RESULTS *for* LIFE
LAB TESTING: BETTER HEALTH, IMPROVED OUTCOMES

Lab Tests for Lead Poisoning: Saving Children's Minds, Saving Children's Lives

Lead poisoning destroys brains, especially those of children. It causes mental retardation, nerve damage, and reduced IQ. Lab tests are the tools that allow physicians to identify lead poisoning and stop it.

"The possible effects at that level," said the doctor, "include a moderate reduction in IQ, learning problems, hyperactivity, and problems with attention span."

It is fair to say that a simple $17 lab test helped spark one of the most significant public health achievements of the 20th century—the dramatic reduction in lead poisoning among American children.

In the 1960–70s, blood lead levels among millions of toddlers and young children in the U.S. were extraordinarily high. Brain and nerve damage among such children was common.

But laboratory blood tests offered the facts and knowledge to combat lead poisoning. The tests identified the children in danger, so physicians could take action. The tests also enabled massive public screening programs that, together with reductions of lead in paint and gasoline, are credited with the large reductions in lead poisoning.

The primary test behind this achievement is the blood lead test, which measures the concentration of lead in the blood. Physicians use this test to identify the degree of lead poisoning and guide treatment and preventive strategies. **Blood lead tests** also allow physicians to monitor the results.

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A Virtual Case Study

The Boy in the Brownstone

Judy is a branch manager of a bank near downtown Boston, and her husband Frank runs a bookstore near Harvard Square. In 2004, they had just begun renovating a turn-of-the-century brownstone when their son James, in kindergarten, started throwing temper tantrums. Between scraping off decades of old paint and replacing the floors after work, Judy and Frank did their best to give James extra attention. They read to him, took him to pet the neighbor's dog, and watched videos with him amid the dust and debris.

But things got worse. He was harder to wake up in the mornings, and he couldn't remember simple tasks. His teacher reported that James was becoming aggressive with other children and suggested that they take James to the doctor for a check-up.

The clinician took a fingerstick blood sample, which showed that James' blood lead level was 20 micrograms of lead per deciliter of blood. The possible effects at that level, said the doctor, included a moderate reduction in IQ, learning problems, hyperactivity, and problems with attention span. But he warned that this could get much worse unless they removed James from the dust and old paint that, most likely, contained large amounts of lead.

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Since the late 1970s, blood lead levels in young children have dropped 98%. But the battle against lead poisoning is not over.

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Other lab tests also provide critical information:

- ✓ **Zinc Protoporphyrin** evaluates the level of zinc in red blood cells, which can suggest iron deficiency caused by lead poisoning.
- ✓ **Iron Deficiency tests** evaluate the level of iron in the blood and the cells of the body. This is important because lead can disrupt the absorption of iron.
- ✓ **Hemoglobin and Hematocrit tests** indicate whether a patient has anemia, which can be caused by iron deficiency.

Since the late 1970s, blood lead levels in young children have dropped 98%. But the battle against lead poisoning is not over. Even the lowest blood lead levels can pose danger. Thus, lab tests will continue to be on the front line with physicians, parents, and policymakers in working to save children's minds.

THE BOY CONTINUED FROM PAGE 1

Frank and Judy immediately moved to Frank's brother's house in the suburbs until they could have a full home risk assessment to identify the source of the lead. James was called back a week later for a venous blood lead test—in which blood is drawn from the arm rather than the finger—to confirm the initial results. The doctor also performed other blood tests—including an iron deficiency test to make sure that James wasn't anemic.

For several months, Judy took James to the doctor for regular tests to monitor his improvement, which was considerable. Judy and Frank hired a company to remove all the old paint and repaint all the walls, which allowed them to move back home within several months.

Since then, James is back to the normal, active behavior of a 5-year-old—with laughter and active play replacing tantrums. The physician believes that James will suffer no permanent damage because of the earlier lead poisoning, but he continues to monitor progress regularly by checking the boy's blood lead level.

Judy, Frank, and James are not real people, but the facts and information presented here depict accurately the role of lab tests in lead screening and the circumstances faced by many patients.

COSTS OF LEAD POISONING

Cost of blood test to detect lead poisoning in a 5-year old boy = $17

Cost of lifetime earnings lost due to lead poisoning in a 5-year old boy = $14,186

Cost of lifetime earnings lost due to lead poisoning in ALL 5-year old boys = $27,800,000,000

Note: Based on 1997 data and cohort of 5-year-old boys in 1997.

Source: See Landrigan, et. al., *Environmental Health Perspectives*, July 2002

WHAT SAVING A CHILD'S MIND MEANS

Measuring the amount of lead in a child's blood involves a simple act—the doctor or technician draws blood from the arm or fingertip, analyzes its content, and reports the findings to the child's parent. But this simple act sets off a chain reaction that can influence the child's entire life. By protecting a child's mind from the harms of lead poisoning, proper testing and treatment preserve a child's IQ and mental capacity and unlock a world of learning and growth—influencing his or her success in school, personal achievement, and success in the labor market. This also holds broader implications. "When aggregated across millions of individuals, even small differences in IQ can make a major impact," said a 2002 study on lead poisoning in the journal Environmental Health Perspectives. "Improvements in cognitive ability benefit society by raising economic productivity, including profits and tax revenues, and by reducing crime and other behaviors with negative impacts on others."

