

# Why Islead Still Poisoning Our Children?

Lead is gone from gasoline and paint—with surprisingly beneficial results. But lead still poses dangers to kids, particularly in older neighborhoods. In DC, hundreds of children are being damaged every year—and the results will be more school dropouts and more crime.

JONATHAN HARRISON is eight years old and has no friends. He struggles to read and do basic arithmetic.

"No one likes me," he tells his mother. "I just want to die."

A little boy with somber brown eyes, Jonathan began life with promise. He weighed ten pounds at birth, walked at one, began speaking before two, and always seemed to be smiling, recalls his mother, Connie Royster. "Jonathan was a beautiful baby, happy all the time. He was a child anyone would want."

Born in October 1997, Jonathan lived the first ten months of his life in Fort Washington, Maryland. Then the family moved to the District, renting a turn-ofthe-century house on 13th Street, Southeast.

Jonathan did the things little boys do. He played with trucks, watched *Sesame Street*, went shopping with his mother. But around age two, his personality changed. He became temperamental and hard to control—almost a different child.

"Jonathan cut all the cables in the house," his mother says. "To the TV, VCR, to everything. Cut them to pieces." The mother of three older children, Royster knew Jonathan's behavior was not normal, even for the terrible twos.

She took Jonathan to a Kaiser

health clinic and was surprised when tests revealed a blood-lead level of 20 micrograms per deciliter (mcg/dl)—twice the "action level" for lead poisoning established by the Centers for Disease Control and Prevention. A repeat test put the level at 22 mcg/dl.

Like most lead-poisoned children, Jonathan exhibited no physical symptoms. But his mother, a DC native and registered nurse, knew of lead's toxicity to the brain and believed his high level explained his behavior change.

Notified of Jonathan's lead poisoning, the DC Department of Health sent inspectors to the home, where tests detected lead in the interior paint and paint

# Photography by Scott Robinson

Once a joyful child with lots of promise, Jonathan Harrison seldom smiles now. PO

DIG

dust. Royster remembered occasionally removing paint chips from Jonathan's mouth when he was a toddler and how he liked to play and crawl in the corner room where all the windows let sunlight in. Leaded dust often results from the opening and closing of windows.

The health department ordered Jonathan and his family not to live in the house until a lead-abatement contractor, to be hired by the landlord, rehabbed the house. The abatement was supposed to take three months but lasted six.

Kaiser doctors referred Jonathan to a pediatric neurologist and a psychiatrist at Children's National Medical Center, where Jonathan was diagnosed with attention deficit hyperactivity disorder. Doctors prescribed two drugs, one for ADHD and one to prevent Jonathan from sleepwalking. The medication helped calm Jonathan for periods of time, but when it wore off he sometimes threw tantrums and became impulsive and aggressive.

At age four, while riding the Metro with older brother Gregory, Jonathan bolted out at a station just as the doors opened. Gregory, now 20 and a junior at the University of the District of Columbia, ran after him, yelling, "Move, move," as he pushed aside incoming passengers. He found Jonathan on the Metro platform, laughing.

One day Jonathan set his mother's bed on fire.

"I knew Jonathan did not act in any way like my other children or like any child I ever knew," says Royster. "He was getting more and more uncontrollable, and there didn't seem to be anything anyone could do to stop it."

**JONATHAN'S STORY** and variations of it occur too often in this country. Every year in Washington, hundreds of children are harmed by lead poisoning. Nationwide, 310,000 children under age five are leadpoisoned each year, according to the Centers for Disease Control and Prevention (CDC); the World Health Organization reports that up to 18 million are harmed worldwide.

What is remarkable about lead poisoning is how destructive it has been to children and society over many decades yet how slowly we are working to eliminate it.

This disconnect persists despite scientific evidence of lead's harm that goes back centuries and is as convincing as that linking cigarette smoking to lung cancer. Lead is a powerful neurotoxin. From the turn of the 20th century to the 1970s, thousands of children died from acute lead poisoning, many misdiagnosed with TB or other illnesses. Although a child died of lead poisoning in Minneapolis this spring, lead



Jonathan and his mother, Connie Royster, on the sidewalk near the home where he was leadpoisoned. More than 20 years earlier, three other children were lead-poisoned while living in the same rental property. Nothing was done to prevent it from happening again.

now seldom kills children; it only damages their brains, and the damage is irreversible. Scores of studies link childhood lead exposure to diminished intelligence, school failure, behavioral disorders, violence, and criminality.

Lead exposure offers a largely unexamined explanation for some of what continues to go wrong in this country.

"Lead's impact on public health and social functioning is such that I think in a hundred years we will look back on the 20th century and recognize that lead, tobacco, and air pollution were the choleras and typhoids of this century," says Dr. Bruce Lanphear, one of the country's top lead researchers.

Carl Shy, professor emeritus of epidemiology at the University of North Carolina, told the World Health Organization: "The mining and production of lead and lead products is the mistake of the 20th century."

**SOME PEOPLE ASSUME** that lead poisoning went away with the total ban on leaded gas in 1995, 23 years after its phaseout began and almost 50 years after lead was first added to gasoline as an antiknock agent. National health surveys in the 1970s had revealed high lead levels among children and adults but showed a 75-percent decrease by 1991. As the tide of childhood lead-poisoning ebbed, there were declarations of victory; a 1995 *Atlantic Monthly* article hailed America's "triumph over lead."

But lead poisoning remains the most significant environmental-health disease of children; it is especially prevalent among inner-city kids. Even though environmental lead levels caused by gasoline have dropped, lead poisoning is a pressing issue now because we've discovered much more about its capacity for human harm.

Children from all levels of society are at risk of lead poisoning, but those at the bottom, who are more apt to live in older, poorly maintained housing, are most often harmed. African-American children have 2½ times the risk of white children, and Latino children about 1½ times the risk, according to the CDC. Ellen Silbergeld,



Johns Hopkins researcher Ellen Silbergeld says lead poisoning has been "ghettoized," with the most harm done to poor children in old housing.

professor of environmental health sciences at the Johns Hopkins Bloomberg School of Public Health, refers to this as the "ghettoization" of lead poisoning.

In DC, as in other cities, some children grow up in lead traps. They may drink leadcontaminated water from their taps. They play in, and sometimes eat, lead-contaminated soil in their yards and playgrounds, a decades-old legacy from leaded-gasoline automobile exhaust and lead paint. They inhale lead-paint dust and eat lead-paint chips in their homes. Children living near waste sites breathe lead particles from the burning of batteries, computers, and other leaded products.

Lead can harm children before birth: It leaches from the bones of expectant mothers exposed during their own childhoods and crosses the placental barrier to enter the fetal brain. The May 2006 issue of *Environmental Health Perspectives* confirmed earlier findings that very low lead exposure during gestation may cause "lasting and

# **PROTECTING KIDS FROM LEAD POISONING: MARYLAND DOES IT BETTER**

Suburban jurisdictions generally do a better job in lead education and prevention efforts than the District, but none is free of childhood lead-poisoning cases.

Maryland screens more children and has tougher lead laws than DC or Virginia. Designed to eliminate lead-paint hazards before a child is poisoned, Maryland's laws are among the strongest in the nation, and they are strictly enforced. Property owners are required to make properties lead-safe according to stringent state standards before renting them out. Failure to do so can result in forgone rent, heavy fines, and jail.

"The law puts a real economic chill on people who don't do the right thing," says Ruth Ann Norton, executive director of the Baltimorebased Coalition to End Childhood Lead Poisoning. Some noncompliant landlords have served time in jail since the laws were passed in 1994, she says, sending an anti-lead-paint message loud and clear to Maryland property owners.

Virginia relies on voluntary compliance. It does not require preemptive inspection of rental properties for lead-paint hazards, as Maryland does, so problems usually are detected after a child is lead-poisoned. The city of Richmond has adopted measures to prevent lead-paint exposure in rental homes, but state law does not require owners to make properties lead-safe prior to renting them. Only when a child is lead poisoned is the landlord required to make the property lead-safe.

"Unless you have a law with teeth," Norton says, "you'll have serious lead-paint problems because you can't count on people's goodwill when money is at stake."

The Virginia Department of Health has published a list of Zip codes where the housing is older and children are at increased risk of leadpaint poisoning. Several of these "at risk" Zip codes are in Arlington and Fairfax counties and Alexandria; they serve as guidelines for private physicians and other healthcare professionals to screen young children who live or go to daycare centers in the areas. Physicians are required to report any child with lead concentrations above the CDC action level of ten micrograms per deciliter (mcg/dl).

Northern Virginia screens about 10 percent of children for lead expo-

sure; Maryland's suburban counties screen about 24 percent. Virginia does "targeted lead screening" in Zip codes where young children may be at increased risk, but there is no strict enforcement. Maryland advises parents who live in areas with older homes to have their children lead-tested. Neither state screens enough children, Norton says.

Federal policy is that children enrolled in Medicaid should be screened for lead around age two. But according to 2005 data compiled by the Alliance for Healthy Homes, Maryland tested 25 percent of two-year-olds on Medicaid, and Virginia tested only 8 percent. Nationally, fewer than 25 percent of Medicaid children age one to two are tested for lead.

Here are the numbers of screenings and elevated lead levels reported by Maryland's Department of the Environment Childhood Lead Registry and the Virginia Department of Health for children under six in 2004.

Montgomery County: 15,934 screenings, 81 cases of elevated lead levels

Prince George's County: 19,785 screenings, 87 cases Fairfax County: 6,969 screenings, 40 cases Arlington County: 2,380 screenings, 18 cases Loudoun County: 439 screenings, no cases Alexandria: 1,856 screenings, 10 cases

Not all the children with elevated lead levels were exposed to lead paint, and not all were exposed in the jurisdictions where they were tested. Melanie Mical of the Montgomery County lead-prevention office says about half the children found to have elevated lead levels there were exposed in other countries before moving to the US. About half the remaining children were lead-poisoned as a result of home renovations or from spending time in homes or daycare centers in DC.

