry containing a metal component with excess lead levels was found. Such written notice shall:
 - (1) Identify the children's jewelry and the associated health hazard;
 - (2) Declare all items of the same style and from the same manufacturer to be a nuisance;

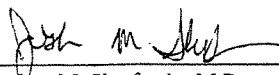
- (3) Specify the corrective action to be taken (e.g., specify that the establishment must immediately stop the sale and/or distribution of such children's jewelry);
 - (4) State the time within which that action must be taken; and
 - (5) Set forth penalties that may be imposed if the corrective action is not timely taken.
 2. The notice shall be served in accordance with section 5-204 of the Baltimore City Health Code.
 3. The Health Commissioner may publish notice in a newspaper of general circulation in the City that:
 - a) Identifies the children's jewelry and the associated health hazard;
 - b) Declares all items of the same style and from the same manufacturer to be a nuisance;
 - c) Specifies the corrective action to be taken by any establishment containing such an item (e.g., specifying that all establishments must immediately stop the sale and/or distribution of this item;
 - d) States the time within which that action must be taken; and
 - e) Sets forth penalties that may be imposed if the corrective action is not timely taken.
- E. Penalties and Right to Hearing
 1. Penalties
 - a) Any person who fails to take the corrective action specified in the nuisance notice may be subject to one or more of the following penalties:
 - b) Any person who fails to comply with a nuisance notice is guilty of a misdemeanor and, if convicted, subject to a fine of not more than \$1,000 for each offense. Health Code § 5-210.

- c) Any person who “knowingly obstruct[s], resist[s], or interfere[s] with the Commissioner or any officer or employee of the Department while carrying out their powers and duties” is guilty of a misdemeanor and, if convicted, subject to a fine of up to \$500 for each offense. Health Code §§ 2-205, 2-212.
 - d) Any person who “fail[s] to comply with any order or notice issued under this article or under the authority of the Health Commissioner” is guilty of a misdemeanor and, if convicted, subject to a fine of up to \$200 for each offense plus \$50 for each day that the offense continues. Health Code §§ 2-207, 2-213.
 - e) An Environmental Control Board citation with a penalty of \$100 can be issued for a violation of a nuisance abatement notice issued under the Health code. City Code Art. 1, § 40-14(e)(7).
2. Right to Hearing. Any person aggrieved by a notice, order, or decision of the Health Department may request a hearing as set forth in section 2-302(b) of the Baltimore City Health Code.

F. Severability

The provisions of this regulation are hereby declared severable. If any word, phrase, clause, sentence, paragraph, section or part in or of this regulation or the application thereof to any person, circumstance or thing is declared invalid for any reason whatsoever, the remaining provisions and the application of such provisions to other persons, circumstances or things shall not be affected thereby but shall remain in full force and effect, the Commissioner hereby declaring that he would have ordained the remaining provisions of this regulation without the word, phrase, clause, sentence, paragraph, section or part, or the application thereof, so held invalid.

Approved:



Joshua M. Sharfstein, M.D.
Commissioner
Baltimore City Health Department

Regulatory Action on Lead in Children's Jewelry

Appendix A



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
DIRECTORATE FOR LABORATORY SCIENCES
DIVISION OF CHEMISTRY
10901 DARNESTOWN RD
GAITHERSBURG, MD 20878

**Standard Operating Procedure for Determining Lead (Pb) and Its
Availability in Children's Metal Jewelry
2/3/2005**

This document provides detailed information on two test methodologies that will be used by the U.S. Consumer Product Safety Commission's testing laboratory (LSC) in the analysis of children's metal jewelry. The first methodology is used to determine the total lead content of a jewelry item or component. It will be used as a screening test for purposes of the Interim Enforcement Policy issued by the Office of Compliance on February 3, 2005. The second methodology is an acid extraction test. It is used to quantify the amount of lead that may migrate from jewelry and result in human exposure through ingestion.

These methodologies are provided to inform interested parties of the methods used by LSC for assessing the availability of lead for estimating potential human exposure. They are not required to be followed by other laboratories in making such assessments; however, other laboratories should consider using these procedures to ensure they obtain results that are consistent with CPSC's for purposes of the Interim Enforcement Policy announced by the Office of Compliance.

CPSC staff has concluded that these test methodologies are sufficient to make appropriate determinations concerning children's metal jewelry. Accordingly, we intend to use them in lieu of the test methodologies previously followed.

Definitions

1. **Sample** – The complete package of a product collected by CPSC field staff and submitted to LSC for analysis. A sample generally contains single or multiple identical units of a particular product. The sample will have an official seal with a sample number, inspector name, and date the package was sealed. Each individual item in a sample is identified with the sample number and sub-numbers, if there is more than one item in the sample. As an example, a sample may contain single or multiple items such as necklaces, rings, bracelets, etc.
2. **Item** – Individual sub-sample within the total sample, such as a necklace, a ring or a bracelet that can be subjected to lead testing. Ideally, the sample should contain only identical items, not a mix of several different items. An item such as a bracelet may be broken into its component parts such as bead, hook, pendant, with those component parts individually analyzed.

3. Instrument Detection Limit (IDL) – 3 times the standard deviation of 10 replicate measurements of reagent blank. The IDL for Pb is 0.01 ppm.
4. Method Detection Limit (MDL) - Reagent blank fortified with 2-3 times the IDL. Seven replicate measurements are made. Calculate the MDL as follows: $MDL = t \times S$, $t = 3.14$ (99% confidence level for 7 replicates), S = standard deviation. The MDL determined for Pb is 0.01 ppm.
5. Laboratory Reagent Blank (LRB) – extraction or digestion media used for a particular Pb test. LRB data are used to assess contamination from the laboratory environment.
6. Calibration Blank – deionized water acidified with nitric acid (3 ml concentrated nitric acid diluted to 100 ml with deionized water).
7. Stock Standard Solution – 1000 ppm solution of Pb purchased from reputable commercial source, used to prepare calibration standards. Replace before expiration date.
8. Calibration Standards - Solutions containing 1, 5, 10, and 25 ppm of Pb in 3% nitric acid matrix are used for digests and extracts containing high Pb levels. Solutions containing 0.1, 0.25, 0.5, and 1 ppm of Pb in 3% nitric acid matrix are used for digests and extracts containing lower Pb levels. Calibration standards shall be prepared weekly.
9. Laboratory Performance Check Solution (LPC) - A Pb standard used to evaluate the performance stability of the instrument system. One of the calibration standards is generally used.
10. Quality Control Sample (QCS) - A solution containing Pb that is used to evaluate the performance of the instrument system. QCS is obtained from a source external to the laboratory and Stock Standard Solution.
11. Laboratory Fortified Blank (LFB) – LRBs to which known quantities of Pb are added in the laboratory. The LFB is extracted and analyzed exactly like a sample. Its purpose is to determine whether method performance is within acceptable control limits.

Materials and Reagents: The materials used for sampling and analysis are as follows:

1. Nitric Acid, Trace Metal Grade
2. Hydrochloric Acid, Trace Metal Grade
3. Glass Beakers, 50ml
4. Glass Beakers or Erlenmeyer Flasks - Shall be large enough to contain extract solutions that are 50 times greater than individual jewelry item weight.
5. Water/Shaker Bath
6. Hot Plate
7. Lead-free Insulated Wire.
8. Metal Cutters
9. Parafilm®
10. Distilled Water

I. Screening Test for Total Pb Analysis

Each unique component type from one subsample is analyzed for total Pb content. The procedure for Total Pb Analysis is as follows and is based on methodology found in Canada Product Safety Bureau Method C-02.4:

1. If the children's metal jewelry is coated with paint or a similar surface coating (it may contain Pb), the coating shall be removed and analyzed, separately from the base metal, for lead content as described in the Association of Official Analytical Chemists (AOAC) standard AOAC 974.02 (Lead in Paint). Care should be taken to remove as little of the substrate metal as possible.
2. Weigh out a 30-50 mg piece of children's metal jewelry in labeled 50ml beaker. Children's metal jewelry items generally weigh several grams, and an aliquot piece (with no paint or similar surface coating) will have to be clipped from item using metal cutters. Samples should be cut into several small pieces or ground to increase the rate of dissolution. If used, grinding apparatus must be thoroughly cleaned to prevent cross-contamination. Record actual weight to the nearest 0.1 mg.
3. Add 8ml of concentrated nitric acid to each beaker and evaporate to approximately 3ml on a hot plate.
4. After cooling, add 2ml of concentrated hydrochloric acid and stir.
5. Dilute with distilled water, washing side of beaker, to 20ml.
6. Warm up solution and gently agitate with stirrer or shaker bath for a minimum of 4 hours.
7. Transfer quantitatively into a 50ml volumetric flask and dilute to 50ml with distilled water.
8. Dilute samples so that Pb results are within calibration range of instrument. Generally a 1:50 dilution is sufficient.
9. Analyze diluted samples for Pb concentration using ICP spectrometer. High Pb standard calibration curve will be required. Analysis procedure is based on methodology found in ASTM E 1613. (Note: Method C-02.4 describes alternate procedure for analysis by Atomic Absorption Spectroscopy.)

II. Acid Extraction Test

The acid extraction simulates exposure to metal that is ingested into the alimentary tract. The analysis is generally performed on an intact item or component. The procedure for the acid extraction is as follows and is based on methodology found in ASTM C927, C738, D5517, and F963:

1. Suspend the children's metal jewelry item in a flask or beaker using insulated wire so that the item does not touch the bottom or edge of the flask/beaker, but will be submerged by acid.
2. Add 0.07N hydrochloric acid (HCL) solution to cover the jewelry item. The amount of acid solution added should be equivalent to 50 times the weight of the jewelry item. Record the volume of acid solution added. Ensure that the jewelry item is submerged.
3. Extraction is conducted for 1 hour at 37°C in the shaker bath.
4. After the 1 hour extraction period, all the acid extract is taken out, an aliquot saved for analysis, and fresh acid extract is added. The second extraction is conducted for 2 hours at 37°C on shaker bath.
5. After the 2 hour extraction period, all the acid extract is taken out, an aliquot saved for analysis, and fresh acid extract is added. The third extraction is conducted for 3 hours at 37°C on shaker bath.

6. After the 3 hour extraction period, all the acid extract is taken out, and an aliquot saved for analysis. The product has been exposed to a total time of 6 hours (1 + 2 + 3 = 6 hours) of extraction.
7. Each of the three extracted solutions is analyzed for Pb content using an ICP spectrometer. The high lead standard curve is generally required. Analysis procedure is based on methodology found in ASTM E 1613.

ICP Operating Procedures and Quality Control Measures

Analysis

1. Perform wavelength calibration monthly. This can be done prior to igniting plasma. An internal mercury lamp is used for wavelength calibration.
2. Ignite plasma. Set conditions as follows, these are the conditions recommended by the instrument manufacturer:
 - a. R.F. Power = 1150 watts
 - b. Auxiliary flow = 1 liter /minute
 - c. Nebuliser flow = 30.06psi
 - d. Pump rate = 100 rpm
 - e. Purge Time = 10 seconds
3. Allow the instrument to become thermally stable before beginning. This requires at least 30 minutes of operation prior to doing peak search for Pb.
4. Open the Lead Method for samples requiring high Pb standards or the Low Lead Method for samples requiring low Pb standards.
5. Ensure the following element and wavelength are selected:
 - a. Pb 220.353
6. Perform peak search using 5 ppm Pb standard to ensure optimum setting.
7. Perform calibration using calibration blank and standards. Calibration shall be performed a minimum of once a day when used for analysis, or each time the instrument is set up. Results for each standard shall be within 5% of the true value. If the values do not fall within this range, recalibration is necessary.
8. Analyze the QCS immediately after the calibration. The analyzed value of Pb should be within $\pm 10\%$ of the expected value. If Pb value is outside the $\pm 10\%$ limit recalibration is required.
9. Analyze the LPC following QCS analysis, after every 10th sample, and at the end of the sample run. The analyzed value for Pb should be within $\pm 5\%$ of its expected value. If Pb value is outside the interval, reanalyze the LPC. If the Pb value is again outside the $\pm 5\%$ limit, recalibrate the instrument. All samples following the last acceptable LPC analysis should be reanalyzed.
10. At least one LRB must be analyzed with each sample set. If the Pb value exceeds 3 times the MDL, the laboratory or reagent contamination should be expected. The source of the contamination should be identified and resolved before continuing analyses. The LRBs for the two Pb test procedures are as follows:
 - a. Total Pb – 8ml of concentrated nitric acid are placed in a 50ml beaker and heated on a hot plate with samples until concentrated to about 3ml followed by the addition of 2ml of concentrated HCL solution, then diluted to 50ml with deionized water after cooling.

b. Acid – 0.07N HCL solution

11. At least one LFB will be analyzed with each batch of samples. The LFB should be an LRB that is spiked with a known amount of Pb stock solution. LFBs should be prepared so that expected Pb values are within the calibration curve. Analyte recoveries should be within $\pm 20\%$ of expected values. If recoveries are outside this limit, the source of the problem should be identified and resolved before continuing analyses.
12. Dilute any samples that have Pb values exceeding 1.5 times the high calibration standard, and reanalyze.

Calculations and Results Reported

Results for the two Pb test methods are calculated and reported as follows:

1. Total Pb - $\%Pb (wt./wt.) = 0.10cd/w$
 - a. c = concentration of Pb detected (in units of ppm)
 - b. d = dilution factor (in ml units)
 - c. w = weight of aliquot digested (in mg units)
2. Acid Extraction Test - Results for each extraction stage (1, 2, and 3 hour) should be recorded separately as:
 - μg Pb extracted = cd
 - a. c = concentration of Pb detected (in ppm)
 - b. d = dilution factor (in ml)
 - The total weight (in grams) of the jewelry item should be measured

Examples:

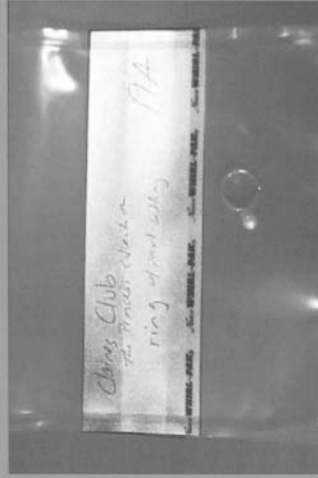
Table 1: Total Pb Analysis

	(c)	(d)		(w)	
Item	ppm Pb	Dilution factor	Total Pb (μg)	Sample wt. (mg)	% Pb
Pendant 1	20	1000	20,000	50	40

Table 2: Acid Extraction Analysis

		(c)	(d)	
Item	Extraction time (hr)	ppm Pb (measured & corrected for blank)	Dilution factor	Total Pb (μg)
Ring 1	1	2.0	40	80
	2	1.5	40	60
	3	1.0	40	40
Total				180

Lead in Children's Jewelry

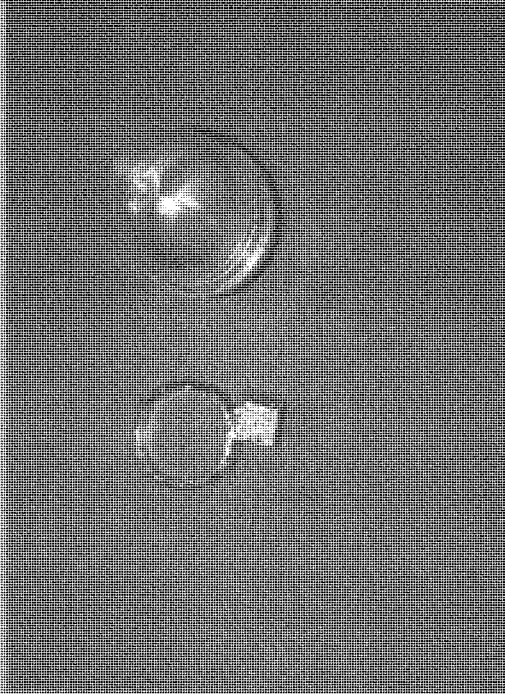


Product: Claire's Club; Princess Collection
jewelry set (3 pieces)

Store: Claire's

Address: The Gallery, 200 E. Pratt Street

Lead result (pearl ring): 68,071 ppm

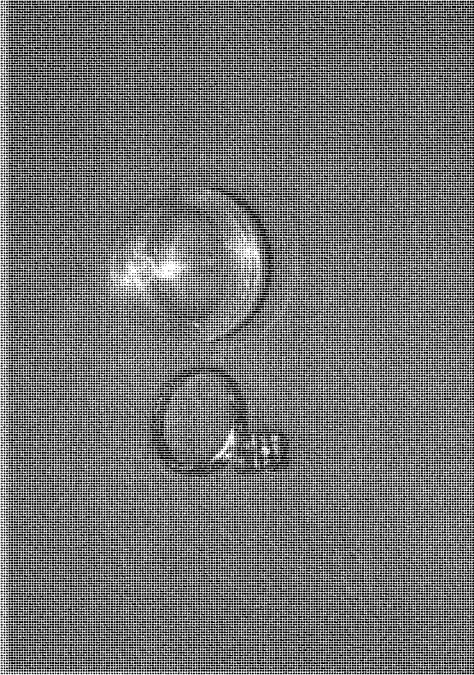


Product: vending machine ring with pink die cube

Store: Food-A-Rama

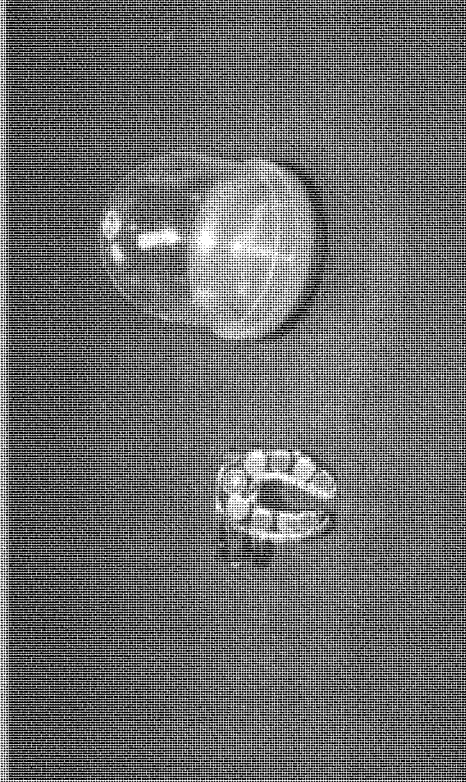
Address: 3801 Eastern Avenue

Lead result: 50-390 ppm



Product: vending machine tray with
plant die cube

Store: Food-A-Rama
Address: 3801 Eastern Avenue
Lead result: 55,190 ppm

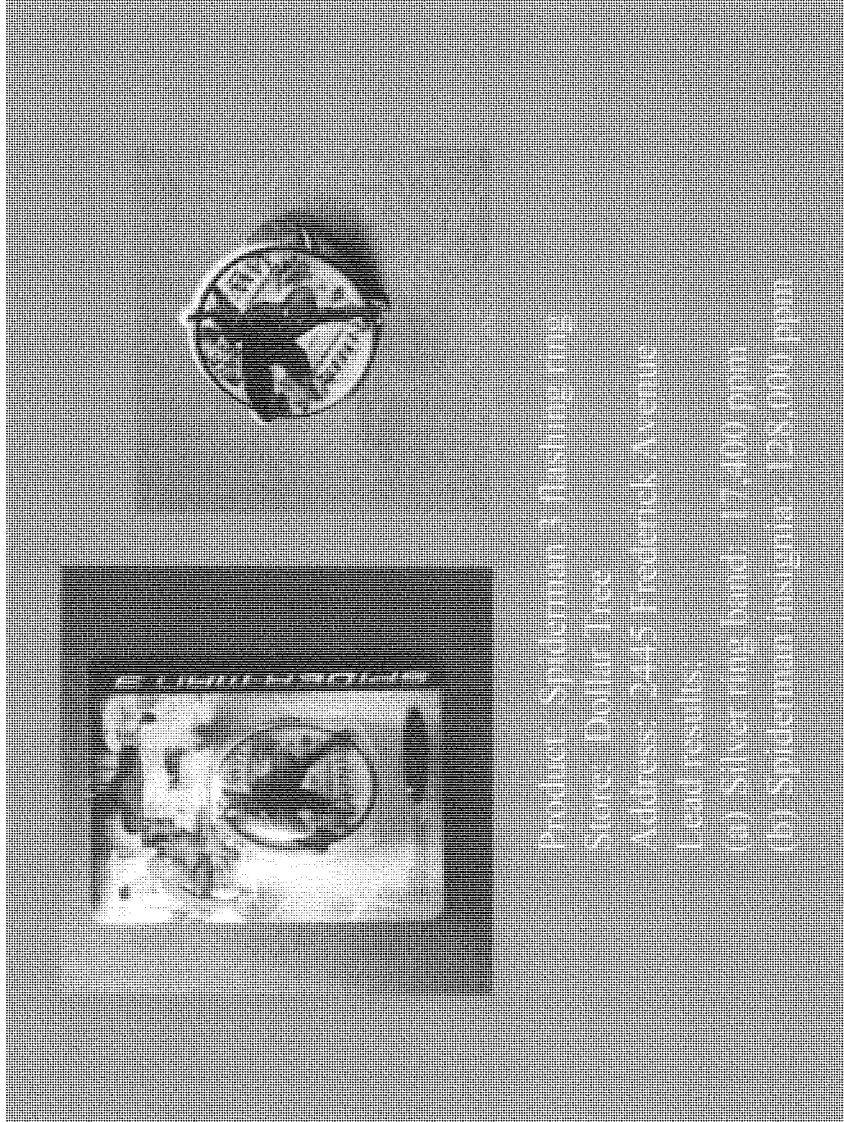


Product: vending machine ring with pink and
green horseshoe

Store: Food-A-Rama

Address: 3801 Eastern Avenue

Lead result: 47,420 ppm



Product: Spiderman 3 flashing ring

Store: Dollar Tree

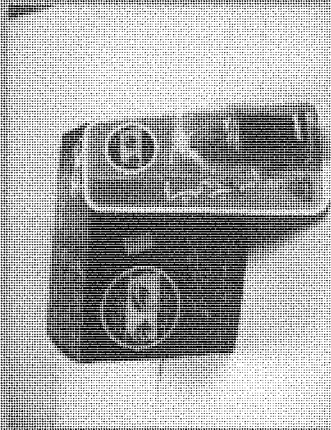
Address: 2445 Frederick Avenue

Lead results:

(a) Silver ring band: 17,400 ppm

(b) Spiderman insignia: 128,000 ppm

Lead in Cosmetics



Product: Kohl
Where the item originates: Almost the Middle East, Iran, Pakistan and India.
Use: Mothers apply this around the eyes of infants and children.
Test Results: two samples were tested results were 39% and 45% lead by weight.

Baltimore City Health Department issued a notice and order to bar the sale of this product.



**BALTIMORE CITY HEALTH DEPARTMENT
NOTICE AND ORDER TO REMOVE HEALTH HUSNANCE**

To: **BALTIMORE CITY RETAIL ESTABLISHMENTS**

Issuance Date: September 8, 2006

Compliance Date: September 11, 2006

The Baltimore City Health Department has determined that products sold within Baltimore City pose an immediate health and safety hazard to inhabitants of the City. These products are marketed as containing a substance known as Kahl, Kaji, Al-Kahl, or Surma (hereinafter referred to as "Kahl"). The Maryland Department of the Environment tested the "Kahl/Kahl Surma Spectral" product and found lead levels of 23% and 45%. These products are applied around the eyes, and two Maryland children have suffered lead poisoning after using the products.

The U.S. Food and Drug Administration has found that products containing kohl are a source of lead poisoning. Selling these products is illegal under Federal law, Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 301, et seq. The Commissioner of Health has determined that products containing kahl are a health hazard and a nuisance pursuant to Titles 2 and 9 of the Baltimore City Health Code, Health Code §§ 2-201, et seq. and 5-301, et seq.

Therefore, by authority of the Commissioner of Health under sections 2-108(f) and 9-101 et seq. of the Baltimore City Health Code, all Baltimore City retail establishments are hereby ordered to take the following corrective actions:

- 1) Immediately stop the sale and/or distribution of "Kahl/Kahl Surma Spectral" and any other cosmetic products containing Kahl, Kaji, Al-Kahl, or Surma within Baltimore City;
 - 2) This action must be completed by 5:00 p.m. on September 11, 2006.
- Failure to comply with this notice and order is a misdemeanor and, if convicted, violators will be subject to a fine of up to \$1,000.00 for each offense.

If any retail establishment fails to comply with this Notice and Order within the time frame stipulated, in addition to initiating criminal proceedings or other legal enforcement proceedings, the Commissioner of Health may secure permission to remove the nuisance from the premises of retail establishments. The person in charge of the property will be liable for the

expenses incurred by such corrective action and such expenses may act as a lien against the property until they are paid in full.
You have the right to request an administrative review of this notice and order in writing, within 10 days, setting forth in full the reason therefor.


Joshua W. Sharfstein, M.D.
COMMISSIONER OF HEALTH

RESPONSE BY OLIVIA FARROW TO AN ADDITIONAL QUESTION
FROM SENATOR INHOFE

Question. In your testimony, you cited the terrible cases where two children were poisoned when their family purchased a product at a Pakistani grocery store that in some cultures was used to improve the health of babies. CDC has identified these types of cultural products as a real problem. How do we address the lead content of these products while still being respectful of the cultural practices of people who come to live in this country?

Response. When a product is found to contain high levels of lead, the only solution is to inform the public and have the product pulled from sale. Certain products are used for certain cultural practices. However, we find that parents, regardless of cultural background, have the best intention for their children. Thus, once they are informed of the health dangers of a product, they voluntarily stop using the product. No parent wants to endanger the health and safety of his or her child.

RESPONSE BY OLIVIA FARROW TO ADDITIONAL QUESTIONS
FROM SENATOR BOXER

Question 1. How important is it to city health departments, like the one that you work for, that Federal agencies ? including EPA ? take stronger actions to stop the use of lead in consumer products, such as toy jewelry?

Response. It is extremely important that Federal agencies take stronger action to stop the use of lead in consumer products. At this time, local health departments, such as Baltimore City, are only reacting to this health threat. Being reactive can only protect consumers to a certain extent. Baltimore City's monthly random testing has fortunately stopped sales of some lead contaminated products. It does not, however, prevent all contaminated products from being sold to the public. In order to proactively address the issue of lead in consumer products, Federal action needs to be taken.

Relying on local or State jurisdictions to enact laws and regulations will result in a patchwork of regulatory oversight that fails to protect children nationwide. Manufacturers would also support a uniform regulatory guideline that would enable them to create a product that meets one standard.

Only the Federal Government has the resources and authority to stop contaminated products from entering the United States or ensuring that manufacturers follow standards across the country.

Question 2. Would stronger Federal efforts to collect information on consumer products that contain dangerous levels of lead help local officials' efforts to protect their citizens? If so, please explain.

Response. More Federal action is needed in order for local efforts to be more effective. Because products are distributed nationally and are available to the public in multiple states, it is necessary for Federal agencies to collect information on those products that pose a risk immediately and notify all affected states and locales. At this time, Baltimore City is primarily relying on its monthly jewelry testing to find products that endanger the public. We hope that we are able to find all products with excessive lead levels. Realistically though, we realize our resources are limited and there may be lead products on store shelves that we have not tested.

Senator BOXER. I think you are just terrific in that. I am going to stop you right there because of time concerns.

Ms. Farrow, I just want to say, it is funny to me. I am taken aback. I can't speak for anybody else, that this burden has fallen on the city. One of the problems is we have the Government witnesses leave after they speak. With all of the staff we have at the EPA, with all of the power they have given the laws of the land, that you are now telling us that you have to protect the kids, when the Consumer Product Safety Commission acted and these goods are still on the shelves.

Senator Inhofe.

Senator INHOFE. I really have to. I am sorry I had to leave 9 minutes ago.

Senator BOXER. That is OK.

Senator INHOFE. So there won't be time for me to—

Senator BOXER. Go ahead. You take my time. It is fine.

Senator INHOFE. All right.

Well, let me just not ask you to respond to any of the questions, but maybe for the record you can respond. There are some things that I think would be interesting. One would be, well let's see.

Dr. Jacobs, there is a statement by the CDC that said, "Efforts to identify and provide services to children with blood lead levels less than 10 micrograms per deciliter may deflect needed resources from children with higher blood levels who are likely to benefit most from individualized intervention." I guess what I would like to know, and this would be fine to do for the record, do you agree with the statement? And then, should we focus or should we not focus our resources on those kids with the greatest risk? That would be one.

Then I wanted to, one of the concerns I have, Mr. Nagel, is because I am very familiar with your—I used to do what your people are doing. I worry a little bit about creating a disincentive for people to have renovations done and end up doing them themselves, which most likely in most cases is going to end up with a higher lead level. This is a concern that I have, and I am not sure how to address this. I think you probably have given some thought to it, and I would like to get your thoughts.

Then also, what would be the likelihood, if we have a rule that comes out that would be very difficult to deal with, that remodelers would just quit remodeling some of these homes? I happen to be living in one of the oldest areas of Tulsa, and frankly I have been guilty of a lot of this myself. But if you just thought, well, the risk is too great, or perhaps you would end up being responsible for something you had no control over, just not taking those jobs, and therefore you are going to keep older houses in a State of continual deterioration, where there would be greater risk.

Maybe just on that last question you could just make a comment, Mr. Nagel, and then I will have to leave, Madam Chairman.

Mr. NAGEL. Absolutely. Working as a professional remodeler who has been trained in lead-safe work practices, working in a pre-1978 house that is known to contain lead creates many issues for us. Certainly, the least of which is a legal issue for us because it puts us in a litigative State that we area acknowledging the existence of lead in that house.

We are not abatement contractors. We are not required to be kept at the standard that abatement contractors are kept at. Having some form of clearance testing at the end of the project, which basically only proves the existence of lead in the house is putting us at risk from a litigation standpoint.

We also have the issue in some States, as in my State of Illinois, where if I know there is lead in a house, I legally am not allowed, as a non-abatement contractor, I am not allowed to renovate that house without somebody coming in and abating it beforehand.

We also have the issue of insurance. Current insurance in our area where workman's comp and liability issues does not cover. In fact, it specifically excludes hazardous waste, and outside contractors working in a hazardous waste situation. So as a professional remodeler who has been in the business for 22 years, if I know the

house has lead in it, I will not work in that house because it puts me at too much risk. It puts my business and my family at risk.

Senator INHOFE. Yes. I understand. I thought that should be in the record. With that, I will have to leave.

Maybe for the record, Ms. Farrow, one of the things that concerns me, and I think it concerns you, too, is if you are dealing—we are talking about the Pakistani things that are originating there—you are dealing with a culture, and you are dealing with a cultural problem. I would like to have you perhaps for the record let me know your thoughts on that. That could be a problem.

Madam Chairman, I want to appreciate you for holding this hearing. You guys don't know this, this is one of the few hearings where we are almost in total agreement with each other.

[Laughter.]

Senator INHOFE. So thank you very much.

Senator BOXER. Well, I am just speechless at that, Senator. Look, we are grandparents. We care about our kids.

Senator INHOFE. Right.

Senator BOXER. Let me just say, this has been a very illuminating hearing for me in many, many ways. I want to get back to Ms. Farrow. I want to understand exactly—you say you do monthly testing. Do you say that in the law in the city of Baltimore in order to sell retail, they have to do the testing? Or do you come in and just test?

Ms. FARROW. No. Actually, we come in and test, and we just pick a few retail shops throughout the city randomly. We are not doing a lot of testing, just two or three stores each month. We just take four or five items just randomly. So it is the Health Department that is actually conducting the testing.

Senator BOXER. And then you put out an alert to all stores, if you have this, they have to get rid of it?

Ms. FARROW. Exactly. We issue a violation notice to the particular store that was selling the product. We issue a press advisory so that everyone in the city is aware in the event that someone has already purchased the product, and then we notify the CPSC also.

Senator BOXER. OK. If the retailer continues to sell the product, are they subject to fines?

Ms. FARROW. Yes. They are subject to misdemeanor fines if found guilty.

Senator BOXER. And you are saying that you found products that had been recalled that are still out there?

Ms. FARROW. Right. Three rings in a vending machine, they had been recalled by the CPSC in 2004, and I can't speak for what happened in 2004.

Senator BOXER. And you reported that to the CPSC?

Ms. FARROW. Right. We reported it to the CPSC, as we do whenever we find positives. In March, we reported that to CPSC. A couple of months later, CPSC actually issued a re-recall of those rings because of our sampling. They realized that this product was back on the market.