Source: Grosse, et. al., *Environmental Health Perspectives*, June, 2002

What is Lead Poisoning?

Lead is a naturally occurring soft metal found in many parts of the environment. It has been used in the production of ceramics, metal products, paints, and gasoline. When inhaled or ingested, it can affect almost every organ and cause irreversible brain damage, nervous system damage, and even death.

What are the benefits of lead testing for individuals?

Identify risk, especially because symptoms are usually not obvious	Enable physicians to begin treatment and monitoring	Alert families to needed changes in the home or environment to reduce exposure

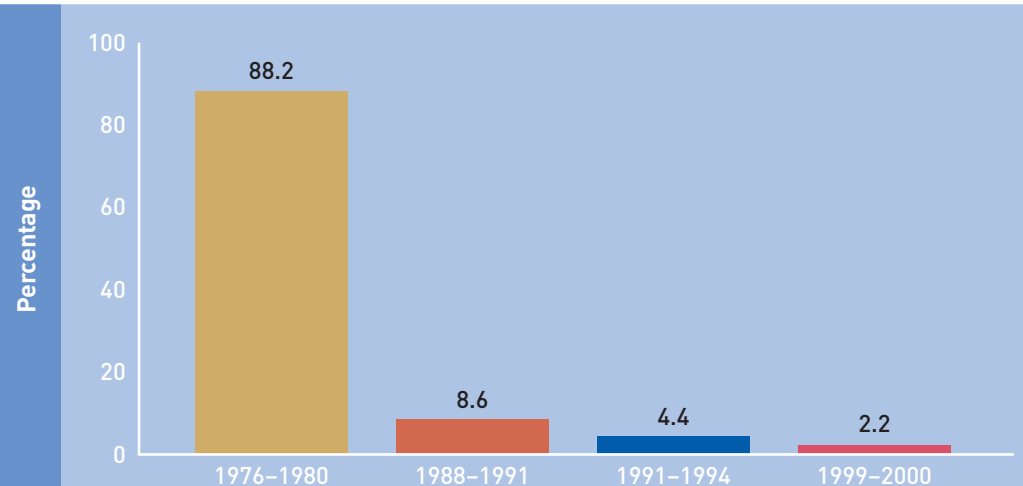
What are the benefits of lead testing for society?

...Better care Increased screening for lead poisoning contributed to a 98% reduction in blood lead levels from 1976–99	**...Better results** IQ's of preschoolers in late 1990s ranged from 2.2 to 4.7 points higher than if blood lead levels of 1976 had remained.	**...More productive lives** Higher IQs for each year's group of 2-year-old children translates into greater earning power of $110–$319 billion during their lifetimes.

Lab Tests Drive Dramatic Decline in Lead Poisoning of America's Children

In the early 1990s, a leading medical journal described lead poisoning as "the most widespread threat to child health in America." But blood lead levels have dropped dramatically in the past 30 years as a result of intensive lead screening programs and the removal of lead from paint and gasoline. The percentage of children exceeding the government's current goal for maximum blood lead levels (less than 10 micrograms per deciliter (mcg/dl)) has dropped more than 86 percentage points (or roughly 98%) since 1976 (see chart). This nation- and economy-wide effort has rested upon the ability of laboratory tests to provide fast, accurate, and low-cost analysis of blood lead levels.

Percent of Children 1–5 years in U.S. with Blood Lead Levels of 10 mcg/dl or more, 1976–2000



Sources: *MMWR*, Centers for Disease Control and Prevention, 2003; *Milbank Quarterly*, 1993.

LAB TESTS FOR LEAD POISONING

- ✓ *Blood lead level test (BLL): Determines the concentration of lead in a patient's blood at that time.*
- ✓ *Zinc Protoporphyrin (ZPP): Evaluates the level of zinc in red blood cells, which can suggest iron deficiency caused by lead poisoning.*
- ✓ *Iron Deficiency tests: Evaluate the level of iron in the blood and the cells of the body. This is important because lead can disrupt the absorption of iron. Tests include Serum Iron, Total Iron Capacity, and Serum Ferritin tests.*
- ✓ *Hemoglobin and Hematocrit tests: Indicate whether a patient has anemia, which can be caused by iron deficiency.*

WHY BLOOD TESTS FOR LEAD POISONING ARE SO CRITICAL...

"The effects of lead exposure extend beyond childhood. In adults, lead exposure...has been associated with some of the most prevalent diseases of industrialized society: cardiovascular disease, tooth decay, spontaneous abortion, renal disease, cognitive decline, and cataracts."

Source: Lanphear, BP, *Journal of the American Medical Association*, May, 11, 2005

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