Officials say that some children were lead-poisoned by medical remedies brought in from other countries, toy jewelry composed mostly of lead, and by kohl, an eye makeup used in Middle Eastern and South Asian cultures. Also called Surma, Alkohl, and Tiro, kohl is applied on very young children as well as pregnant women. Kohl samples tested by the Alexandria Health Department were found to contain 79 percent lead.



Dr. Jerome Paulson of the Mid-Atlantic Center for Children's Health and the Environment at George Washington University is a longtime children's advocate. "There are thousands of children in this city who are not being protected by this government" from lead exposure, he says. Parents may call the center at 202-994-1166 with questions about lead and other environmental hazards.

possibly permanent effects" on a child's cognitive development.

The toxic legacy of early lead exposure extends into adulthood. Analyzing census and health-survey data on more than 20,000 Americans, Silbergeld at Hopkins and Mark Lustberg of the University of Maryland reported in 2002 in Archives of Internal Medicine that more than 29 million adult Americans may be at increased risk of premature death because of lead exposure in the 1970s, before the use of leaded gas began to drop. The authors found that premature mortality occurred at lead levels above the current CDC action level of 10 mcg/dl and rose sharply as the levels went higher. When childhood lead levels reached 30 mcg/dl, adult cancer deaths increased 68 percent.

Early lead exposure is also linked to vascular and kidney disease, hypertension, Alzheimer's disease, stroke, and diabetes.

**THE GREATEST RISK** of lead exposure today comes from housing stock built before 1978, the year the federal government, after earlier restricting the amount of lead in paint, eliminated it entirely. Up until 1950, paint used in houses contained as much as 50 percent lead by weight. Even though it may have been put on 60 or more years ago and painted over many times since, old paint remains a hazard: If the newer paint chips off, the old paint can, too. Lead-paint dust and chips appeal to children because they taste sweet, and even a dime-size chip of pre-1950 lead paint contains enough lead to poison a two-year-old. Toddlers are especially vulnerable because their brains are developing. Like Jonathan, they crawl on the floor and put all manner of things in their mouths.

The Department of Housing and Urban Development (HUD) estimates that 38 million American housing units contain lead-based paint, and more than half are in dilapidated condition.

The CDC estimates that 90 percent of American preschoolers with elevated blood-lead levels live in pre-1978 housing. Children are especially sensitive to lead's harmful effects in part because their stomach and intestines absorb up to 50 percent of ingested lead, whereas adults absorb about 10 percent. Children deficient in certain nutrients, especially iron and calcium, are even more disposed to absorb lead.

Lead poisoning is most prevalent in oneand two-year-olds, the ages kids are most apt to put their fingers in their mouths after crawling on floors with lead-paint dust.

In the District, about three-fourths of the housing stock was built before 1978, according to the best estimates. Although housing in the Washington suburbs is generally newer and freer of lead contamination, suburban children are not immune, especially when lead dust is generated during renovations of older homes.

**HUMANS HAVE MINED** and used lead for more than 6,000 years, and its toxicity was recognized as early as 2000 BC. Because of lead's abundance and malleability, Romans made liberal use of it in their municipal water system. The word "plumbing" is derived from "plumbum," the Latin word for lead.

Romans used lead in their drinking vessels, dishes, pots and pans, cosmetics, and—because of its sweet taste—in the making, preserving, and storing of wine and some foods.

Vitruvius, a Roman engineer at the time of Julius Caesar, noted the pallor among Rome's lead miners and smelters and concluded that lead was "harmful to the human body." In 14 BC he wrote, "Water should not be brought in lead pipes if we desire to be wholesome." He recommended "more wholesome" clay pipes.

Lead poisoning is suspected to have contributed to unprecedented levels of infertility among women and sterility among men, including Caesar Augustus. Some scholars believe lead poisoning was an important factor in the degeneracy of emperors Caligula, Nero, and Commodus and in the decline and fall of the Roman Empire.

**AS EARLY AS** the 1890s the dangers of lead paint were well known to health au-

thorities. In 1904, a pediatrician in Queensland, Australia, reported lead-paint poisoning among children, including the first reported death of a child from it. In 1914 the first US-recorded lead-paint poisoning death occurred in Baltimore when a fiveyear-old boy died after chewing crib railings coated with lead paint.

Undeterred, US paint manufacturers advertised lead paint throughout the early 1900s. Dutch Boy Paints, owned by the National Lead Company, used a child's image on its label and ran ads recommending lead paint for toys and children's rooms to "brighten their mood." A 1929 ad titled "The Dutch Boy Conquers Old Man Gloom" read in part:

This famous Dutch Boy Lead of mine Can make this playroom fairly shine Let's start our painting right away You'll find the work is only play.

White lead, or lead carbonate, had many desirable qualities for paint companies. It is easy to produce, mixes with linseed oil used to make paint, can be tinted different colors, and provides superior covering power.

By 1920 Australia and a number of European countries had banned lead paint. In 1922, League of Nations members signed an agreement forbidding the use of white-lead interior paint. The United States did not join in the prohibition. Massachusetts banned lead paint that year, but the lead industry helped engineer a repeal.

The National Lead Company and other white-lead producers continued to maintain that lead paint was not harmful. During the 1920s, these companies produced 200,000



Dutch Boy used a happy child as its symbol in the ads it ran while its leaded paint poisoned thousands of children.

![](_page_5_Picture_0.jpeg)

Abating lead problems in the home is a job for contractors certified to do it. DC, Maryland, and Virginia maintain databases of certified contractors.

### HOW TO CHECK FOR LEAD IN YOUR HOME— AND WHAT TO DO ABOUT IT

Remodeling an older home can expose families to dangerous levels of lead.

"Anytime paint on the walls, windows, or floors is disturbed in an older home, it creates dust that could put adults, kids, and pets at risk," says Dr. Jerome Paulson of the Mid-Atlantic Center for Children's Health and the Environment at George Washington University Medical Center.

Paulson says homes built before 1978 may have lead paint if the they have never been gutted to the foundation walls. Homes built before 1950 almost certainly have lead paint if they haven't had major work done.

Because of the threat of lead exposure, "most renovations in old homes should not be do-it-yourself projects," Paulson says. Harrison Newton of Lead Safe DC, a Washington nonprofit, says homeowners should never do their own remodeling in houses where young children or pregnant women live; instead, hire contractors who are certified for lead abatement. Trained contractors remove lead paint through chemical processes or specially designed sanding equipment that traps the potentially dangerous dust. If you want to check for lead in your home, the Environmental Protection Agency does not recommend using store-sold kits, which it says aren't reliable. EPA-accredited laboratories (*epa.gov/lead*) will test samples of dust that you collect from your home using a baby wipe or something similar. The cost is \$20 to \$30; call 800-424-LEAD for information and a list of area labs.

If the dust-wipe test proves positive, a lead inspector can help pinpoint the source of lead and suggest a treatment. Inspectors typically charge \$200 to \$300.

Maryland maintains a database of statecertified lead-inspection and abatement firms at *mde.state.md.us.* (In the "land" box program list, choose "lead.") Virginia runs a similar database that's searchable by Zip code and gives larger contractors' addresses but not phone numbers. Go to *dpor.virginia.gov* and "license lookup."

DC's list of certified contractors is at *dchealth.dc.gov.* Click on "environmental health," then "lead-based paint" and "certified businesses."

-CAITLIN CARROLL AND DREW LINDSAY

tons of white lead a year, making this country the world's largest lead producer.

In 1928, to combat undesirable publicity about lead's health hazards, companies formed the Lead Industries Association, a trade group of white-lead manufacturers.

"It's very clear from the lead industry's own documents that it did everything it could to obscure the dangers associated with lead in paint and gasoline for as long as it possibly could, and it was very successful," says Dr. Jerome Paulson, associate professor of pediatrics and public health at George Washington University and codirector of the Mid-Atlantic Center for Children's Health and the Environment. "Industry knows the big lie works. If you say something often enough and vociferously enough, people will believe it to be true in spite of the fact it is patently untrue."

The lead industry had allies in academia, most notably Dr. Joseph Aub, a Harvard researcher. In the 1920s, when lead's toxicity could not be denied, Aub claimed that eating lead paint did not harm children. Rather, he said, they must already have been "defective" in order to eat it. In saying this, Aub created a myth that still endures.

Because most scientific research on lead, including Aub's, was underwritten and overseen by the lead industry, the metal's adverse health effects were downplayed and often denied.

"We in academia share the blame for letting this happen," says Johns Hopkins's Silbergeld. "It takes two to collaborate. The great institutions of research, including my own, were certainly willing to continue to accept money from these sources, even to participate in their defense long after it was acceptable."

**UP UNTIL THE 1970S,** lead poisoning was defined by a blood-lead level of 60 mcg/dl, six times the current action level—and then only when there were overt symptoms such as anemia, stomach ailments, convulsions, and seizures. By 1991, when it was clear that children were harmed at much lower lead levels, the CDC threshold was lowered to 10 mcg/dl.

"Lowering the threshold to ten was a very important step in public health," says Paulson, a tireless advocate for lead-poisoning prevention. "But no one should have assumed that kids with blood-lead levels below ten were safe."

Studies by Bruce Lanphear and others have found that children's brains are impaired at lead concentrations of 5 mcg/dl —half the CDC's standard—and lower. This came to light recently, Lanphear explains, "because until the last decade we couldn't find children with levels low enough to study them in this way." Lanphear says this evidence proves there is no such thing as a "safe level" of lead exposure for children.