Senator BOXER. I guess the question I have, the issue of recall and the product continues to come in, and people continue to sell it, they ought to be—would you agree that there ought to be some

punishment out there for people who continue to import a product that has been banned? It just seems to me, it just sounds like these recalls are not working as they are supposed to work.

Ms. FARROW. Meaningless, yes.

Senator BOXER. Well, I just can't get over the fact that we have to have this enforcement at the city level. I just admire what you are doing, because here is the thing. You could see from the EPA, they are not that interested in getting involved in toy safety. They have to be pushed by Sierra Club to do the minimal amount of work, and they haven't even done that. They are taking so long to do this rule on remodeling. So we have the EPA just trying to bow out of this, and everybody is taking credit for the lead in paint, which is a wonderful accomplishment, but as my staff counsel pointed out to me, if you are a child and you put one of these toys in your mouth, it doesn't matter that the lead is out of the paint. This is pretty much death, sickness, retardation and the rest.

So what you are doing in stepping in here is really commendable. Do you know of other cities that are doing this as well?

Ms. FARROW. No. We are trying to follow the model of California and I believe there is some work going on in Illinois. But as far as a local jurisdiction, I can't say right offhand.

Senator BOXER. OK.

Mr. Neltner, in response to my questioning of Mr. Gulliford about how he is responding to the settlement of those lawsuits, you said that you were surprised that they were going to slowly. I think I would just say to my staff, I mean I guess I would like to ask you since you are the attorney who was involved in this. Are you the attorney?

Mr. NELTNER. Yes, I am.

Senator BOXER. Your expectation was that they would be taking action much quicker on these imported toys?

Mr. NELTNER. Right, that the rule would have been effective in June 2008. It sounds like much longer than that now. They are talking a year from whenever they issue this rule, and they didn't firmly commit to a deadline to issue the rule.

Senator BOXER. Would you think that that is a violation of the settlement agreement, if that is the case?

Mr. NELTNER. Perhaps.

Senator BOXER. Well, this is what I want to do. I am going to write a letter today and ask for immediate response, and ask them how the timetable they laid out meets the settlement.

Mr. NELTNER. It also seems inconsistent with the Toxic Substances Control Act, because they received a recommendation from the Interagency Testing Committee in June to issue this rule to implement the recommendations. They have no industry opposition. The industry said, fine, just do what you promised, and there has been no opposition. So I don't understand why it would take so long to do a simple rule on this one—because of the way TSCA allows them to act more quickly. It is interesting that it seems to be taking a long time.

Senator BOXER. OK. I have another question. That one we will work on together. If you could give me your top three recommendations on how EPA could use its authorities under TSCA that so far it is refusing to do. Because my sense is, they keep saying, we can't

do this under TSCA, and we have a different view. I wonder what you believe TSCA allows them to do, without any change in law.

Mr. NELTNER. Well, obviously issue the renovation, repair and painting rule in a manner that allows consumers to be able to take steps to protect themselves. Second issue quality control orders to any company that has a recall. If a company has had a recall, they have obviously had a quality control problem. Issue an order, get those quality control procedures, find out the factories—also under TSCA 8(e) they should be submitting these notices—find out those factories that have a problem and then begin to work on those factories and work with the Consumer Product Safety Commission.

In many ways, because of the failure of EPA, the Consumer Product Safety Commission and EPA have been working blind. When you have facts, you make better decisions. They have been reluctant to get those facts.

Senator BOXER. So you are saying under TSCA, without any change in law, they could issue quality control orders to companies who have been subjected to having their products recalled.

Mr. NELTNER. Correct. Their response in the negotiations was, you can't force us to issue an order because it was a glitch in the way the law was written for citizen petitions. You can only force us to issue a rule, but you can't make this issue a rule until we first issue an order. A little complicated, but the bottom line is they have the authority and they could do it very quickly, much quicker than the Consumer Product Safety Commission.

Senator BOXER. Have they ever issued a quality control order to a company that has been the subject of a recall?

Mr. NELTNER. No.

Senator BOXER. OK. And if they were sitting here now say they can't do it?

Mr. NELTNER. That seems to be my impression. I would sure like to figure that out. I can't figure out why they don't feel they have the authority. If it means deference to the Consumer Product Safety Commission, we also asked them to formally ask Consumer Product Safety Commission for that go-ahead, and they refused to do that by saying, the Sierra Club can't force EPA to issue a Section 9 report to CPSC.

Senator BOXER. OK. So in your opinion, they could go ahead and do that.

OK, what else could they do?

Mr. NELTNER. Well, because they issued one of those letters to the 120 companies about Section 8(e) notices, reminding them of their responsibilities, it became clear to us that EPA wasn't going to act when the companies weren't submitting these notices. So we ended up filing a notice of intent to sue against 11 companies, including Mattel, saying, you have had repeat recalls; you need to follow the law; you need to submit the TSCA 8(e) notices.

We would like to see EPA enforce the law instead of having to rely on citizens groups to do it. The citizen groups are prepared to sue Oriental Trading Company and Mattel because EPA won't. When EPA goes out to companies with this 8(e) reminder, they could also remind them of their new responsibilities under this 8(d) rule. EPA could include the names of the factories that have been producing the lead-contaminated products in China. They have

that ability to get that information from the companies. It is very hard for CPSC to get that.

Senator BOXER. Yes.

Mr. NELTNER. Get that information on the factories, and then let all the other importers know that if you use these factories, you should check your products. Right now, we have a catch—as-catch-can system where local health departments, as you correctly pointed out, are using their very limited resources, resources that should be focused on housing, to do what the Federal Government is unwilling to do.

If they would have done that, if they would have systematically gone to importers to check their other products, then we would be able to start fixing the system and proactively get ahead of the curve.

Senator BOXER. It just seems to me that so much of the problem is from these imported products. I don't know why we can't easily have testing done. First ask the companies in America to sign a statement that they know there is quality control. But I guess if there is a quality control order, it would be issued on a company like Mattel, for example?

Mr. NELTNER. Right.

Senator BOXER. And then Mattel would have to—see if I am right on this—then if they had a quality control order, Mattel would have to go over to these factories and do the testing, and they would be held liable if the products came in with lead.

Mr. NELTNER. Well, three points. One is the order would only ask them to submit their procedures so EPA could identify the shortcomings and adopt a rule to order that testing, to require them to do more.

But you asked, why haven't the companies have not done the testing. The Consumer Product Safety Commission has been behind the curve when it comes to the technology needed to test the products. In large measure, you can test in a nondestructive way using an XRF device. You can check products very quickly. That is how we check these products here with a Niton XRF. You can quickly check them.

What I understand now is that instead of relying on CPSC's standard test, companies are going ahead and using the new technology, checking lots more products, and that is part of the reason we are getting so many recalls.

So CPSC is just behind the technology curve, and that is another area where EPA could have provided some support to Consumer Product Safety Commission because EPA knew all about these XRFs and their ability to quickly determine the lead content.

Senator BOXER. OK. I would greatly appreciate it if any of the witnesses here today, because you are all so knowledgeable on this, could send to the Committee, Senators Inhofe and myself, your recommendations for what EPA could be doing right now without any change in the law. Because I think there is a reticence on their part. They are focused on the paint, which of course is super critical. But even there, they are slow on the home remodeling rule.

But it seems to me they have a great statement on their website which says the following. One of their biggest goals is, it says, "to make significant progress toward our goal of virtually eliminating

childhood lead poisoning as a public health threat by advancing meaningful reductions in blood lead levels for children at risk through a comprehensive program of new regulations, technical assistance, education, outreach, and community assistance.”

Those are nice words, but I don't get it from the EPA witness today that that is what we are seeing here at all. I see a great reticence, a slow-down, taking credit for past efforts. Wonderful. They have been good, but we need to do more because, again, even if the homes are 100 percent clean, if a kid puts something in his mouth, it is going to undo it all.

Mr. Jacobs, you showed us the beautiful colors of paints that are in these foreign countries that have astronomical levels of lead. Are the people there unaware of the problem, No. 1? And No. 2, how do you think they could make their way in? You said they are going to make their way onto our shores. Under our current laws, could they make their way onto our shores?

Mr. JACOBS. It would be illegal, of course, because it would violate the existing Consumer Product Safety Commission, but so were a number of these other products that have already crossed our borders.

Senator BOXER. Right.

Mr. JACOBS. These are children's products as well.

To borrow a lesson from the lead paint experience, one of the things that often happens is agencies will point to each other and say, this is not our job; this is CPSC's or EPA's job.

Senator BOXER. Yes.

Mr. JACOBS. Lead disclosure for properties was sort of like that; it was not entirely clear which agency should required owners to disclose information on lead paint hazards. The solution was pretty straightforward: Congress required that HUD and EPA pass a joint regulation. It is a little unwieldy, but it works. Agencies don't like it, but it can be done and it is quite effective, and you don't get the finger-pointing that way. There is no reason that CPSC and EPA can't coordinate their activities to take steps that are necessary through joint regulation.

Senator BOXER. Right.

Mr. JACOBS. I suspect many people in these other countries are not aware of this problem. There are a few researchers in India, Nigeria and other countries that working to make this known and to have their governments take action. I have left out one important element here, and that is it is the same companies, some of them may have affiliations to U.S. paint companies, who are manufacturing these paints with high amounts of lead. Singapore actually has an effective regulation. The same company will manufacture these products and comply with the much lower Singapore standards. This green paint sample is from Singapore, and it only had 300 parts per million. And yet the same color paint, made by the same company in China, has a lead content of hundreds of thousands parts per million.

So the technology is there to make paint with low levels of lead. This is a matter of making sure that there are global restrictions on the production of lead in paint. Back in the late 1980's, there was an effort by the United Nations Environment Program, UNEP, to globally ban all non-essential uses of lead. Senator Inhofe was

correct. There are some essential uses of lead. They can be managed. We need to take steps to make sure that happens.

But it is time to refocus our attention on a global ban of non-essential uses of lead. We have been down this road too many times. There is no reason to repeat it again.

Senator BOXER. I really do agree.

Anybody else have anything to add for the record before we adjourn? Yes, sir, Doctor.

Dr. LANPHEAR. I would just like to add, just so we are realistic moving into this. If you look at the dramatic declines in blood lead levels that we have seen, we have to realize that that too happened under great duress and great resistance. In fact, for the air lead standard, EPA didn't take action until they were sued by NRDC.

So to be realistic, they need this kind of pressure. That is part of our job, but they really need it to protect kids.

Senator BOXER. Yes. Well, I couldn't agree with you more.

I just want to say to the whole panel, thank you so much. It has just been a really good hearing. I am glad the votes on the floor cooperated with us at the end.

We do stand adjourned.

Brush With Toxics

An Investigation on Lead in Household Paints in India

By

Dr. Abhay Kumar
Senior Program Officer,
Toxics Link



Toxics Link
for a toxics-free world

New Delhi, Chennai, Mumbai
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September 2007

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Foreword

Lead is a heavy metal, which undisputedly has health effects at relatively low exposure levels, especially in children. This has been known for several decades. It is therefore surprising that its use, especially in countries like India has received such little attention, both by the government as well as by consumers. It was only recently that it was removed from gasoline here, since it was found to have very high levels in the city's ambient air. However it is still used in generic products like paints, pigments and certain types of plastics, despite the fact that lead in all such uses are replaceable by safe alternatives.

Toxics Link started to work on the issue of heavy metals beginning from its work on mercury and heavy metals contamination of food. Through empirical studies (such as the one on heavy metals in vegetables, as well as lead in toys) as well as through investigating the trade, supply and regulatory issues through researched reports, we have over the past 7 years attempted to highlight the extent and range of the problem. The conversations have been of late also of concern to the international community, as exemplified by decisions of the UNEP Governing Council on heavy metals, especially since both mercury and lead have long range transport problems. Alongside, as trade becomes more global, there have been rising concerns from developed country consumers and regulators about the issue of lead in toys, in children's jewellery and other products as well, resulting in products recalls. Some of these recalled products were manufactured in India.

This report on lead in paints is important since paints are widely used across products, and across households, giving rise to scattered and distributed contamination concerns. Lead free paint has been used in Europe, the US, Australia amongst other countries for several decades, and often the manufacturers are the same as those who sell in India. However owing both to the lack of governmental regulation as well as consumer awareness, industry has not reacted or taken action in India, even though there are some torch bearers amongst them. We hope that this report will lead to safer paints, and also set the ball rolling for safer products per se.

Ravi Agarwal
Director

About Toxics Link

Toxics Link is an information outreach and environmental advocacy organization set up in 1996. It has a special emphasis on reaching out to grassroots groups and community based organization. The areas of its engagements include research, outreach and policy advocacy on issues of communities and urban waste, toxics free healthcare, hazardous waste and pesticides.

Toxics Link works closely with all stakeholders working on similar issues and has been conducive to the formation of several common platforms for them. It also networks internationally and is part of international networks working on similar issues.

The mission of the organization is to:

“Working together for environmental justice and freedom from toxics. We have taken upon ourselves to collect and share both information about the sources and dangers of poisons in our environment and bodies, and information about clean and sustainable alternatives for India and rest of the world”

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Acknowledgement

First and foremost, I would like to thank Perry Oxfeld, Director, Occupational Knowledge, US for his sustained encouragement for carrying out this work. His guidance at every stage of the study, including comments while preparing the report were crucial in the completion of work. His help in getting the laboratory analysis done at Galson Laboratories, US was vital assistance. On behalf of the Toxics Link, I take this opportunity to express my sincere thanks to Galson Laboratory, NY, US for conducting the lab analysis.

I am thankful to Ravi Agarwal, Director, Toxics Link and Satish Sinha, Associate Director-Program, Toxics Link for their supervision of work. Their inputs and comments at every stage of work were key to the successful completion of the project. I also wish to extend my gratitude to Prof. C.S. Clark of University of Cincinnati, USA for providing important insights on the issue.

My other colleagues at Toxics Link were equally helpful. Their comments and suggestions were critical in understanding the issue. I thank all of them. My special thanks, though, to Prashant, Pragya, Parvinder, Kishore, Sriram and Dinesh for their important help in procuring and processing of samples.

Abhay Kumar

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INTRODUCTION

Paints, depending upon the nature of their usage, can be categorized as decorative or industrial. Decorative paints are primarily used on the interior or exterior of homes and buildings and include other coatings such as emulsions, enamels, varnishes, wood finishes and distempers. Industrial paints find their use in automobile coatings, steel structures, marine coatings and for other high performance purposes. Decorative paints can further be classified into premium, medium and distemper segments. Premium decorative paints are acrylic emulsions used mostly in the metros. The medium range consists of enamels, popular in smaller cities and towns. Distempers are economy products demanded in the suburban and rural markets. Nearly 20 per cent of all decorative paints sold in India are distempers, which is largely dominated by the unorganised sector (Lotus Strategic Management Consultants, http://www.domain b.com/industry/paints/200012_paint_overview.html)

Use of Lead in Paints

Lead* is added to paint not only to impart colour but also to make it durable, corrosion resistant, and to improve drying. It provides longevity to coatings on walls, woods and metals. A number of lead compounds can be used as pigments in paints such as lead oxide, lead carbonate (also known as white lead) and lead chromates/molybdates (ILZSG, 2004). Lead carbonate was historically used for wall paint in households and still is a significant source of lead exposure. Lead chromates, molybdates and sulphates are still widely used. They are inorganic pigments for bright and opaque yellow, red and orange colours in paints. Lead chromates represent 1 percent of the total lead

* Lead (Pb) is categorized as heavy metal belonging to group IV A (14) of the periodic table having atomic number 82 and relative atomic mass 207.2. Pure lead is a silvery-white metal that oxidizes and turns blue-grey when exposed to air (USA EPA, 1998). It is soft (enough to be scratched by fingernail), dense (11.3 g/cm³), malleable and readily fusible. Alloying it with small amounts of arsenic, copper, antimony or other metals hardens lead. Lead-containing products are manufactured using these alloys. The use of lead, and the process of extracting lead from ore, date back to ancient times: the earliest known example of metallic lead is a metal figure recovered from the Temple of Abydos in Upper Egypt, considered to date from 4000 BC (Thornton *et al.*, 2001). Metallic lead occurs rarely in nature. Lead is usually obtained from sulphide ores, often in combination with other elements such as zinc, copper and silver. Its abundance in Earth's crust is about 0.0013 percent. Lead exists in three oxidation states Pb(0)-elemental form, Pb(II) and Pb(IV) and has three chemical forms, viz., metallic lead, inorganic lead compounds and organic lead compounds.

use worldwide (ILZSG, 2004). There are, however, readily available substitutes for all these lead compounds.

Paint Composition

In addition to lead, paints may contain a mixture of other metal pigments and compounds used as vehicles, pigments or additives. The liquid portion of paint (constituting 50–75 percent of paint) is also known as the 'vehicle', which is essentially composed of volatile organic compounds (VOCs). 'Pigments' are the solid portion of the paint, which is used to impart colour, durability and consistency to paints. Titanium dioxide and other metal compounds are the preferred compounds for this purpose. 'Additives' present in lower concentrations act as corrosion inhibitors, fungicides, preservatives, wetting agents, water resistance, gloss, etc. 'Binders' are generally oils, resins and plasticisers, which tend to hold pigment together.

Paint Industry in India

Some of the basic statistics related to paint industries in India are given in table 1 and 2. Figures 1 and 2 also show the sales figures of various paint companies and their forex earnings in goods.

Source: Industry: Market Size & Shares, Center for Monitoring Indian Economy

Name	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Asian Paints	33.32	33.76	35.52	36.73	35.84	38.05
Kansai Nerolac Paints Ltd.	16.36	15.37	16.24	17.39	16.98	17.43
Berger Paints India Ltd.	13.62	13.27	13.98	14.73	15.29	16.05
I C I India Ltd.	9.43	8.4	9.1	9.83	10.2	10.49
Shalimar Paints Ltd.	3.28	3.05	3	2.53	3.52	3.57
Bombay Paints Ltd.	1.2	0.84	0.42	0.33	0.41	0.42
Jenson & Nicholson (India) Ltd.	3.6	2.78	1.39	0.35	0.3	0.33

	2002-03	2001-02	2000-01	1999-00
Number Of Factories	814	790	737	783
Factories In Operation	808	774	726	738
Income (in Rs Lakhs)	114259	119363	109966	58802
Profit (in Rs Lakhs)	73606	77585	72607	30731

Fig 1. Sales figures (in Rs. crores) of various paint industries between year 2003-2006

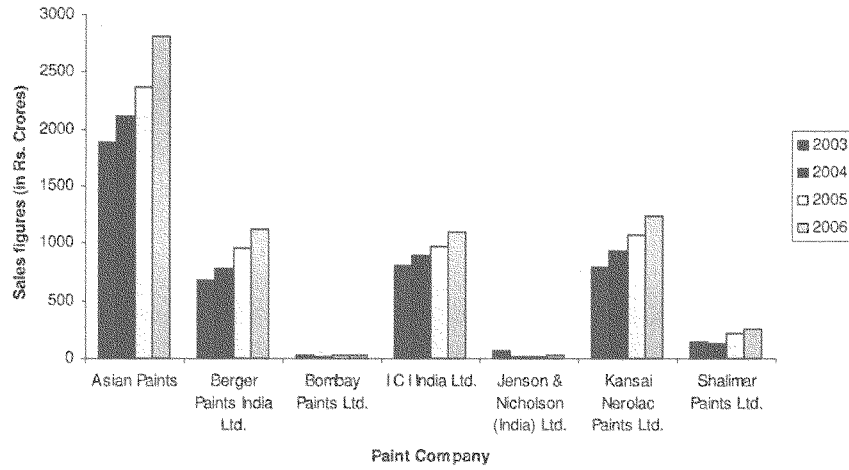
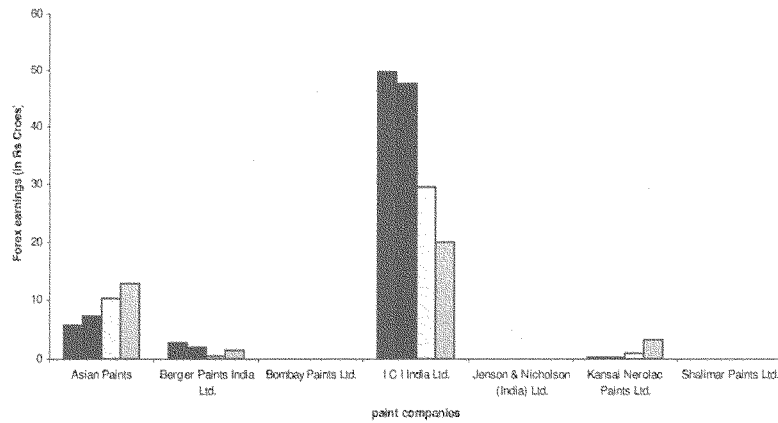


Fig. 2. Forex earnings from goods for various companies in year 2003 to 2006



As is evident from tables 1 and 2 that brands like Asian Paints, Berger, Nerolac, ICI Dulux, Shalimar, Bombay Paints and Jenson & Nicholson have major shares in paint products market; the three brands, viz., Asian paints, Nerolac and Berger among themselves control more than 70 percent of the market share. Asian paints is the industry leader. It has more than 15,000 retail outlets, while Nerolac has a distribution network of 10700 retail outlets. Figure 1 reveals that sales figures of all brands have consistently increased since 2003. While on one hand foreign exchange earned by selling goods have been substantial for ICI Dulux in comparison to other brands on the other it's also declining since year 2003 which is just reverse in case of Asian Paints (Fig. 2)

All the paint majors in India have tie-ups with global paint leaders for technical collaboration. About the various tie-ups, a website informs, *"Asian Paints has formed a joint venture with PPG Industries Inc. while Berger gas a series of tie-ups for various purposes. It has a technical tie-up with Herbets GmbH of Germany in addition to its joint venture with Becker Industriefag. With the agreement with Herbets coming to an end in 2001, Berger has now allied with the Japanese major Nippon Paints. It also has an agreement with Orica Australia Pvt. Ltd. to produce new generation protective coatings. The company also has tie-ups with Valspar Corp and Teodur BV for manufacturing heavy duty and powder coatings. ICI makes paints with the technical support of Herbets, which has been recently acquired by by E I Du Pont de Nemours of the US. Interestingly, Du Pont, which is a leader in automotive coatings in the US, has a technical tie-up with Goodlass Nerolac for the manufacture of sophisticated coatings for the automotive sector. Goodlass also has technical collaborations with Ashland Chemicals Inc, USA, a leader in the petrochemical industry, Nihon Tokushu Toryo Co and Oshima Kogyo Co Ltd, Japan".* (http://www.domainb.com/industry/paints/200012_paint_overview.html)

Human Exposure Pathways

Although children are known to eat paint chips, more commonly lead paints in and around homes contribute to dust and soil contamination that is often the most significant source of exposure for children. Children then ingest lead from playing close to the ground and having frequent hand-to-mouth contact. Significant exposure may also occur from lead paint when smaller particles become airborne during sanding and scrapping while repainting and remodeling. In addition, damaged

paint and the weathering of paints on the exterior of buildings also contribute to lead in soil. Contaminated soil is a particularly significant source of exposure to children. Ingestion of contaminated soil, dust and lead based paint chips and toys due to hand-to-mouth activity form important sources of lead exposure in infants and young children. In addition to paint and dust, food and water may also be significant sources of lead exposure. However, relative importance of these sources varies amongst different populations. In infants and young children as much as 50 percent of dietary lead is absorbed, although absorption rates for lead from dusts/soils and paint chips can be lower depending upon the bioavailability (IPCS, 1995). Absorption routes and absorption itself are dependent on particle size, chemical speciation, and solubility in body fluids.

Health Impacts of Lead

The US ATSDR, 2005 document best summarizes the health impacts of lead. It states, *"The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults to lead at work has resulted in decreased performance in some tests that measure functions of the nervous system. Lead exposure may also cause weakness in fingers, wrists or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people. Lead exposure may also cause anemia. At high levels of exposure, lead can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production"* (U.S. ATSDR, 2005).

A WHO/UNECE, 2006 document further describes the health effects of lead. According to this document, *"Lead is a well known neurotoxic metal. Impairment of neurodevelopment in children is the most critical lead effect. Exposure in uterus, during breast-feeding, and in early childhood may all be responsible for the effects. Lead accumulates in skeleton and its mobilization from bones during pregnancy and lactation causes exposures to foetus and breast fed infant. Hence, life time exposure of woman before pregnancy is important. Epidemiological studies show consistently that effects in children are associated with lead levels in blood (Pb-B) of about 100-150 µg/l. There are indications that lead is harmful even at blood lead concentrations*

considerably below 100 µg/l and there may be no threshold for these effects." (WHO/UNECE, 2006).

Toxicity Mechanism of Lead

Various mechanisms of lead toxicity have been proposed which include lead binding to the sulphhydryl (SH) groups of proteins, lead displacing calcium and zinc inside proteins, lead having an affinity for cell membrane, lead interfering with mitochondrial oxidative phosphorylation, it impairing the activity of calcium dependent intracellular messengers and protein kinase C and lead inhibiting DNA repair and exerting genotoxic effect and also affecting sodium, potassium and calcium ATP-ase. (Skerfving *et. al.*, 1998; Lidsky and Schneider, 2003; Toscano and Guilarte, 2005).

Impacts on Vulnerable Populations

Young children (below 6 years old) are recognized as the most susceptible to lead exposure even at low levels. Pregnant women are the second most vulnerable group. Lead also crosses the placenta and reaches the developing fetus. Absorbed lead is rapidly taken up by blood and soft tissue, followed by a slower redistribution to bone. Bone accumulates lead during much of the human life span and may serve as an endogenous source of lead that may be released slowly over many years after the exposure stops (IPCS, 1995).

Regulations for Lead in Paints

For over 50 years now dangers represented by lead paint manufacturing and application led to many countries' enacting bans or restrictions on the use of white lead for interior paint: France, Belgium, and Austria in 1909; Tunisia and Greece in 1922; Czechoslovakia in 1924; Great Britain, Sweden and Belgium in 1926, Poland in 1927; Spain and Yugoslavia in 1931; and Cuba in 1934 (Markowitz, 2000). In 1922 the third International Labour Conference of the League of Nations recommended the banning of white lead for interior use (AJPH, 1923).

With respect to the existing US standard for lead in new paints, the Consumer Product Safety Commission (CPSC) of US states, *"that paint and similar surface-coating materials for consumer use that contain*

lead or lead compounds and in which the lead content (calculated as lead metal) is in excess of 0.06 percent of the weight of the total nonvolatile content of the paint or the weight of the dried paint film (which paint and similar surface-coating materials are referred to hereafter as "lead-containing paint") are banned hazardous products under sections 8 and 9 of the Consumer Product Safety Act (CPSA), 15 U.S.C. 2057, 2058. (See parts 1145.1 and 1145.2 for the Commission's finding under section 30(d) of the Consumer Product Safety Act (CPSA) that it is in the public interest to regulate lead containing paint and certain consumer products bearing such paint under the CPSA.)" (CFR, 2004).

In 1997, Australia recommended 0.1 percent of total lead as the maximum amount of lead in domestic paint (DEH 2001). Singapore also has a standard of 0.06 percent of lead in new paints. China has the most stringent standard for lead in paints, which is 90 ppm (Barboza, D., 2007).

The existing Indian standard (which is voluntary) for maximum content of lead in paint is governed by IS 15489: 2004, superseding IS 5411 (Part 1): 1974 and IS 5411 (Part 2): 1972 (Bureau of Indian Standards, 2004). Under additional optional requirements for ECO-Mark, which was introduced by Ministry of Environment and Forests (MoEF) and is administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per the Resolution No. 71 dated 20th February, 1991 published in Gazette of Government of India, the para 6.12.2.2 of IS 15489: 2004 states, "*The product shall not contain more than 0.1 percent by mass (as metal), of any toxic metals such as lead, cadmium, chromium (VI) and their compounds when tested by the relevant Atomic Absorption Spectrophotometric methods*". For a product to be eligible for ECO-Mark it shall carry standard mark of BIS for quality besides meeting additional optional environmental friendly (EF) requirements of Eco-Mark. Therefore, these voluntary standards, in effect, mean that no manufacturer is bound by any law to subscribe to these standards. Even if one wishes to follow IS 15489: 2004, one is not required to limit the lead concentration in paint products below 0.1 percent (1000 ppm) as the requirement for lead to be below 0.1 percent comes under an optional scheme of ECO-Mark. So a paint product labeled ISI (thereby confirming to the BIS voluntary standards) may not contain lead below 1000 ppm unless it also has ECO-Mark.

Table 3 summarizes the various standards for lead in new paints.

Table 3: Standards for Lead (Pb) in new paints in some countries.

USA				India		
New paints	Australia	China	Singapore	ISI voluntary standard (IS 15489: 2004)	ECO-Mark (Optional under the same ISI voluntary standard)	Intended for defense purposes (as PbO)
600 ppm (0.06 %)	1000 ppm (0.1 %)	90 ppm (0.009 %)	600 ppm (0.06 %)	No limit exists	1000 ppm (0.1 %)	50000 ppm (5 %)

LITERATURE REVIEW

An enormous body of literature exists on issues related to lead toxicity and blood lead concentrations in children. That lead is a toxic element has been well established (John, H., *et al.*, 1991; WHO, 1995; US Department of Health and Human Services, 1988; Goldstein, 1992)). It is the toxicity of lead that led WHO and US Centers for Disease Control and Prevention (CDC) to consider lead concentrations in blood higher or equal to 10 µg/dl as elevated. In fact a recent body of literature points out that there may be no safety margin at existing exposures and that children exposed to even < 10 µg/dl have also shown intellectual impairment (Koller, *et. al.*, 2004; Needleman, 1995; Needleman and Bellinger, 2001; Needleman, *et. al.*, 2002) Sources of lead in the environment that have been shown to contribute greatly to elevated blood lead concentrations include petrol, paint, water, food, cosmetics and lead-glazed ceramics (Lanphear, *et al.*, 1998; Brown, *et al.*, 2000). Unlike overt lead toxicity, where there is usually one identifiable source, low-level environmental exposure to lead is associated with multiple sources (petrol, industrial processes, paint, solder in canned foods, water pipes) and pathways (air, household, dust, street dirt, soil, water food) (Tong, *et al.*, 2000). Evaluation of the relative contributions of sources is therefore complex and likely to differ between areas and population groups (von Schirnding, 1999).

In a majority of developed countries, concerted efforts have led to a reduction in the release of lead into the ambient environment in recent years, reflecting a decline in the commercial use of lead, particularly in petrol (CDC, 1991; Edwards-Bert, Calder and Maynard, 1994). Blood lead levels in the general population in these countries have fallen dramatically over the past 20 years, thanks to the phasing out of lead from petrol and the reduction of environmental exposure to the metal (Edwards-Bert, Calder and Maynard, 1994; Annest, 1983; Pirkle, *et. al.*, 1994). In the USA between 1976 and 1991 the mean blood lead level of persons aged 1-74 years dropped by 78 percent, from 12.8 µg/dl to 2.8 µg/dl (Pirkle, *et. al.*, 1994). Mean blood lead levels of children aged 1-5 years declined by 72 to 77 percent for various social groups of children (Pirkle, *et. al.*, 1994). Some recent investigations have revealed that even low-level and long term lead exposure can lead to health related problems such as renal dysfunction or delayed puberty in girls (Selvan, *et.al.*, 2003; Wu, *et.al.*, 2003; Marsden, 2003).

Lead continues to be a significant public health problem in developing countries where there are considerable variations in the sources and pathways of exposure (Tong and McMichael, 1999; Falk H, 2003)). In a study done on 281 children in Lebanon, it was found that the mean Pb-B was 66.0 $\mu\text{g/l}$ with 14 percent children having Pb-B more than 100 $\mu\text{g/l}$ (Nuwayhid, et al., 2003). Logistic regression analysis showed that elevated Pb-B was associated with paternal manual jobs (odds ratio [OR]: 4.74), residence being located in high traffic areas (OR: 4.59), summer season (OR: 4.39), using hot tap water for cooking (OR: 3.96 and living in older buildings (OR: 2.01). In a study investigating the prevalence of elevated blood lead (Pb-B) levels in children 1-6 years old in Kaduna, Nigeria, mean Pb-B was found to be 10.6 $\mu\text{g/dl}$ and 2 percent of children had Pb-B levels higher than 30 $\mu\text{g/dl}$ (Nriagu, 1997). The strongest associations were found between Pb-B and whether family owned a car or lived in a house on tarred road. In a similar study done in Karachi, it was found that about 80 percent (n=430) of children (aged 36-60 months) had blood lead concentrations higher than 10 $\mu\text{g/dl}$ (Rahbar, et al., 2002). It also derived that at the 5 percent level of significance, houses nearer to the main intersection in the city center, application of *surma* to children's eyes, father's exposure to lead at workplace, parent's illiteracy and child's habit of hand-to-mouth activity were among variables associated with elevated lead concentrations in blood.