Children with lead levels below 10 mcg/ dl are not considered lead-poisoned by city or state health departments or the CDC, so there are no official numbers on the children damaged by supposedly harmless levels. But it's believed by lead researchers that many more children have been harmed by lead levels below the action level. A reasonable estimate is that a million or more mostly minority children nationwide are at risk each year of preventable cognitive or behavioral impairments from lead exposure, perpetuating what Silbergeld calls "the social tragedy of lead poisoning in the United States."

This may help explain why so many urban schools have so many young children who don't meet academic standards and why more than half of young African-American men do not finish high school.

In the District, 90 percent of fourthgraders do not read at grade level; some 11,000 District youngsters are in specialeducation programs. Only one in four DC high-school freshmen graduates from high school. Blame is assigned to educators, Because most of the scientific research on lead was underwritten by the lead industry, its adverse health effects were downplayed.

parents, and students themselves. But it may well be that lead has so impaired the brains of many young urban children that they cannot succeed in school.

A 2002 study of school failure titled "A Strange Ignorance" conducted by research analyst Michael T. Martin for the Arizona School Boards Association said of lead: "The fact that most 'failing schools' are in low-income neighborhoods where children live in housing known to be laced with a brain damaging neurotoxin is not just a coincidence."

**MILLIONS OF US** have at least some lead in our blood and bones that doesn't belong there. Bone measurements of ancient Peruvians reveal that the CDC's current action level of 10 mcg/dl is about 625

### WATCH OUT! SURPRISING SOURCES OF LEAD EXPOSURE

•Toys and furniture made before 1978 and painted with lead-based paint.

• Mini-blinds (imported vinyl, nonglossy varieties). As they age, lead dust can be released. Look for a label that says "nonleaded" or "no lead added."

• Lead in **soil** may come from paint chips that have flaked off older homes or from leaded-gasoline exhaust from cars. When children play in the soil, lead clings to their hands.

• Lead-glazed **ceramic dishes and cups**, especially handmade items and Mexican terra-cotta pottery. These and **lead crystal** and **pewter dishes** should not be used to store food or beverages—particularly acidic drinks like orange juice—for long periods.

• Metal toy jewelry and trinkets. In July 2004, 150 million pieces of toy jewelry from India were recalled because of lead. Several other recalls of inexpensive metal charms and jewelry have taken place since then.

• Lead used in hobbies—especially lead soldiers, ceramic glazes, and the lead dividers in stained glass.

• Many garden hoses contain lead and should not be used for drinking unless labeled "safe for drinking."

• Folk remedies containing lead, such as greta and azarcon, used to treat upset stomach in Hispanic and Asian communities.

• Chapulines (grasshoppers) from Mexico, eaten as snack food. Usually seasoned, sold in small, unlabeled bags at Hispanic food stores or flea markets; some have been found to be highly contaminated with lead.

• Cosmetic products called Sindoor produced in India; also called kohl. Contain high levels of lead.

• Litargirio, a skin product from the Dominican Republic. Nearly 80 percent lead, this powder may be used as an antiperspirant or foot powder or to treat fungal skin infections and burns.

• Certain **imported candies**, especially from Mexico. Dulmex-brand Bolirindo Iollipops, tamarind candy, and candies flavored with chili powder have been found to contain unacceptable amounts of lead.

 Some imported candles. When leaded wicks burn, they release poisonous fumes that can be inhaled and may also leave a toxic dust. Ask about lead when you buy.

• Sidewalk chalk. Multicolored sidewalk chalk manufactured in China was found in 2003 to contain high levels of lead.

times higher than "natural background" blood-lead levels of preindustrial humans.

An estimated 300 million tons of lead have been mined over the past century. The years 1945 to 1971 were the period of greatest US lead use, when we released an estimated 165,000 to 275,000 tons a year from auto exhaust pipes. Much of the lead was hauled from mines in Missouri, Illinois, Ohio, Colorado and Tennessee.

Over the half century of US leaded-gas use, an estimated 7 million tons of lead churned into the air, leaving 4 to 5 million tons of residue in the environment. Lead is the most widely dispersed toxic metal on earth.

Americans didn't get all their lead exposure from gasoline and paint. They ate food and drank milk from lead-soldered cans, stored drinking water in lead-lined tanks, and transported water through lead-soldered pipes. They squeezed it from leadlined toothpaste tubes and poured it from wine bottles sealed with lead-covered corks.

"The mining and smelting of lead and the dispersal of manufactured lead products within the human environment is actually a monumental crime committed by humanity against itself," noted the late Clair Cameron Patterson, a California Institute of Technology geochemist credited as the first person to measure the earth's age accurately (4.55 billion years).

When he made his earth-dating measurement in the 1950s, Patterson detected abnormally high lead levels in the earth's ice caps and knew it came from human activity. Alarmed by the dangers—and pervasiveness—of lead, he became a powerful antilead advocate.

Unlike copper, iron, and some other metals, lead has no useful purpose in the human body. It does not biodegrade; it accumulates where it is deposited. It enters the body via the lungs and gastrointestinal tract and migrates to the bloodstream, where the body mistakes it for calcium because of their chemical similarities. A chemical needed for cell regulation, calcium is especially important in the first three years of life, when the brain develops from a collection of billions of neurons into an organized learning organ.

Researchers at the Kennedy-Krieger Institute in Baltimore found that "many of the neurotoxic effects of lead appear related to the ability of lead to mimic or in some cases inhibit the action of calcium as a regulator of cell function."

The kidneys, auditory system, reproductive and nervous systems, and red-bloodcell production are vulnerable to lead. But no part of the human body is as vulnerable as the brain—especially the develop-(CONTINUED ON PAGE 111) ing brain. There lead can wreak havoc with the developmental process, leading to cognitive deficits. It also interferes with the synthesis of serotonin and dopamine, neurotransmitters essential for impulse control and the suppression of violent behavior.

AS HE GREW OLDER, Jonathan became more aggressive. In a swimming pool, he pushed his brother Gregory's girlfriend's head under and held it there as she struggled to break free. As she reached the surface gasping for air, Jonathan laughed.

At a shopping mall with Gregory, Jonathan waited at the door for a woman walking in. He suddenly slammed the door against her, pinning her between the door and the frame. She screamed, but Jonathan kept pushing on the door until Gregory pulled him away and freed the woman.

"You don't know from one second to the next what Jonathan will do," says Gregory, who has great affection for his little brother. "He can be sitting next to you quietly watching TV and the next second shove popcorn in your face and try to start a fight. With Jonathan, you always have to expect the unexpected."

Jonathan's half-sisters, both in their twenties, told their mother they're afraid to take Jonathan on outings because he dashes into the street. His mother says he can't be trusted to tell the truth. Jonathan throws things without provocation. His mother says she cannot allow Jonathan to be around a younger child if no adults are present. "If he's alone with young kids," she says, "he'll hurt them."

Jonathan once told his mother that if he had a gun he would shoot his father. When she asks why he says and does these things, he answers, "I don't know why. I just do them."

Often Jonathan paces until daybreak. He's been prescribed sleeping medication, but his mother uses it sparingly. "I don't want to turn him into a zombie," she says.

Jonathan resists going to school and taking ADHD medication, so Royster, who works part-time to be home with him, grinds it up and puts it in applesauce. Jonathan's father, Clayton, a teacher at the West Elementary School that Jonathan attends, no longer lives with Royster but often arrives in the morning to take his son to school. Royster says Jonathan has had violent outbursts at school.

"The fact that his father teaches at that school and helps with Jonathan is why Jonathan is still there," Royster says. "Otherwise, I think the school might have already expelled him."

On medication, Jonathan is cooperative with his teachers and friendly to his classmates. He can be affectionate and loving to his family. But neither medica-

## FOODS THAT MAY LESSEN THE EFFECTS OF LEAD EXPOSURE

Vitamin C. Studies have found a link between decreased blood concentrations of lead and increased concentrations of vitamin C. If the findings hold up, increasing vitamin C intake may offer a cost-effective way to help reduce harm from lead exposure, says Joel A. Simon of the University of California, San Francisco, author of a 1999 study in the Journal of the American Medical Association. Simon says people at high risk for lead toxicity should eat more fruits and vegetables and consider taking a vitamin C supplement. There is some evidence that vitamin E also may offer some protection from childhood lead exposure, but it is not as well established as that for vitamin C.

**Calcium.** Studies show that calcium reduces both absorption and retention of lead. Calcium is present in dairy products and many vegetables. The recommended dietary allowance (RDA) for calcium for ages one to ten is 800 milligrams a day.

**Iron.** There is evidence that iron helps block lead absorption in the gastrointestinal system. It is available in many foods including beef, kidney beans, boiled spinach, and oatmeal as well as iron-fortified breakfast cereals such as Cheerios, Froot Loops, and Cap'n Crunch. The RDA for iron for children six months to ten years is ten milligrams a day.

Iron supplements for children with iron deficiency who are lead-poisoned have been shown to improve development-assessment scores, a finding that suggests iron may reduce brain damage caused by childhood lead exposure. Iron deficiency is not common in developed countries, so iron supplements should be given only on the advice of a physician because excessive iron levels also pose dangers to children.

Iron deficiency is widespread in developing countries. Iron-deficiency anemia affects 25 percent of infants worldwide. It poses dangers for children in Africa and Asia, including Nigeria, Africa's most populous country, and Pakistan, where leaded gasoline is widely used. Latin America and Asia have made great strides in reducing the use of leaded gas.

![](_page_7_Picture_18.jpeg)

In groundbreaking research, Rick Nevin found a surprising link between childhood lead exposure and violence later in life.

tion nor the group therapy he attends with his mother has diminished his emotional eruptions when the medication begins to wear off, she says.

Royster, who gave birth to Jonathan when she was 43, despairs for his future and her own. "He keeps getting bigger and stronger," she says. "And I keep hoping he'll get better, but the older he gets, it seems, the worse he gets."