India Related Studies

In a study on lead poisoning in major Indian cities, the George Foundation reported 51.4 percent of the total sampled population having more than 10 $\mu\text{g/dl}$ of Pb-B while 12.6 percent having more than 20 $\mu\text{g/dl}$ of Pb-B (The George Foundation, 1999). In cities like Delhi and Kolkata almost 19 percent of sampled population had blood lead concentration more than 20 $\mu\text{g/dl}$. In Mumbai 14.7 percent of children had more than 20 $\mu\text{g/dl}$ of blood lead concentration.

In a study conducted to estimate the Pb-B and prevalence of lead toxicity in school children and children residing in urban slums in Delhi, it was found that the mean Pb-B was 7.8 $\mu\text{g/dl}$ and proportion of children having more than 10 $\mu\text{g/dl}$ of Pb-B was 18.4 percent (Kalra, V., et al., 2003). It also suggested that distance of the residence or school from a main road appeared to be associated with higher blood lead concentrations, but these differences were not statistically significant.

Similar reports highlight high concentrations of blood lead in children in various other cities in India and relate it with local practices and exposure pathways (Kumar and Kesaree, 1999; Kaul, 1999; Patel, *et. al.*, 2001).

Literature Related to Lead in Paints

It is evident from the research above that high blood lead levels in children are prevalent in India and developing countries. Most of these studies have tried to relate high blood lead concentrations to various exposure sources like lead-based gasoline and paint chips. However, with lead in gasoline being phased out worldwide, it becomes imperative to look into the whole issue of lead-based paint and its exposure to children. While developed countries have moved in this direction, in developing countries it leaves a lot to be desired. Public health policies must reflect the new findings in this regard. It is easier said than done as the lead industry has repeatedly sought to resist any shift to alternatives (Markowitz, 2000)

Lead based paint in older houses has long been associated with elevated blood lead in children residing within them (Clark, *et al.*, 1985). The causal relationships were considered to be mainly due to ingestion of lead-based paint chips (Lin-Fu, 1967). In one of the first studies on lead in paints and soil, Clark, *et. al.*, (2005) concluded that lead paint should be considered a significant potential source of lead poisoning in India. They also determined lead in 29 paint samples collected from Gujarat and Karnataka in India and reported that 11 of them were either equal or exceeded 1.0 mg/cm^3 after the application of one to three coats. In one of the studies to investigate the sources of lead in environment in children with elevated blood lead concentrations with the help of Field Portable X-Ray Fluorescence Analyzer, Kuruvilla A., *et. al.*, (2004) attributed high blood lead levels in one student with the brightly coloured swings painted with lead based paint in an area where he routinely played. In another case high blood lead level was associated with a railing coated with lead based yellow paint where the child played. The third child with high blood lead level had the habit of licking the painted surface (pica) leading to ingestion of lead. In another interesting study done by Clark, *et. al.*, (2005), they found sixty six percent of new paint samples purchased from China, India and Malaysia containing 5000 ppm or more while 78 percent contained 600 ppm or more. They also point out that lead content in paints depended upon the

regulations. The same brand has different contents of lead in different countries depending upon whether any regulation existed or not (Clark, *et. al.*, 2006). They also reported that 100 percent (n=17) of paint samples from India had more than 600 ppm of lead concentration while 83 percent samples had more than 5000 ppm of lead contents.

STUDY OBJECTIVES AND METHODOLOGY

Objectives

The main objective of the present study was to determine the total concentration of lead (Pb) in decorative paints of all types viz., plastic (water based or latex) and enamel (oil based) intended for residential uses. Although lead as a source of health hazard has been studied in soil and in atmosphere, very few studies have been done on paints in India. The previous study done by C. S. Clark, *et. al.* (2006) included only 17 samples of new paints from India.

Sampling

All paint samples were purchased from different retail shops in Delhi and Mumbai between 23rd November 2006 to 11th December 2006 and then brought to the Toxics Link office in Delhi. These paints were easily available in various markets. According to shopkeepers, these paints were intended largely for residential uses for painting the interior and exterior surfaces of houses. Shopkeepers also informed us that what they called “plastic paints” were water based and largely used to coat interior plastered surfaces of house while “enamel paints” were mainly for painting wooden and metal surfaces. Although some of the paints are marketed especially for exterior or interior use, consumers use these paints according their own convenience based on the price, colour, shade and brands of the paints. Majority of the samples were purchased from Delhi while a few were also purchased from Mumbai markets. Samples were labeled and information mentioned on containers noted down. A total of 69 paint samples were purchased which included 38 plastic and 31 enamel paint samples.

While all plastic and exterior paint samples were purchased in 1 L container, enamel paints were purchased in 50/100/200 ml cans. The plastic paints are sold after blending base paints with colour pigments as per a fixed ratio provided by each brand depending upon the colour requirement. The price of plastic paints ranged from Rs. 150 to Rs. 360 for 1-liter can. Enamel paints cost Rs. 14–18 for 50 ml can and Rs 24–26 for 100 ml can. Price of 200 ml enamel paint ranged from Rs. 44 to Rs. 60. Most of the paint samples belonged to known branded products. Paint samples of one local brand were also purchased. No paint sample had ISI mark or ECO-mark on it. The complete description of the

samples is given in table 4. We came across a brand, which had a label indicating, "no added lead, mercury, chromium compounds".

Materials and Methods

Samples were analysed as according to Standard Operating Procedures for Lead in Paint by Hotplate or Microwave-based Acid Digestions and Inductively Coupled Plasma Emission Spectroscopy, EPA, PB92-114172, Sept. 1991; SW846-740 (US EPA, 2001)

Sample preparation

1. Wet paint samples were applied on to individual clean glass surfaces (one sq. feet) using different brushes for each sample to avoid any cross contamination. Samples, thus applied were left to dry for a minimum of 72 hours.
2. After drying samples were scraped off from glass surfaces using sharp and clean knives. Same knife was not used again for other samples to avoid any contamination.
3. Thus scraped, samples were collected in polyethylene bags and sent via courier to the Galson Laboratories 6601 Kirkville Road, East Syracuse, NY 13057 Tel: (315) 432-5227 Fax: (315) 437-0571, www.galsonlabs.com for further analysis.

Laboratory Methods

1. Scraped samples were crushed using mortar and pestle to make samples as homogenous as possible. Latex paint does not grind hence they were teared into small pieces using pre-cleaned steel scissors.
2. 1 g of each sample was weighed out into an acid -washed 100 ml beaker and then digested/extracted.
3. Standards were also taken similarly.

Digestion Procedures

1. 3 ml. of concentrated HNO_3 and 1 ml of H_2O_2 were added into beaker containing samples and standards and then covered with a ribbed watch glass.

2. Samples and standards were then heated on a hot plate at 140^o Centigrade until most of the acid was evaporated. Then it were removed from hot plate and allowed to cool at room temperature.
3. Then 2 ml of HNO₃ and 1 ml 30% H₂O₂ were added into the beakers and dried on hot plate to dryness and then allowed to cool.
4. Step 3 was repeated once again.
5. Watch glass and walls of beaker were rinsed with 3 to 5 ml of 1MHNO₃. Solution was evaporated gently to dryness and then removed from heat and cool.
6. 5 ml of concentrated HNO₃ were added to residue and samples were then swirled for a minute or so to dissolve soluble species.
7. Samples were poured from beaker into a labeled, pre-measured 125ml wide mouth graduated container to achieve desired total volume. Samples were brought to 100 ml volume by adding DD and mixed vigourously.
8. Digested samples were then analysed for total lead (Pb) in Thermo 61E Trace Inductively Coupled Plasma (ICP) Spectrometer.

RESULTS AND DISCUSSION

Results

The total concentrations of lead (Pb) in plastic and exterior paint samples are given in table 5. Lead concentration in enamel paint samples are presented in table 6. Tables 7 and 8 give average and median values of enamel paint data for various brands and colour-wise respectively. Table 9 gives the percentage of enamel paints samples that exceed existing standards for lead in paint.

1. As per table 5, all water-based plastic paints contained less than 25 ppm of total lead concentration. These paints therefore comply with the voluntary standard, under Indian Eco Mark Scheme, which suggests that total lead concentration in paints should not exceed 1000 ppm (0.1 percent).
2. Table 6 shows that most oil-based enamel paints contain high concentrations of lead (Pb), ranging up to 14000 ppm (0.0025 to 14 percent). Only one paint brand sample had results consistently less than 600 ppm. The average concentration of lead ranged from 49.7 ppm to 39900 in other brands tested. (Table 7)
3. As per table 8, the white enamel paints had the lowest concentration of lead among all colors tested. The average concentration for white enamel paint was 991.8 ppm while the maximum average concentration of lead was found in yellow colour enamel paints followed by orange, green, red, blue and then black.
4. As per the US standard, new paint containing more than 600 ppm (0.06 percent) of total lead is banned for residential use and from products intended to be used by children. Table 9 gives the percentage of enamel paint samples falling above various Indian and US standards. Of 31 enamel samples analysed for total lead concentration, 83.87 percent of samples had more than 600 ppm of lead. The same percentage of samples exceeded 1000 ppm limit set by Eco Mark scheme, while 61.3 percent of paint samples contained more than 5000 ppm. In sum 38 percent of all samples, including plastic, enamel and exterior types, contained lead at levels above 600 ppm.

Discussion

The results clearly indicate that water-based plastic paints or exterior paints have low level of lead concentration in all brands. The lead concentration is much below the Indian standard of 1000 ppm or US standard of 600 ppm, which is now widely accepted as the maximum limit of lead concentration in new paints. However, high concentration of lead in enamel paints is the most worrying part of the whole issue of "lead in paints". Except for one brand, all others had multiple samples that contained high concentration of lead, exceeding the voluntary Indian standard of 1000 ppm (0.1 percent) and the US standard of 600 ppm. The scatter plot of lead concentration (%) in enamel paints (Figure 3) indicates that the lead concentration in enamel paint samples ranged from below 1 percent to 14 percent.

Table 10 provides a comparison of results of the present study with that of paint samples collected in India by Clark, C. S. *et. al.*, 2006. Although not mentioned, it appears that the data obtained by Clark *et. al.*, 2006 relates to enamel paints. Their study reported that 100 percent of new paint samples from India exceeded 600 ppm whereas the present study reports that 83.87 percent of enamel paints sampled have lead concentrations greater than 600 ppm. In general terms, the range of lead concentrations observed are consistent for enamel paints in this study.

Table 10. Comparison of present data with that of Clark *et. al.*, 2006

Comparison of present data with that of Clark <i>et. Al.</i> , 2006		
	Clark <i>et. al.</i> , 2006	The Present Study (of enamel paints)
Yellow	159200 ppm *	90000 ppm
Green	39200 ppm	21250 ppm
Brown	10980 ppm	-
All Samples Median value	16720 ppm	7800 ppm 26131 ppm (average)
No of paints having more than or equal to 600 ppm	100 (n =17)	83.87 (n = 31) 38 (n = 69)**
Maximum	187200 ppm	140000 ppm
	* of 2 samples (187200 and 131300 ppm)	** taking into account all samples

Cleaner substitutes for lead based pigments are available for some time now and titanium dioxide is generally used as a substitute for lead. At

least one brand within the same price range appears to have eliminated the use of lead pigment and other lead additives. Indian paint companies can shift to lead-free alternatives and still remain competitive without affecting quality.

CONCLUSION

1. Plastic paints contain low concentration of lead across the brands, well below the Indian voluntary standard of 1000 ppm.
2. Majority of the enamel samples (83.87 %) contained more than 600 ppm of lead. Same percentage also exceeded 1000 ppm. 61.3 percent of samples had more than 5000 ppm.
3. 38 percent of all samples, including plastic and enamel types, contained lead at levels above 600 ppm, an international standard formulated by the US EPA.
4. Lead concentrations in paint also appear to be dependent upon colour of the paints and follow the following order: White<Black<Blue<Red<Green<Orange<Yellow.

Table 4. Sample description

Sample No	Brand types	Nature of Paints	Colour	Mfg Date	Place of Purchase	Other information
1	A	Plastic	Red X 117	Aug-06	Delhi	
2	A	Plastic	Yellow X 104	Aug-06	Delhi	
3	A	Plastic	Green Jungle Trail 7565	Jul-06	Delhi	
4	A	Plastic	Ink Blue 7246	Jul-06	Delhi	
5	B	Plastic	Red	Sep-06	Delhi	
6	B	Plastic	Blue	Sep-06	Delhi	
7	B	Plastic	Black	Sep-06	Delhi	
8	B	Plastic	Orange	Sep-06	Delhi	
9	B	Plastic	Green	Sep-06	Delhi	
10	B	Plastic	Yellow	Sep-06	Delhi	
11	B	Plastic	Base	Sep-06	Delhi	
12	B	Plastic	White	Sep-06	Delhi	
13	G	Plastic	Yellow	Sep-06	Delhi	
14	G	Plastic	Blue	2006	Delhi	
15	G	Plastic	Red	2006	Delhi	
16	G	Plastic	Green	2006	Delhi	
17	G	Plastic	White	Nov-05	Delhi	
18	A	Plastic	White	Jun-06	Delhi	
19	D	Plastic	Red	Aug-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
20	D	Plastic	White	Nov-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
21	D	Plastic	Blue	Nov-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
22	D	Plastic	Green	Nov-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
23	D	Plastic	Yellow	Nov-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
24	D	Plastic	Brilliant White	Nov-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
25	A	Enamel	White	May-06	Delhi	
26	D	Enamel	Black	Mar-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
27	D	Enamel	White	Apr-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree

Sample No	Brand types	Nature of Paints	Colour	Mfg Date	Place of Purchase	Other comments
28	D	Enamel	Red	Mar-06	Delhi	The can mentions "no added lead, mercury, chromium compounds" around a mark of green tree
29	B	Enamel	Deep Orange	May-05	Delhi	
30	B	Enamel	Golden Yellow	Sep-05	Delhi	
31	E	Enamel	Signal Red	Aug-03	Delhi	
32	E	Enamel	Brilliant white	Dec-05	Delhi	
33	E	Enamel	Orange	Jul-05	Delhi	
34	E	Enamel	Golden Orange	Feb-05	Delhi	
35	G	Superfac Hi Gloss Enamel	Red	Feb-06	Delhi	
36	G	Superfac Hi Gloss Enamel	Golden Yellow	Dec-05	Delhi	
37	G	Superfac HiGloss Enamel	Green	Oct-04	Delhi	
38	G	Superfac HiGloss Enamel	Oxford Blue	May-02	Delhi	
39	H	Synthetic Enamel	Golden Blue	Jul-06	Delhi	
40	H	Synthetic Enamel	Bus Green	Sep-06	Delhi	
41	H	Synthetic Enamel	Phiroza	Aug-06	Delhi	
42	H	Synthetic Enamel	Black	Sep-06	Delhi	
43	H	Synthetic Enamel	White	Aug-06	Delhi	
44	H	Synthetic Enamel	Red	Oct-06	Delhi	
45	E	Enamel	Bus Green	Apr-04	Delhi	
46	E	Enamel	Oxford Blue	Apr-05	Delhi	
47	B	Hi Gloss Enamel	Bus Green	Nov-05	Delhi	
48	B	Hi Gloss Enamel	Snow White	Mar-06	Delhi	
49	B	Hi Gloss Enamel	Signal Red	Apr-06	Delhi	
50	B	Hi Gloss Enamel	Black	Jun-06	Delhi	
51	B	Hi Gloss Enamel	Oxford Blue	Jun-06	Delhi	
52	A	Premium Gloss Enamel	P.O. Red	Mar-06	Mumbai	
53	A	Premium Gloss Enamel	Golden Yellow	Mar-06	Mumbai	
54	A	Premium Gloss Enamel	Black	Feb-06	Mumbai	
55	A	Premium Gloss Enamel	Oxford Blue	Dec-04	Mumbai	
56	A	Premium Gloss Enamel	Deep orange	Nov-05	Mumbai	
57	E	Plastic	NBE White	Aug-06	Delhi	
58	F	Acrylic Plastic Emulsion	Radiant White	Mar-01	Delhi	
59	E	Premium Acrylic Emulsion	Wonder white	Jun-04	Delhi	
60	E	Excel Acrylic Exterior	White	Aug-97	Delhi	

Sample No	Brand types	Nature of Paints	Colour	Mfg Date	Place of Purchase	Other comments
61	F	Exterior Finish	Base	Feb-00	Delhi	
62	D	Watershield Acrylic Exterior Wall Finish	Base	Nov-04	Delhi	The can mentions "no added lead, mercury,chromium compounds" around a mark of green tree
63	F	Sheen Emulsion	Base-C	Jun-02	Delhi	
64	B	Weather coat Smooth Finish 100 percent acrylic	White		Delhi	
65	A	Apex weather proof exterior emulsion	Classic White	Oct-05	Delhi	
66	E	Emulsion	No 60 with fast yellow stains (E hi-power universal stainer)	Oct-06	Delhi	
67	E	Emulsion	No 61 with fast yellow stains (E hi-power universal stainer)	Oct-06	Delhi	
68	E	Emulsion	No 62 with fast yellow stains (E hi-power universal stainer)	Oct-06	Delhi	
69	E	Emulsion	No 64 with fast yellow stains (E hi-power universal stainer)	Oct-06	Delhi	
70	E	Emulsion	No 65 with fast yellow stains (E hi-power universal stainer)	Oct-06	Delhi	

Table 5: Lead (Pb) concentration in plastic and exterior paint samples

Sample No	Sample Description	Pb (ppm)	Pb (%)
1	Brand type A /Red X 117/ Plastic	< 25	< 0.0025
2	Brand type A /Yellow X 104/ Plastic	< 24	< 0.0024
3	Brand type A /Green Jungel Trail 7565/Plastic	< 24	< 0.0024
4	Brand type A /Ink Blue 7246/ Plastic	< 24	< 0.0024
5	Brand type B/Red/Plastic	< 25	< 0.0025
6	Brand type B /Blue/Plastic	< 25	< 0.0025
7	Brand type B /Black/Plastic	< 25	< 0.0025
8	Brand type B /Orange/Plastic	< 25	< 0.0025
9	Brand type B /Green/Plastic	< 25	< 0.0025
10	Brand type B /Yellow/Plastic	< 25	< 0.0025
11	Brand type B /Base/Plastic	< 24	< 0.0024
12	Brand type B /White/Plastic	< 24	< 0.0024
13	Brand type G/Yellow/Plastic	< 23	< 0.0023
14	Brand type G /Blue/Plastic	< 25	< 0.0025
15	Brand type G /Red/Plastic	< 24	< 0.0024
16	Brand type G /Green/Plastic	< 24	< 0.0024
17	Brand type G /White/Plastic	< 24	< 0.0024
18	Brand type A /White/Plastic	< 25	< 0.0025
19	Brand type D/Red/Plastic	180	0.018
20	Brand type D /White/Plastic	< 24	< 0.0024
21	Brand type D /Blue/Plastic	< 24	< 0.0024
22	Brand type D /Green/Plastic	< 25	< 0.0025
23	Brand type D /Yellow/Plastic	< 25	< 0.0025
24	Brand type D /Brilliant White/Plastic	< 25	< 0.0025
57	Brand type E/ Plastic/ NBE White/08.06/Third quality	< 25	< 0.0025
58	Brand type F/ Acrylic Plastic Emulsion/ Radiant White/03.01	< 25	< 0.0025
59	Brand type E/Premium Acrylic Emulsion/Wonder White/06.04	< 24	< 0.0024
60	Brand type E/Excel Acrylic Exterior Paint/White/ 08.97	< 25	< 0.0025
61	Brand type F/ Acrylic Exterior Finish/02.00/Base A	< 25	< 0.0025
62	Brand type D/Weather shield Acrylic Exterior Wall Finish/ Base/11.04	< 25	< 0.0025
63	Brand type F/ Insta acryl Base -C/ Sheen Emulsion/ 06.02	< 25	< 0.0025
64	Brand type B/Weather coat Smooth Finish/100 % acrylic/White	< 25	< 0.0025
65	Brand type A/Apex Weather Proof exterior/ Emulsion/10.05/classic white	< 24	< 0.0024
66	No 60 with fast yellow stains (brand type E hi-power universal stainer 10.06/200ml)	< 25	< 0.0025
67	No 61 with fast yellow stains (brand type E hi-power universal stainer 10.06/200ml)	< 24	< 0.0024
68	No 62 with fast yellow stains (brand type E hi-power universal stainer 10.06/200ml)	< 23	< 0.0023
69	No 64 with fast yellow stains (brand type E hi-power universal stainer 10.06/200ml)	< 24	< 0.0024
70	No 65 with fast yellow stains (brand type E hi-power universal stainer 10.06/200ml)	< 25	< 0.0025
	Average	Less than 25 ppm	

Table 6. Lead concentration in enamel paint samples

Sample No	Brand type	Paint Types	Colour	Pb (ppm)	Pb (%)
25	A	Enamel	White	< 25	< 0.0025
26	D	Enamel	Black	56	0.0056
27	D	Enamel	White	62	0.0062
28	D	Enamel	Red	31	0.0031
29	B	Enamel	Deep Orange	67000	6.7
30	B	Enamel	Golden Yellow	110000	11
31	E	Enamel	Signal Red	5700	0.57
32	E	Enamel	Brilliant white	72	0.0072
33	E	Enamel	Orange	86000	8.6
34	E	Enamel	Golden Yellow	77000	7.7
35	G	Hi gloss Enamel	Red	8000	0.8
36	G	Hi gloss Enamel	Golden yellow	64000	6.4
37	G	Hi gloss Enamel	Green	11000	1.1
38	G	Hi gloss Enamel	Oxford Blue	12000	1.2
39	H	Synthetic Enamel	Golden blue	59000	5.9
40	H	Synthetic Enamel	Bus Green	14000	1.4
41	H	Synthetic Enamel	Phiroza	3300	0.33
42	H	Synthetic Enamel	Black	3000	0.3
43	H	Synthetic Enamel	White	2200	0.22
44	H	Synthetic Enamel	P.O. Red	16000	1.6
45	E	Enamel	Bus Green	30000	3
46	E	Enamel	Oxford Blue	1300	0.13
47	B	HiGloss/Enamel	Bus Green	30000	3
48	B	HiGloss/Enamel	Snow white	2600	0.26
49	B	HiGloss/Enamel	Signal red	3700	0.37
51	B	HiGloss/Enamel	Oxford Blue	4500	0.45
52	A	Premium Gloss Enamel	P.O. Red	5800	0.58
53	A	Premium Gloss Enamel	Golden Yellow	140000	14
54	A	Premium Gloss Enamel	Black	7800	0.78
55	A	Premium Gloss Enamel	Oxford Blue	6900	0.69
56	A	Premium Gloss Enamel	Deep Orange	39000	3.9
		Average		26131	
		Median		7800	

Table 7: Average and median values for various brands of the enamel pain samples

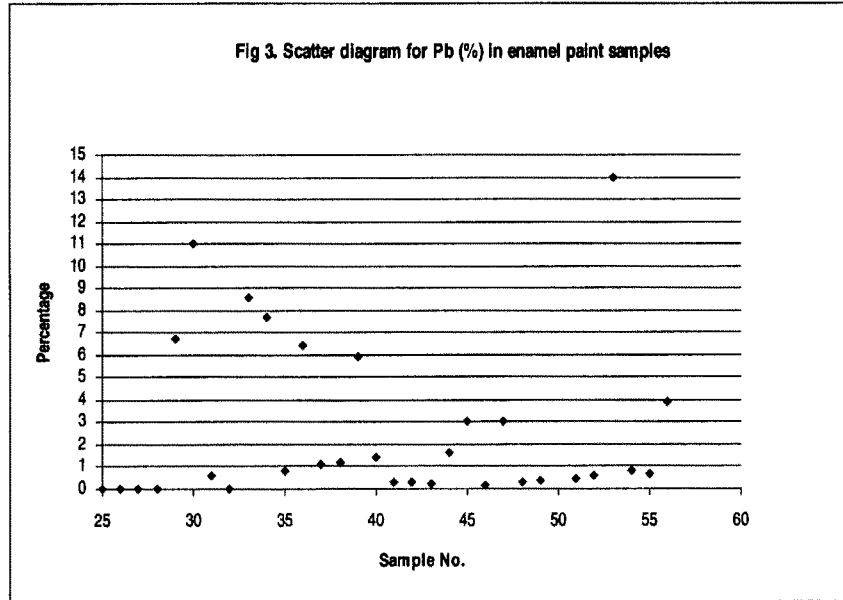
Paint types	Average (ppm)	Median (ppm)
Brand type D/Enamel	49.7	56
Brand type B/Enamel	36300	17250
Brand type E/Enamel	33345.3	17850
Brand type G/Enamel	27666.7	27000.7
Brand type H/enamel	16250	8650
Brand type A/Enamel	39900	7800
	27001	7900

Table 8: Average and median concentrations of lead in various colours of enamel samples

Colours	Average	Median
White	991.8	72
Black	3618.7	3000
Blue	5600	4500
Red	6538.5	5800
Green	21250	22000
Orange	4000	67000
Yellow	90000	77000

Table 9: Percentage of Enamel Paint samples Exceeding Applicable Standards

Above 600 ppm	Below 600 ppm	Above 1000 ppm	Above 5000 ppm
83.87	19.1	83.87	61.3



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United States Senate
Environment and Public Works Committee

WRITTEN STATEMENT OF
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October 18, 2007

**CLEARCORPS USA: REPORT ON INVESTIGATION
OF LEAD IN CHILDREN'S PRODUCTS**

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CLEARCORPS USA: Report on Investigation of Lead in Children's Products

Thank you, Senators, for the opportunity to testify today in one of the most important environmental concerns our children face. CLEARCorps USA is a national AmeriCorps program that began in 1995 as part of the University of Maryland Baltimore County at The Shriver Center with support from the National Paint & Coatings Association and its member organizations. In 2002, we expanded our mission and became an independent organization with a board of national experts.

CLEARCorps USA has been dedicated to protecting children from the harmful effects of exposure to lead and other environmental toxins in a child's environment since we received our first grant from the Corporation for National Service in 1995. We have been making homes and communities safe from lead and other environmental hazards since early 1996 and currently have CLEARCorps sites in Detroit, MI; Durham, NC; Grand Rapids, MI; Kellogg, ID; Minneapolis, MN; Newark, NJ; Providence RI; Rochester, NY, Seattle, WA. CLEARCorps USA has been a model of public and private partnerships working together to benefit children's health.

Recent events have brought home to the general public what CLEARCorps has known for many years: ignorance of the problem is not bliss. Ignorance of the dangers of lead poisoning can and will tragically harm our children.

In February of 2006, a four year old Minnesota boy swallowed a charm and died from lead poisoning. CCUSA was saddened by his death and decided that we needed to find out if this was truly a rare occurrence that a charm contained lead or if it was a systemic issue. CC members at four different sites (Minnesota, Detroit, Newark, and Idaho) **shopped for and** bought a wide range of children's products including toys, jewelry, and clothes that had zippers or buttons. We partnered with Bill Radosevich of Thermo Fisher Scientific who used the Niton XRF to test the products. In total, CC purchased approximately 250 to 300 items from a variety of stores including discount stores such as dollar stores and Target to higher priced stores such as Nordstrom's and Libby Lu at the Mall of America.

The test results were surprising. Our original assumption that the **leaded** charm was a rare occurrence or that only discount stores and cheap jewelry would test positive was entirely wrong. The variety of products that tested positive for lead at levels higher than the Consumer Products Safety Commission standards was surprising as was the range of stores that sold those products. We were also dismayed at the extremely high levels of lead that we found. Our original expectation was that we would find lead levels to be slightly over the CPSC standard of 600 parts per million (ppm). Instead, we found lead levels as high as 186,000 parts per million (ppm) in Fairy Dust sold at Wal-Mart stores in Minnesota and Detroit.

We had also assumed that more products purchased at dollar stores and other discount stores would test higher for lead and at high lead levels. Again, we were surprised to discover that this was not the case. In fact, there was no correlation between levels of lead and the cost of the item or the location that it was sold. The children's necklace at Club Libby Lu at the Mall of America, a store aimed at middle class kids, tested at 139,000 ppm, one of the highest lead levels we found. Items from Claire's and Herbergers also tested in at 4000 ppm and 3700 ppm.

Finally, the range of lead levels was so varied from product to product that **we could not conclude that any specific type of jewelry or type of store could be proclaimed as safer than others. Nor could we conclude that only jewelry was dangerous and that other products were only minimally worrisome.** Our Dora the Explorer backpack tested positive for lead as well as the Dora purse and the chalk holder and the orange cap of the Elmer's Glue stick. All items marketed directly to children under the age of six.

In effect, our random testing only demonstrated that there was no message to give parents that would reassure them that their children were safe.

CC determined that the next step was to submit the information that we had learned to the Consumer Products Safety Commission. We expected that at a minimum the items that we tested would be recalled and that our results would spark the Commission to test more children's products for lead levels. We also assumed that the test results would further spur the CPSC to realize that there was a wider problem than the isolated death in Minnesota.

CC staff submitted the results of the Niton XRF testing to the CPSC on their report forms in June of 2006. We then waited to hear for the recalls. After a month went by with no response from CPSC, I called to see what the status was of our submissions. CPSC stated that they had received the reports but had not acted on them yet. Several more months went by and I called again. After talking to several different people I finally connected with a staff member in the enforcement division who carefully explained the process that CPSC uses to determine if they should act on submitted reports.

I was dismayed to discover that they do not act on all of the reports submitted. In fact, this **CPSC staffer** went on to explain that they had few staff members and even fewer resources (dollars) to investigate all of the reports that they receive. He further explained that they would use their own judgment to decide if the lead was immediately accessible to children using the product. If not, then the report is filed and no further investigation is completed. He did not know if they would investigate any of the products that we submitted reports on for high levels of lead.

To my knowledge, CPSC never investigated any of the products listed in our submitted reports. None of the products were recalled in the months following the submission of our report. CCUSA has not received any further communications from CPSC regarding our investigations or the reports.

CLEARCorps USA continued to test toys and other children's products and those results confirm that there is no current standard or system in place that allows us to assure parents that purchasing any toy or other children's products is safe. Nor can they be assured that if they purchase items from higher priced stores that those products will be any safer than those bought at a dollar or discount store. Many experts and press reports state that heavy metal items or jewelry should be the most suspect but the results of our investigations show that the problem is more widespread and that focusing parents on one type of item is giving them a false sense of security.

There is no current answer that has been given by industry, advocates, or the press that CC feels is adequate. There have been reports of people using lead check swabs to test toys which is widely known to be inaccurate. Parents do not have access to an XRF to test their children's toys. As a result, parents are focusing on avoiding toys from China and some are having their children tested for lead in their blood. There is no real history in this country of testing children for lead unless they live in older housing or are in a targeted neighborhood.

Therefore, we do not know what the data will show if large numbers of children that we previously thought were safe from lead due to properly maintained or newer housing suddenly show up with low levels of lead in their blood. It is possible that we are currently standing at the tip of a problem that has been brewing and undocumented for years and that we are finally addressing it.

What I am saying is not new, Senators. What you are hearing – you have heard before; much of it recently. I urge you to consider the recommendations that are being made today and to move forward to implement them.

Thank you for your invitation to submit this testimony and for your attention and willingness to protect our nation's children from serious harm and promote policies and systems that will give every child the best start for a full and productive life.

Identifying Housing That Poisons: A Critical Step in Eliminating Childhood Lead Poisoning

Nimlia L. Reyes, Lee-Yang Wong, Patrick M. MacRoy, Gerald Curtis, Pamela A. Meyer, Anne Evens, and Mary Jean Brown

The purpose of our study was to develop a method to identify and prioritize "high-risk" buildings in Chicago that could be targeted for childhood lead poisoning prevention activities. We defined "high-risk" buildings as those where multiple children younger than 6 years with elevated blood lead levels (BLLs) had lived and where lead hazards were previously identified on environmental inspection. By linking 1997–2003 Chicago elevated blood lead surveillance, environmental inspection, and building footprint data, we found that 49,362 children younger than 6 years with elevated BLLs lived at 30,742 buildings. Of those, 67 were "high-risk" buildings and these were associated with 994 children with elevated BLLs. On average, 15 children with elevated BLLs had lived in each building (range: 10–53, median: 13). Almost two thirds ($n = 43$) of the high-risk buildings had two or more referrals for inspection to the same apartment or housing unit; of those, 40 percent ($n = 17$) failed to maintain lead-safe status after compliance. Linking blood lead surveillance, environmental inspection, and building footprint databases allowed us to identify individual high-risk buildings. This approach prioritizes lead hazard control efforts and may help health, housing, and environmental agencies in targeting limited resources to increase lead-safe housing for children.