**RICK NEVIN DOES** not look like a radical as he relaxes in his tenth-floor office in Fairfax. Yet after years of research, Nevin, an economic consultant, has advanced a revolutionary explanation as to why this country's violent-crime rate increased so sharply, why it fell sharply, and why it will continue to diminish. It all has to do with lead.

Beginning in the early 1990s, violent crime, which had risen for decades, experienced a suddent decline, according to the Federal Bureau of Investigation's Uniform Crime Reports. By the end of 2004, violent crimes—murder, robbery, rape, and aggravated assault—had dropped 32 percent since 1995. Juvenile violent-crime rates also declined, and violent crimes in our nation's schools fell to about half of what they were in 1992. According to the Justice Department's 2004 National Crime Victimization Survey, the rate of violent crime is at its lowest point since the survey began in 1973. Conventional wisdom has offered the usual suspects: The end of the crack epidemic. New police strategies. An aging population. Tough sentencing laws. The best-selling book *Freakonomics* credits *Roe v. Wade* for the decline because fewer unwanted pregnancies meant fewer unwanted children, who are statistically more likely to commit crime.

The beginning of legalized abortion correlates with lower crime rates in the 1990s by allowing for a time lag of 17 to 23 years after birth. But lead follows the identical pattern, observes Nevin. In 1972, the year before *Roe v. Wade*, the phasing out of leaded gasoline began, a result of the 1970 Clean Air Act. In 1975, something unexpected happened to accelerate the phaseout: Leaded gas ruined the catalytic converters the federal government now required automakers to install on new

# In the brain, lead interferes with neurotransmitters essential for impulse control and the suppression of violent behavior.

cars. This resulted in plummeting production of leaded gas, not because it poisoned children but because it poisoned catalytic converters.

By 1980, the amount of lead in US gasoline had dropped to half of what it had been five years earlier; average American blood-lead levels dropped by 30 percent over the same period, according to the National Health and Nutrition Examination Study (NHANES). Both continued to decline throughout the 1980s and '90s.

Then there's the case of Great Britain. It legalized abortion in 1967 yet experienced a dramatic increase in violent crime throughout the 1990s. According to the International Crime Victimization Survey issued by the US Justice Department, by 2000 Great Britain's violent-crime rate was twice ours. Nevin believes that's because Great Britain did not significantly reduce gasoline lead emissions until 1986 and did not ban leaded gas until 2000. He predicts that Great Britain will begin to see a drop in violent crime in the not-distant future.

**NEVIN'S FINDINGS ON** crime and lead grew out of a cost analysis on lead-paint reduction he prepared for HUD while a vice president with ICF Consulting in

# HOW LEAD GOT INTO GASOLINE—AND WHY IT TOOK SO LONG TO GET IT OUT

The advent of the automobile proved a boon to the lead industry. Automakers already needed it to make car batteries and tires, but nothing increased the demand for lead like gasoline.

In 1922 General Motors engineers discovered that adding tetraethyl lead (TEL) would eliminate a major problem—engine "knock." In a high-compression engine, fuel tended to explode instead of burning evenly. As a result, the engine made a knocking sound, and power decreased.

One way to fix the problem would have been to use a higher grade of gasoline in a smaller, more efficient engine. Automakers instead developed larger, less-efficient engines fueled by lower-quality gasoline improved with TEL, which the industry called "an apparent gift of God."

GM contracted with the DuPont Corporation to develop a way to produce large amounts of TEL. In 1923 DuPont opened its first TEL plant in Deepwater, New Jersey, the year leaded gas went on sale. A year later, GM and Standard Oil of New Jersey established the Ethyl Gasoline Corporation to produce and market TEL. DuPont took part in the venture by virtue of its owning a nearly 40-percent interest in GM. Standard Oil soon developed its own method to produce TEL at its Elizabeth, New Jersey, facility.

Although not as toxic as metallic lead, TEL is a volatile liquid easily absorbed by the human body. This became apparent in October 1924 when some workers became seriously ill at Standard Oil's New Jersey refinery. Five died. Workers at DuPont's Deepwater facility called TEL "loony gas" and named their plant "the house of butterflies" after an estimated 300 workers were lead-poisoned there in 1924. Many suffered hallucinations—such as imagining butterflies—and showed symptoms of psychosis severe enough for some to be institutionalized permanently. More than a dozen men died from lead exposure in the DuPont and Standard Oil plants as well as the GM research facility in Dayton, Ohio.

The poisonings were reported by the press and generated protests. The companies at first tried to blame worker carelessness, but this did not allay concerns over TEL's safety. Production was halted for further study, and sales of leaded gas were suspended.

In 1925, with public-health and government officials in attendance, representatives of automotive, lead, oil, and chemical companies dominated a conference on leaded gasoline convened by the Surgeon General in the US Treasury Department auditorium.

Dr. Alice Hamilton of the Harvard School of Public Health, one of the country's leading authorities on lead toxicity, urged that something other than lead be found to improve gasoline performance.

Engineers knew that other remedies existed. Alcohols, including ethanol, could boost power and eliminate knocking when blended with gas. They were clean-burning, high-octane fuels from vegetable sources. Although alcohols were seen to have only "minor disadvantages," they were abandoned in favor of tetraethyl lead. (Congress recently mandated that ethanol be blended with gasoline to reduce gasoline consumption.)

Hamilton and other scientists warned that leaded gas would poison the air of our nation's cities and pose a grave threat to public health. The Surgeon General ended the conference by announcing that he would appoint an expert committee to study the issue.

After a brief investigation, the committee concluded that lead was "poisonous," but there were "no good grounds" for banning leaded gas. It noted that leaded gas could become a health hazard and recommended that the Public Health Service continue to study it.

In 1926, Surgeon General Hugh Cummings approved leaded gas for general use. The TEL production plants devised better methods to protect workers, and by 1929 US lead production had more than doubled. By the mid-1930s, 90 percent of gasoline sold contained lead. The recommended Public Health Service follow-up studies were never funded, and the expert committee's report was used by industry to claim that leaded gas had received a "clean bill of health."

Over the next six decades, leaded gas exposed more than 60 million American children to toxic lead levels. For much of this time, the prevailing consensus held that lead in the atmosphere was harmless and that lead toxicity occurred only at very high exposures. Most data supporting this consensus came from a single source: the Kettering Laboratory of Applied Physiology at the University of Cincinnati, established and funded by the Ethyl, DuPont, and Frigidaire corporations.

Fairfax. He evaluated all the statistics on early lead exposure and violent-crime rates and found "a stunning fit."

"To say this surprised me is an understatement," Nevin says, "because as someone who is very skeptical of environmental regulation, my biases could not have made me a more unlikely candidate to come to these conclusions." He is now a senior adviser for the National Center for Healthy Housing.

Using regression analysis, which permits researchers to account for multiple factors simultaneously, Nevin concluded that childhood lead exposure explained 88 percent of the variation in the violent-crime rate in the United States over several decades. Teen unemployment, long cited as a major reason for youthful criminality, accounted for only 2 percent, he determined.

Nevin's conclusions amplify earlier stud-

Childhood lead poisoning was the single greatest predictor of school disciplinary problems, which in turn were the major predictor for juvenile crime.

ies linking lead exposure and criminal behavior, none more striking than work by Deborah W. Denno, a professor at Fordham University School of Law.

Longitudinal studies analyze the same group of individuals over a period of time,

and Denno carried out one of the nation's largest on the biological, sociological, and environmental predictors of crime. She did this using data collected on a group of 487 young black males from the time their mothers entered the hospital to give birth to age 25. In all, she weighed more than 3,000 variables over 25 years to test differing theories on crime. Her findings were published in her 1990 book, *Biology and Violence*.

Supported by the National Institute of Justice, an arm of the US Justice Department, Denno's study began as her PhD dissertation at the University of Pennsylvania in 1978. She drew from data collected by the Collaborative Perinatal Project, a study of some 58,000 pregnancies in 12 US cities conducted from 1959 to 1974. Still used today as a research resource, the NIHsponsored study included health, socioeconomic, religious, family, and employment

## IN FIGHTING LAWSUITS, PAINT COMPANIES HAVE SOME INTERESTING ALLIES

In February, the state of Rhode Island won a landmark lawsuit against makers of leadbased paint. The state claimed that 37,000 children had been harmed by lead paint over a period of 11 years.

Before Rhode Island's legal victory, lawsuits against paintmakers had always failed; most were dismissed before trial. None had even been settled. But now a door has been opened, and St. Louis, Milwaukee, Philadelphia, New Orleans, Chicago, Oakland, San Francisco, and Santa Clara County have pending lead-paint lawsuits, as has the New York City Housing Authority. Most of the suits seek to recover public money spent on detecting and abating lead hazards, for screening and treatment of lead-exposed children, and for lead-education programs.

More states, cities, counties, and school districts with lead-paint problems are likely to file lawsuits. If so, and state courts give them the go-ahead, the paint industry could find itself in a legal predicament reminiscent of those faced by the tobacco and asbestos industries.

The Rhode Island case was argued in court by Motley Rice, the South Carolina law firm involved in multistate litigation against tobacco companies that was settled in 1998 for \$206 billion. No taxpayer money is used to bring leadpaint lawsuits; lawyers working with the plaintiffs take the cases on a contingency basis.

The Rhode Island verdict asked the three companies on trial to pay for removing leadpaint hazards from more than 300,000 state dwellings and public buildings that are accessible to children. Making just one home lead-safe can cost several thousand dollars. The three paint companies in the Rhode Island case—Sherwin-Williams, NL Industries (formerly National Lead Co., maker of Dutch Boy paints), and Millennium Holdings, the successor to Glidden paints—were held liable by the jury even though there was no direct evidence at trial that their products were responsible for harm to any Rhode Island children. Moreover, they had stopped making lead-based paint nearly 30 years ago.

The paint industry maintains that the lawsuits are unjustified because it sold paint legally. The industry has retained high-powered law firms, including Arnold & Porter and Kirkland & Ellis in Washington. The McLean-based Bork Communication Group, headed by Robert Bork Jr., a son of the rejected US Supreme Court nominee, has helped paint companies devise legal and public-relations strategies. Accord to *PR Week*, Bork, a former journalist, is "considered a pioneer in the area of litigation PR."

Paint companies have also retained Bonnie Campbell, the former attorney general of Iowa, as well as former officials and lawmakers in cities where lead-paint lawsuits are pending.

The paint industry's position also appears to be getting support from the Reverend Benjamin Hooks, former head of the NAACP and now chair of the Washington-based Children's Health Forum. Other board members include former HUD secretaries Jack Kemp and Henry Cisneros and former Baltimore mayor Kurt Schmoke, now dean of the Howard University law school.

Founded in 2002 by Hooks with DuPont Corporation funding, the CHF bills itself as a "nonprofit organization dedicated to the eradication of lead hazards and the prevention of childhood lead poisoning." It says it provides grants, advocacy, technical support, and education programs. In 2002, the same year the first Rhode Island lead-paint lawsuit ended in a hung jury, Hooks published an op-ed article in the *Baltimore Sun* that called lawsuits against paint manufacturers "misguided" and contended that they distracted from the immediate task of "eradicating lead hazards."

He published another op-ed this February in the *Milwaukee Journal Sentinel* criticizing lawsuits against paint manufacturers; it ran while the suits were the subject of debate in Wisconsin. Although the CHF says it does not "support or oppose" these suits, Hooks signed his opinion pieces as the CHF board chair.

Originally a defendant in the Rhode Island lawsuit, DuPont was dropped from the case by the Rhode Island attorney general when the company agreed to donate \$12 million to three nonprofits. Part of the money went to Brown University and part to the Dana-Farber/Brigham and Women's Cancer Center in Boston, but DuPont pledged by far the largest share, \$9 million, to the CHF. According to the CHF, the money will be used in Rhode Island over the course of several years. Although CHF now has other corporate contributors, DuPont remains its major funding source.

The *Providence Journal* reported in June that Rhode Island attorney general Patrick Lynch accepted \$4,250 in campaign contributions from DuPont Corporation lawyers and lobbyists before and after he negotiated the lead-paint settlement with the company. Lynch has denied any wrongdoing.

![](_page_10_Picture_0.jpeg)

Ruth Ann Norton, of the Coalition to End Childhood Lead Poisoning, is critical of DC's efforts to protect children from lead. She thinks the District needs a lead czar "with authority and a bully pulpit" to coordinate the city's lead-control programs.

data; eye and foot preferences; the IQs of subjects and their mothers; and serological, neurological, psychological, hearing, language and speech, and genetic data.

The 487 subjects Denno chose were all born in the Pennsylvania Hospital in Philadelphia between 1959 and 1962 and went through the city's public-school system. Denno says the "gold mine" of data allowed her to control for hundreds of factors. Her subjects were African-American males because the number of whites was too small for inclusion in her analysis, but Denno contends that the subjects' homogeneity strengthened the results of her study.

"We knew their life circumstances in great detail," Denno says, "and given everything about them, their neighborhood, their low socioeconomic status and family situations—the very things sociologists and criminologists look at to explain criminal behavior—these young men should have all been committing crimes, but they weren't. So the big question we asked was, if they all have such similar backgrounds and environments, why did some of them commit crimes and others not?"

After performing computer regression analyses on all the different factors, something unexpected emerged: "What came popping up again and again," Denno says, "was the amazingly powerful effect lead had on crime. It totally blew me away."

**BEFORE HER STUDY**, Denno, like Nevin, thought the idea that a heavy metal could have anything to do with crime was "nonsense."

"No one had ever looked at lead and crime," she says. "Criminologists hadn't even considered it." She included bloodlead levels as a risk factor only because the data were available along with other blood studies performed in the perinatal project. She found it "stunning" that elevated childhood lead levels emerged as a powerful predictor of antisocial behavior in her three basic categories—school disciplinary problems, delinquency, and adult criminality. Lead turned out to be the only factor out of the thousands she accounted for to have an impact in all three areas.

Childhood lead poisoning was the single greatest predictor of school disciplinary problems, which in turn were the major predictor for juvenile crime. She found anemia to be the second-leading predictor for school-discipline problems. Anemia is a common symptom of lead poisoning because lead inhibits the function of hemoglobin, vital for blood oxygen transport.

Denno found childhood lead poisoning to be the fourth-leading predictor of adult crime, but the leading predictor for adult crime was the number and seriousness of juvenile offenses. In other words, she says, lead was, directly or indirectly, the leading predisposing factor for all three categories of antisocial behavior.

"Among the most striking results we found," she adds, "is that lead proved to be a key factor for the most violent offend-

# WHAT ABOUT LEAD IN DC'S DRINKING WATER?

Concerns about lead in DC's drinking water made headlines two years ago, and while lead in water can cause harm, experts say it is a less-troubling problem than lead paint.

In 2004 the *Washington Post* revealed that the DC Water and Sewer Authority (WASA) knew in 2002 that there were elevated lead levels in drinking water and concealed the information. WASA's tests in 2002 and 2003 revealed that 2,287 residences had water-lead levels of more than 50 parts per billion (ppb), and 157 of those had levels exceeding 300 ppb. The EPA "action level" for lead in municipal water is 15 ppb. The EPA charged WASA with violating the federal Safe Drinking Water Act.

The US Public Health Service and the DC Department of Health offered residents free bloodlead tests. Forty of the 1,954 children under age six who were tested had elevated lead levels, but only 14 of them lived in homes with lead water-service lines. All but one of the remaining 26 lived in homes that had dust and/or soil lead levels that exceeded federal guidelines.

The lead found in DC's water is thought to have leached from corroded solder connections between main water lines and home service lines. The corrosion may have been a result of chloramine added to the water supply. A compound made of ammonia and chlorine, chloramine replaced chlorine after tests discovered that chlorine alone had begun combining with organic matter in the system to form trihalomethanes, a byproduct known to be carcinogenic.

To allay the lead problem, WASA has added different chemicals to the water supply to prevent it from leaching and says by 2010 it will replace more than 1,600 lead service lines. The city has awarded hundreds of grants to homeowners to replace water service lines to their houses.

"Lead in water is an important issue but not as grave as we thought it could be," say Dr. Jerome Paulson of George Washington University. "And WASA's commitment to replacing all the lead pipes they're responsible for will fix the problem."

An unexpected consequence of the water scare, says Dr. Danielle Dooley, a physician with Unity Health Care—which serves the Hispanic and immigrant population around 14th Street, Northwest—came about when worried parents purchased bottled water for their children. "Bottled water is unfluoridated," she says, "and as a result there has been a striking increase in tooth decay among the children we see at the clinic." ers, those kids who committed homicides, rapes, and other violent crimes."

Denno acknowledges that blood-lead tests in the 1950s and '60s were not as sophisticated as they are today. "But as every good researcher knows," she says, "the greater the precision for measuring a variable, the better your results will be. In other words, if there had been a more precise measurement, the lead effect would have been even stronger."

Denno concludes, "I am very confident in my study, confident that lead predisposes people to act in an impulsive, antisocial way. But I found these results to be extraordinarily sad because it is all so preventable."

**OTHER STUDIES SUPPORT** Denno's and Nevin's findings, and evidence of a link between childhood lead exposure and violent behavior is now so persuasive that the question is not whether lead contributes to violent crime but how much.

Dr. Herbert Needleman, professor of child psychiatry and pediatrics at the University of Pittsburgh School of Medicine, reported a link between delinquent behavior and lead in a 1996 issue of the *Journal of the American Medical Association*. Needleman followed 301 boys in Pittsburgh's public schools over a period of years. Their behaviors—reported by the boys' teachers, their parents, and the boys themselves were correlated with their bone lead levels.

Boys with the highest lead levels were consistently more likely to engage in antisocial activities like bullying, vandalism, truancy, and shoplifting, even when race, education, and the neighborhood crime rate were taken into account. Their behavior got worse as they grew older. In contrast, behavior did not change among boys with low lead levels.

Needleman believes that lead exposure reduces impulse control, likely through the suppression of serotonin. Reduced impulse control increases school and behavior problems, which may lead to feelings of frustration and failure that are expressed by violent or criminal behavior. Lead exposure, Needleman says, is arguably this country's most preventable cause of antisocial behavior.

"Lead exposure is responsible for many problems of the inner city," he says. "It is a big part of the crime picture."

**RICK NEVIN'S PEER-REVIEWED** study linking lead exposure and violent crime was published in the May 2000 issue of *Environmental Research*—to nearly universal indifference. This surprised Nevin, but it probably shouldn't have. His findings, like Denno's and Needleman's, fly Thousands of kids across the country are still coming up with high blood-lead levels from old lead paint. This is a continuing and needless tragedy.

in the face of preconceptions about crime. How could lead be a major cause of crime when for decades we've assumed that factors like poverty, racism, lack of education, broken homes, unemployment, and drugs are the culprits?

Nevin's data tracks seem almost uncanny. On one graph, a line traces the violentcrime rate since 1941, while a second line traces variations in leaded gasoline use, as measured in tons per capita of population. Adjusting for the time lag between early lead exposure and the prime age range for committing crime, the two lines are nearly identical. As leaded-gasoline use increased, so did violent crime 17 to 23 years later. People with the highest gasoline-lead exposures lived in major cities where the heaviest motor-vehicle traffic is concentrated; central cities also have the highest rates of violent crime.

Nevin drew a second graph that tracks lead-paint exposure, also measured in tons

per population, and the murder rate from the years 1900 to 1959, when leaded gas was either a nonfactor or a lesser one. It shows a similar convergence.