KEY WORDS: childhood lead poisoning, hazard control, housing, primary prevention

The adverse health effects of childhood lead exposure are well-documented. They range from subtle cognitive, developmental, and behavioral problems at the lowest blood lead levels (BLLs) to seizures, coma, and death at BLLs $\geq 70 \mu\text{g}/\text{dL}$.^{1–3} Despite continuing de-

clines in children's BLLs, childhood lead poisoning remains a major environmental public health problem for children in the United States. Approximately 310,000 (1.6%) of US children aged 1–5 years have elevated BLLs ($\geq 10 \mu\text{g}/\text{dL}$).⁴

The primary strategy for preventing childhood lead poisoning in the United States has been to control the sources of lead. A common high-dose source of lead exposure for US children today is deteriorated residential lead-based paint and the lead-contaminated dust and soil it generates.^{5,6} An estimated 92 percent of all lead in paint is contained in housing built before 1950.⁷ Children living in old housing, in which the lead paint chips and degrades, and whose families are poor are disproportionately at risk for elevated BLLs.⁸ Ideally, all

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lead-based paint hazards should be eliminated. However, because of limited resources, remediation efforts need to be directed to residential properties posing the greatest risk to children. CDC's Advisory Committee on Childhood Lead Poisoning Prevention recommends prioritizing remediation by identifying housing where multiple children with elevated BLLs have been identified.⁸

Prioritizing remediation efforts is a challenge in a city such as Chicago, which has large numbers of old housing units and children living in poverty. Chicago has 602,934 (52.3%) pre-1950 housing units and 74,071 (28.4%) children younger than 6 years living below the poverty level.⁹ For the past several years, Chicago's Childhood Lead Poisoning Prevention Program (CLPPP) has reported that the city has more children with elevated BLLs than does any other US city. In 2001, Chicago reported 11,645 (10.6% of tested) children younger than 6 years with confirmed elevated BLLs. Chicago's CLPPP partnered with CDC to use existing Chicago data to identify properties where children with elevated BLLs have been repeatedly identified.

The objective of our study was to identify "high-risk" Chicago buildings where multiple children younger than 6 years with confirmed elevated BLLs had lived and where lead hazards were identified on at least one environmental inspection.

● Methods

Data

We used the Chicago CLPPP's *Systematic Tracking of Elevated Blood Lead Levels and Remediation* (STELLAR) database to obtain elevated blood lead data and environmental inspection records. Each record has a unique identification number to link with other records. STELLAR generates referrals for environmental inspection automatically on the basis of a child's BLL. The BLL trigger for an environmental inspection referral has decreased over time: 25 $\mu\text{g}/\text{dL}$ in 1997, 20 $\mu\text{g}/\text{dL}$ in 1999, 15 $\mu\text{g}/\text{dL}$ in 2001, and 10 $\mu\text{g}/\text{dL}$ for children aged 2 years or younger in 2003. The results of the environmental inspections, including the date of the inspection and the address and sources of lead identified, are entered into STELLAR.

The City of Chicago has developed a Geographic Information Systems (GIS) Building Footprint database, which contains the ranges of addresses for all buildings, including single family homes, in Chicago. A building footprint (polygon) is an overview of the outline (shape and size) and location of each building in Chicago, as determined from aerial photographs. Each building

footprint is assigned a building identification number; each building identification number is associated with one or more addresses linked to that building.

Analysis

Criteria for inclusion of a child's elevated blood lead surveillance record into the final dataset were as follows: (1) the specimen was drawn between January 1, 1997, and December 31, 2003; (2) the child was younger than 6 years at the time the specimen was drawn; (3) the specimen was the first confirmed elevated BLL of the child between 1997 and 2003; and (4) the child's address could be validated and geocoded. We defined a confirmed elevated BLL as 1 venous blood specimen equal to or more than 10 $\mu\text{g}/\text{dL}$ or 2 capillary blood specimens equal to or more than 10 $\mu\text{g}/\text{dL}$ drawn within 12 weeks of each other.

We selected a child's address at the time of the blood draw to indicate the child's residence at the time of exposure. Addresses of children were standardized according to US Postal Service protocol, and then validated and geocoded using Centrus Desktop (version 4.02) software. Address names and ranges that were not geocoded were corrected using the US Postal Service "Find a ZIP Code" Web site and the 2003 *National Five-Digit ZIP Code and Post Office Directory*. Geocoded addresses were brought into GIS; those addresses that were outside Chicago's city boundaries were excluded. Many problems were resolved with input from the Chicago CLPPP.

The linking process began with linking each child's geocoded address to the building footprint file to determine the number of children with elevated BLLs for each building. The cutoff for the number of children with elevated BLLs per building needed to be large enough to be meaningful and to allow for possible lead exposure from other sources. If it were too large, however, it would identify only a small number of buildings (Table 1). After evaluating the number of buildings that would be identified using various cutoffs, we decided to use a cutoff of 10 children per building.

Next, buildings with 10 or more children with elevated BLLs were linked to environmental inspection

TABLE 1 ● Outcomes of Using Different Cutoffs for Number of Children per Building—Chicago, 1997–2003

Cutoff No. of children per building	No. of buildings	% of buildings	No. of children	% of children
≥ 2	9,713	32	28,333	57
≥ 5	915	3	7,019	14
≥ 10	124	0.4	2,315	5
≥ 15	48	0.2	1,444	3

data using each child's address. Inspection records for each child's address (housing unit) were analyzed by building to determine which buildings had a history of lead hazards. A building was defined as having a lead hazard if an inspection of any unit in that building identified an interior or exterior lead hazard. We assumed that all units in a building were similar in age and condition; therefore, the detection of lead-based paint hazards in one unit likely represented similar or potential lead-based paint hazards in other units in the same building.

Finally, buildings with 10 or more children with elevated BLLs and any lead hazards on inspection were identified as "high-risk buildings." The Chicago CLPPP reviewed the list of "high-risk buildings" for potential errors, such as nonresidential buildings.

Data cleaning, merging, and calculations of frequencies of children per building were done using SAS

software. Maps were created using ESRI ArcGIS 9.0. Data from the Census SF-3 files provided information on children living below poverty, pre-1950 housing units.

● Results

From 1997 to 2003, 49,362 children younger than 6 years with confirmed elevated BLLs lived at 33,235 geocoded addresses. These addresses were linked to 30,742 buildings. Among these buildings, 124 (0.4%) had 10 or more children with elevated BLLs; 123 of these buildings had inspection records. Of these, 69 (56.1%) buildings had at least one inspection record with documented lead hazards and thus were designated as "high-risk buildings." Inspection records for the 54 other buildings showed combinations of "N = no lead

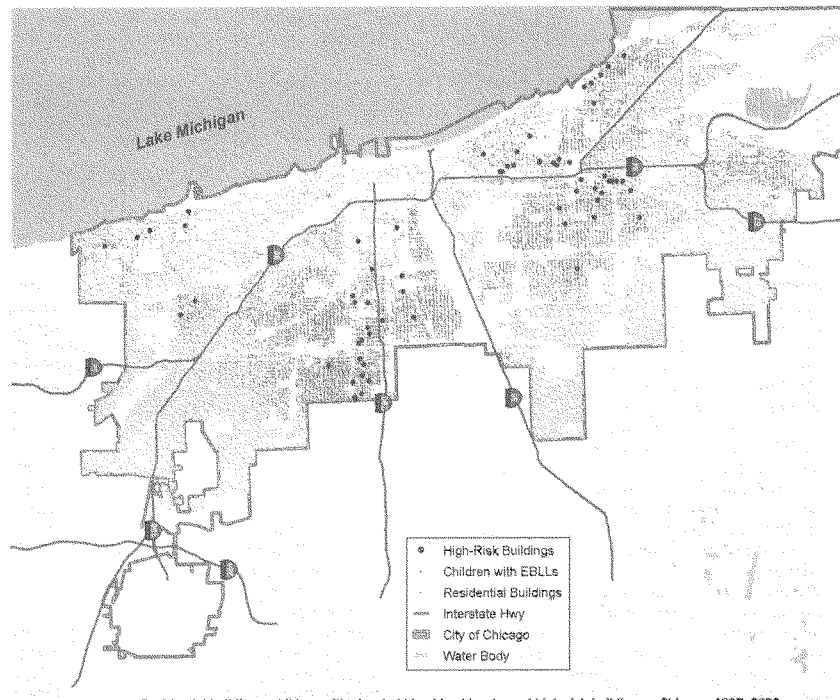


FIGURE 1. Residential buildings, children with elevated blood lead levels, and high-risk buildings—Chicago, 1997–2003.

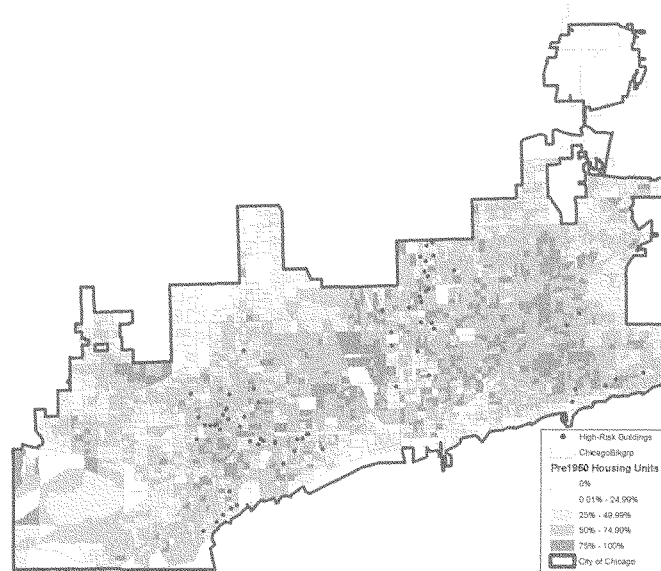


FIGURE 2. Percentage of pre-1950 housing units (by block group) and high-risk buildings—Chicago, 1997–2003.

hazards,” “Z = unknown,” and missing data. Information from the Chicago CLPPP resulted in two buildings being dropped from the high-risk list. The one building address was for the former lead program office, and the other was a data entry error.

The remaining 67 high-risk buildings were associated with a total of 994 children with elevated BLLs from 1997 to 2003. Therefore, 0.2 percent of buildings in Chicago were home to 2 percent of the children with elevated BLLs. On average, 15 children with elevated BLLs had lived in each building (range = 10–53, median = 13). Almost two thirds ($n = 43$) of the high-risk buildings had two or more referrals for inspection to the same apartment or housing unit from 1997 to 2003. Of those 43, approximately 40 percent ($n = 17$) had failed to maintain lead-safe status after compliance.

GIS maps of the 67 high-risk buildings showed that those buildings were generally located in block groups with high densities of children with elevated BLLs, high percentages of pre-1950 housing, and high percentages of children aged 0–5 years living below poverty (Figures 1–3).

Discussion

Linking Chicago’s elevated blood lead, environmental inspection, and building footprint databases allowed us to identify individual high-risk buildings. This approach can focus interventions to specific high-risk buildings rather than larger, more commonly used high-risk geographical areas such as census tract or ZIP code. The high-risk buildings identified in this study were responsible for a disproportionate number of children with elevated BLLs. Had these 67 high-risk buildings been remediated when the first child with an elevated BLL was identified, nearly 1,000 children who later lived in these buildings could have been prevented from ever being exposed to residential lead hazards.

Following identification of the 67 high-risk buildings, the Chicago Department of Public Health took a variety of enforcement actions. Additional inspections were conducted at all the buildings, and orders to correct all identified hazards were issued. Several of the properties were identified as having probable violations of the Federal Lead-Based Paint Disclosure Rule (Section 1018 of the Residential Lead-Based Paint

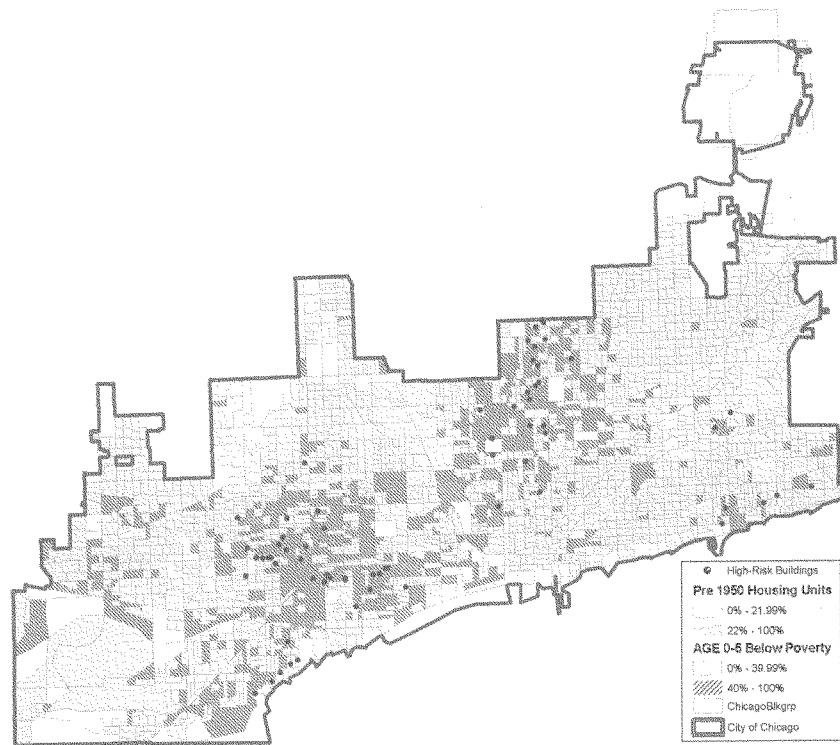


FIGURE 3. Block groups with $\geq 22\%$ of pre-1950 housing units, block groups and $\geq 40\%$ children aged 0–5 years living below poverty, and high-risk buildings—Chicago, 1997–2003.

Hazard Reduction Act of 1992). These properties were referred to the US Environmental Protection Agency, Region V office, for further investigation.

Childhood lead poisoning is a preventable public health problem. Current prevention and control strategies focus primarily on screening young children for elevated BLLs and finding lead sources in their environment and remediating after they have been exposed. However, no BLL is clearly safe. Researchers have not been able to identify a threshold below which there are no adverse health effects of lead.^{31,10,11} Furthermore, no medical treatment exists that can reverse the cognitive deficits caused by lead.^{12,13} Consequently, the focus of prevention efforts must shift from screening children (secondary prevention) to controlling lead-based

paint hazards before children are exposed (primary prevention).

Primary prevention efforts often are targeted to high-risk geographical areas with a high percentage of old housing and poverty, known risk factors for childhood lead poisoning. However, in cities with many high-risk areas, resource constraints limit the ability to target all residential buildings within those high-risk areas. Identifying high-risk buildings would avoid the costs of extensive environmental sampling by using existing BLL and inspection data to help prioritize targeting. State and local health departments should examine the impact of different definitions of high risk to accommodate their resources. In this study, we used 10 or more children per building because targeting 124

buildings seemed feasible for the Chicago CLPPP staff. Areas with fewer pre-1950 buildings might select a lower cutoff, and the cutoff can continue to be lowered as the highest risk buildings are remediated. It is important to note that not all of these buildings with multiple children with elevated BLLs had documented lead hazards. Furthermore, a number of these buildings had already been demolished or were vacant. Focusing on more recent data would likely eliminate buildings that no longer present lead hazards for children. In addition, if only elevated BLLs of children below 3 years of age were used to identify buildings, it is more likely that these BLLs would reflect recent exposure.

Linking the blood lead and building footprint databases had several advantages. It was relatively easy to gain access to these existing data. Because the building footprint data contained the ranges of addresses within buildings, it allowed us to identify all the addresses within one apartment building or complex. STELLAR, which contained the blood lead data, also included the environmental inspection results. This allowed us to know if a lead source had been found and reported at an address. However, linking these data required skill in manipulating large databases, cleaning and merging data, and geocoding addresses. Retrieving missing or inaccurate data in the environmental inspection database from the original hard copies of the inspection forms took time. Similarly, finding missing child address information required time to obtain the information from supplemental sources.

Our study was subject to several limitations. First, a child's BLL may reflect exposure to lead-based paint at a previous address or to lead sources other than paint. However, we focused on buildings with 10 or more children with elevated BLLs to increase the probability that these buildings were a significant source of lead exposure for at least most of these children. Second, surveillance data include only children who were screened; so many more children with elevated BLLs probably were never identified. Third, we assumed that the presence of lead hazards in one unit was an indication of similar or potential lead hazards in other units in the same building. This may not always be the case. Fourth, while a single positive environmental sample for lead is an indication of an existing lead hazard, a negative result is not necessarily an indication of lead-safe conditions. Finally, the databases are used mainly for administrative purposes rather than scientific analysis; therefore, data are not always complete or accurate. The quality of existing databases is critical because poor quality limits the usefulness of this method.

Other high-risk areas similar to Chicago may find this approach—or a modification of this approach—useful as a primary prevention strategy. Sharing this information with housing and environmental agencies

and targeting resources to high-risk buildings should protect more children more quickly than working on this problem without coordinating efforts. To meet the *Healthy People 2010* goal of elimination of elevated BLLs in young children by 2010,¹⁴ health, housing, and environmental agencies must make every effort to target limited resources to increase housing that is lead-safe for children.

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randomly selected primary sampling units (PSUs), from which 831 eligible units and their occupants were recruited and completed the survey. (A PSU is a county or a cluster of contiguous counties, such as a metropolitan statistical area.) Documentation on using the data, and the data files themselves, are available at the HUD lead web site (U.S. HUD 2001, 2002). A comparison of the units in the study with national distributions of housing characteristics and socioeconomic and demographic factors from the 1997 American Housing Survey for the United States (U.S. Census Bureau 1997) and the 1998 and 1999 Current Population Surveys (U.S. Census Bureau 1999) showed that the units in this study did not differ significantly from nationwide characteristics (Table 1). Although the

percentage of households in the sample with incomes below \$20,000 and above \$60,000 are both slightly below national estimates, the percentage of households in poverty is very close to the national estimates. It is possible that households with very low incomes (where the risk of lead poisoning is greatest) and with very high incomes (where the risk is lowest) may have been slightly undersampled.

A stratified sample of four rooms within each unit was drawn according to the following priorities: child's bedroom, common living area within the unit, kitchen, and one other random room. If no child's bedroom was present, another bedroom was selected according to a standard protocol. Table 2 presents the type and location of dust and soil samples and paint measurements made in each room, from

the building exterior, and in the yard. Soil samples were collected from children's play areas at 375 housing units in 40 of the original 75 PSUs, and general yard samples were collected in all 75 PSUs. The 40 PSUs were randomly selected from the original 75 PSUs. Play area and yard area soil lead hazards are both included in the estimates of lead-based paint hazards reported here (see definition of "lead-based paint hazard" below). Weights were developed for housing units, rooms, yards, and exterior play yard areas to be nationally representative.

A standardized questionnaire was administered to an adult resident in each unit to determine age and renovation history of the unit; occupants' age, race and ethnic group, occupation, hobbies, and smoking patterns;

Table 1. Comparisons of the National Lead-Based Paint Survey population with the American Housing Survey (AHS) and the Current Population Survey (CPS).

Housing unit characteristic	No. estimated (thousands)	National Lead-Based Paint Survey estimates		Housing units in sample	AHS (1997) (%) ^f	CPS (1998–99) ^g (%)
		Percent estimated ^a	95% CI ^b			
Total housing units ^d	95,688	100		831		
Construction year						
1976–1980	29,774	31	26–32	220	30	
1960–1977	27,874	29	28–30	267	30	
1940–1959	20,564	21	20–23	186	20	
Before 1940	17,476	18	17–20	158	20	
Region						
Northeast	19,230	20	19–22	155	20	
Midwest	22,083	23	22–24	196	24	
South	35,474	37	36–39	277	35	
West	18,841	20	18–21	203	21	
Urbanization						
MSA ≥ 2 million population	26,814	28	24–32	276		30
MSA < 2 million population	45,753	48	43–53	417		47
Non-MSA	23,121	24	19–30	138		23
One or more children under age 18	36,994	39	38–39	398	37	
Refusal/don't know ^e	230			3		
Housing unit type						
Single family	82,651	86	84–89	705	88	
Multifamily	13,037	14	11–16	126	12	
Tenure						
Owner occupied	66,232	69	65–73	539		67
Renter occupied	29,074	30	27–34	289		33
Refusal/don't know ^e	381			3		
Household income (\$30,000)						
< \$30,000/year	33,830	35	30–41	309		40
≥ \$30,000/year	56,111	59	54–63	482		60
Refusal/don't know ^e	5,747			40		
Household income (\$20,000)						
\$0–18,999/year	19,359	20	17–24	189		26
\$20,000–39,999/year	25,855	27	23–31	228		27
\$40,000–59,999/year	19,316	20	16–25	152		19
≥ \$60,000/year	22,890	24	20–28	203		28
Refusal/don't know ^e	6,268			59		
Poverty						
In poverty	13,221	14	11–16	137		15
Not in poverty	76,336	80	77–82	651		85
Refusal/don't know ^e	6,130	6		43		
Race						
White	77,005	80	78–83	622	83	
African American	10,365	11	9–13	118	12	
Other ^h	6,571	7	5–8	77	6	
Refusal/don't know ^e	1,746	2		16		
Ethnicity						
Hispanic/Latino	7,434	8	6–10	86	9	
Not Hispanic/Latino	87,008	91	88–93	736	91	
Refusal/don't know ^e	1,246	1		9		

^aAll percentages are calculated with total housing units (95,688,000) as the denominator; percentages may not total 100% due to rounding. ^bCI = 95% confidence interval for the estimated number or percentage. ^cCPS data were taken from the 1998 CPS for household income and poverty measures and from the 1998 CPS for urbanization and tenure measures. ^dHousing units include permanently occupied, noninstitutional housing units in which children are permitted to live. ^eRefusals and "don't know" responses by survey respondents. ^fOther^h race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

household cleaning schedules; type of housing; types of heating, ventilating, and air conditioning systems; types of flooring; presence of pets; presence of pests; occupant income; government housing support; and other information. The responses to the questions on household size and income were used to apply the 1996 U.S. Census Bureau poverty thresholds (U.S. Census Bureau 1996) to determine whether or not a household was in poverty. The Census Bureau poverty income thresholds vary with household size.

Single-surface dust wipe samples were collected from floors, interior windowsills, and window troughs in accordance with the method in American Standards for Testing Materials (ASTM) E1728-95 (ASTM 1995b). Paint measurements were made in a nondestructive manner using portable X-ray fluorescence (XRF) lead-based paint analyzers, in accordance with HUD procedures and the applicable Performance Characteristic Sheet

(U.S. HUD 1997). A single commercial-brand of XRF instrumentation was used to minimize analytical error. Building components were tested in accordance with a standard procedure (Table 3). Soil samples were collected from the following areas: main entry, foundation/drip line, mid-yard area, and play areas (identified by the presence of play equipment or report from the adult occupant); if present, bare soil was sampled preferentially. Soil sampling was conducted in accordance with the method in ASTM E1727-95 (ASTM 1995a) using a core sample of the top one-half inch of soil, which is most accessible to children. All samples were collected by certified lead-based paint inspectors and analyzed in laboratories recognized under the National Lead Laboratory Accreditation Program of the U.S. Environmental Protection Agency (U.S. EPA) and accredited by the American Industrial Hygiene Association Environmental Lead Laboratory Accreditation Program.

Detailed quality control/quality assurance protocols, laboratory analytical techniques, data management procedures, and a discussion of other potential sources of error (e.g., nonresponse bias and random sampling) have been reported elsewhere (U.S. HUD 2001).

Fieldwork for this survey was conducted between 1998 and 2000, with most units sampled during the warmer months. Dust lead levels may be slightly higher in the warmer months, due to increased track-in or other factors. Data presented here are not controlled for seasonal effects.

In this article, the term "lead-based paint hazard" is defined in the same way as in U.S. HUD and U.S. EPA regulations (U.S. EPA 2001; U.S. HUD 1999) (Table 4). A "significant lead-based paint hazard" means the area of deteriorated lead-based paint is above the *de minimis* levels (Table 5, note a) specified in the HUD regulations (U.S. HUD 1999) and/or that interior floor or windowsill dust lead or soil lead in the yard or play areas meet or exceeds the levels established by the U.S. EPA. "Lead-based paint" is a paint or coating with a lead content ≥ 1 mg/cm² or 0.5% by weight (the same definition used in Title X of the 1992 Housing and Community Development Act, also known as the Residential Lead-Based Paint Hazard Reduction Act).

Results

Hazards. The results show that an estimated 25% of the nation's housing (equivalent to 24 million housing units) had significant lead-based paint hazards in the form of deteriorated paint, dust lead, or bare soil lead. The prevalence rates of significantly deteriorated lead-based paint and dust lead hazards were about the same—14% and 16%, respectively. Only 7% of houses had soil lead levels above current U.S. EPA/HUD standards (U.S. EPA 2001; U.S. HUD 1999) (Table 4).

The prevalence of lead-based paint hazards varies by region, housing unit age, household income, and other factors (Table 5). Of the units with significant lead-based paint hazards, an estimated 1.2 million units were occupied by low-income families (< \$30,000/year) with children under 6 years of age. Among low-income households, 35% of the units had lead-based paint hazards, compared with 19% of units among households with middle and upper incomes (\geq \$30,000/year). Seventeen percent of government-assisted, low-income housing had lead-based paint hazards, which is about the same as that for middle- and upper-income housing.

The prevalence of units with significant hazards varies with age of housing and region (Table 5), but less so with degree of urbanization. Housing built before 1960 had five to eight times the prevalence of hazards compared

Table 2. Location and type of sample collected.

Rooms and sample type	Yard/play areas	Walls	Ceilings	Windows	Doors	Other trim	Floors
Kitchen							
Lead dust				X			X
Paint		X	X	X	X	X	X
Living room/family room							
Lead dust				X			X
Paint		X	X	X	X	X	X
Bedroom(s)							
Lead dust				X			X
Paint		X	X	X	X	X	X
Other random rooms							
Lead dust				X			X
Paint		X	X	X	X	X	X
Major entrance							
Lead dust							X
Interior common area (multi-family only)							
Lead dust							X
Exterior							
Paint		X		X	X	X	
Soil	X						

Table 3. Paint testing locations.

Interior paint testing per room	Exterior paint testing
Wall—all four major walls	Siding—all four walls
Ceiling	Trim—two miscellaneous, one random wall
Door and related trim (if present)	Window and related trim—one random wall
Window and related trim (if present)	Door of major entrance to building
Baseboard	Porch and railing
Floor	Surfaces with deteriorated paint
Surfaces with deteriorated paint or friction areas	

Table 4. Type of lead-based paint hazard.

Type of hazard	No. housing units (thousands) ^a Estimate	95% CI ^a	Percent housing units ^a Estimate	95% CI
Significantly deteriorated lead-based paint	13,634	10,928–16,341	14	11–17
Interior lead-contaminated dust	15,468	12,982–17,954	16	14–19
Lead-contaminated soil	6,460	3,122–9,799	7	3–10
Any significant lead-based paint hazard	24,026	21,306–26,746	25	22–28
Any lead-based paint	37,897	34,521–41,272	40	36–43

^aAll percentages are calculated with total housing units (95,688,000) as the denominator; percentages may not total 100% due to rounding.

with units built between 1960 and 1978. Approximately 36% of the housing in the Northeast and Midwest had lead-based paint hazards, compared with about 16% of housing in the South and West. Surprisingly, units in large urban and small urban and rural areas had roughly the same prevalence of lead-based paint hazards (~27%).

Rental units also had a slightly higher prevalence of lead-based paint hazards

compared with owner-occupied units (30% and 23%, respectively).

This study also examined for the first time the prevalence of lead-based paint hazards in housing built after lead paint was banned in 1978. Among housing built between 1978 and 1998, 3% (1,042,000 housing units) had significant lead-based paint hazards, but 7% (2,031,000 housing units) may have had lead-based paint. (More than half of the XRF

measurements above 1.0 mg/cm² in these newer units were on painted tile or stone substrates and are therefore uncertain because the lead may be in the substrates themselves, not the paint.)

Interior dust lead hazards. An estimated 16% of all housing units nationwide (equivalent to 15.5 million units) had one or more lead dust hazards on either floors or windowsills (Table 4). The geometric mean dust

Table 5. Prevalence of significant lead-based paint hazards in housing units (number and percent).^a

Characteristics	No. housing units (thousands)			Percent housing units ^c		No. housing units in sample
	All housing units ^b	Units with hazards	95% CI ^b	Units with hazards	95% CI	
Owner-occupied housing units	10,328	2,822	2,192-3,452	27	19-35	1,118
Multifamily	1,328	2,078	1,188-2,968	15	10-20	118
Single family	9,000	7,744	6,554-8,934	22	19-25	1,000
Renter-occupied housing units	10,669	8,178	7,128-9,228	33	28-38	1,118
Multifamily	10,669	8,178	7,128-9,228	33	28-38	1,118
Single family	0	0	0-0	0	0-0	0
Construction year						
1978-1998	29,774	1,042	169-1,915	3	1-6	220
1960-1977	27,874	2,340	1,445-3,235	8	6-12	287
1940-1959	20,564	8,926	6,720-10,933	43	32-51	186
Before 1940	17,476	11,818	10,045-13,591	68	56-75	158
One or more children < 6 years old						
All housing units	16,402	4,155	2,948-5,363	25	18-33	184
Units built 1978-1998	5,847	< 89 ^d	0-178	< 1 ^e	0-2	56
Units built 1960-1977	5,098	469	0-940	9	0-19	81
Units built 1940-1959	3,056	1,732	1,088-2,375	57	36-78	40
Units built before 1940	2,401	1,955	1,190-2,720	81	50-113 ^f	27
Urbanization						
MSA ≥ 2 million population	26,814	6,793	4,978-8,609	25	19-32	276
MSA < 2 million population	45,753	10,232	8,171-12,293	22	18-27	417
Non-MSA	23,121	7,001	3,948-10,153	30	17-44	138
Housing unit type						
Single family	62,651	21,584	18,974-24,194	28	23-29	705
Multifamily	13,037	2,442	1,208-3,676	18	9-28	128
Occupant status						
Owner occupied	62,232	15,305	13,191-17,419	23	20-26	539
Renter occupied	29,074	8,721	6,583-10,859	30	23-37	289
Refusal/don't know ^g	381					3
Household income						
< \$30,000/year	33,830	12,007	9,336-14,679	35	28-43	309
≥ \$30,000/year	56,111	10,464	8,250-12,678	19	15-23	482
Refusal/don't know ^g	5,747					40
One or more children < 6 years old						
All income categories	16,402	4,155	2,948-5,363	25	18-33	184
< \$30,000/year	4,791	1,201	600-1,801	25	13-38	81
≥ \$30,000/year	11,236	2,860	1,763-3,957	25	16-35	117
Refusal/don't know ^g	375					16
Household size						
1 person	4,411	950	475-1,425	21	11	104
2 persons	10,221	2,418	1,712-3,124	24	16	118
3 persons	4,386	1,142	672-1,612	26	16	116
Poverty						
In poverty	13,221	4,976	3,458-6,494	38	26-49	137
Not in poverty	76,336	16,576	13,598-19,555	22	19-26	651
Refusal/don't know ^g	6,100					43
Race						
White	77,005	19,089	16,475-21,703	25	21-28	622
African American	10,385	2,969	1,807-4,131	29	17-40	116
Other ^h	6,571	1,496	672-2,321	23	10-36	77
Refusal/don't know ^g	1,746					16
Ethnicity						
Hispanic/Latino	7,434	2,399	1,235-3,564	32	17-48	86
Not Hispanic/Latino	87,009	21,196	18,674-23,719	24	21-27	736
Refusal/don't know ^g	1,746					9

^aSignificant lead-based paint hazard means a lead-based paint hazard above *de minimis* levels as defined in U.S. EPA and U.S. HUD regulations (U.S. EPA 2001; U.S. HUD 1999). The *de minimis* levels for paint deterioration are ≥ 20 mg/m² (exterior) or ≤ 2 mg/m² (interior) of lead-based paint on large surface area components (walls, doors), or damage to $\leq 10\%$ of the total surface area of interior small surface area component types (windowsills, baseboards, trim). ^bAll percentages are calculated with total housing units (95,088,000) as the denominator; percentages may not total 100% due to rounding. ^c95% confidence interval for the estimated number or percentage. ^dAll percentages are calculated with the "All housing units" column in each row used as the denominator. ^eNo 1978-1998 housing units with one or more children < 6 years old in this sample have lead-based paint hazards. ^fUpper 95% CI value > 100% reflects uncertainty in number of housing units in first data column. ^gRefusals and "don't know" responses by survey respondents. ^hOther^h race includes Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, and more than one race.

lead level for floors, window sills, and window troughs was 1.1 $\mu\text{g}/\text{ft}^2$, 9.4 $\mu\text{g}/\text{ft}^2$, and 96.4 $\mu\text{g}/\text{ft}^2$, respectively (Table 6). The arithmetic means (used for composite dust sampling) for these surfaces were 13.6 $\mu\text{g}/\text{ft}^2$, 195 $\mu\text{g}/\text{ft}^2$, and 1,991 $\mu\text{g}/\text{ft}^2$, respectively. These can be compared with the current U.S. EPA/HUD dust lead hazard or clearance standards for these surfaces, which are 40 $\mu\text{g}/\text{ft}^2$, 250 $\mu\text{g}/\text{ft}^2$, and 400 $\mu\text{g}/\text{ft}^2$, respectively (U.S. EPA 2001; U.S. HUD 1999).