Ellen Silbergeld says she was "astounded" when she read Nevin's study. "I passed his article around to people I believe to be experts, colleagues who do social-science analysis," she says, "and they consider this to be a magnificent study." Silbergeld says animal studies in her lab reveal that mice that are given lead become far more aggressive and violent than mice that aren't.

So why has Nevin's work not made its way into the national debate on crime?

"People just don't believe it," Nevin says. "I think one of the reasons for the skepticism is the overwhelming research showing the association of lead exposure with lower IQ, but the association between lead exposure and impulsive and violent behavior is less well known. Also, they look at my data and say, 'These kids had so many other problems, how can you single out lead?' But those kids had those same problems in the 1990s, so why did the crime rate fall like a rock?"

Nevin says people have suggested his study would be more widely accepted if he'd found that lead accounted for only 40 or 50 percent of the variation in violent-crime rates. "When I say lead explains nearly 90 percent of the variation, people think it's preposterous," he says.

"I don't blame them because it sounds like a bad science-fiction plot. Can you

![](_page_11_Figure_19.jpeg)

This graph maps violent crime from 1964 to 2004 against the per-capita use of lead in gasoline between 1941 and 1986. Gasoline-lead exposure paralleled the violent-crime rate trend with a lag of 23 years. Researcher Rick Nevin expects the violent crime rate to decline more slowly than in the 1980s, largely because lead-paint hazards have not declined as rapidly.

imagine a script about a planet that systematically poisoned its youngest children with the same neurotoxin in two different ways over the course of the same century, with profound social consequences? You'd say this is a ridiculous plot line. But this is what happened."

**LIKE ALMOST EVERYONE** knowledgeable about lead, Nevin believes the banning of leaded gas and lead paint constitutes one of the 20th century's greatest triumphs for public health.

"The data on declining blood-lead levels in the country show spectacular progress, and we will gain additional benefits over the next 20 or 30 years with lower crime rates and higher school achievement," he says. "But the number of kids at the wrong end of the blood-lead curve today is still horrifying. Thousands and thousands of kids across the country are still coming up with blood-lead levels over 20 mcg/dl from old lead paint. This is a continuing and needless tragedy."

Removing all the lead paint from America's walls would cost billions of dollars. But leaving it there is even more costly. A CDC study published in *Environmental Health Perspectives* in 2002 calculated that the economic benefits from IQ increases resulting from the lead-level decline between 1976 and 1999 ranges from \$110 billion to \$319 billion because of increased worker productivity. The study did not take into account the savings from less school failure, less special education, greater productivity, and less violent crime.

WHEN HE WAS in the first grade, Jonathan was referred for a series of tests because of "academic problems." The evaluation took place in autumn 2004, just before Jonathan's seventh birthday. The psychologist giving the test found him "consistently inattentive and distracted."

According to the psychologist, Jonathan's "conversational proficiency was considered limited for his age," and he had "visual motor integration problems." Jonathan also exhibited lapses in his "working memory."

Earlier, Jonathan's first-grade teacher had commented that "Jonathan cannot retain much of the material covered in class." She also noted that he "forgets simple tasks like taking his jacket with him outside or remembering where he puts his lunch box."

Jonathan's verbal ability tested "low average." While he could identify words with which he was familiar, Jonathan "did not display any decoding skills with unfamiliar words." In effect, Jonathan could not read. He scored "low average" in math; he did not understand subtraction and was unable to solve written math problems.

Jonathan's overall thinking ability was considered "average" because he displayed some proficiency in visual and auditory memory and could retain some information when it was repeated to him. But his overall "cognitive efficiency" was "in the below-average range" with an overall score of 70. On the basis of Jonathan's intelligence and ADHD, he was recommended for "specialized instruction." He is enrolled in special-education classes.

**IN 1979 NEEDLEMAN,** then at Harvard, published a study of 524 schoolchildren in Boston suburbs that compared their school performances with their lead levels, determined by examining the students' teeth. None of the students had any physical symptoms of lead poisoning such as stomach ailments or anemia.

Needleman's team found that the average IQ of children with low lead levels was 107 and those with higher levels was 102. Five percent of the low-lead group scored in the gifted IQ range, but none in the high-lead group did. Four times as many students in the high-lead group had verbal IQs below 80. Needleman also reported that seven- and eight-year-old lead-poisoned students suffered serious attention deficits and hyperactive behavior that intensified their school problems.

Needleman's study, published in the New England Journal of Medicine, redefined lead poisoning by revealing that a child need not display symptoms of lead exposure to be seriously harmed by it.

For his efforts, Needleman endured years of attacks denigrating the quality of his research and his integrity as a scientist. In 1982 the industry-funded International Lead Zinc Research Organization (ILZRO) went to the Environmental Protection Agency to accuse Needleman of scientific misconduct. The EPA convened a committee of experts, which concluded that Needleman's study had not proved a connection between lead exposure and a child's mental development. Needleman countered that the committee report contained serious mistakes. The EPA agreed, reversed the committee's findings, and lauded Needleman's "pioneering study," saying it confirmed a "significant association" between lead exposure and childhood intelligence.

The ILZRO hired the public-relations firm Hill & Knowlton to publicize the original committee's criticisms of Needleman.

**TWO SCIENTISTS LED** the next attack on Needleman. One was Sandra Scarr, a developmental psychologist at the University of Virginia who had been a member of the EPA committee that disputed Needleman's study. The second was Claire Ernhart, a developmental psychologist at Case Western Reserve University in Cleveland, who called Needleman's study "slipshod." Beginning in 1983, Ernhart, who had

![](_page_12_Figure_17.jpeg)

This graph by researcher Rick Nevin tracks the US murder rate between 1900 and 1960 against per-capita incidence of lead in paint from 1879 to 1939—reflecting a lag time of 21 years between lead exposure and murderous behavior.

conducted lead research, received about \$50,000 a year from ILZRO for research support but denies being beholden to the lead industry or speaking on its behalf. Scarr claims not to have received money from ILZRO other than expert witness fees and likewise denied industry influence.

Ernhart and Scarr joined forces against Needleman after he testified for the US Department of Justice in a lawsuit against three corporations accused of leaving lead deposits near a residential area. Ernhart and Scarr testified for the corporations.

The companies eventually settled. Soon thereafter Ernhart and Scarr brought formal charges of scientific misconduct against Needleman with the Office of Research Integrity (ORI) in the Department of Health and Human Services. They accused him of manipulating his research to emphasize the negative effects of lead. In March 1994, the ORI concluded that Needleman was not guilty of scientific misconduct but noted, as earlier peer inquiries into his study had, that Needleman had made several errors, mostly of a statistical nature that did not materially affect his conclusions.

In all, the attacks on Needleman's work and integrity and his defense against them dragged on for 15 years.

What happened to Needleman is an extreme example of a common industry tactic, says David Michaels, professor of environmental and occupational health at the George Washington University School of Public Health.

"In effect, the lead industry, like other industries, tries to raise doubts about a negative finding to manufacture uncertainty," says Michaels, a former assistant secretary of Energy for environment, safety, and health. "They then use that uncertainty to avoid the financial burdens of stricter regulations or victim compensation and delay regulation so they can continue to use their product in an unfettered way. They don't necessarily do this in a conspiratorial way. They don't go to bed at night thinking they're poisoning little children. It's my sense they convince themselves their product is safe with the rose-colored glasses of financial association."

**NEEDLEMAN HAS BEEN** vindicated by a compilation of studies that validate his linkage of lead to diminished IQ, inattentive and hyperactive behaviors, and poor school performance.

Studies dating from the late 1990s have linked lead to ADHD. This May, a new twist was added in a paper presented at the Pediatric Academic Societies annual meeting. Tanya Froehlich, a pediatric development and behavioral specialist at Cincin"Lead almost certainly plays a role in the IQ differences between Afro-American children and white and Asian children," says Landrigan.

nati Children's Hospital Medical Center, reported that children with a high genetic risk of ADHD seemed unaffected by lead exposure, but children at low genetic risk were. When exposed to lead, she said, children who had a low genetic risk of ADHD were much more likely to have attention deficits and other cognitive problems. How many American children develop ADHD from lead exposure is unclear.

In 1995 the American Academy of Pediatrics reviewed 18 scientific studies on the correlation between children's mental abilities and lead in their blood and reported "the relationship between lead levels and IQ deficits was found to be remarkably consistent."

Perhaps the most unsettling news about lead's impact on children's intelligence arises from studies finding that the steepest rate of IQ decline occurs at lead levels considered harmless.

Bruce Lanphear's research team measured blood-lead levels twice a year in 172 children from age six months to five years. At ages three and five, the children were given Stanford-Binet IQ tests. After controlling for many variables, including maternal IQ, race, sex, tobacco use during pregnancy, and household income, the study compared children with a range of lead levels.

Not unexpectedly, the study reported that higher lead levels were associated with IQ declines. Less expected was the finding that IQs declined most precipitously among children whose lead levels did not exceed "safe" levels for the length of the study.

Researchers said the sharpest IQ decline "is due largely to the initial IQ loss" incurred in the so-called "safe" range. The study appeared in the April 17, 2003, issue of the *New England Journal of Medicine*.

Lanphear's results have been confirmed by other studies. An analysis of 1,333 children who took part in seven international lead studies revealed IQ deficits associated with blood-lead levels below the 10 mcg/ dl threshold. This analysis, in the July 2005 issue of *Environmental Health Perspectives*, also found that the steepest rate of IQ decline occurred at blood-lead levels of 7.5 mcg/dl and lower.

Lanphear says these data strongly indicate that most children are harmed at blood-lead levels that don't even meet the CDC action level and that "their number is much higher than we've estimated."

"The effects of these subtle changes in IQ accumulate over time," says Lanphear. "In purely monetary terms, they are estimated to cost society more than \$40 billion a year in reduced lifetime earnings.... These IQ decrements are just the tip of the iceberg. Costs from behavior problems, delinquency, school failure, and crime come to many billions more."

**MINORITY CHILDREN**, especially African-American children, are overrepresented in special-education classes, and African-American males are overrepresented in such categories as mental retardation and emotional disturbance. A National Research Council report on minority representation in special education found African-American children are twice as likely as whites to be identified for the mental-retardation category. Black students are about half again as likely as white students to be classified with an emotional disturbance.

African-Americans score on average 15 points lower on standard IQ tests than whites and Asians, a central point of the controversial book *The Bell Curve*. The book argued that these intelligence differences were essentially genetically determined and therefore unchangeable. But can lead exposure, and not genes or the cultural and socioeconomic differences between races, explain the apparent IQ difference or at least some of it?

"Lead almost certainly plays a role in the differences in IQ between Afro-American children and white and Asian children," says Dr. Philip Landrigan, an environmental-toxin authority who chairs the department of community and preventive medicine at the Mount Sinai School of Medicine in New York. "It's hard to say precisely how much of that 15-point difference may be due to lead, but I have no hesitation in saying that lead is contributing to some of it."

Nevin thinks that lead accounts for all of the IQ differences between whites, Asians, and African-Americans. "Although there is this rich history of literature that IQ is inherited," he says, "the fact that IQ scores have risen throughout the century clearly suggests there is some kind of an environmental factor. When people think about environmental factors they always think in terms of the socioeconomic environment. They do not think of an environmental factor in which toxic chemicals block brain development." Nevin's mention of rising IQ scores refers to the observation of James Flynn, a New Zealand political scientist, that IQtest scores in Western societies have risen fairly consistently, about three points a decade. Troubled that many people assumed the IQ-test gap between blacks and whites results from genetic differences—a major argument in *The Bell Curve*—Flynn compared 40 years of IQ testing from 20 countries, including the United States, and came upon the rising-IQ phenomenon, now known as "the Flynn effect."

Many subsequent studies confirmed Flynn's findings. Allowing for variations among countries, all found rising scores for every type of IQ test and for every group. In other words, the real differences in IQ scores were between generations, not races. Genetics could never explain such rapid change, so Flynn knew the answer had to lie in environment. In this country, for example, the average IQ score for African-Americans today is about the same as it was for white Americans 50 years ago.

Different theories have been advanced to explain the Flynn effect, including improved nutrition and educational advances. But Flynn has concluded that no single theory can explain his finding.

Nevin believes much of the Flynn effect can be explained by variations in the production of leaded gas and lead paint through much of the 20th century. He says the widespread use of heavily leaded paint in the first part of the century harmed cognitive development of many children. He believes this is reflected when widespread IQ testing began in the 1940s, from which Flynn began comparing IQ-test results.

In other words, Flynn observed increasing IQ scores because his baseline scores from the 1940s were low because of the impact of lead exposure. As paint lead content was reduced in the 1950s, IQ-test scores began rising.

Beginning in the 1950s, Nevin says, the increase in gasoline lead exposure more than offset the decline in paint lead exposure. This may explain why the rise in IQ scores seemed to slow or stop in many nations during the 1980s and 1990s. Nevin's study also found evidence that the sharp decline in leaded-gas production beginning in the mid-1970s—and the resulting drop in blood-lead levels—explains why there has been an accelerated rise in IQ scores for US grade-school children in 1984 and 1992. The acceleration appears to be continuing.

**JONATHAN'S INITIAL BLOOD** test made him a human lead detector. Before his high blood-lead levels were discovered, DC's Department of Health, Department of

# Some 4,000 of the District's children six and under may have lead levels recognized by the CDC as potentially hazardous.

Housing and Community Development, and Department of Community and Regulatory Affairs—the three agencies empowered to deal with lead-paint issues—had done nothing to identify and remediate his lead-contaminated home. By the time the Department of Health ordered the landlord to abate the lead problem, Jonathan had been irrevocably harmed.

The District had had fair warning about the house. Nearly 25 years earlier, three young boys who lived in the same house had been poisoned by lead paint, according to their sister, Taleeya Green, and a written statement from the children's mother, Kathy Marable.

The oldest boy, Reginald Marable, had high-enough lead levels for doctors to admit him to Children's National Medical Center for chelation therapy, a process that extracts lead from the body.

A younger brother, Ronald, a toddler at the time, and a cousin who lived with the family also were poisoned. Ronald was later diagnosed with ADHD, which his mother believes was caused by his lead poisoning.

Although treated with Ritalin, Ronald had behavior problems in school and at home, according to his sister. He lived a short and troubled life. A few minutes after midnight on April 18, 1995, DC police found him next to a building in the 1800 block of Q Street, Southeast, dead from a gunshot wound. He was 18.

According to Green, her stepfather also suffered lead poisoning and was hospitalized. She says the family notified the DC government about the lead contamination and reached an out-of-court settlement with the landlord, a different owner than the current one.

**JUST AS COAL** miners once used canaries to detect toxic gas, testing children's lead levels is how the District government identifies lead-contaminated properties.

"Using children to identify unsafe housing is unethical," says GW's Paulson. "It needs to stop."

There is no systematic screening of children in the District; there is no budget for it. Mostly, children are tested haphazardly at daycare centers and health fairs, when they enter Head Start, or by health clinics or private physicians.

"The closest thing to a formal leadscreening system we have here," says Dr. Benjamin Gitterman, a member of the CDC lead-advisory task force and codirector of the Mid-Atlantic Center for Children's Health and the Environment, "is the federal request that all kids on public health insurance have blood-lead tests at ages one and two as part of their health screening."

Fewer than half of District children under age two on Medicaid were screened for lead in 2003, but this is a major improvement over 1999, when 7 percent were screened, according to Medicaid.

Determining how many children in the District are lead-poisoned is difficult. One member of the DC Joint Lead Screening Advisory Committee calls the health department's recordkeeping "discombobulated."

The joint committee was formed in 2002 to monitor the city's anti-lead-poisoning efforts in response to a CDC grant requirement. The panel comprises officials from city agencies, CDC representatives, members of citizen and environmental organizations, and the medical community.

One criticism is that the District's data collection and analyses on lead screening are not done according to standard publichealth methods. For that reason, the DC lead data don't reflect the true incidence of lead poisoning.

According to the Department of Health's Childhood Lead Poisoning, Screening, and Education Program figures, of the 33,803 children under six reportedly screened in 1998, 2,146 had lead levels above the CDC action level. Many observers think it unlikely that 33,803 children actually were screened that year, and it is uncertain whether that many children really were lead-poisoned. The next year the health department reported that 11,777 children were screened, and only 215 had lead concentrations above the CDC action level—a dramatic drop that has not been explained.

From 2000 through 2003, the health department reported fewer than 200 youngsters with elevated lead levels each year. In 2004, the number above the action level increased to 332 out of a reported 15,121 children tested. In 2005 the number dropped to 200.

Ruth Ann Norton, executive director of the Baltimore-based Coalition to End Childhood Lead Poisoning, says the District's lead-screening data cannot be believed. "I think Washington, DC, is one of the most underreported cities in the country when it comes to childhood lead poisoning," she says. "It has a history of having bad numbers, and when I look at them they make no sense to me."

How many of the District's nearly 40,000 children under six years old acquire lead concentrations above the action level every year? It's almost impossible to tell because of the inconsistencies in the data. A guess of 500 to 1,000 or even more a year is not unreasonable.

How many District children under six today have elevated blood-lead levels?

A 2001 survey by Chicago health officials found 11 percent of that city's children above the CDC action level; a survey in Baltimore found 9.5 percent. If similar percentages hold for the District, some 4,000 of the city's children six and under may have lead levels recognized by the CDC as potentially hazardous.

Given the evidence that children can be impaired at levels below the CDC action level, the total District children harmed by lead exposure is anyone's guess. One thing is certain: The number is much greater than the health department's figures indicate.

**DR. MURIEL WOLF,** senior pediatrician at the Child Health Center at DC's Children's National Medical Center, says the city needs a more effective way to protect children from lead threats.

"When we find kids with lead poisoning who live on certain streets," she says, "we know other homes on those streets also have lead-paint problems. You can just drive around neighborhoods, and you know many of the older homes you see have lead problems. We need to be proactive about this."

For three decades Wolf has tested and treated children with lead poisoning. She says the District should provide dust-wipe kits so families could collect dust in their homes to be analyzed for evidence of lead. The kits and tests are relatively cheap.

Says Paulson: "The District government has records of when houses were built. It could systematically inspect all the homes built before 1978, and any lead-contaminated home in which kids live could be made lead-safe." This approach is known as "primary prevention."

Many of the city's oldest homes are in Georgetown, but most are well maintained and free of cracked and peeling paint. Lead paint usually becomes a problem in affluent areas only when home renovations are not handled carefully. Census data from 1990 show that Wards 1, 4, 5, and 6 have the city's highest percentage of pre-1950 housing. Not surprisingly, these wards also have the greatest prevalence of lead poisoning. Far from the primary-prevention approach espoused by Paulson, Wolf, and others, the District's lead-abatement efforts are "fragmented and ineffective," says the nonprofit advocacy organization DC Action for Children.

The District has no systematic programs to inform parents about the hazards of lead and how to minimize them. It has no citywide program to warn pregnant women about lead's potential harm to unborn children. It has no citywide childhood lead-screening program. Much of the work in these areas is done by private and volunteer groups.

Legislation prepared by the mayor's office to require that landlords test rental properties for lead when a tenant vacates and remediate any problem before a new tenant moves in was brought before the DC Council in 1999. It died in committee and has not been reintroduced. District apartment-building owners opposed it. Councilman Jim Graham has introduced two lead bills, and they too died.