Dust lead hazards are more likely to exist in homes with significantly deteriorated interior

lead-based paint. Although only one-third of homes with interior lead-based paint in good condition had dust lead hazards, nearly two-thirds of the homes with deteriorated interior lead-based paint had dust lead hazards (Table 7). Based on our results, of the 24 million units with lead-based paint hazards, 2.7 million units with no lead-based paint on either the interior or exterior at the time of the survey have dust lead hazards. Of the 2.7 million housing units with dust lead hazards but no intact or deteriorated lead-based paint, approximately 270,000 units had soil lead

hazards, and occupants in another 700,000 units reported having a lead hobby or an occupation potentially using lead, all of which can contribute to interior dust lead levels.

Bare soil lead hazards. An estimated 5% (-4.9 million) of housing units nationwide had play area soil lead levels ≥ 400 ppm, the current U.S. EPA/HUD standard (U.S. EPA 2001; U.S. HUD 1999) (Table 8). Among all housing unit yard areas, 7% (-6.3 million) have bare soil lead levels $\geq 1,200$ ppm, the current U.S. EPA/HUD standard outside of play areas (U.S. EPA 2001; U.S. HUD 1999) (Table 9). Soil lead levels are also related to deteriorated exterior lead-based paint. Comparing units with and without deteriorated exterior lead-based paint, the percentage of units with bare soil lead levels $\geq 1,200$ ppm decreases from 24% to only 4%, respectively (Table 10).

Lead-based paint. Our results indicate that 38 million units have lead-based paint somewhere in the interior or on the exterior of the unit (Table 4). The influences of age, demographic, and socioeconomic factors on the presence of lead-based paint are similar to those presented in Table 5 for significant lead-based paint hazards. Although 40% of housing units had lead-based paint somewhere, most surfaces, even in older housing stock, did not have lead-based paint (Table 11). In post-1960 housing, only 0–2% of interior surfaces had lead-based paint, whereas 0–12% of exterior surfaces had lead-based paint. Even in older pre-1940 housing, only 7–22% of interior surfaces and 24–41% of exterior surfaces had lead-based paint. In almost all age categories for both interior and exterior surfaces, the building components with the highest prevalence of lead-based paint were windows and doors. These are friction and impact surfaces that can generate significant levels of lead dust and paint chips.

For all housing units, we estimate 7.5 billion ft^2 of interior lead-based paint and 29.2 billion ft^2 on exterior surfaces, roughly 2% and 22% of the total interior and exterior painted surfaces, respectively. On average, for each housing unit with lead-based paint, there are 259 ft^2 of lead-based paint on interior surfaces and 996 ft^2 on exterior surfaces (Table 12).

A comparison of the 1990 HUD survey (U.S. EPA 1995; U.S. HUD 1990) with this study shows that the number of units with lead-based paint fell from 64 million units in 1990 to 38 million in 2000 (Tables 4 and 13). Some possible reasons for this decline are discussed below.

Discussion

The results show that despite considerable progress, significant lead-based paint hazards remain prevalent, existing in 25% of all U.S. housing. The association between lead-based

Table 6. Dust lead loadings on floors and windows.

Statistic	Floors ($\mu\text{g}/\text{ft}^2$)	Windowsills ($\mu\text{g}/\text{ft}^2$)	Window troughs ($\mu\text{g}/\text{ft}^2$)
Arithmetic mean	13.6	194.9	1,990.9
Arithmetic SD	483.5	1,882.7	12,086.5
Geometric mean	1.1	9.4	96.4
Geometric SD ^a	3.8	9.3	14.4
25th percentile	0.375	2.0	19.0
Median	0.9	8.3	89.1
75th percentile	2.0	37.13	462.0
90th percentile	6.0	172.8	2,624.2
95th percentile	13.2	524.9	6,974.6
HUD/EPA standards	40	250	NA
No. samples	3,894	2,202	1,607

NA, not applicable. For this table, zero and negative values were set to 0.375.

^aThe geometric standard deviation is computed as $\exp(s)$, where s is the arithmetic standard deviation of the natural logarithms of the loadings (e.g., Gilbert 1987).

Table 7. Association between dust lead hazards and presence and condition of interior lead-based paint (all housing unit ages, thousands of units).

Characteristic	No lead-based paint on interior or exterior		No interior lead-based paint ^a		Interior lead-based paint in good condition		Significantly deteriorated interior lead-based paint	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
No interior dust lead hazards								
Estimate ^b	55,105	95	62,752	94	15,244	67	2,389	39
Lower 95% CI ^c	51,893	90	60,141	90	12,633	56	1,565	26
Upper 95% CI	58,318	100	65,363	98	17,855	78	3,213	53
Interior dust lead hazards								
Estimate ^b	2,686	5	4,068	6	7,508	33	3,727	61
Lower 95% CI	1,372	2	2,584	4	6,024	26	2,505	41
Upper 95% CI	4,001	7	5,552	8	8,992	40	4,949	81
Total housing units	57,791	100	66,820	100	22,752	100	6,116	100

^aIncludes houses with only exterior lead-based paint. ^bEstimate is either the number of permanently occupied, noninstitutional housing units in which children are permitted to live, or the percentage of total housing units. ^cCI, 95% confidence interval for the estimated number or percentage.

Table 8. Distribution of bare soil lead concentrations in children's play areas.

Bare play area soil lead levels (ppm)	No. housing units (thousands) ^a		Percent housing units ^b		Housing units (n)
	Estimate	95% CI ^c	Estimate	95% CI	
≥ 0	76,404	69,826–82,982	80	73–87	294
≥ 20	49,019	42,946–55,092	51	45–58	209
≥ 50	28,878	25,826–31,929	30	27–33	127
≥ 200	10,849	7,899–13,800	11	9–14	101
$\geq 400^d$	4,856	2,096–7,616	5	2–8	84
$\geq 1,200$	2,493	458–4,529	3	1–5	82
$\geq 1,800$	2,078	92–4,963	2	0–4	80
$\geq 2,000$	1,777	0–3,871	2	0–4	77
$\geq 5,000$	380	0–1,231	0	0–1	1
No play area	12,368	6,659–18,077	13	7–19	53
Missing ^e	6,916	1,862–11,969	7	2–13	23
Total	95,688		100		375

^aAll percentages are calculated with total housing units (95,688,000) as the denominator; percentages may not total 100% due to rounding. ^bAll percentages are calculated with total housing units (95,688,000) as the denominator. ^cU.S. EPA standard for play areas. ^dMissing means that soil was present but no lead value is available (usually due to inaccessibility or respondent refusal).

paint, lead-contaminated dust, and lead-contaminated soil is consistent with the 1990 HUD survey. Yet 2.7 million homes without lead-based paint had dust lead hazards at the time of the recent survey. However, the fact that lead-based paint was not found in these homes at the time of the survey does not necessarily mean it had never been present at some time in the past. Ongoing housing rehabilitation, maintenance, and repainting all tend to remove lead-based painted surfaces but may leave behind dust lead hazards. Also, some lead-contaminated dust may be from lead-contaminated soil tracked into homes. Although some dust lead may be due to aerosol deposition from ambient air, air lead levels in the United States have declined greatly with the phaseout of leaded gasoline. It is also possible that lead-contaminated dust can originate from lead-based paint in nearby dwellings that are undergoing rehabilitation, maintenance, or repainting. Additionally, some of the lead hobbies or occupations reported by occupants could produce a lead dust hazard. In any case, Table 7 shows that the vast majority of houses with dust lead hazards have lead-based paint on either the interior or exterior, and that houses with deteriorated lead-based paint are far more likely to have dust lead hazards. Further research is needed to identify other potential sources of dust lead hazards.

The apparent decrease in the number of units with lead-based paint over the past decade was greater than expected, declining from about 64 million (or 83%) of pre-1980 housing units to 38 million (or 40%) of all 96 million housing units in the sampling frame of this study, a decline of 26 million units. A number of factors that likely contributed to this apparent decline are discussed below.

Ongoing lead hazard control activities.

The number of units undergoing lead hazard control likely increased over the past decade because of HUD's lead hazard control grants to local governments; other similar local, state, and federal lead hazard control programs; lead hazard control requirements in HUD's public housing program and federally assisted housing programs; promulgation and enforcement of the U.S. EPA/HUD lead-based paint disclosure regulation (U.S. HUD and U.S. EPA 1996); and increased public awareness of lead-based paint hazards, which likely resulted in privately funded lead hazard control activities. The effect of public education (carried out largely through federal, state, and local programs) in prompting lead hazard control efforts is difficult to quantify but may be much larger than is currently understood.

Demolition and renovation. Although demolition, remodeling, and renovation activities are known to increase exposures in the short run if lead-safe work practices are not used, they reduce both the number of

units and the number of surfaces within units with lead-based paint over the long run. Over the past 5 years, standardized curricula and training courses have been developed to educate the work force on lead-safe work practices, and the U.S. EPA has promulgated a final rule regarding public education prior to certain renovation practices (U.S. EPA 1998). This educational effort should reduce the generation of lead-contaminated dust during renovation and maintenance.

It is widely assumed that the phaseout of lead in gasoline and lead in food canning are primarily responsible for most of the decline in population blood lead levels over the past several decades (along with regulation of lead in water and industrial emissions). But it is likely that housing rehabilitation, maintenance, and demolition also had a significant impact over the same time period. The President's Task Force on Environmental Health Risks and Safety Risks to Children (2000) used data

from the American Housing Survey and other sources to estimate the size of this effect during the 1990s. Those data show that older units with lead-based paint are more likely to undergo rehabilitation or demolition than are newer houses. From 1989 to 1999, the number of pre-1940 units declined by 2.8% annually, the number of 1940-1959 units declined by 2.65% annually, and those from 1960-1974 declined by 2.1% annually. In short, from 1989 to 1999, the number of units with lead-based paint declined by a total of about 10 million units due to housing demolition and renovation alone (Appendix to the President's Task Force Report 2000). This same pattern likely occurred during earlier decades as well, contributing to the overall decline in population blood lead levels in ways not previously recognized.

Improvements in laboratory and XRF technology and quality control. This study used an XRF model that is both more precise and more

Table 8. Distribution of bare soil lead concentration in entire yard by construction year.

Bare soil lead concentration (ppm)	No. housing units (thousands) ^a					Percent housing units ^b				
	All years	Before 1940	1940-1959	1960-1977	1978-1998	All years	Before 1940	1940-1959	1960-1977	1978-1998
≥ 0	77,888	12,015	16,843	23,185	25,645	81	69	82	83	87
≥ 20	55,114	12,015	15,404	17,345	10,350	58	69	75	62	35
≥ 50	40,023	11,193	12,789	10,437	5,603	42	64	62	37	19
≥ 200	15,299	7,243	6,073	1,793	190	16	41	30	6	1
≥ 400	9,986	5,148	3,736	1,111	0	10	30	18	4	0
≥ 1,200 ^c	8,271	3,388	2,886	0	0	7	19	14	0	0
≥ 1,600	3,900	2,006	1,894	0	0	4	12	9	0	0
≥ 2,000	3,124	1,320	1,804	0	0	3	8	9	0	0
≥ 5,000	1,580	1,106	475	0	0	2	6	2	0	0
Missing ^d	145	145	0	0	0	2	1	0	0	0
No bare soil	15,413	4,313	2,762	4,613	3,724	16	25	13	17	13
No soil ^e	2,242	1,033	339	95	205	2	6	5	0	1
Total	95,688	17,476	20,544	27,893	29,774	100	100	100	100	100

^aHousing units* include permanently occupied, noninstitutional housing units in which children are permitted to live. ^bAll percentages are calculated with total housing units of that age as the common denominator. ^cU.S. EPA standard for yards. ^dMissing* means that soil was present but no lead value is available (usually due to inaccessibility or respondent refusal). ^eNo soil* means that there was no soil on the property to sample.

Table 10. Association between bare soil lead concentration and housing units with or without deteriorated exterior lead-based paint.

Bare soil lead concentration (ppm)	Without any lead-based paint		Without significantly deteriorated exterior lead-based paint ^{a,b}		With significantly deteriorated exterior lead-based paint ^{a,b}	
	Percent	95% CI	Percent	95% CI ^c	Percent	95% CI
≥ 0	83	78-88	83	77-88	73	55-92
≥ 20	49	41-56	56	48-63	73	54-92
≥ 50	28	20-36	38	30-47	67	51-83
≥ 200	5	1-9	13	9-17	39	19-58
≥ 400	3	0-5	8	5-11	30	11-49
≥ 1,200	1	0-3	4	2-7	24	7-41
≥ 1,600	1	0-3	2	1-4	17	4-30
≥ 2,000	1	0-2	2	0-4	13	2-24
≥ 5,000	0	0-0	1	0-2	8	0-17
Missing ^d	0	0-0	30	0-0	1	0-5
No bare soil	14	10-19	15	11-20	22	3-41
No soil ^e	3	0-6	2	0-4	4	0-9
Total	100		100		100	

^aAll percentages are calculated with total housing units (95,688) as the denominator; percentages may not total 100% due to rounding. ^bPercentages are calculated with the number of housing units without any lead-based paint, and with and without deteriorated lead-based paint, 57,781,000, 11,473,000 and 84,215,000, respectively, as the denominators. ^cMissing* means that soil was present but no lead value is available (usually due to inaccessibility or respondent refusal). ^dNo soil* means that there was no soil on the property to sample.

accurate than the instrument used in 1990 (U.S. HUD 1990). Over the past decade, Performance Characteristics Sheets defining acceptable tolerance limits for all commercially available instruments have been published (U.S. HUD 1997), which has spurred the introduction of a new generation of more precise and accurate lead-based paint analyzers, one of which was used in this study. In addition, all states now have certification (licensing) laws (or are covered by the U.S. EPA) for lead-based paint inspectors (U.S. EPA 1996); in 1990, only one state had such a law. All of this makes it less likely to misclassify a surface with lead-based paint in the more recent survey.

Larger sample size. The recent study sampled more units (831 vs. 284), more rooms within units (4–6 rooms vs. 2 rooms), and completed more measurements within rooms,

compared to the 1990 survey (U.S. HUD 1990), making these estimates more precise and accurate. The larger number of measurements would be expected to increase the number of homes with lead-based paint, contrary to the findings above, if the number of units with lead-based paint in fact had remained the same. There may be other methodologic differences in the two surveys that could explain some of the observed decline, which will be explored in future papers.

Other key findings. Differences in the definition of what constitutes a lead-based paint hazard and the protocols to measure lead in dust and soil changed greatly between the two surveys, making a direct comparison of hazard prevalence problematic. The percentage of housing units with deteriorated lead-based paint actually increased slightly, from 19% in

1990 to 22% in the present study (Table 13). Although the difference did not reach statistical significance, such an increase could reflect continued aging of the housing stock and changes in the definition of paint deterioration used in the two studies. If the prevalence of deteriorated paint either increased or remained constant over the past decade, additional efforts are needed to maintain lead-based paint in a way that ensures that it does not deteriorate and present new hazards.

This study shows that most painted surfaces, even in older housing, are not coated with lead-based paint. Use of lead-safe work practices on surfaces with lead-based paint is essential in order to minimize dust, paint chips, and contaminated soil that may be generated during maintenance and housing rehabilitation activities, because only a small amount of lead-based paint is needed to produce very high dust lead levels. For example, if sanded and turned into contaminated dust that is spread across an average-size room, only 1 ft² of paint at a lead concentration of 1 mg/cm² (the federal standard) is needed to produce a settled dust lead level of 9,300 µg/ft², several orders of magnitude above current dust lead standards (U.S. HUD 1995).

This study also suggests that rental properties are somewhat more likely to have lead-based paint hazards than are owner-occupied properties (30% vs. 23%, respectively), perhaps because of the increased turnover rates and lower maintenance levels that may be more common in rental units. Thus, efforts to increase homeownership may also serve to reduce the prevalence of childhood lead poisoning.

Although it has been widely assumed that large cities have a higher prevalence of lead-based paint hazards than do smaller ones, these data show that urban and rural areas both have roughly the same prevalence—about 26% (Table 5). These results suggest that greater attention may need to be given to rural housing, although large cities clearly have more units with lead-based paint hazards within relatively small geographic areas.

The percentage of building components coated with lead-based paint in housing built after the 1978 ban is 0–3% (Table 11). This suggests that the ban was not immediately effective in removing stocks of lead-based paint from retail and wholesale outlets. It also suggests that there may be continuing use of industrial or marine lead-based paint, which is still available, in housing. The fact that about half of the XRF readings indicating a lead concentration greater than 1 mg/cm² were taken on tiled surfaces means that the percentage of surfaces with lead-based paint in newer housing is between 1% and 2%. It is not known whether lead was actually present in the tile itself or in the glazing of the tile, or

Table 11. Building components coated with lead-based paint by year of construction (%).

Component type	All years	1978–1998	1960–1977	1940–1959	Before 1940
Interior					
Walls, floors, ceilings	2	0	1	2	7
Windows	9	1	2	6	21
Doors	7	0	1	7	22
Trim	5	0	2	4	15
Other	4	0	1	2	12
Exterior					
Walls	14	0	9	18	34
Windows	25	0	12	30	41
Doors	15	2	5	29	33
Trim	11	3	8	16	24
Porch	15	1	7	25	28
Other	18	0	8	37	37

Table 12. Surface area of lead-based paint.

Component	National total surface area of lead-based paint		Avg surface area per housing unit (ft ²)
	Square feet (billions)	Paint on component (%)	
Interior			
Wall, floor, ceiling	4,993	2	173
Window	687	9	24
Door	911	6	32
Trim	499	5	17
Cabinets, chimney, beams	388	2	13
Total	7,448	2	259
Exterior			
Wall	26,706	18	912
Window	365	28	12
Door	446	14	15
Trim	556	12	19
Porch	1,086	21	37
Total	29,159	22	996

Avg. average.

Table 13. Comparison of the prevalence of lead-based paint^a to that in the 1990 HUD survey (housing units built before 1980).

Location and condition of lead-based paint	1990 HUD survey		2000 HUD national survey ^b	
	No. ^c	Percent	No. ^c	Percent
Housing units built before 1980	77,177	100	69,756	100
Units with lead-based paint	64,059	83	34,195	50
Interior lead-based paint	48,986	63	26,184	38
Exterior lead-based paint	56,495	73	27,379	40
Units with deteriorated lead-based paint ^a	14,354	19	14,962	22
Interior deteriorated lead-based paint	5,596	7	7,281	11
Exterior deteriorated lead-based paint	9,657	13	11,784	17

^aDeteriorated lead-based paint is as defined in U.S. HUD (1995). ^bAll the data in this table are restricted to housing built before 1980. ^cThousands of housing units.

whether it was an instrumentation artifact. Furthermore, it is not known whether tile poses a significant source of lead exposure to children. Further analyses of the prospect of continuing contamination of U.S. housing through new application of lead-based paint and the nature and importance of lead in tile are both needed. Nevertheless, it is clear that lead-based paint hazards in housing built after 1978 are very rare.

Conclusion

This study shows that despite a large decline in the number of housing units with lead-based paint from 1990 to 2000, there are still millions remaining with hazards. Resources should be directed to those most likely to cause childhood lead poisoning: older housing units with lead-based paint hazards that are occupied by (or likely to be occupied by) children under 6 years of age and are low-income and/or are undergoing certain housing rehabilitation or maintenance that disturbs surfaces coated with lead-based paint. Hazard controls should focus on deteriorated lead-based paint, windows, doors, dust, and bare soil in play areas. Window replacement also has other important benefits, such as energy conservation.

This study confirms a prediction released by the President's Task Force in February 2000. That forecast indicated that based on trends in demolition, housing rehabilitation, lead hazard control, and other factors, the number of units with lead-based paint hazards in 1999 could be expected to be 24 million. This study found that the actual number is 24 ± 2.7 million units, making the task force estimate well within the confidence interval of this survey. The task force report indicated that private and public expenditures for the incremental cost of lead hazard control totaling approximately \$230 million per year for 10 years would be needed to virtually eliminate childhood lead-based paint poisoning and realize a net benefit of \$890 million per year for 10 years from avoided childhood lead-poisoning cases. This cost analysis factors in ongoing housing rehabilitation, maintenance, and lead hazard control, as well as regulation of federally assisted low-income housing. Further efforts are needed to improve maintenance standards by incorporating lead-safe work practices into routine housing operations, especially in low-income housing.

Further efforts are also needed to educate maintenance and housing rehabilitation workers, property owners, parents, and others to help ensure that lead-based paint remaining in millions of houses does not become hazardous and pose future risks to millions of children born into or occupying such houses in the coming decades.

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The lead content of currently available new residential paint in several Asian countries[☆]

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Abstract

Worldwide prohibitions on lead gasoline additives were a major international public health accomplishment, the results of which are still being documented in parts of the world. Although the need to remove lead from paints has been recognized for over a century, evidence reported in this article indicates that lead-based paints for household use, some containing more than 10% lead, are readily available for purchase in some of the largest countries in the world. Sixty-six percent of new paint samples from China, India, and Malaysia were found to contain 5000 ppm (0.5%) or more of lead, the US definition of lead-based paint in existing housing, and 78% contained 600 ppm (0.06%) or more, the limit for new paints. In contrast, the comparable levels in a nearby developed country, Singapore, were 0% and 9%. In examining lead levels in paints of the same brands purchased in different countries, it was found that some brands had lead-based paints in one of the countries and paints meeting US limits in another; another had lead-free paint available in all countries where samples were obtained. Lead-based paints have already poisoned millions of children and likely will cause similar damage in the future as paint use increases as countries in Asia and elsewhere continue their rapid development. The ready availability of lead-based paints documented in this article provides stark evidence of the urgent need for efforts to accomplish an effective worldwide ban on the use of lead in paint.

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Keywords: Lead-based paint; Housing; Childhood lead poisoning; Globalization and the environment; International public health

1. Introduction and background

The phasing out of lead from gasoline is regarded as a critical first step in reducing worldwide blood lead concentrations and is considered a major international public health achievement (Falk, 2003). The phase out has been accomplished by actions in many countries, Western countries such as the United States, countries in the former Soviet Union, in Asia (Michaelowa, 1997; Lovei, 1999), Africa (Montgomery and Mathe, 2005), and elsewhere.

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The percentage of children aged 1–5 years in the US with blood lead levels 10 µg/dL or higher has reduced from 77.8% to 4.4% from the period 1976–1980 to 1991–1994 and further reduced to 0.7% in the period 1999–2002 (MMWR, 2005). These dramatic reductions are due in part to the reduction of air lead and in part to efforts to control exposures from lead-based paints in older housing (Falk, 2003). The estimated number of US housing units containing lead-based paint was reduced from 64 million in 1990 to 24 million in 2000 through demolition, rehabilitation, lead hazard control, and other factors (Jacobs et al., 2002). Public health awareness of the dangers to the health of children and others from lead-based paint increased in the United States in the middle of the 20th century, although a US regulation of the lead content in new paint for residential use was not in effect until 1978 when a limit

of 600 ppm became effective (US CPSC, 1977). For existing housing, US regulations now require that the paint contain less than 5000 ppm or 1.0 mg/cm² of lead (US HUD, 1995; US EPA, 2001a). Decades earlier the International Labour Organization promulgated a convention on the prohibition of the use of lead-based residential paint (ILO, 1921). Some other countries have established limits on the lead content of paint; Singapore, for example, has a limit of 600 ppm in new paints (Singapore NEA, 2004). In many countries, however, there are apparently still no regulations on the lead content of either new paint or paint in existing housing.

In many developing countries lead exposure from smelters and battery-recycling operations are considered to be major sources of lead poisoning for children and adults (Falk, 2003; Hashim et al., 2000; Nriagu et al., 1996; Shen et al., 1996). Little is known, however, about the lead content of paint in many developing countries and thus about exposures to children from lead-based paint. Reports on the paint lead levels in housing in Asia and Africa are very few. In China, painted surfaces of classroom desks, pencils and toys are reported to contain hazardous levels of lead (Shen et al., 1996). Over 60% of houses of a population of children in Venezuela with elevated blood lead were found to have paint lead levels above the regulatory limit (Rojas et al., 2000). Lead chromate has been reported to be unregulated in most African countries (Nriagu et al., 1996). In a recent report on lead paint levels in South Africa (Montgomery and Mathe, 2005), it was stated that a voluntary agreement has been in place among some industry stakeholders since the 1970s to limit the use of lead in paint but that a regulatory limit had not been established. In their survey of 239 homes, 20% were found to contain at least one surface with lead-based paint as defined by the US. Paint is considered to be a source of lead for children in Malaysia but levels of lead were not provided (Hashim et al., 2000). Lead-based paint was found in the homes of 3 of 10 children with blood leads of at least 40 µg/dL in India (Kuruvilla et al., 2004). Several years ago, an examination of samples of 24 new paints purchased in India (Van Alphen, 1999) revealed that 4 (17%) had a lead concentration exceeding 0.5% by weight, 3 (13%) were higher than 1% and 1 (5%) exceeded 10%. In a recent study of new paint in India, field-portable X-ray fluorescence (XRF) analyzers were used to determine the lead content (mg/cm²) of surfaces with a single coat of new paint and three coats of new paint. Three coats were used to simulate surfaces in older housing, which typically receive multiple coats over time; 14% of surfaces with one coat of paint and 28% of surfaces with three coats of new paint, respectively, had lead levels greater than or equal to the US limit of 1.0 mg/cm² for existing housing (Clark et al., 2005).

It is very important to know the content of lead in paint in existing housing so that the necessary poisoning prevention efforts can be implemented. Equally important for future generations is whether lead-based paints for

domestic use are currently available and are continuing to be applied in housing. If lead-based paints are still available, then major action is needed to promote their effective banning to curb the growth of future cases of lead poisoning, an entirely preventable disease.

2. Objective and methods

In an effort to determine the extent to which lead-based paint is currently available for purchase in selected Asian countries, new paint samples were obtained in China, India, Malaysia, and Singapore. In each of the study countries, new paints were purchased from retail shops readily accessible to the public. Paints were selected with assistance of coauthors and others in the countries involved using two criteria: multiple brands and a variety of colors. The colors selected included those sampled earlier by Van Alphen (1999)—black, blue, green, orange, red, and white. To prepare each paint sample, the paint was stirred and applied by brush to individual wood blocks. Each stirring utensil and paintbrush was used only once. The paint was carefully removed from a premeasured area on the painted wood surface using a clean sharp paint scraper, using care not to remove portions of the wood. The scraping was done in the Hematology and Environmental Laboratory at the University of Cincinnati, which also analyzed the removed paint for lead. Paint scrapings were extracted using nitric acid and hydrogen peroxide according to the method: Standard Operating Procedures for Lead in Paint by Hotplate or Microwave-based Acid Digestions and Atomic Absorption or Inductively Coupled Plasma Emission Spectroscopy, EPA, PB92-114172, September 1991 (US EPA, 2001b). Extracts were analyzed by flame-atomic absorption spectroscopy using a Perkin-Elmer 5100 spectrometer. This laboratory is accredited by the American Industrial Hygiene Association as an industrial hygiene laboratory and an environmental lead laboratory under the National Lead Laboratory Accreditation Program. Consequently, the laboratory participates in the Proficiency Analytical Testing (PAT) and Environmental Lead Proficiency Analytical Testing (ELPAT) proficiency programs. Strict quality control procedures are maintained according to the accreditation guidelines. The laboratory is also a recognized facility through the National Environmental Laboratory Accreditation Conference and participates in the New York proficiency program for environmental sample analytes including lead.

3. Results

A total of 80 samples of paint were obtained from four countries: 9 were obtained in Shanghai, China; 17 were obtained in India from Vallabh Vidyanagar, Gujarat and in the Territory of Diu; 32 were from Johor Bahru and Kuala Lumpur, Malaysia; and 22 were from Singapore. A wide range of paint lead concentrations were observed (Fig. 1) with paints from China, India, and Malaysia

generally having much higher concentrations of lead than those from Singapore. Concentrations of 10% and higher were found in some samples from India and Malaysia. The percentages of paint samples with lead concentrations exceeding the US limit of 600 ppm for new paints were 100%, 72%, 56% and 9% for India, Malaysia, China, and Singapore, respectively; and the percentages of which would be defined as lead-based paint in existing US housing (5000 ppm) were 82%, 62%, 44%, and 0%, for India, Malaysia, China, and Singapore, respectively (Table 1). One of the new paints from Malaysia (143,000 ppm) had also recently been applied to an existing home; the label from this paint indicated that its producer was a Korean company.

Sixty-six percent of new paint samples from China, India, and Malaysia combined were found to contain 5000 ppm (0.5%) or more of lead and 78% contained 600 ppm (0.06%) or more. In contrast, the comparable levels in a nearby developed country, Singapore, were 0% and 9%.

Some brands of paint sampled were marketed in two or more countries (Table 2). In examining lead level, of the same brand in different countries, it was found that some of the paints were lead-based paints in one of the countries and not in another. Samples of one brand were obtained in India and Singapore; the samples from India contained from 1.10% to 15.9% lead while in the samples from Singapore the levels ranged from less than 0.005% lead to

0.04%. Paint samples of another brand contained 2.4–14.9% lead in Malaysia and about 0.004% in Singapore. A third brand of paint, for which the containers state that no lead was added, contained less than detectable levels of lead (less than 9 ppm (0.0009%) in Malaysia and Singapore).

4. Discussion and conclusions

In the first known study of the lead levels in new paints in several Asian countries, the lead levels in the three countries which did not have regulatory limits greatly exceeded levels in the regulations in place in the US and elsewhere. In the fourth country where paint samples were collected, and which had a regulatory limit, concentrations were markedly lower. Some brands of paint marketed in two or more countries had lead-based paint in one country and low-lead paint in the country that had a regulatory limit. One of the brands of yellow paint analyzed in this study, marketed with a label statement that it contains no added lead, contained a low level of lead, <9 ppm, in the country that contained a regulatory limit (Singapore) and in one that did not (Malaysia). In a third country (India) the level of lead in yellow paint from this brand was found, by XRF analysis in a previous study (Clark et al., 2005), to contain 0.00 mg/cm². In unpublished data from new paint

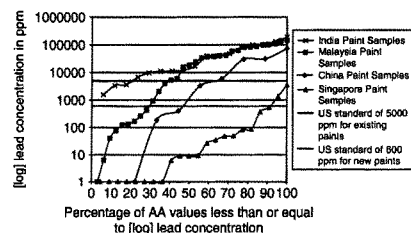


Fig. 1. Frequency distribution of lead concentrations by atomic absorption among new paint samples from China, Malaysia, Singapore, and India.

Table 2
Comparisons of lead levels in new paints by color, brand, and country (ppm)^a

Color	Brand	India	Malaysia	Singapore
Yellow	A	159,200 ^b	—	408
Green	A	39,200	—	35
Brown	A	10,980	—	50
Yellow	B	—	149,100	47 ^c
Green	B	—	24,200	35
Yellow	C	^d	<9	<9

^aPaint lead levels determined by atomic absorption.

^bAverage of two samples (187,200 and 131,300 ppm).

^cAverage of two samples (86.8 and <9 ppm).

^dAs described under Discussion and conclusions, using unpublished data, the yellow paint in India from brand C was estimated to contain less than or equal to 1328 ppm lead.

Table 1
Lead Concentration (ppm) in new household paints by country (analyses by atomic absorption)

Country	Number of paint samples	Median (ppm)	Maximum (ppm)	% (No.) Paints ≥ 600 ppm	% (#) Paints ≥ 5000 ppm
China	9	3280	73,400	56 (5)	44 (4)
India	17	16,720	187,200	100 (17)	82 (14)
Malaysia	32	21,300	143,000	72 (23)	62 (20)
China, India, and Malaysia combined	58	17,570	187,200	78 (45)	66 (38)
Singapore	22	9	3500	9 (2)	0 (0)

samples analyzed first by XRF and then by atomic absorption (AA), of 28 paint samples measured by XRF as 0.00 mg/cm², the corresponding AA values ranged from <9 to 1328 ppm. Thus it is likely that the brand marketed in India as having no added lead, and measured as 0.00 mg/cm² by XRF, contained less than or equal to 1328 ppm lead. One of the countries where high lead levels were frequently found (Malaysia) is adjacent to the country with low lead levels and a regulatory limit, Singapore. In general, it appears that the lead levels of many brands of paint depend on whether an enforceable regulatory limit exists in the specific country where the paint is marketed.

Lead-based paint was readily available for purchase in three of the four countries where samples were obtained. It is also possible that these lead-based paints could be exported to other countries, including the United States, as it has on jewelry, miniblinds, and other consumer products. As paint use in housing increases in these countries, a very likely result of increasing development, it is only a matter of time before childhood lead poisoning becomes an even greater public health issue. Substitutes for lead pigments have been available for many years and are indeed used in at least one paint brand marketed in three Asia countries where samples were obtained. Therefore, preventing future poisonings of children and others exposed to paint is a clearly achievable public health goal. This goal urgently calls for worldwide action, similar to that which occurred for gasoline lead additives. With the increased attention being given to globalization issues, including the environmental conditions of workers and families involved, consideration should be given to the inclusion in agreements and treaties of bans on the use of lead in paints so that this preventable disease does not increase.

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Short communication

Lead content of dried films of domestic paints currently sold in Nigeria

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Abstract

Children are at higher risk from lead exposure because their developing neural system is susceptible to its neurotoxic effects. We studied lead levels of paints manufactured in Nigeria in 2006. Lead levels in 5 colors of paints, each from different manufacturers were measured using flame-atomic absorption spectroscopy. We found that 96% of the paints had higher than recommended levels of lead. The mean lead level of paints ranged from 84.8 to 50,000 ppm, with mean of 14,500 ppm and median of 15,800 ppm. The main determinant of lead levels was color of the paint. As lead levels in paint sold in the past years in Nigeria are likely to be at least as high as that currently sold, it is likely that many existing houses contain dangerously high levels of lead. Efforts need to be undertaken to assess the presence of high lead levels in existing housing and if detected, intervention programs for eliminating risk of exposure should be developed in addition to measures to increase awareness and enforce regulations leading to the elimination of lead based domestic paint.

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Keywords: Lead; Dried paint film; Nigeria

1. Background

Exposure to environmental health hazards is a continuing threat to the health, particularly in developing countries though reducing environmental health hazards is one of the 8 aims of the United Nations' Millennium Development Goals (MDG) (Briggs, 2003; Hrynkow et al., 2003; Meyer et al., 2003; Obasanjo, 2005; United Nations, 2005). For example, lead-

exposure associated mental retardation is the 6th most important disease in terms of environmental contribution to total global burden of diseases measured in disability adjusted life years (Pruss-Ustun and Corvalan, 2006). Since economically-feasible technology has been available for more than one half century to produce paints without added lead, there is no plausible reason to continue to produce paints with any lead at all.

Exposure to lead in the domestic environment from potable water, dust, soil and paint is a particular health hazard for children. Though lead exposure is harmful to both adults and children, children are more susceptible

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to the neurobehavioral toxicity of lead exposure because their nervous system is still developing, their absorption rates are higher, they have higher likelihood of engaging in hand-to-mouth practices and frequently spend time on the floor and on soil areas so they are more likely to be exposed to lead from paint, dust, soil and water in the domestic environment (Baghurst et al., 1992; Bellinger, 2004; Lidsky and Schneider, 2003; Needleman and Landrigan, 2004). Furthermore, their lack of involvement in the economic system limits their exposure from other sources, including occupational and leaded petrol which is still used in many countries (The Lead Education and Abatement Design Group, 2006). Previous studies in Nigeria have shown that 70% of children aged 6 to 35 months had blood lead levels greater than 10 µg/dL (Pfitzner et al., 2000) and that flaking house paint was an important determinant of this (Wright et al., 2005).

In a previous study, we have shown that emulsion and gloss types of paints currently manufactured and sold in Nigeria contained substantial levels of lead (Adebamowo et al., 2006a) but we could not compare our results with international studies because we had not prepared a dried film of paint. In this paper, we present our analysis of the lead level in dried films of paints manufactured and sold in Nigeria for domestic use and compare these with paints sold in some Asian countries.

2. Methods

In June 2006, we purchased at least 5 different colors of the most popular brands (based on our market survey) of new glossy paints, manufactured and sold in Ibadan — a city of about 2 million people mostly engaged in agriculture and the services industry in South Western

Nigeria. To prepare each paint sample for analysis, we stirred the paint and applied it by brush to individual clean and unused wood blocks. Each stirring utensil and paintbrush was used only once. After drying by exposure to ambient environment, the blocks were packed in individual Ziploc® bags and shipped to the Hematology and Environmental Laboratory of the University of Cincinnati, Ohio where the paints were removed from pre-measured areas on the wood surfaces using clean sharp paint scraper and care so as not to remove portions of wood.

Paint scrapings were first extracted using nitric acid and hydrogen peroxide according to the method: Standard Operating Procedures for Lead in Paint by Hotplate or Microwave-based Acid Digestions and Atomic Absorption or Inductively Coupled Plasma Emission Spectroscopy, EPA, PB92-114172, September 1991. Extracts were analyzed by flame-atomic absorption spectroscopy using a Perkin-Elmer 5100 spectrometer. This laboratory is accredited by the American Industrial Hygiene Association as an industrial hygiene laboratory and as an environmental lead laboratory under the National Lead Laboratory Accreditation Program. Consequently, the laboratory participates in the Proficiency Analytical Testing (PAT) and Environmental Lead Proficiency Analytical Testing (ELPAT) proficiency programs. Strict quality control procedures are maintained according to the accreditation guidelines. The laboratory is also a recognized facility through the National Environmental Laboratory Accreditation Conference and participates in the New York proficiency program for environmental sample analytes including lead. We analyzed the data with MS Excel® and STATA 8.2® (STATA Corporation, College Station,

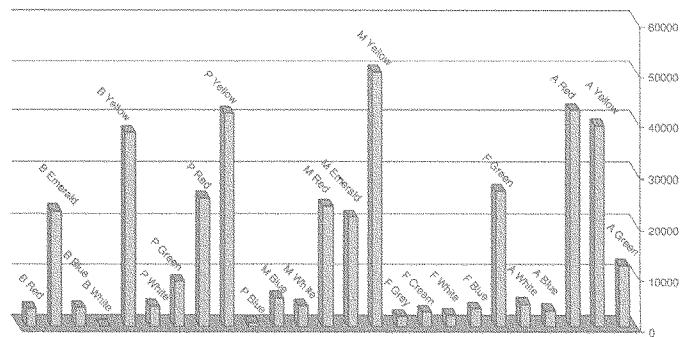


Fig. 1. Lead level in parts per million (ppm) in domestic paint in Nigeria according to manufacturers, Ibadan, 2006.

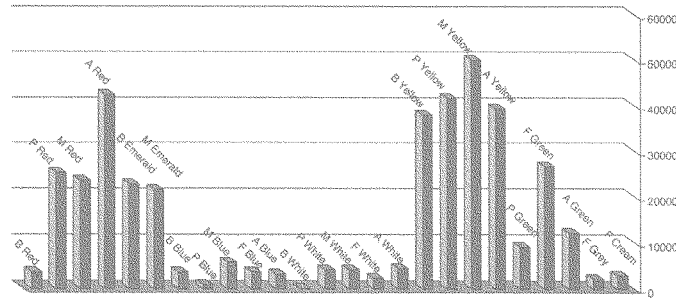


Fig. 2. Lead level in parts per million (ppm) in domestic paint in Nigeria according to color, Ibadan, 2006.

TX). We performed chi-squared nonparametric test of the equality of medians (Mann-Whitney) because of non-normality of distribution of the data. We set the level of statistical significance at 0.05.

3. Results

We analyzed paints of 5 different colors from 5 different manufacturers in Nigeria. Because some colors were not available from some of the manufacturers at the time of the market survey, we could not ensure that we obtained the same range of colors from all the manufacturers. Our analysis showed that 96% of the paints had higher than the recommended 600 parts per million [ppm] and the mean lead levels was 14,500 ppm while the median was 15,800 ppm. The lowest level was 84.8 ppm while the highest was 50,000 ppm. Only one out of the 25 samples (4.0%) had a level less than the

600 ppm recommended by the US EPA and Consumer Product and Safety Commission for new paint (Environmental Protection Agency, 2001; US Consumer Products Safety Commission, 1977).

Fig. 1 shows the lead levels of paint according to manufacturers. Pearson χ^2 for comparison of median lead level of paints was 2.56 with a *p*-value of 0.63. Fig. 2 shows the lead levels according to color of paint. Pearson χ^2 for comparison of median lead levels according to paint color was 22.0 with a *p*-value of 0.003 indicating that the main determinants of different lead levels were the colors. With regards to the manufacturer whose white paint had lead below the recommended level, other paint from the same manufacturer had high lead levels with a mean (SD) of 17,000 (16,600) ppm if the sample with low lead level was excluded.

We compared the lead level of paints in this analysis with published and unpublished data on the level of lead

Table 1
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	-	-	-

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in paints sold in 2004 in India, Singapore, China, Malaysia and India (Clark et al., 2006). As shown in Table 1, the level of lead in the paints sold in all these countries was high with the exception of Singapore. We also found that the level of lead varied with color. In general, yellow paint had the highest amount of lead in each country followed by red, green, blue and white. Even in Singapore where all except two of the paints tested had lead below the recommended level, the highest mean amount of lead was found in yellow paint. Furthermore, the median lead level of Nigerian paints did not substantially differ from those of these Asian countries (15,800 ppm compared to 16,500 ppm; *p*-value 0.16) (Clark et al., 2006). The highest lead level found in Nigeria was in yellow paint with 50,000 ppm of lead compared to 187,000 ppm found in the Indian yellow paint sample which was the highest found in Asia. While 96% of Nigerian paints had lead levels above 600 ppm, only 78% of Asian paints were above this level. Furthermore, 52% of Nigerian paints had lead levels above 5000 ppm compared to 66% of Asian paints.

4. Discussion

This is the first report of an examination of the lead levels in new paint in Africa and we found almost all the paints tested had lead above the recommended level. We also found that while these levels varied significantly by color — with the highest levels occurring in bright colorful paints like yellow, red and green, they did not vary by manufacturer suggesting that all manufacturers were producing paint with above recommended lead levels and the main determinant of varying lead level was use of lead pigments to enhance colors in paint.

The health hazards of exposure to lead in the domestic environment have been understudied in developing countries though its importance as a source of morbidity is widely recognized (Nriagu et al., 1996). Previous studies in Nigeria have shown that over 70% of children have lead above 10 µg/dL and that flaking paint was an important determinant of this (Pfitzner et al., 2000; Wright et al., 2005). Lead exposure is associated with a wide variety of effects (Agency for Toxic Substances and Diseases Registry, 1999). Recent studies show that even once thought safe blood lead levels are associated with increased risk of death from many causes (Menke et al., 2006). Adults tend to be exposed to lead through occupations and inhalation of fumes from combustion of leaded petrol, children are less likely to be exposed in this manner because they are not yet members of the workforce. Exposure to lead in the

domestic environment is therefore a particular hazard for them.

Many countries have legislation setting the permissible limits of lead in domestic paints but these are often poorly enforced. Comparison of our data with that of some countries in Asia (India, Malaysia and China) show similarly high levels of lead in the paint sold in these countries while paint sold in a developed Asian country — Singapore — where regulations are enforced generally contained lower or no lead levels (Clark et al., 2006). Recent economic recovery in Nigeria may lead to increased activity in the building industry and Nigeria like other African countries is increasing trade with Asia, particularly with China. It is therefore important that an international regulatory regime should be in place to supplement local efforts to ensure that paints have lower than recommended lead levels, with the ultimate goal of eventually eliminating all lead from paint. Increasing globalization and outsourcing of manufacturing increases the likelihood that products with higher than permissible levels of lead may be traded across borders into countries with effective regulation of local paint industry (Anon, 2007). One of the brands of paint tested in Nigeria is manufactured by a corporation that also produces paint in Asia. While its brand in Nigeria and India contained high levels of lead, the brand sold in Singapore did not.

Lead in paints can be replaced by the use of other additives such as titanium dioxide or barium sulfate and their durability can be improved by adding silicon or aluminum oxides. The increase in cost resulting from these is relatively small and cannot be compared with the human cost of continued exposure to lead. In a recent report from South Africa, 20% of the houses tested had at least one surface containing a hazardous level of lead (Mathee et al., 2003). High lead levels have recently been reported in new residential paints sold in China, India and Malaysia but not in a nearby country with an enforced lead regulation (Singapore) (Clark et al., 2006). Previously, high lead levels had been reported in new paints in India (Clark et al., 2005; Van Alphen, 1999).

Our cross country analysis of lead content of paint also show that in all countries, paints of the color yellow, red and green were most likely to contain the highest lead levels — even in countries with lead content within permissible levels while colors like white and blue have generally lower lead contents. Banning the sale of leaded paints is clearly an immediately achievable public health goal that will benefit the present and future generations of children and adults. This is made more urgent by studies that show that there is no safe lead

level (Canfield et al., 2003; Lanphear et al., 2000). In the interim, the use of bright colors such as yellow, red and green should be avoided by consumers in these countries because of the high risk that they contain non-permissible levels of lead.

5. Conclusion

There is a need to increase awareness of the harmful effects of lead in the domestic environment, in household paints, similar to what has been done for leaded petrol (Adebamowo et al., 2006b,c; Thomas et al., 1999). A public health agenda leading to elimination of lead in paint should be formulated and systematically prosecuted (Clark et al., 2006). There is an urgent need to determine the extent of leaded paints in existing housing stock in Nigeria and other developing countries, its effect on children's blood lead levels, and to develop programs to reduce the risk of exposure.

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Validation of a 20-year forecast of US childhood lead poisoning: Updated prospects for 2010

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Available online 28 February 2006**Abstract**

We forecast childhood lead poisoning and residential lead paint hazard prevalence for 1990–2010, based on a previously unvalidated model that combines national blood lead data with three different housing data sets. The housing data sets, which describe trends in housing demolition, rehabilitation, window replacement, and lead paint, are the American Housing Survey, the Residential Energy Consumption Survey, and the National Lead Paint Survey. Blood lead data are principally from the National Health and Nutrition Examination Survey. New data now make it possible to validate the midpoint of the forecast time period. For the year 2000, the model predicted 23.3 million pre-1960 housing units with lead paint hazards, compared to an empirical HUD estimate of 20.6 million units. Further, the model predicted 498,000 children with elevated blood lead levels (EBL) in 2000, compared to a CDC empirical estimate of 434,000. The model predictions were well within 95% confidence intervals of empirical estimates for both residential lead paint hazard and blood lead outcome measures. The model shows that window replacement explains a large part of the dramatic reduction in lead poisoning that occurred from 1990 to 2000. Here, the construction of the model is described and updated through 2010 using new data. Further declines in childhood lead poisoning are achievable, but the goal of eliminating children's blood lead levels $\geq 10 \mu\text{g/dL}$ by 2010 is unlikely to be achieved without additional action. A window replacement policy will yield multiple benefits of lead poisoning prevention, increased home energy efficiency, decreased power plant emissions, improved housing affordability, and other previously unrecognized benefits. Finally, combining housing and health data could be applied to forecasting other housing-related diseases and injuries.

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Keywords: Lead; Lead paint; Childhood lead poisoning; Housing; Healthy housing; Forecast methodology; Windows; Energy conservation; Health care; Policy

1. Introduction

It is well established that children under age 6 are especially vulnerable to lead exposure because their nervous systems are still developing (National Academy

of Sciences, 1993). While elevated blood lead levels (EBL) $\geq 10 \mu\text{g/dL}$ are clearly associated with harmful effects on children's learning and behavior, there is currently no lower threshold for some of the observed adverse effects of lead in children (US Centers for Disease Control and Prevention, 1991, 1997). Childhood blood lead levels below $10 \mu\text{g/dL}$ have been associated with intellectual impairment (Canfield et al., 2003). In addition, there are data suggesting that early childhood lead exposure may be associated with delinquent and criminal behavior among juveniles and young adults (Denno, 1990; Dietrich et al., 2001; Needleman et al., 1996; Nevin, 2000), although no clear dose–response relationship has been established for this effect.

The two main sources of childhood lead exposure in the United States during the 20th century were leaded gasoline

Abbreviations: AHS, American housing survey; CDC, Centers for Disease Control and Prevention; EBL, Elevated blood lead (childhood blood lead $\geq 10 \mu\text{g/dL}$); EPA, US Environmental Protection Agency; HUD, US Department of Housing and Urban Development; HR, High-risk housing; LR, low-risk housing; NHANES, National Health and Nutrition Examination Survey; NLPSP, National Lead Paint Survey (1990); NSLAH, National Survey of Lead and Allergens in Housing (2000); PIR, poverty to income ratio; RECS, Residential Energy Consumption Survey

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and lead paint (Agency for Toxic Substances and Disease Registry, 1988; Clark et al., 1991; Jacobs, 1995). While lead poisoning can be caused by inhalation of airborne particulate lead, ingestion of lead paint chips, and occasionally other sources, the main childhood exposure pathway is from lead-contaminated dust that settles on horizontal surfaces, such as floors and window sills, and is then ingested via normal hand-to-mouth contact (Bornschein et al., 1987; Duggan and Inskip, 1985; Lanphear et al., 1995, 1998). Before leaded gasoline was banned, children were also exposed to dust lead from settling gasoline emissions. Older homes with interior lead paint are especially likely to have lead dust hazards if the lead paint has deteriorated (Jacobs et al., 2002), but lead dust hazards may also be created by lead paint on friction and impact surfaces, such as windows, and by home renovation that disturbs lead paint without appropriate dust containment and cleanup procedures (President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000).

1.1. Trends in childhood lead poisoning

The percentage of EBL children under age six fell from 88% during the Second (1976–1980) National Health and Nutrition Examination Survey (NHANES) to 9% during NHANES III phase 1 (1988–1991) (Pirkle et al., 1994). This decline revealed the public health impact of regulatory actions to remove lead from gasoline, new paint, and food and beverage can solder. But the 1988–1991 data showed that 1.7 million American children under age six still had EBLs. The sale of lead paint for residential use was banned in 1978, but a large body of research shows that lead paint hazards in older homes are now the most important remaining source of childhood lead exposure today (National Academy of Sciences, 1993; US Centers for Disease Control and Prevention, 1991, 1997; President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000). By statute, the term "lead-based paint hazard" includes deteriorated lead paint $\geq 1 \text{ mg/cm}^2$, as well as lead above certain levels in settled housedust and bare soil (US Environmental Protection Agency, 2001; US Department of Housing and Urban Development, 1999b).

EBL prevalence for American children under six declined to 4.4% during NHANES III phase 2 (1992–1994), but those same data showed an EBL prevalence of 16.4% among low-income children and 22% among African-American children living in houses built before 1946 (US Centers for Disease Control and Prevention, 1997). EBL prevalence for all children under age six fell further to 1.6% during the 1999–2002 NHANES (Brody et al., 2005). The ongoing decline in EBL prevalence is confirmed by CDC surveillance data (Meyer et al., 2003) that reflect blood lead tests for about 7–8% of children under age 6 in each year from 1997 to 2001 and account for a larger share of EBL children because surveillance programs target low-income areas

with older, substandard housing and higher EBL prevalence. Even within this at-risk population, EBL prevalence (as a percentage of children tested) declined from 7.66% in 1997 to 3.01% in 2001, although the disparity between low-income minority children and other children was still large (Meyer et al., 2003). Despite this progress, the 2000 national goal of eliminating blood lead levels in young children above 25 $\mu\text{g/dL}$ was not achieved (Meyer et al., 2003). In short, lead poisoning, primarily but not exclusively from lead paint hazards in housing, still remains a major childhood environmental disease in the United States.

1.2. Lead paint regulatory actions

In 1992, Congress passed Title X of the Housing and Community Development Act, also known as the Residential Lead Hazard Reduction Act (Public Law 101-550; 42 USC 4851 *et seq.*). Title X authorized new programs regarding public education, standardized inspection and hazard control procedures (US Department of Housing and Urban Development, 1995), required disclosure of known lead paint hazards in most pre-1978 housing, provided funding from the US Department of Housing and Urban Development (HUD) to eliminate lead paint hazards in privately owned low-income housing, and performed other actions. Furthermore, HUD implemented lead paint regulations and released technical guidelines on lead hazard identification and control in public and Indian housing in 1990, both of which likely spurred remedial action on the part of both housing agencies and private owners during that decade. Regulatory and other efforts by some state and local governments also accelerated during the 1990s (Guthrie and McLaine, 1999). In addition, Title X prescribed lead paint hazard control activities for all federally assisted housing (not only public and Indian housing), but HUD did not issue new regulations for federally assisted housing until 1999 (US Department of Housing and Urban Development, 1999b). While all these actions likely had a positive influence, the decline in childhood lead poisoning during the 1990s cannot be explained solely by regulatory changes in assisted housing, because such housing constitutes only a small fraction of the nation's housing stock.

In 2000, the federal government released the first interagency plan on childhood lead poisoning, under the auspices of the President's Task Force on Children's Environmental Health and Safety Risks (President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000). The plan included a forecast model for lead paint hazard and EBL prevalence for 1990–2010. The model is based on NHANES blood lead data combined with data on lead paint, housing demolition, window replacement, and household characteristics derived from three different housing data sets.

New data now validate the midpoint of the model forecast, with important implications for lead poisoning

prevention and for environmental health research. The model shows that a window replacement policy will yield multiple benefits, including lead poisoning prevention, increased home energy efficiency, and other benefits. (Energy-inefficient single-pane windows in older houses are especially likely to have lead paint on interior window surfaces and associated lead dust hazards.)

This paper explains how the model was constructed; compares the forecast with empirical estimates; updates the forecast using new housing data; presents new housing data confirming that single-pane window replacement explains a large part of the 1990–2000 reduction in lead poisoning; and examines broader implications for environmental health research. To our knowledge, this is the first time that important public health trends have been accurately anticipated based on analysis of housing data. Similar analytical methods hold promise for improving our understanding of the linkage between other housing conditions and adverse health outcomes.

2. Methods and data sources

The forecast model was constructed in two main parts. The first calculated the changes in the number of housing units by year built (i.e., year of construction) and two categories of lead paint hazard risk (“high” or “low”) for 1989–2010. The second part of the model linked that housing risk forecast to NHANES data to calculate the number of EBL children in each year from 1993 to 2010.

The model was first constructed in 1999. At that time, the most recent data on EBL prevalence and residential lead paint hazards were from 1992 to 1994 NHANES III (Pirkle et al., 1994) and the 1989–1990 National Lead Paint Survey (NLPS) (US Department of Housing and Urban Development, 1990), respectively. The model combined these data with housing demolition and window replacement rates derived from the 1989–1997 (five biennial) American Housing Surveys (AHS) (US Bureau of the Census and US Department of Housing and Urban Development, 2000) and the 1993 Residential Energy Consumption Survey (RECS) (US Department of Energy, Energy Information Administration, 1995).

The demolition of older houses reduces lead paint hazards and EBL prevalence because lead paint was widely used on interior and exterior surfaces and demolition eliminates such surfaces. NLPS and RECS data also showed that window replacement is a good indicator of housing rehabilitation that is likely to remove lead paint and the most severe lead dust hazards. For example, NLPS data showed that 17% of pre-1940 units had no interior lead paint in 1989 (US Department of Housing and Urban Development, 1990), and RECS data showed that 13% of pre-1940 units had all windows replaced prior to 1990 (US Department of Energy, Energy Information Administration, 1995). This suggests that most pre-1940 units without any interior lead paint in 1989 had probably removed interior lead paint through substantial rehabilitation including window replacement.

In addition to serving as an indicator of extensive rehabilitation and ongoing property maintenance, window replacement was also directly linked to reducing lead paint hazards. The NLPS showed that windows were the housing component with the highest levels of lead dust (US Department of Housing and Urban Development, 1990). Lead dust on horizontal window surfaces is also significantly correlated with children's blood lead levels (Lanphear et al., 1995). The national evaluation of the HUD lead hazard reduction grant program, a longitudinal study involving over 3000 dwellings in a dozen jurisdictions, also showed that window replacement is a common and effective hazard control strategy adopted by many local governments (National Center for Healthy Housing and University of Cincinnati Department of Environmental Health, 2004).

The effectiveness of window replacement in controlling lead dust hazards was well established when the model was developed (US Department of Housing and Urban Development and Office of Lead Hazard Control, 1999a). Preintervention median dust lead loadings in rooms treated with paint stabilization and window replacement were 60% higher than in rooms treated with paint stabilization and window repairs, and over three times higher than median dust lead loadings in rooms treated only with paint stabilization. Rooms that underwent window replacement had postintervention dust lead loadings that were significantly lower than dust lead loadings in rooms where window lead paint was only repaired. Rooms that underwent window replacement also had dust lead loadings significantly lower than the dust lead loadings in rooms with just paint stabilization 1 yr after intervention (US Department of Housing and Urban Development, 1999a). More recent data show dust lead loadings in units with window replacement 3 years after intervention (National Center for Healthy Housing and University of Cincinnati Department of Environmental Health, 2004) and 6 years after intervention (Wilson et al., accepted for publication) were significantly lower than in units without window replacement.

2.1. Definitions of high- and low-risk housing

Units with interior lead paint in 1989 were forecast to follow one of three paths that would determine the risk of those units having lead paint hazards through 2010. Some would undergo window replacement and ongoing property maintenance, resulting in a relatively low risk of lead paint hazards. Other units with interior lead paint would be demolished. The third path was that the units would remain occupied without window replacement, resulting in a relatively high risk of lead paint hazards over the 20-yr forecast horizon.

The term “high risk” used here should not be confused with the regulatory definition of lead paint hazards. Lead paint hazards are identified at a given housing unit at the time of its risk assessment, whereas the model forecast the risk of such hazards over a 20-yr time horizon. Intact interior lead paint, by itself, does not constitute a lead paint hazard from a regulatory standpoint. But the model defined high risk units in 1989 to include all units with interior lead paint, whether intact or deteriorated, because houses with interior lead paint had a higher risk of developing lead paint hazards (including lead dust hazards) over the 20-yr forecast horizon. Similarly, the term “low risk”, as used in this model, does not necessarily mean that there is no risk; instead, it simply means that such units posed comparatively less risk than the high-risk units.

Because interior lead paint, window replacement, and demolition are all more common in older housing, the model used four housing age categories to further define risk: pre-1940, 1940–1959, 1960–1974, and post-1974. AHS data were available for each of these categories and similar housing age categories were available for NLPS and NHANES data. NHANES provided EBL prevalence data in pre-1946, 1946–1973, and post-1973 housing. The model assumed that EBL data for pre-1946 housing were representative of all pre-1940 units, because very little housing was built from 1940 to 1945 during World War II. Blood lead data for 1946–1973 housing were used to characterize EBL prevalence in 1940–1974 housing, because the two time spans are similar. NLPS data on lead paint and lead paint hazards were available for pre-1940, 1940–1959, and 1960–1977 housing. The model used the 1960–1977 NLPS data to characterize 1960–1974 housing, due to the similarity of time spans. Finally, all post-1974 housing was defined as low risk, because comparatively little lead paint was sold in the last years before it was banned in 1978 (Nevin, 2000) after initial efforts to ban lead paint for residential use began in 1971 (US Consumer Product Safety Commission, 1977). We have chosen to use the term “low-risk” for this category of housing, because there may still be some potential for exposure due to informal retailing and sale of existing lead paint stocks from store shelves following the 1978 ban on new production of residential lead-based paint.

The 1993 RECS provided data on the percentage of housing units that had all windows replaced through 1993, but window replacement data were not collected in the 1997 (or 2001) RECS. The 1995 and 1997 AHS

reported the number of units with windows and doors replaced from 1994 to 1997 and the dollar amount spent on each upgrade, but the AHS did not collect equivalent data before 1995. Therefore, the model combined RECS and AHS data to estimate the percentage of high-risk units that had most or all of their windows replaced in any given year.

2.2. Definitions of household categories for EBL forecast

The second part of the model linked the housing risk forecast with 1992–1994 NHANES data and 1997 AHS data on family income and the number of children under age 6 per occupied unit. Temporal changes in the number of EBL children were calculated for households characterized by family income, housing risk, and housing age. AHS data on family poverty-to-income ratio (PIR below 1.3) were used to characterize family income because that threshold is consistent with the NHANES data and roughly consistent with many HUD assistance programs. PIR is defined as household income divided by the level of income needed to meet the federal definition of poverty. For this model, a PIR greater than 1.3 means that a household had an income that was more than 130% of the poverty level. A decline in EBL prevalence within each housing category was forecast based on the overall decline in the percentage of housing characterized as high risk. The number of EBL children each year was then forecast for 14 different household categories (for PIR above and below 1.3 in each of seven housing risk/age categories).

2.3. Housing risk forecast

Table 1 shows the model forecast for selected years from 1989 to 2000 in seven distinct categories of housing: 3 year-built categories of high-risk (HR) housing units and 4 year-built categories of low-risk units. The parameters used to forecast changes in housing risk were the annual rates of window replacement (W) and demolition (D) in pre-1975 housing and net growth (construction minus demolition) in post-1974 housing.

NLPS data on units with and without interior lead paint were used to calculate the number of pre-1975 high- and low-risk units, respectively, in 1989. AHS data were used to estimate the total number of post-1974 units. The forecast increase in post-1974 housing units reflects a constant net growth (new construction minus demolition) of 3.7% per year, which is the average of 1989–1997 AHS data. The forecast decline in pre-1975 high-risk housing is due to the combined effects of demolition and window replacement. A forecast increase in pre-1975 low-risk housing reflected low-risk unit demolition that is more than offset by an increase in low-risk

units due to window replacement in high-risk units, because window replacement moves high-risk units into the low-risk category.