**A JANUARY MEETING** of the DC Joint Lead Screening Advisory Committee offered a glimpse into the bureaucratic problems.

Last year the CDC compiled a list of 157 "repeat offender" housing units in the District—rental properties where multiple children have been lead-poisoned over the past six years. In many instances, four and five children had been poisoned at the same address; at a residence on Rhode Island Avenue, Northwest, six were lead-poisoned.

The DC government has legal authority to compel property owners to remediate lead-contaminated properties, but when asked about the disposition of these 157 offending properties, city officials were at a loss. Representatives from the leadbased paint program in the Department of Health indicated that five of the 157 properties had been made lead-safe. It appeared that ten more might have been rehabbed, but there was some uncertainty.

"Does anyone know if these remaining properties are lead-safe?" Dr. Paulson asked. Neither health-department officials nor any other representative of the DC government could answer.

It's not for lack of money. In 2003, under its "lead-safe" program, the US Department of Housing and Urban Development awarded two grants to the District totaling nearly \$5 million. Including city matching funds, DC's lead-safe program is funded at more than \$8 million. It makes grants of up to \$17,500 per unit available to landlords who cannot afford to rehabilitate their lead-contaminated properties. Hundreds of properties could be made lead-safe with this money, but so few landlords have applied and so few properties have been lead-abated under the grants that the District is in jeopardy of losing them. HUD did not renew the grants last year and has put them into its "red zone": The District may have to give money back to HUD because it isn't spending enough of it to fix lead-contaminated properties.

Says Paul Cohn, acting director of the Lead Safe Washington Program in DC's Department of Housing and Community Development: "The response is not anything we want it to be. Not enough people are coming in the doors to take advantage of the money, so we have not been able to spend as much as we would like to spend. It's an issue we're all concerned about."

Cohn told the joint committee in March that only 15 percent of the HUD grant money had been spent to date, more than two-thirds of the way through the threeyear grant period. The District government allocated additional matching funds that also have not been spent.

Ruth Ann Norton finds the inability to spend this "free money" to abate contaminated properties "absolutely dumbfounding."

"These HUD programs have been successful all over the country," she says. "We've used them in Baltimore and have had a 92-percent decline in lead poisoning in the past decade."

Cohn says his office is "constantly working" to induce more landlords to apply for grant money through outreach and partnerships with public and private agencies.

At the January meeting, the CDC's Barry Brooks chided DC officials for their lack of progress. "You need to get moving. You need to implement lead-abatement programs. You need to execute," he said.

The CDC renewed its \$1.5-million leadscreening and education grant to the District in June but underscored its concerns by attaching several conditions, including a requirement that people be hired in a timely way to fill nursing and health-educator positions. At this writing, it remains to be seen when, or if, the District will comply.

The same January meeting at which the 157 repeat-offender properties were revealed also disclosed that two programs in the health department could not account for 80 children whose blood-lead levels had tested 15 mcg/dl or higher. This came to light because the lead-screening program is required to refer these lead-poisoning cases to the lead-based-paint program in the health department's environmental section. In theory, an inspector is then dispatched to perform a lead assess-

ment of the properties where the poisoned children live. But of the 90 children on the list, the homes of only ten could be accounted for. No one in the health department seemed to know what had happened with the other 80 children or their homes. From the evidence at hand, it did not appear that the homes had been inspected or lead-abated.

Had the health-department screening office made the referrals to the department's lead-paint program? Did the leadpaint program receive the referrals? Did the inspectors not inspect the homes, or did they inspect them and not make any record of doing so? There appeared to be no paper trail that could yield answers.

"Why are we not shocked to learn about this?" interruped an exasperated Linda Lewis, a registered nurse who has chaired the joint advisory committee since its inception and for 20 years has been an advocate for lead-poisoning prevention. "So where did these 80 kids go? Did they disappear into a black hole? If we keep spinning the same stupid circle over and over again, we are not going to get money from the CDC to help the kids in this city."

The normally calm Paulson erupted in frustration. "Excuse my attitude today," he said, "but I have worked on the lead issue and sat around tables like this for 15 years, and I've heard the same thing over and over again. Nothing ever gets done. No one ever has answers. There are thousands of children in this city who are not being protected by this government."

**OBSERVERS SAY THE** recent shift of the lead-based-paint program from the health department into the city's new environmental agency is likely to further fragment the city's antilead efforts.

Ralph Scott, a member of the advisory committee and community-projects director for the Alliance for Healthy Homes, a national nonprofit organization to protect children against environmental hazards, has watched DC's antilead efforts up close. He says the confusion about the 80 unaccounted-for kids and the 157 repeat offender properties is not new or unusual.

"There's a complete lack of cooperation in the District, not only between different agencies that deal with lead problems but between different programs within the same agency," Scott says.

"The health department has a leadscreening and education, a case-management, and a lead-based-paint program in the environmental section. In an effective system, every time a lead-poisoned child is identified by the lead-screening program, the lead-paint program would be notified

# In communities where there have been large declines in lead poisoning, Norton says, "we are seeing the rates of reading and school attendance go up."

so it could send out inspectors to determine if the child's home required lead-enforcement actions. If it did, this information would be referred to the Department of Housing and Community Development as well. But based on data we've been given for last year, this very rarely happens. There should be hundreds of referrals each year, but we found a very small number of cases where referrals, inspections, and enforcement are carried out when a lead-poisoned child is identified."

The lack of coordination extends to a third city agency, the Department of Community and Regulatory Affairs (DCRA), whose representatives, though invited, seldom attend the joint lead-screening advisory committee meetings.

The DCRA is the city's housing-codeenforcement agency. With the authority to cite or even condemn properties for building-code violations, it could serve as an early sentinel about properties with leadpaint problems, enabling the health and housing departments to act before a child is poisoned.

This seldom happens, even though the DCRA inspects thousands of District rental properties a year, citing hundreds for code violations, because inspectors usually ignore lead-paint violations, Scott says.

"The DCRA does not routinely check paint for the presence of lead, and they routinely don't follow the law that allows them to cite these properties for deteriorated lead paint and require that it be fixed," he says. "They usually see peeling paint as a cosmetic problem, not something that can damage a child's brain. If they do flag a property for paint problems, they usually tell the owner to scrape the paint, which can make the hazard even worse."

DCRA officials did not respond to requests for an interview.

**LAST DECEMBER,** Dick Tobin, director of Philadelphia's Childhood Lead Poisoning Prevention Program, spoke before the DC joint advisory committee about his city's efforts to deal with its lead-paint problems. Described by one advisorycommittee member as "light-years" ahead of DC in lead abatement, Philadelphia once faced many of the same bureaucratic problems as the District, Tobin said. That changed when a high-ranking member of the city government became "lead czar."

The lead czar has the authority to call department heads together for meetings to coordinate antilead efforts—the power to "knock heads," as Tobin put it. Philadelphia also has a special "lead court" to adjudicate lead-contamination cases. Tobin, who recently retired, said the court instills fear in landlords because it handles cases quickly and metes out serious punishments. As a result landlords apply in droves for HUD lead-abatement grants. "It's the old carrot and the stick," Tobin said.

The key to getting things done, he concluded, is to have someone in the city government with "passion and power" who sees lead poisoning as a serious problem and embraces it as his or her own.

Ruth Ann Norton agrees: "The one thing DC has lacked is one someone with authority and a bully pulpit to create cohesion, build partnerships with community groups, and coordinate all the city's leadcontrol programs."

Educating the public is critical, she adds. "We have been able to show the people of Baltimore that an investment in lead safety has innumerable returns in terms of housing-market value, social and health costs, and productivity. You gain an understanding that what we're truly wasting when children are impaired by lead is the opportunity for them to achieve positive things in life. Baltimore has had horrible schools, but in the communities where we have had an extraordinary drop in childhood lead poisoning, we are seeing the rates of reading and school attendance go up, and that's not coincidental."

This spring, after two months of trying, members of the joint advisory committee set up a meeting with city administrator and deputy mayor Robert Bobb to establish an interagency work group to coordinate the city's antilead efforts. Bobb, who some hoped might assume the role of lead czar, did not appear, but an aide told the advisory committee that Bobb had convened an initial meeting of the new interagency group they had requested. A follow-up meeting with Bobb was promised in four weeks, but the time stretched to ten. The meeting finally occurred on June 6, and Bobb said he planned to hire someone to coordinate antilead-poisoning efforts in the District.

Until real progress occurs, the District government, like others around the country, will fail to protect many of its children from lead poisoning. And there will be thousands more children like Jonathan.

**IN APRIL OF THIS YEAR,** Connie Royster reached a financial settlement on Jonathan's behalf with the owners of her rental home. Her attorney, Alan Mensh of Baltimore, who has represented other families of children harmed by lead paint, says the terms and amount of the settlement cannot be revealed because of a confidentiality agreement but that it will provide some funds to help meet Jonathan's needs in the coming years. Part of the legal settlement stipulates that Royster and her family vacate their home, which she is very willing to do.

"I think we'll move back to Prince George's County," she says. "That's where my other kids grew up, and I think it will be good for Jonathan."

Royster feels more hopeful because Jonathan recently showed progress in reading. He is also clever at figuring out how to work electronic gadgets like cell phones, digital cameras, and DVDs. Royster is the one person who usually can calm Jonathan down when he's upset or angry, and she treasures those times when Jonathan is loving and huggable and tells her he loves her.

"God gave Jonathan to me," says Royster. "He is my life, and I will never give up on him."

••••••

Contributing editor John Pekkanen has been writing about health and medicine for three decades. His interest in lead grew out of earlier stories on life in the womb and the influences of environmental toxins on early development. As he looked into such toxins as mercury and PCBs, he was surprised to find that lead had the most pervasive and harmful effect on children.