The equations and definitions used to generate Table 1 are as follows:

$$\begin{aligned} & \text{1989 high-risk (HR) units} \\ & = \text{Pre-1975 units with interior lead paint (from HUD 1990),} \end{aligned} \quad (1)$$

$$\begin{aligned} & \text{1989 low risk (LR) units} \\ & = \text{Pre-75 units without interior lead paint (from HUD 1990)} \\ & \quad + \text{post-74 units (from AHS).} \end{aligned} \quad (2)$$

For each year after 1989 (separate calculation by year built):

$$\begin{aligned} & \text{HR housing in Year}_{t+1} \\ & = \text{HR housing in Year}_t - D_{HR} - W_{HR}; \text{ where} \end{aligned} \quad (3)$$

$$\begin{aligned} D_{HR} & = (\text{high risk demolition rate, } D\%) \\ & \quad \times (\text{HR housing in Year}_t), \end{aligned} \quad (4)$$

$$\begin{aligned} W_{HR} & = (\text{high risk window replacement rate, } W\%) \\ & \quad \times (\text{HR housing in year}_t). \end{aligned} \quad (5)$$

$$\begin{aligned} & \text{Pre-1975 LR housing in Year}_{t+1} \\ & = \text{LR housing in Year}_t - D_{LR} + W_{HR}; \text{ where} \end{aligned} \quad (6)$$

$$\begin{aligned} D_{LR} & = (\text{low-risk demolition rate, } D\%) \\ & \quad \times (\text{LR housing in year}_t), \end{aligned} \quad (7)$$

$$\begin{aligned} W_{HR} & = \text{high-risk window replacement} \\ & \quad \text{units, calculated above for same age of housing.} \end{aligned} \quad (8)$$

$$\begin{aligned} & \text{Post-74 housing in year}_{t+1} \\ & = 1.037 \times (\text{post-74 housing in year}_t). \end{aligned} \quad (9)$$

2.4. Demolition rates by housing risk category

The model used a demolition rate for all low-risk housing of 0.4% per year, regardless of year built, which is slightly below the average 0.5% demolition rate reported by 1989–1997 AHS data for all 1960–1974 units. This slightly lower rate was used because many of these low-risk units had been substantially rehabilitated. Demolition rates for each age category of high-risk units were then calculated using a weighted average of high- and

Table 1
High- and low-risk housing forecast through 2000

	Annual rate of change			Housing units (millions)					
	Window replacement %	Demolition %	Total %	1989	1993	1994	1999	2000	
High-risk units									
(year of construction)									
Pre-1940	-1.85	-0.95	-2.80	17.3	15.4	15.0	13.0	12.6	
1940–1959	-1.85	-0.80	-2.65	14.4	13.0	12.6	11.0	10.7	
1960–1974	-1.50	-0.60	-2.10	12.5	11.5	11.2	10.1	9.9	
Total high-risk units				44.2	39.9	38.8	34.1	33.2	
Low-risk units									
Pre-1940		-0.4		3.5	4.7	5.0	6.2	6.4	
1940–1959		-0.4		6.5	7.4	7.6	8.6	8.7	
1960–1974		-0.4		13.0	13.5	13.6	14.2	14.3	
Post-1974		+3.7 (net)		26.5	30.7	31.8	30.7	31.8	
Total low-risk units				49.5	56.3	58.0	67.1	69.0	
Percentage high-risk				47.2%	41.5%	40.1%	33.7%	32.5%	

Table 2
Derivation of high- and low-risk demolition rates

HR% = 1989 high-risk percentage of all housing, by age of housing
 LR% = 1989 low-risk percentage of all housing, by age of housing (= 1-HR%)
 D%-All = Overall demolition rate, by age of housing
 $D\%_{All} = (HR\% \times D\%_{HR}) + (LR\% \times D\%_{LR})$, where
 D%_{HR} = high-risk demolition rate, by age of housing
 D%_{LR} = low-risk demolition rate, by age of housing = 0.4%

1960–1974	1940–1959	Pre-1940
HR% = 49%	HR% = 69%	HR% = 83%
LR% = 51%	LR% = 31%	LR% = 17%
D%-All = 0.5%	D%-All = 0.68%	D%-All = 0.86%
D% _{LR} = 0.4%	D% _{LR} = 0.4%	D% _{LR} = 0.4%
$(0.49 \times D\%_{HR}) + (0.51 \times 0.4) = 0.5$	$(0.69 \times D\%_{HR}) + (0.31 \times 0.4) = 0.68$	$(0.83 \times D\%_{HR}) + (0.17 \times 0.4) = 0.86$
Therefore, D% _{HR} = 0.6%	Therefore, D% _{HR} = 0.8%	Therefore, D% _{HR} = 0.95%

Table 3
Derivation of window replacement rates in high- and low-risk housing

HR% = 1989 high-risk percentage of all housing, by age of housing
 LR% = 1989 low-risk percent of all housing, by age of housing (= 1-HR%)
 W%-All = Overall window replacement rate, by age of housing
 $W\%_{All} = (HR\% \times W\%_{HR}) + (LR\% \times W\%_{LR})$, where
 W%_{HR} = high-risk window replacement rate, by age of housing
 W%_{LR} = low-risk window replacement rate, by age of housing

1960–1974	1940–1959	Pre-1940
HR% = 49%	HR% = 69%	HR% = 83%
LR% = 51%	LR% = 31%	LR% = 17%
W%-All = 1.25%	W%-All = 1.6%	W%-All = 1.6%
W% _{LR} = 1.0%	W% _{LR} = 1.05%	W% _{LR} = 1.85%
$(0.49 \times W\%_{HR}) + (0.51 \times 1.0) = 1.25$	$(0.69 \times W\%_{HR}) + (0.31 \times 1.05) = 1.6$	$(0.83 \times W\%_{HR}) + (0.17 \times 0.4) = 1.6$
Therefore, W% _{HR} = 1.5%	Therefore, W% _{HR} = 1.85%	Therefore, W% _{LR} = 0.40%

low-risk demolition rates, such that the overall demolition rate equated the rate provided in the AHS. Table 2 shows the weighted average calculations used.

2.5. Window replacement rates by housing risk

RECS and AHS data showed that the window replacement rate during the 1990s was 1% per year in units built during the 1970s (President's Task Force on Environmental Health Risks and Safety Risks to Children, 2000). The model applied this 1% replacement rate to all low-risk 1960–1974 housing. The window replacement rate in low-risk 1940–1959 housing was assumed to be 1.05% (slightly above the rate for 1970s housing), and the model also assumed that the window replacement rate would be similar in all high-risk pre-1960 units. These assumptions were combined with overall window replacement rates from the AHS and RECS data to calculate low- and high-risk rates, by age of construction, where the weight for high-risk housing was the "1989 high-risk %" value, by age of housing. Table 3 shows the weighted average calculations used to derive window replacement rates, by year built, for high- and low-risk housing.

Only the high-risk window replacement rates derived from this analysis were used in further analysis, because window replacement in low-risk units would not change the assignment to the low-risk category.

2.6. Forecast for EBL children

Table 4 shows the 1992–1994 NHANES data on EBL prevalence by age of housing and PIR.

The model combined these NHANES estimates with the housing risk forecast to develop EBL prevalence estimates by age of housing, PIR, and housing risk category. This analysis assumed that EBL prevalence in pre-1974 low-risk units is equal to the EBL prevalence in post-1974 units. NHANES EBL prevalence estimates for pre-1974 housing reflect a weighted average of the prevalence in low- and high-risk housing, where the weights reflect the percentage of housing in each year-built category that was characterized as high-risk housing in 1994. The weighting factors were derived as follows:

Pre-1940 HR% = 75% (15 million out of 20 million units), (10)

Pre-1940 LR% = (1 - Pre-1940 HR%) = 25%, (11)

1940–1974 HR% = 53% (24 million out of 45 million units), (12)

1940–1974 LR% = (1 - 1940–1974 HR%) = 47%. (13)

These weighting factors were used to derive EBL prevalence estimates for distinct EBL risk categories, characterized by family PIR, age of housing, and housing risk, defined as follows:

- X1 = EBL prevalence for children with PIR under 1.3 in low-risk housing = 4.33%, (14)
- X2 = EBL prevalence for children with PIR above 1.3 in low-risk housing = 0.22%, (15)
- X3 = EBL prevalence for children with PIR under 1.3 in high-risk pre-40 housing, (16)
- X4 = EBL prevalence for children with PIR above 1.3 in high-risk pre-40 housing, (17)
- X5 = EBL prevalence for children with PIR under 1.3 in high-risk 1940–74 housing, (18)
- X6 = EBL prevalence for children with PIR above 1.3 in high-risk 1940–74 housing, (19)
- X7 = EBL prevalence for children with PIR under 1.3 in all pre-40 housing = 16.37%, (20)
- X8 = EBL prevalence for children with PIR above 1.3 in all pre-40 housing = 3.19%, (21)
- X9 = EBL prevalence for children with PIR under 1.3 in all 1940–1974 housing = 7.25%, (22)
- X10 = EBL prevalence for children with PIR above 1.3 in all 1940–1974 housing = 2.24%. (23)

The values for X1 (4.33%) and X2 (0.22%) reflect NHANES data for post-1973 housing, and values for X3–X6 were derived from the

NHANES data for X7–X10 as follows:

$$\begin{aligned} \text{Pre-1940 LR}\% \times X1 + \text{Pre-1940 HR}\% \times X3 &= X7 \\ \Rightarrow 0.25 \times 4.33 + 0.75 \times X3 &= 16.37 \\ \Rightarrow X3 &= (16.37 - (0.25 \times 4.33))/0.75 = 20.38\%, \end{aligned} \quad (24)$$

$$\begin{aligned} \text{Pre-1940 LR}\% \times X2 + \text{Pre-1940 HR}\% \times X4 &= X8 \\ \Rightarrow 0.25 \times 0.22 + 0.75 \times X4 &= 3.19 = X8 \\ \Rightarrow X4 &= (3.19 - (0.25 \times 0.22))/0.75 = 4.18\%, \end{aligned} \quad (25)$$

$$\begin{aligned} 1940-1974 \text{ LR}\% \times X1 + 1940-1974 \text{ HR}\% \times X5 &= X9 \\ \Rightarrow 0.47 \times 4.33 + 0.53 \times X5 &= 7.25 \\ \Rightarrow X5 &= (7.25 - (0.47 \times 4.33))/0.53 = 9.84\%, \end{aligned} \quad (26)$$

$$\begin{aligned} 1940-1974 \text{ LR}\% \times X2 + 1940-1974 \text{ HR}\% \times X6 &= X10 \\ \Rightarrow 0.47 \times 0.22 + 0.53 \times X6 &= 2.24 \\ \Rightarrow X6 &= (2.24 - (0.47 \times 0.22))/0.53 = 4.00\%. \end{aligned} \quad (27)$$

These calculations indicate an EBL prevalence of about 4% for children with PIR below 1.3 in low-risk housing (X1) and for children with PIR above 1.3 in high-risk housing (X4 and X6). The EBL prevalence for children with PIR above 1.3 in low-risk housing is only 0.22%. The EBL prevalence is much higher for children with PIR below 1.3 in high-risk housing: 20.38% for children in pre-40 housing and 9.84% for children in 1940–1974 housing.

Table 5 illustrates how the second part of the model linked the housing risk forecast with the EBL prevalence estimates by family PIR, age of housing, and housing risk to forecast 1993–2000 changes in EBL prevalence for young children in six household categories. The EBL prevalence estimates derived above, from 1992 to 1994 NHANES data, were entered for 1993. EBL declines were then forecast based on the assumption that EBL prevalence (EBL%) within each of the six categories would decline at a rate proportionate to the decline in the percentage of all housing units characterized as high-risk in that category.

The equation used in Table 5 is as follows:

$$\text{EBL}\% \text{ in Year}_{t+1} = (\text{EBL}\% \text{ in Year}_t) \times (\text{HR}\% \text{ in Year}_{t+1} / \text{HR}\% \text{ in Year}_t), \quad (28)$$

where $\text{HR}\% \text{ in Year}_t = (\text{high-risk housing units in Year}_t) / (\text{all housing units in Year}_t)$ from Table 1 $\text{HR}\% \text{ in Year}_{t+1} = (\text{high-risk housing units in Year}_{t+1}) / (\text{all housing units in Year}_{t+1})$ from Table 1.

While the direct benefit of the decline in high-risk housing was reflected in the declining percentage of children living in high-risk units, the indirect benefit was reflected in the forecast decline in EBL prevalence within each housing risk category. This indirect benefit would reflect declining neighborhood lead paint hazards (e.g., deteriorating exterior lead paint) and reduced lead paint hazard exposure in other residential units visited by children (including units where child care is provided), both of which can increase the blood lead levels of children who have no lead paint in

Table 4
Prevalence of children under age 6 with blood lead levels $\geq 10 \mu\text{g}/\text{dL}$ by poverty to income ratio (PIR) and housing year of construction

	Pre-1946 (%)	1946–1973 (%)	Post-1973 (%)
PIR ≤ 1.3	16.37	7.25	4.33
PIR > 1.3	3.19	2.24	0.22

Table 5
Model forecast for prevalence of high-risk housing and childhood blood lead level $\geq 10 \mu\text{g}/\text{dL}$ for selected years between 1993 and 2000

	1993 (%)	1994 (%)	1999 (%)	2000 (%)
<i>Percent of housing that is high-risk (HR%)</i>				
Pre-1940	77	75	68	66
1940–1959	64	62	56	55
1960–1974	46	45	42	41
<i>Elevated blood lead prevalence (%) by housing age and poverty/income ratio</i>				
Poverty/income ratio > 1.3 , high risk, Pre-1940	4.19	4.1	3.4	3.3
Poverty/income ratio > 1.3 , high-risk, 1940–1974	3.96	3.8	3.2	3.1
Poverty/income ratio > 1.3 , low-risk	0.22	0.2	0.2	0.2
Poverty/income ratio < 1.3 , high-risk, Pre-1940	20.38	19.7	16.6	16.0
Poverty/income ratio < 1.3 , high-risk, 1940–1974	9.84	9.5	8.0	7.7
Poverty/income ratio < 1.3 , low-risk	4.33	4.2	3.5	3.4

Table 6
Model forecast for number of children <6 with blood lead levels $\geq 10 \mu\text{g}/\text{dL}$ by age of housing and poverty/income ratio (PIR)

Housing category	Number of children <6 per housing unit	Poverty/income ratio > 1.3 (%)	Year			
			1993	1994	1999	2000
			Thousands of children PIR > 1.3			
High-Risk pre-1940	0.214	67.0	89	85	64	60
1940–1959	0.216	66.0	71	68	51	48
1960–1974	0.199	67.3	64	60	44	41
Low-risk pre-1940	0.214	67.0	1	1	2	2
1940–1959	0.216	66.0	2	2	2	2
1960–1974	0.199	67.3	4	4	3	3
Post-1974	0.249	77.7	14	14	13	13
			Thousands of children PIR < 1.3			
High-risk pre-1940	0.214	33.0	313	278	152	143
1940–1959	0.216	34.0	104	96	65	61
1960–1974	0.199	32.7	88	81	53	50
Low risk pre-1940	0.214	33.0	20	19	15	15
1940–1959	0.216	34.0	26	25	22	22
1960–1974	0.199	32.7	45	43	32	31
Post-1974	0.249	22.3	82	80	75	75
All children <6 with blood lead levels $\geq 10 \mu\text{g}/\text{dL}$ (thousands)			925	857	593	565

Columns may not sum to totals due to rounding.

their own homes. This forecast methodology implicitly assumed that eliminating all high-risk housing would also end childhood EBL caused by exposure to lead paint hazards.

Table 6 illustrates how the model then combined the housing risk and EBL prevalence forecasts with AHS data on the average number of children under age six per unit and percentage with PIR above and below 1.3 (by age of housing) to forecast the number of EBL children in the 14 household categories, by housing risk, year built, and family income. The equations used in Table 6 are as follows:

$$\begin{aligned} \text{EBL children with PIR} < 1.3 \text{ in each of seven housing risk/age} \\ \text{categories} &= (\text{Forecast units, from Table 1}) \\ &\times (\text{Children} < 6 \text{ per unit}) \times (\% \text{ PIR} < 1.3) \times (\text{EBL}\%), \end{aligned} \quad (29)$$

$$\begin{aligned} \text{EBL children with PIR} > 1.3 \text{ in each of seven housing risk/age} \\ \text{categories} &= (\text{Forecast units, from Table 1}) \\ &\times (\text{Children} < 6 \text{ per unit}) \times (\% \text{ PIR} > 1.3) \times (\text{EBL}\%). \end{aligned} \quad (30)$$

To summarize, the forecast number of EBL children in each year was derived from the forecast number of housing units in each of the seven housing risk/age categories from Table 1; the forecast EBL prevalence for each of the six EBL risk categories in Table 5; and AHS data on the average number of children per housing unit and the percentage of children with PIR < 1.3 in each category. The total number of EBL children for each year was forecast by summing the 14 different household categories for children with PIR above and below 1.3 within each of the seven housing risk/age categories (Table 6).

3. Results

3.1. Validation of estimate of housing units with lead paint hazards

The model forecast a decline in high-risk housing from 44.2 million units in 1989 to 33.3 million in 2000, with

window replacement and demolition accounting for 70% and 30% of this decline, respectively. The model forecast an increase in low-risk units from 49.5 million units in 1989 to 69 million in 2000. Window replacement in high-risk units accounted for almost 75% of the growth in low-risk units and net growth in post-1974 units accounted for the remaining 25%. The decline in high-risk units and the growth in low-risk units had a combined effect of reducing the percentage of all housing characterized as high-risk from 47.2% in 1989 to 32.5% in 2000 (Table 1).

The NSLAH (completed in 2000) revealed that the initial model was especially accurate in anticipating the extent of lead paint hazards in pre-1960 units, but less accurate for 1960–1978 units (Table 7). This disparity likely is due to the much smaller sample size of the NLPS, which had only 284 housing units, while the 2000 NSLAH had 831 units. A comparison of NLPS and NSLAH data (Table 8) suggests that the percentage of pre-1940 homes with interior lead paint declined over the 1990s from 83% to 79%; the percentage of 1940–1959 homes with interior lead paint declined from 69% to 46%; and the percentage of 1960–1974 homes with interior lead paint fell from 49% to just 16%. The decline in the percentage of pre-1960 homes with interior lead paint could be explained largely by housing demolition and rehabilitation, but the large decline in 1960–1978 units with interior lead paint is more likely a reflection of estimation error in the NLPS.

The 1960–1978 data from the larger NSLAH sample are also more consistent with historical data on the sale of

Table 7
Comparison of forecast for high-risk housing in 2000 with empirical estimate of number of housing units with lead paint hazards by year of construction (millions of housing units)

	Pre-1940	1940–1959	1960–1974/1978
Model forecast for 2000	12.6	10.7	9.9
Empirical estimate for 1999–2000 (from Jacobs et al., 2002)	11.8	8.8	2.3
95% confidence interval for empirical estimate	10.0–13.6	6.7–10.9	1.4–3.2

Table 8
Percentage of housing units with interior lead paint 1990–2000

	Pre-1940 (%)	1940–1959 (%)	1960–1978 (%)
1990 percentage of housing units with interior lead paint	83	69	49
2000 percentage of housing units with interior lead paint	79	46	16

Table 9
Total weight of lead paint in housing and lead paint production by housing age of construction (thousands of tons)

	Pre-1940	1940–1959	1960–1978
Total lead in house paint	255	75	45
White lead produced for paint	843	128	33
Percent of historic white lead use	30%	59%	136%

white lead (lead carbonate), the most common form of lead used in the production of lead paint. The NLPS data showed that total lead remaining in paint in 1960–1978 housing in 1989 was 36% greater than the total amount of white lead used in paint from 1960 to 1980, which of course is highly unlikely (Table 9) (President's Task Force, 2000).

3.2. Validation of estimate of EBL children

At the time when the model was first completed (1999), the 1997 AHS had the most recent data available to calculate the number of children under age 6 per occupied unit and the percentage of children with PIR below 1.3 (both by year of construction). The forecast assumed that these values would remain constant through 2010. However, more recent 2001 AHS data show that both the average number of children per occupied unit and the percentage with PIR < 1.3 actually declined from 1997 to 2001 (Table 10).

Finally, Table 11 compares the original and updated model forecasts for EBL children with 1999–2000 NHANES data. The original model forecast 565,000 EBL children in 2000, based on 1997 AHS data. But using the more recent 2001 AHS data on children per unit and percentage with PIR < 1.3 yields a lower forecast of 498,000 EBL children in 2000. This revised forecast is more consistent with the NHANES mean estimate of 430,000 EBL children in 1999–2000.

Table 10
Trend in number of children per occupied housing unit and percentage with poverty/income ratio < 1.3 by housing age from 1997 to 2001

Housing age	Number of children < 6/unit		%Poverty/income ratio < 1.3	
	1997	2001	1997	2001
Pre-1940	0.214	0.204	33.0%	33.0%
1940–1959	0.216	0.207	34.0%	27.0%
1960–1974	0.199	0.180	32.7%	28.5%
Post-1974	0.249	0.227	22.3%	17.4%

3.3. Lead dust and lead paint on interior window surfaces

In 2000, lead dust hazards (the most common pathway of childhood lead exposure) were present in 61% of homes with deteriorated interior lead paint; 33% of homes with interior lead paint in good condition; and only 6% of homes with no interior lead paint (Jacobs et al., 2002). NSLAH data also confirm the NLPS finding that windows are the housing component where lead paint is most likely to be found. To better characterize the relationship between lead dust hazards and lead paint on windows, NSLAH data for pre-1978 homes were divided into five distinct categories related to deteriorated interior lead paint:

1. Deteriorated interior lead paint *only* on window surfaces.
2. Deteriorated interior lead paint *only* on nonwindow surfaces.
3. Deteriorated interior lead paint on window *and* non-window surfaces.
4. *No* deteriorated interior lead paint, but lead paint on interior window surfaces.
5. *No* deteriorated interior lead paint, *and* no lead paint on interior window surfaces.

Table 11
Original and revised 2000 forecast for children with blood lead levels $\geq 10 \mu\text{g}/\text{dL}$ compared to empirical estimate, by poverty/income ratio and housing category

Housing category	Original forecast for 2000 (thousands of children)			Revised forecast for 2000 (thousands of children)		
	Poverty/income ratio < 1.3	Poverty/income ratio > 1.3	Total	Poverty/income ratio < 1.3	Poverty/income ratio > 1.3	Total
High-risk: Pre-1940	143	60	203	136	57	193
1940–1959	61	48	109	46	50	97
1960–1974	50	41	91	39	40	79
High risk: total	253	148	402	222	147	369
Low-risk Pre-1940	15	2	17	15	2	16
1940–1959	22	2	24	17	2	19
1960–1974	31	3	35	25	3	28
Post-1974	75	13	88	53	13	66
Low-risk: total	143	20	164	109	20	129
Total	397	169	565	331	167	498
1999–2000 empirical Estimate (from National Health and Nutrition Examination Survey (NHANES), Meyer et al., 2003)				434		
1999–2000 empirical estimate, 95% CI				189–846		

Columns may not sum to totals due to rounding error.

Table 12
Window sill dust lead and interior lead paint condition

	Housing units with dust lead hazards		Median windowsill dust lead loading ($\mu\text{g}/\text{ft}^2$ in units with dust hazards)
	Number (millions)	Prevalence (row %)	
<i>Housing units with deteriorated interior lead paint</i>			
On windows and other interior surfaces	1.0	78	924
Only on windows	2.4	58	926
Only on interior surfaces other than windows	1.5	52	889
<i>Homes without deteriorated interior lead paint</i>			
With intact lead paint on interior window surfaces	4.7	40	725
Without intact lead paint on interior window surfaces	5.4	12	360

Within each of these categories, the prevalence of lead dust hazards and the median interior windowsill lead dust loading in units with dust hazards were calculated (Table 12). These data provide several insights into why window replacement rates proved to be such an accurate way of predicting lead paint hazards, particularly in pre-1960 housing. First, about 70% of units with deteriorated interior lead paint have deteriorated lead paint on interior window surfaces (3.4 million out of 4.9 million). Indeed, half of these units have deteriorated interior lead paint *only* on window surfaces. Second, the prevalence and the severity (median lead loading) of dust lead hazards are greatest in units with deteriorated lead paint on interior window surfaces.

Table 12 also shows that the prevalence and the severity of dust lead hazards in houses with intact lead paint on

interior window surfaces and *no* deteriorated interior lead paint is almost as great as the prevalence and severity of lead dust hazards in units with deteriorated interior lead paint *only* on nonwindow surfaces. Furthermore, the total number of houses in this category with lead dust hazards (4.7 million) is almost as great as the number of homes with dust hazards that can be explained by deteriorated interior lead paint.

Finally, Table 12 shows that homes with *no* deteriorated interior lead paint and *no* lead paint on interior window surfaces actually account for about one-third of all units with lead dust hazards. But the prevalence of dust hazards in this category is much lower (12%), and the median lead dust loading on windowsills in these units ($360 \mu\text{g}/\text{ft}^2$) is substantially lower. Dust lead hazards in these units could come from exterior lead paint, prior renovation work that

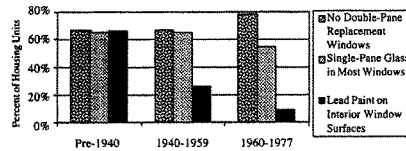


Fig. 1. Single-pane windows vs. lead paint on interior window surfaces.

removed lead paint without adequate cleanup, and/or track-in from lead-contaminated soil or other exterior sources. (Houses with *no* deteriorated interior lead paint and *no* lead paint on interior window surfaces were characterized as low-risk houses in the Task Force model, with a low EBL prevalence that is consistent with relatively low dust lead loadings.)

3.4. Single-pane windows and windows with interior lead paint

Fig. 1 shows that single-pane windows in older homes are an indicator of lead paint on interior window surfaces (and thus an indicator of higher dust lead hazard prevalence and severity).

The NSLAH data show that about two-thirds of pre-1940 homes, 25% of 1940–1959 homes, and 10% of 1960–1977 homes have lead paint (intact or deteriorated) on interior window surfaces. The RECS and AHS data show that about two-thirds of pre-1960 homes had single-pane glass in most windows and *no* double-pane replacement windows at the time of the 1998–2000 NSLAH. Double-pane windows were not used in new home construction before 1960 (Fisette, 2003), so pre-1960 houses with double-pane glass in most windows have already had most or all original windows replaced. RECS data also show that almost all double-pane replacement windows were installed after the 1978 ban on lead paint (US Department of Energy, Energy Information Administration, 1995), so houses with double-pane windows are highly unlikely to have lead paint on interior window surfaces. Conversely, single-pane window replacement in older homes also effectively targets homes with lead paint on interior window surfaces. Lead paint was used on most original windows in pre-1940 construction, so almost all pre-1940 homes with single-pane windows today are also likely to have lead paint on interior window surfaces. Homes with lead paint on interior window surfaces also appear to account for about 40% of 1940–1959 homes with single-pane windows.

4. Discussion

Both the original and revised model forecasts are well within the 1999–2000 NHANES 95% confidence interval

Table 13
Percentage of nondisaster upgrade expenditures used for window replacement

	1997 American housing survey estimate (%)	2001 American housing survey estimate (%)
All assisted upgrades	9.1	13.3
Assisted upgrades in pre-1960 housing units	7.2	15.3
All unassisted upgrades	8.5	8.7
Unassisted upgrades in pre-1960 housing units	7.8	8.5

estimate of 189,000–846,000. Although this is a large confidence interval due to NHANES sample size limitations (n = approximately 800 children aged 1–6 yr), the model forecast trend is also consistent with blood lead surveillance data reported to the CDC (Meyer et al., 2003). The model forecast that the total number of EBL children would decline by 27.2% over these years, while the actual number of EBL children reported to CDC from surveillance data declined by 35.5% from 1997 to 2001 (Meyer et al., 2003), which is a reasonably good agreement between the model and the surveillance data.

In addition, AHS data for 2001 suggest that the overall window replacement rate in pre-1975 housing has increased substantially over the 1989–2000 replacement rates used in the original Task Force model (Table 13).

Fig. 2 shows that the model, updated to reflect the 2001 AHS data on children per unit and percentage below 130% of poverty, plus the 20% increase in window replacement rates for 2000–2010 (relative to 1989–2000 rates), now forecasts that market trends for window replacement and demolition alone would reduce the number of EBL children to 292,000 by 2010, not counting other efforts to reduce childhood lead exposure. The new HUD rule will also protect more children living in federally assisted housing, but 250,000 children would still be at risk by the end of the decade unless further action is taken. In addition, there could be other recent housing stock changes that would be expected to affect the 2010 forecast. For example, it is possible that the effect of Hurricane Katrina and other weather-related events will accelerate the rate of demolition and substantial rehabilitation of older housing, at least in some areas of the country. As we near 2010, updating the model with newer empirical estimates will be needed, underscoring the need for continued surveillance of both high-risk children and housing.

The validation of the Task Force model suggests that the additional action needed should include a “lead-safe window replacement” initiative, which would yield multiple benefits of childhood lead poisoning prevention, increased home energy efficiency, reduced air pollution and carbon emission caused by power plant emissions, and improved housing affordability (Nevin and Jacobs, 2006).

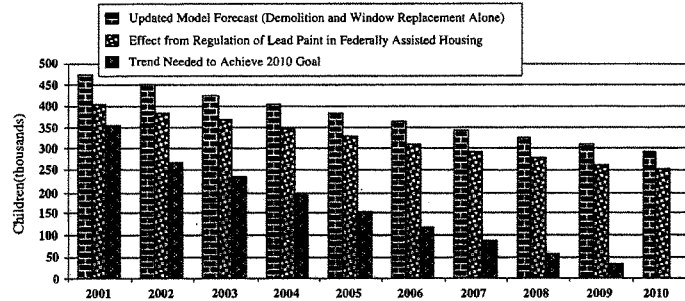


Fig. 2. Number of children with blood lead levels $\geq 10 \mu\text{g/dL}$ from 2000 to 2010.

Window replacement, combined with control of other lead-based paint hazards, has been shown to reduce both dust lead and children's blood lead levels (National Center for Healthy Housing and University of Cincinnati Department of Environmental Health, 2004). This relationship should be confirmed with additional research.

The validation of the Task Force model also suggests that a more systematic effort to combine housing and health interventions could further help protect the population from other diseases related in part to housing condition. Although home weatherization is sometimes associated with increased indoor air pollution and mold and moisture problems, occupants of properly weatherized homes report reduced incidence of colds, flu, allergies, headaches, and nausea, while a control group showed no change over the same period (Berry et al., 1997). A large randomized trial of housing insulation treatments in New Zealand showed significant improvements in children's days off school, adult's days off work, self-rated general health, reduced respiratory symptoms, and reduced visits to physician's offices and hospitals (Howden-Chapman et al., 2005). Some of these health benefits may be directly related to energy efficiency improvements that reduce drafts and improve temperature consistency, but weatherization programs also routinely repair combustion equipment and exhaust ventilation systems to reduce carbon monoxide poisoning risks and other health hazards. Leaking air ducts reduce home energy efficiency and also cause moisture problems, which are associated with mold-induced illness and the distribution of indoor air pollution throughout a home.

Substandard housing conditions have been linked to a large number of adverse health outcomes (Breyse et al., 2004; Jacobs, 2005; Krieger and Higgins, 2002; Matte and Jacobs, 2000). For example, dust mites, mold, cockroach, and other allergen-producing organisms in the home environment are triggers for asthma, especially in children. The specialized cleanup required to remove lead dust

hazards, such as using a high efficiency particulate air (HEPA) vacuum cleaner with wet cleaning, is similar to cleanup techniques used to reduce allergens in dust. Such cleaning, together with other coordinated housing and medical interventions, has achieved statistically significant improvements in asthma in a large inner-city cohort of children in seven cities (Morgan et al., 2004). Integrating these hazard reduction protocols could address both lead dust hazards and the most common triggers for asthma simultaneously.

Further research on the relationship between housing condition and health outcome is needed. One important research opportunity is to integrate housing and community data into the planned National Children's Study. For example, combining American Housing Survey data for the specific cities to be included in the study would be essential.

While the energy efficiency benefits of window replacement, duct sealing and other weatherization activities are well established (Nevin and Watson, 1998; Nevin et al., 1999), the related health benefits, especially those associated with chronic disease morbidity and mortality, are only beginning to be fully understood. The experience with lead poisoning, which clearly shows the benefits of housing-based health interventions, can serve as a model in addressing other housing-related health problems. Currently, housing-related health problems are largely ignored in housing markets and are not reflected in housing value and price. This contributes to inefficient cost shifting between housing and health care sectors of the economy, substandard housing and inadequate health care (Jacobs, 2005).

Better data on costs and market value impacts from these upgrades could also inform mortgage underwriters about default risks. If a lead-safe window replacement initiative were expanded to address other healthy home energy efficiency improvements, an evaluation that tracks costs, health benefits, energy savings, and other benefits from bundled home upgrade strategies would be essential.

in order to enable the market to properly value health investments in housing.

5. Conclusion

The 1999 model has now been validated with empirical estimates. Trends in housing demolition, window replacement, abatement, regulatory and other initiatives, and demographic patterns all help explain the dramatic reduction in childhood lead poisoning that occurred from 1990 to 2000. Yet without additional action, the nation is unlikely to meet its goal of eliminating childhood blood lead levels above 10 µg/dL, just as it failed to meet the 2000 goal of eliminating childhood blood lead levels above 25 µg/dL. The actions needed are well known, the disease is entirely preventable, and it has persisted for far too long. Furthermore, a focused window replacement policy can yield multiple benefits of lead poisoning prevention, home energy efficiency, reduced air pollution, improved housing affordability, and other benefits. Finally, modeling housing, demographic, and disease data holds great promise in recognizing, forecasting and preventing other housing-related diseases and injuries.

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Disclaimer: The findings and opinions expressed in this paper are those of the authors, not the US government. The authors declare they have competing financial interests.

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CLEARCORPS USA: LEAD IN CHILDREN'S JEWELRY

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CLEARCorps Minnesota Jewelry Investigation Results

ITEM TESTED	STORE NAME	Pb CONTENT RESULTS
Necklace	Claire's at Mall of America	4000 ppm
Vending machine item	Wal-Mart	1666 ppm
Vending machine item	Wal-Mart	7728 ppm
Amber Glow	Dollar Saver	11,000 ppm
Mood Ring	Dollar Saver	28,900 ppm
Necklace	Dollar Tree	1913 ppm
Vending Machine	Dollar Tree	1029 ppm
Square Charm	Park @ Mall of America	64,000 ppm
Clip Earrings	Dollar City	1700
Ring	Dollar City	5100 ppm
Necklace	Club Libby Lu	139,000
Vending Machine Item	Toys R Us	18,300 ppm
Fairy Dust	Wal-Mart	186,000 ppm
Sidewalk Chalk Holder	Target	2056 ppm
Dora the Explorer Purse	Sears	791 ppm
Charm Bracelet	Sears	1500 ppm
Necklace	JoAnn Fabric	1034 ppm
Mexican Pottery	Valerie's Carniceria	931,500 ppm
Charm	Herberger's	3700 ppm
Hello Kitty Bag	Target	1788 ppm
Bead Spacer	Michael's	6200 ppm
Panama Jack Jewelry	Wal-Mart	14,100 ppm
Panama Jack Jewelry	Wal-Mart	32,000 ppm
Bracelet	Rainbow Foods	32,800 ppm
Red Beaded Necklace	(Personal Item)	980 ppm

CLEARCorps New Jersey Jewelry Investigation Results

Charm Bracelet	Claire's	98400 ppm
Club Libby Lu Keychain	Libby Lu	65,800 ppm
'Diddl' keychain	Toys R Us	2,000 ppm
Emotions reversible necklace	Dollar Tree	23100 ppm
Flip Up butterfly clip on charm	Wal-Mart	19600 ppm
No Boundaries set of 3 pins	Wal-Mart	124700 ppm
No Boundaries charm bracelet	Wal-Mart	3100 ppm
Blue Moon Beads (shoe charm)	Rag Shop	32500 ppm
Diva 'High Maintenance' Keychain	Dollar Tree	34200 ppm
Divine Inspirations Bracelet	Dollar Tree	800 ppm
Happy Holidays Tree Earrings	Wal-Mart	48800 ppm
Jewelry charms (mug, rocking horse, carriage)	Rag Shop	12500 ppm
'Madly in Love' clip	Wal-Mart	5500 ppm

CLEARCorps Detroit Jewelry Investigation Results

Lock and Keys	Vending Machine	9100 ppm
Dressy Necklace	Target	1000 ppm
Claire's Club rigid bracelet (flowers)	Claire's	6500 ppm
Claire's Club 3 crystal rings	Claire's	34900 ppm
Claire's 18" soccer ball necklace	Claire's	1000 ppm
Fairy Dust Jewelry	Wal-Mart	74300 ppm
Sassy & chic glass bead bracelet		900 ppm
Personalized Bracelet "PRINCESS"		1700 ppm
SpongeBob mini mug	Vending machine	12500 ppm



April 17, 2006

Steve Johnson, Administrator
Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

Hal Stratton, Commissioner
U.S. Consumer Products Safety Commission
4330 East West Highway
Bethesda, MD 20814

Re: Citizen Petition to CPSC and EPA Regarding Lead in Consumer Products, Especially Toy Jewelry

Dear Commissioner Stratton and Administrator Johnson:

Enough is enough! In February of 2006, a Minnesota child died from lead poisoning after swallowing toy jewelry offered as a "bonus" to buyers of Reebok shoes.¹ This child's death follows a July 8, 2004 voluntary recall of 150 million metal toy jewelry items by four major importers pursuant to an agreement with the Consumer Products Safety Commission.² It also follows a severe case of lead poisoning from a toy necklace in that occurred in 2003. Both of these poisonings resulted from products that were distributed in violation of the CPSC's

¹ U.S. Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Dispatch, March 23, 2006 / 55(Dispatch);1-2

² U.S. Consumer Products Safety Commission, News from CPSC, "CPSC Announces Recall of Metal Toy Jewelry Sold in Vending Machines: Firms agree to stop importation until hazard is eliminated", originally issued July 8, 2004 and revised on March 1, 2006. See www.cpsc.gov/CPSCPUB/PREREL/prhtml04/04174.html.

December 22 1998 Codification of Guidance Policy on Lead in Consumer Products.³ These are not isolated incidents.⁴

The federal government has set a goal of eliminating childhood lead poisoning by 2010. Realizing that goal seems even more distant when we learn of a child dying of lead poisoning and ineffectual efforts by our federal government to prevent the child's death. For poor children and children of color, the implications are even more serious since they are likely to be exposed to dangerous levels of lead. These exposures continue to contribute to the health disparities that characterize lead poisoning.⁵ They represent an environmental injustice that must be resolved.

Environmental justice demands that all people live free of the dangers posed by lead. By threatening the health and survival of our children, lead exposure threatens our future generations. We have a responsibility to our future generations to be especially protective of their health and well being.

The current system is not working. CPSC has not fulfilled its responsibilities to the public. EPA and CPSC must take stronger action regarding lead in jewelry and other products which may be ingested by children. The Sierra Club believes that lead is unacceptable in products that children use. There has to be a better way!

Petition to U.S. Consumer Product Safety Commission:

In this letter, the Sierra Club petitions the Consumer Products Safety Commission pursuant to 5 U.S.C. § 553(e)⁶ to issue regulations to ban lead in all toy jewelry using its authorities under the Federal Hazardous Substances Act.⁷ Specifically, the Sierra Club asks the CPSC act with utmost speed to:

1. **Classify Toy Jewelry Containing Lead as Banned Hazardous Substance**
Adopt regulations declaring that any toy jewelry containing more than 0.06% lead by weight for which there is a reasonably foreseeable possibility that children could ingest be declared a banned hazardous substance pursuant to Section 2(q)(1)(B)⁸ and Section 3.

³ U.S. Consumer Products Safety Commission, "Codification of Guidance Policy on Lead in Consumer Products." December 22, 1998 *Federal Register*, Vol. 63, No. 245, pp. 70648-70649.

⁴ U.S. Consumer Products Safety Commission, List of Recalled Toys, www.cpsc.gov/cpsc/pub/prere/cpsc/category/toy.html and List of Recalled Infant/Child Products (not including toys), www.cpsc.gov/cpsc/pub/prere/cpsc/category/child.html.

⁵ U.S. Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, Dispatch, March 23, 2006 / 55(Dispatch);1-2.

⁶ 5 U.S.C. § 553(e) (2006). "Each agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule."

⁷ Federal Hazardous Substance Act, P.L. 86-613, 74 Stat. 372 (1960), codified at 15 U.S.C. 1261-1278,

⁸ Federal Hazardous Substance Act Section 2(q)(1)(B) (2006). It states that "any hazardous substance intended, or packaged in a form suitable, for use in the household, which the Secretary by regulation classifies as a "banned hazardous substance" on the basis of a finding that, notwithstanding such cautionary labeling as is or may be required under this Act for that substance, the degree or nature of the hazard involved in the presence or use of such substance in households is such that the objective of the protection of the public health and safety can be adequately served only by keeping such substance, when so intended or packaged, out of the channels of interstate commerce."

CPSC should begin by immediately issuing an advanced notice of proposed rulemaking pursuant to Section 3(f).⁹

The Sierra Club recommends 0.06% as an interim step because that cutoff has already been established as the concentration cutoff for paint on consumer products.¹⁰ Like jewelry, paint is not intended to be ingested, but children do it anyway. The Sierra Club does not believe that 0.06% of lead by weight in jewelry is low enough to protect children and recommends that EPA undertake other actions in cooperation with CPSC to determine a more appropriate cutoff in a different action described below.

The Sierra Club believes that toy jewelry is any item that serves a decorative but no or minimal functional purpose that is valued at less than \$20 per item. People are less likely to store such low-cost jewelry in secure containers or out of reach from children.

2. **Revise Guidance to Reflect Latest Science**

CPSC must revise its December 22, 1998 Codification of Guidance Policy on Lead in Consumer Products¹¹ to reflect the latest science regarding lead poisoning. In the guidance, CPSC states that the “scientific community generally recognizes a level of 10 micrograms of lead per deciliter of blood as a threshold level of concern with respect to

⁹ Federal Hazardous Substance Act Section 3(f) (2006). It states that “A proceeding for the promulgation of a regulation under section 2(q)(1) classifying an article or substance as a banned hazardous substance or a regulation under subsection (e) of this section shall be commenced by the publication in the Federal Register of an advance notice of proposed rulemaking which shall—

- (1) identify the article or substance and the nature of the risk of injury associated with the article or substance;
- (2) include a summary of each of the regulatory alternatives under consideration by the Commission (including voluntary standards);
- (3) include information with respect to any existing standard known to the Commission which may be relevant to the proceedings, together with a summary of the reasons why the Commission believes preliminarily that such standard does not eliminate or adequately reduce the risk of injury identified in paragraph (1);
- (4) invite interested persons to submit to the Commission, within such period as the Commission shall specify in the notice (which period shall not be less than 30 days or more than 60 days after the date of publication of the notice), comments with respect to the risk of injury identified by the Commission, the regulatory alternatives being considered, and other possible alternatives for addressing the risk;
- (5) invite any person (other than the Commission) to submit to the Commission, within such period as the Commission shall specify in the notice (which period shall not be less than 30 days after the date of publication of the notice), an existing standard or a portion of a standard as a proposed regulation under section 2(q)(1) or subsection (e) of this section; and
- (6) invite any person (other than the Commission) to submit to the Commission, within such period as the Commission shall specify in the notice (which period shall not be less than 30 days after the date of publication of the notice), a statement of intention to modify or develop a voluntary standard to address the risk of injury identified in paragraph (1) together with a description of a plan to modify or develop the standard.

¹⁰ 15 U.S.C. § 2681(9), (Toxic Substances Control Act Section 401(9)) (2006). It states the “term “lead-based paint” means paint or other surface coatings that contain lead in excess of 1.0 milligrams per centimeter squared or 0.5 percent by weight or (A) in the case of paint or other surface coatings on target housing, such lower level as may be established by the Secretary of Housing and Urban Development, as defined in section 4822(c) of title 42, or (B) in the case of any other paint or surface coatings, such other level as may be established by the Administrator.

¹¹ U.S. Consumer Products Safety Commission, “Codification of Guidance Policy on Lead in Consumer Products.” December 22, 1998 *Federal Register*, Vol. 63, No. 245, pp. 70648-70649.

lead poisoning. To avoid exceeding that level, young children should not chronically ingest more than 15 micrograms of lead per day from consumer products.”¹²

These statements contradict conclusions by the U.S. Centers for Disease Control and Prevention in its August 2005 “Preventing Lead Poisoning in Young Children: A Statement by the Centers for Disease Control and Prevention.”¹³ CDC states that:

“In 1991 the CDC recommended lowering the level for individual intervention to 15 µg/dL and implementing communitywide primary lead poisoning prevention activities in areas where many children have BLLs >10 µg/dL. Some activities, such as taking an environmental history, educating parents about lead, and conducting follow-up blood lead monitoring were suggested for children with BLLs of >10 µg/dL. However, this level, which was originally intended to trigger communitywide prevention activities, has been misinterpreted frequently as a definitive toxicologic threshold.”

“As the accompanying review of recent studies indicates, additional evidence exists of adverse health effects in children at BLLs <10 µg/dL. The available data are based on a sample of fewer than 200 children whose BLLs were never above 10 µg/dL and questions remain about the size of the effect.”¹⁴

It is clear that CDC never intended for CPSC to use the 10 µg/dL as a level that must not be exceeded. Rather it serves as a trigger for investigation by the community to determine the cause of serious problem. CDC makes it clear that there is no safe level of exposure for children to lead. While Sierra Club believes the evidence for serious adverse health effects at levels less than 10 µg/dL is more compelling than CDC suggests, CDC’s doubts about the size of the effect do not justify ignoring these adverse health effects.

3. **Convert Voluntary Guidance into Enforceable Regulations**

After making the revisions called for above, CPSC must convert its December 22, 1998 Codification of Guidance Policy on Lead in Consumer Products from voluntary guidance into enforceable requirements. Clearly the voluntary guidance was insufficient. With enforceable regulations in place, CPSC can more effectively prevent mistakes from happening and more quickly react when they do occur.

¹² Id at 70649.

¹³ U.S.CDC, “Lead Levels – United States, 1999-2002”, Vol 52 / No. 20, pp 513 to 516.

¹⁴ Id at page 2.

Petition to U.S. Environmental Protection Agency:

In this letter, the Sierra Club also petitions the U.S. Environmental Protection Agency pursuant to Section 21 of the Toxic Substances Control Act ("TSCA")¹⁵ to take action in coordination with CPSC to protect children from lead in toy jewelry. Specifically, the Sierra Club asks that EPA adopt regulations as follows:

1. Require TSCA Section 8(d) Health and Safety Data Reporting for Lead and Lead Salts

In CPSC's December 22, 1998 Codification of Guidance Policy on Lead in Consumer Products, CPSC stated that "to avoid the possibility of a Commission enforcement action, a manufacturer who believes it necessary to use lead in a consumer product should perform the requisite analysis before distribution to determine whether the exposure to lead causes the product to be a "hazardous substance." If the product is a hazardous substance and is also a children's product, it is banned. If it is a hazardous household substance but is not intended for use by children, it requires precautionary labeling. This same type of analysis also should be performed on materials substituted for lead."¹⁶

CPSC identified the following factors as critical to determining whether a potential hazard exists and whether the product may be a banned hazardous substance:

- a. The total amount of lead contained in a product;
- b. The bioavailability of the lead;
- c. The accessibility of the lead to children;
- d. The age and foreseeable behavior of the children exposed to the product;
- e. The foreseeable duration of the exposure; and
- f. The marketing, patterns of use, and life cycle of the product.

Assuming product manufacturers and importers having taken heed of CPSC's guidance – guidance which deals with lead in all consumer products not just toy jewelry – then EPA needs to use its authority under TSCA §8(d),¹⁷ to obtain information on the six items listed above to enable EPA and CPSC to take more effective action to protect children from lead in consumer products.

EPA must at utmost speed require producers, importers, and processors of lead and its salts that are reasonably likely to be incorporated into consumer products to provide EPA with lists and/or copies of ongoing and completed unpublished health and safety studies related to the six factors identified by CPSC. The health and safety studies include:

- a. Epidemiological or clinical studies;
- b. Studies of occupational exposure;
- c. Health effects studies;

¹⁵ 15 U.S.C. § 2620 (Toxic Substance Control Act, Section 21) (2006). It states that (a) "Any person may petition the Administrator to initiate a proceeding for the issuance, amendment, or repeal of a rule under section 2603, 2605, or 2607 of this title or an order under section 2604(e) or 2605(b)(2) of this title.

¹⁶ U.S. CPSC Codification of Guidance Policy on Lead in Consumer Products at page 70649.

¹⁷ 15 U.S.C. § 2607(d) (Toxic Substance Control Act, Section 8(d)) (2006).

- d. Ecological effects studies; and
 - e. Environmental fate studies (including relevant physicochemical properties).
2. **Submit TSCA Section 9 Report to CPSC Regarding Lead and Lead Salts**
 EPA has undertaken several significant rulemaking efforts in the past few months designed to prevent lead poisoning. On January 10, 2006, it proposed a rule to regulate renovation, repair and paint activities in target housing.¹⁸ On December 2, 2005, it sought comments on two volumes of its Air Quality Criteria Document for Lead.¹⁹

With the wealth of information from these rulemaking efforts as well as the recalls and reports on lead in toy jewelry, EPA needs to exercise its authority under TSCA Section 9.²⁰ EPA must report to the CPSC that it has a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of lead destined to be used in toy jewelry presents or will present an unreasonable risk of injury to health or the environment and that EPA determines that such risk may be prevented or reduced to a sufficient extent by action taken under the Federal Hazardous Substance Act. This report must be published in the Federal Register. It must describe the risk posed by lead to children and include a specification of the activity or combination of activities which the Administrator has reason to believe so presents such risk.

The report shall also request that CPSC:

- (A)(i) determine if the risk described in such report may be prevented or reduced to a sufficient extent by action taken under such law, and
 - (ii) if CPSC determines that such risk may be so prevented or reduced, issue an order declaring whether or not the activity or combination of activities specified in the description of such risk presents such risk; and
- (B) respond to EPA with respect to the matters described in subparagraph (A).

Pursuant to TSCA Section 9(a)(2),²¹ if CPSC does not respond within 90 days or its response is inadequate, EPA should proceed to use its authorities under Section 6 and adopt regulations declaring that manufacturers and importers may not add lead in excess of 0.06% lead by weight to any toy jewelry for which there is a reasonably foreseeable possibility that children could ingest is prohibited from manufacture or importation.

¹⁸ U.S. EPA Proposed Renovation, Repair and Painting Rule, 71 Fed. Reg. 1588 (2006) (to be codified at 40 C.F.R. Part 745) (proposed January 10, 2006).

¹⁹ U.S. EPA Air Quality Criteria Document for Lead, 70 Fed. Reg. 231 (December 2, 2005) pages 72300-72301.

²⁰ 15 U.S.C. § 2608 (Toxic Substance Control Act, Section 9) (2006)

²¹ Id at Section 9(a)(2)(2006)

3. **Issue Significant New Use Notification Regarding Lead and Lead Salts in Toy Jewelry**

On July 8, 2004, CPSC reached an agreement with four toy jewelry importers to eliminate lead in jewelry.²² Apparently, these companies manufacture or import the vast majority of the toy jewelry. EPA must adopt a Significant New Use Notification Rule pursuant to TSCA Section 5 requiring any business from manufacturing or importing toy jewelry containing lead at levels greater than 0.06% by weight to provide advance notice of its action.²³ While this action would not prevent the importation of manufacture of lead-containing toy jewelry, it would allow EPA to be aware of the pending action and take appropriate action.

4. **Issue Section 6(b) Quality Control Order Regarding Production of Toy Jewelry**

EPA should work with CPSC to identify the manufacturer or processor that produces any toy jewelry with more than 0.06% lead by weight. If EPA identifies any manufacturer or processor that it has jurisdiction over using its TSCA authorities, it should immediately issue Section 6(b) quality control orders.²⁴ In this order, EPA should require the manufacturer or processor to modify its quality control procedures to the extent necessary to remedy the inadequacy.

²² U.S. Consumer Products Safety Commission, News from CPSC, "CPSC Announces Recall of Metal Toy Jewelry Sold in Vending Machines: Firms agree to stop importation until hazard is eliminated", originally issued July 8, 2004 and revised on March 1, 2006. See www.cpsc.gov/CPSC/PUB/PREREL/prhtml04/04174.html.

²³ 15 U.S.C. § 2604 (Toxic Substance Control Act, Section 5) (2006)

²⁴ 15 U.S.C. § 2605(b) (Toxic Substance Control Act, Section 6(b)) (2006)

Conclusion

The Sierra Club requests that CPSC and EPA act in the manner described above to protect children from lead poisoning by consumer products. The current system is not working. EPA and CPSC must take stronger action regarding lead in jewelry and other products which may be ingested by children.

There has to be a better way.

The Sierra Club looks forward to EPA's response to this petition within 90 days, as required by TSCA, 15 U.S.C. § 2620(b)(3).²⁵

Sincerely,

Ed Hopkins
Director, Environmental Quality Program

²⁵ 15 U.S.C. § 2620(b)(3) (Toxic Substance Control Act, Section 21(b)(3)) (2006)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 30 2007

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Jacqueline Elder
Assistant Executive Director
Office of Hazard Identification and Reduction
U.S. Consumer Product Safety Commission
4330 East West Highway, Room 702
Bethesda, MD 20814

Dear Ms. Elder:

As you know, in 2006, the Sierra Club petitioned both the Consumer Product Safety Commission (CPSC) and the Environmental Protection Agency (EPA) to take certain measures to address risks from lead in toy jewelry. The Sierra Club's petition to EPA requested, among other things, that EPA require health and safety data reporting for lead and lead salts under section 8(d) of the Toxic Substances Control Act (TSCA) and that EPA issue TSCA section 6(b) quality control orders regarding the production of toy jewelry. EPA denied these requests in July 2006. In September, the Sierra Club and Improving Kids Environment filed suit in the U.S. District Court for the Northern District of California challenging EPA's denial and seeking to compel EPA to perform the requested actions.

EPA and the plaintiffs have now signed a settlement agreement establishing a process that will conclude with the dismissal of the lawsuit. During settlement negotiations, the plaintiffs raised questions about the adequacy of quality control measures by companies importing and/or distributing children's jewelry. For example, the Centers for Disease Control and Prevention (CDC) reported that lead levels in the Reebok charm that resulted in the poisoning of a young boy last year varied widely between suppliers and production lots.¹ This type of variation may indicate an absence of quality control measures with respect to lead content. In fact, several of the comments EPA received on the Sierra Club's petition identified a lack of quality control as a problem. This and other information EPA has reviewed raise questions about the adequacy of quality control measures by companies importing and/or distributing children's jewelry.

EPA is concerned about the continuing use of lead in toy jewelry, and is committed to the

¹CDC, *Morbidity and Mortality Weekly* vol. 55, March 23, 2006; available at:
<http://www.cdc.gov/mmwr/PDF/wk/mm55d323.pdf>

Federal goal of eliminating childhood lead poisoning by 2010. We understand that CPSC has undertaken numerous recalls in an attempt to reduce risks from lead in toy jewelry, and recently published an advance notice of proposed rulemaking to ban children's metal jewelry containing more than 0.06% lead. EPA supports CPSC's efforts addressing lead in metal toy jewelry, and in an attempt to learn more about childhood lead exposure, EPA will seek unpublished health and safety studies regarding lead in other consumer products intended for children. We look forward to working with you to develop a comprehensive approach to this public health challenge.

Sincerely,

A handwritten signature in black ink, appearing to read "Maria J. Doa", with a long horizontal flourish extending to the right.

Maria J. Doa, Ph.D.

Director

National Program Chemicals Division

cc: Lori Saltzman, CPSC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C., 20460OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

April 30, 2007

Ms. Jane Doe
President
XYZ Manufacturing, Inc.
123 Elm Street
Anytown, US 00001

Dear Ms. Doe:

The U.S. Environmental Protection Agency (EPA or Agency) is committed to doing its part to contribute to the federal goal of eliminating childhood lead poisoning by 2010, and is concerned about a number of reports involving lead in toy jewelry and other products intended for use by children.¹ You are receiving this letter because XYZ Manufacturing, Inc. is one of many companies that EPA has identified as having participated in a recall related to lead in a consumer product or a settlement with the State of California last year regarding lead in jewelry. For this reason, EPA is writing to ensure that you are aware of the reporting requirements under the Toxic Substances Control Act (TSCA) section 8(e) (15 U.S.C. § 2607(e)), which provides:

Any person who manufactures, processes, or distributes in commerce a chemical substance or mixture and who obtains information which reasonably supports the conclusion that such substance or mixture presents a substantial risk of injury to health or the environment shall immediately inform the Administrator of such information unless such person has actual knowledge that the Administrator has been adequately informed of such information.

Toxicity data that indicate a substantial risk of injury to health or the environment are the most common kinds of information received by EPA under TSCA section 8(e), but the Agency also often receives information on exposure, environmental persistence or other kinds of information that indicate a substantial risk of injury to health or the environment.

The health of consumers who are exposed to lead through use of lead-containing products may be at risk. For example, young children often put objects in their mouths. When those

¹See e.g., CDC, Morbidity and Mortality Weekly vol. 55, March 23, 2006; available at: <http://www.cdc.gov/mmwr/PDF/wk/mm55d323.pdf>

objects, such as toy jewelry, contain lead, a child can suffer from lead poisoning as a result of this exposure. Lead may cause a range of health effects, from behavioral problems and learning disabilities, to seizures and death. For more information on the health effects of lead please visit the EPA's lead homepage at www.epa.gov/lead.

As you probably know, the U.S. Consumer Product Safety Commission (CPSC) has authority under the Consumer Product Safety Act and the Federal Hazardous Substances Act to take certain actions to address risks from consumer products. The CPSC has undertaken numerous recalls and other actions in an attempt to reduce risks from lead in toy jewelry. On January 9, 2007, CPSC published an advance notice of proposed rulemaking (72 FR 920) to ban children's metal jewelry containing more than 0.06% lead. EPA also is working to address health risks from lead in children's products, by assessing the problem and gathering information that may be useful in determining future efforts to reduce risks from these products.

Your company can play a role in identifying and reducing these potential risks. In addition to possible obligations under the Consumer Product Safety Act and the Federal Hazardous Substances Act, persons who manufacture, process, or distribute lead in products also may have obligations under TSCA.

With respect to TSCA section 8(e), EPA guidance issued in September 2006 and currently available on the Agency's website² states:

Q.25. Are studies or reports showing absorption from manufactured products or articles of a chemical known to be capable of causing serious health effects potentially reportable under TSCA section 8(e)? For example, are studies or reports showing absorption of lead following oral or dermal exposure to a particular type of article for which it was not previously known that such absorption could occur potentially reportable under TSCA 8(e)?

A.25. Yes – The discovery of previously unknown and significant human exposure to a chemical, when combined with knowledge that the subject chemical is recognized or suspected as being capable of causing serious adverse health effects (e.g., cancer, birth defects, neurotoxicity), provides a sufficient basis to require the reporting of the new-found exposure data to EPA under section 8(e).

Q.26. Is the discovery of a hazardous or toxic constituent in a product reportable under TSCA section 8(e)?

A.26. Reporting of the presence of a hazardous or toxic constituent that was previously unknown to be contained in a product, including manufactured articles, should occur under TSCA section 8(e) where data shows that widespread or significant exposure to the

²“September 2006 Frequent Questions,” available at <http://www.epa.gov/oppt/tsca8e/pubs/frequentlyaskedquestionsfaqs.htm#health2>.

toxic component has occurred or is substantially likely to occur, and such exposure presents a substantial risk of injury to health or the environment. Persons subject to TSCA 8(e) reporting should consider the toxicity of the constituent, the constituent's concentration in the product, and whether significant exposure to the toxic component has occurred or is likely to occur at any stage in the product's lifecycle from production through disposal. In cases of extremely toxic chemical substances in products in commerce, exposure may generally be presumed.

We hope this letter will assist you in assessing your company's potential obligations under TSCA. More information on TSCA section 8(e) reporting is available on the TSCA section 8(e) website at www.epa.gov/opptintr/tsca8e; directions on how to send 8(e) submissions to EPA is provided at <http://www.epa.gov/oppt/tsca8e/pubs/contactus.htm>. Please refer questions on TSCA section 8(e) requirements to Walter Cybulski at (202) 564-2409.

If you have general questions regarding TSCA requirements, please contact the TSCA Assistance Information Service (TSCA Hotline) at (202) 554-1404. The TSCA Hotline can also be reached via email at tsca-hotline@epa.gov.

Sincerely,



fa

James B. Willis
Director

Chemical Control Division
Office of Pollution Prevention and Toxics

cc: Lori Saltzman, CPSC

State of Connecticut

RICHARD BLUMENTHAL
ATTORNEY GENERAL



Hartford

August 16, 2007

Via facsimile 310-252-2179

Bob Eckert
Chief Executive Officer
Mattel, Inc.
333 Continental Boulevard
El Segundo, CA 90245-5012

Dear Mr. Eckert:

I write in regard to your announcement of another recall of Mattel toys containing dangerous lead paint. I agree with your statement that there is nothing more important than the health and safety of our children. I hope that you and Mattel remain committed to protecting consumers, especially our young people, from chemicals as dangerous as lead.

While a recall is an essential first step to resolving this issue, this is only the first in a series of steps Mattel must take to ensure that the lead in its toys will not cause further harm. It is essential that any disposal in Connecticut of toys containing lead fully comply with the environmental statutes and regulations governing such disposal. Connecticut, like many states, seeks to protect the health and safety of its citizens by minimizing and eventually eliminating the release of dangerous chemicals, such as lead, into our environment. If we are to truly protect our children, the lead in these toys must not be allowed to contaminate our environment.

In accordance with state and federal hazardous waste regulations, including section 22a-449(c)-102(a)(1) of the Regulations of Connecticut State Agencies (RCSA), incorporating 40 CFR 262.11, Mattel must determine whether the products to be disposed of will constitute hazardous waste and whether Mattel or involved retailers or distributors, in disposing of these wastes, will become generators of hazardous waste. If so, Mattel must ensure compliance with all legal requirements.

Therefore, I request that you certify in writing within thirty (30) days that any disposal of Mattel toys containing lead in the state of Connecticut will be conducted in compliance with applicable federal and state laws. If disposal will be conducted by the individual retailers or distributors of these toys within the state of Connecticut, you should contact each and every retailer and distributor to instruct them to dispose of these products in accordance with applicable Connecticut and federal law. I further request that you certify in writing within thirty (30) days that you have done so and have instituted a plan to monitor disposal. My office and other

Connecticut state agencies will continue to review this matter, and we do not foreclose the initiation of enforcement action to ensure compliance with environmental law.

I expect that Mattel will continue to take responsibility for the complete and safe removal of these products from the hands of our children, and further, will ensure that the lead is not released into the environment. Please contact me if you wish to discuss this matter further.

Sincerely,



RICHARD BLUMENTHAL

State of Connecticut

RICHARD BLUMENTHAL
ATTORNEY GENERAL



Hartford

August 17, 2007

Michael A. Monahan
Senior Counsel - Regulatory Affairs
Mattel, Inc
333 Continental Boulevard
El Segundo, CA 90245

Re: Fisher Price and Mattel Recall

Dear Mr. Monahan:

I write regarding the voluntary recall of various Fisher-Price and Mattel toys by your company in cooperation with the U.S. Consumer Product Safety Commission ("CPSC"). This letter raises additional and different concerns than the letter I sent yesterday to Mr. Eckert regarding proper disposal of recalled toys. According to statements by both the CPSC and Mattel, the surface paints on approximately 1.2 million toys contain excessive levels of lead. Mattel has also recalled millions of other toys because small magnets inside the toys can fall out. If swallowed by children, the magnets can cause serious injury or death.

While the recalls are plainly appropriate and necessary, I remain concerned about how Mattel could have distributed these products in the first place. The Connecticut Child Protection Act, Conn. Gen. Stat. § 21a-335 *et seq.*, prohibits the "introduction or delivery for introduction into commerce of any misbranded hazardous substance or banned hazardous substance." Conn. Gen. Stat. § 21a-337(1). A "banned hazardous substance" is defined as:

[A]ny toy, or other article intended for use by children, which is a hazardous substance, or which contains a hazardous substance in such manner as to be susceptible to access by a child to whom such toy or article is entrusted

Conn. Gen. Stat. § 21a-335(p)(A). A "hazardous substance", in turn is defined in part as "any substance or mixture of substances which ... is toxic." Conn. Gen. Stat. § 21a-335(e)(1)(A)(i). To the extent that Mattel distributed these toys in Connecticut, its conduct could be deemed to violate the Child Protection Act. Continued violations of the

Act would constitute unfair and deceptive trade practices pursuant to the Connecticut Unfair Trade Practices Act, Conn. Gen. Stat. § 42-110a *et seq.*

So that I may understand how these events came about, and to ensure that such conduct does not occur again in the future, I request that you provide the following information regarding Mattel's business practices:

- The total number of toys subject to the recalls that were distributed or delivered to the State of Connecticut.
- The identity of all retailers in the State of Connecticut who sold the recalled toys.
- The total number of recalled toys returned to Mattel by such retailers. In your response, also identify the specific reason(s) each toy was recalled.
- The total number of recalled toys returned to Mattel by Connecticut consumers.
- The names and addresses of any Connecticut consumers who have complained to you about any of the recalled toys, along with copies of such complaints.
- The identity of any laboratory which analyzed the toys in question for the presence of toxic substances, along with copies of any test reports.
- The identity of the company or companies that manufactured and supplied the toys at issue to you.
- When and how Mattel first learned that the surface paints used in the production of your toys contained lead.
- The reason or reasons lead paint was used in the production of your toys.
- When and how Mattel first learned that the magnets in the toys could fall out.
- The reason or reasons the magnets fall out.
- Any reported injuries or deaths that have been attributed or allegedly attributed to the magnets dislodging from the toys and, if so, how many, and when and how they reportedly occurred.
- Whether any Connecticut consumers were involved in the reported injuries or deaths, and, if so, the nature and extent of their injuries, as well as the names and addresses of such consumers.

- The identity of the person(s) responsible for designing the recalled toys, and the specific nature of the redesign
- Mattel's procedures for ensuring that toys intended for use by children do not contain hazardous substances susceptible to access by children
- Any changes to those procedures implemented or being considered by Mattel in response to the events giving rise to the toy recall.

These requests cover the period of January 2005 to the present. I ask that you provide this information in writing by the close of business on August 31, 2007. You may send your response directly to Assistant Attorney General Gary Tan by mail, fax, or e-mail. His mailing address is 110 Shetman Street, Hartford, CT 06105; his fax number is (860) 808-5593; and his e-mail address is: gary.tan@po.state.ct.us. If you have any questions or wish to discuss this in more detail, please contact Assistant Attorney General Tan at (860) 808-5400. Thank you.

Very truly yours,



RICHARD BLUMENTHAL

RB/pas

