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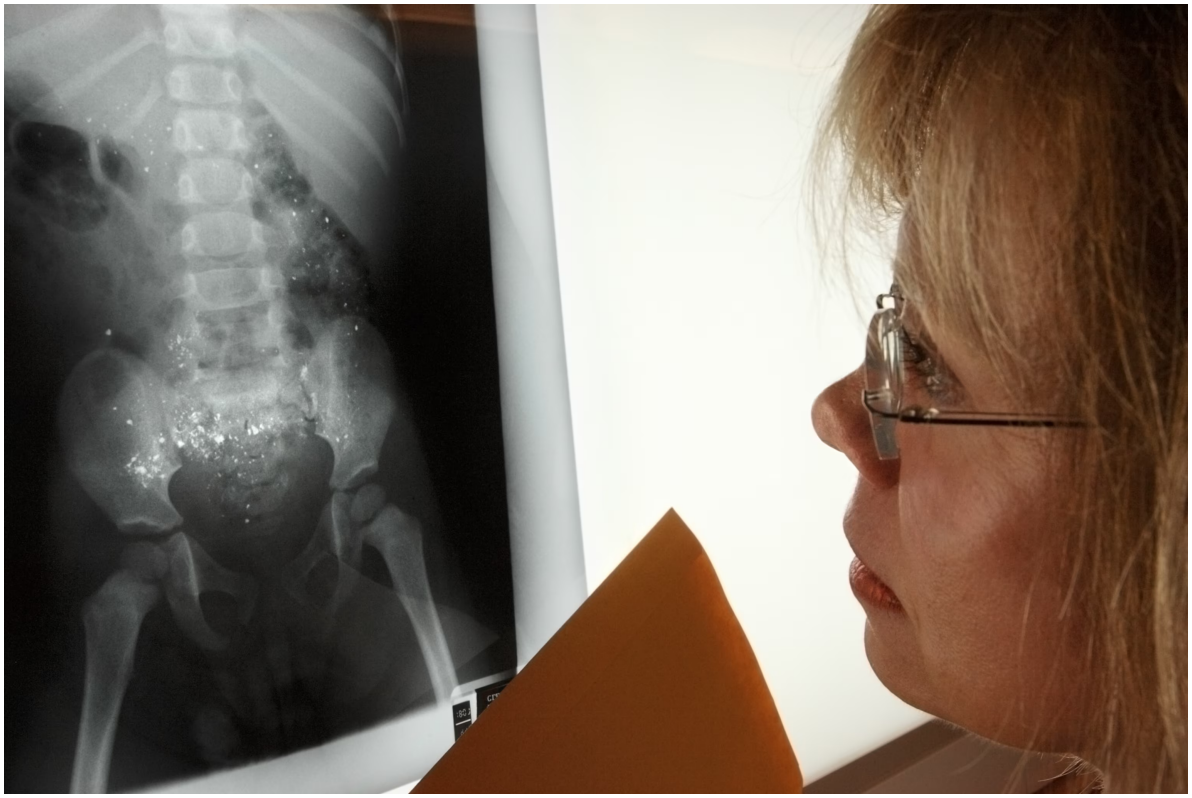
This is what you need to know about lead and your health

6–8 minutes



An x-ray shows lead paint chips swallowed by a two-year-old. Early lead exposure can cause longterm mental and physical issues, and in severe cases, can be fatal.

Photograph by PETER ESSICK, Nat Geo Image Collection

- SCIENCE

From popular reusable water bottles to aviation fuel, lead is ubiquitous. Should we be worried?

Invisible to the naked eye, odorless, and nearly impossible to detect by taste—traces of lead are in the products we use, the beverages we drink, and the homes we live in. It even shows up in our reusable water bottles, like the lead found lining the bottom of Stanley cups—a controversial discovery that recently reignited consumer attention toward an age-old issue.

Although natural sources like volcanic eruptions have marginally contributed to lead concentrations on the planet's surface, the primary culprit behind the global lead pollution problem—which prematurely kills an estimated 5.5 million people every year—is human activity.

"Natural levels of lead air pollution don't really exist unless you're under a volcano. The lead you breathe is manmade," says Alexander More, a climate and health scientist at the University of Massachusetts and Harvard University who has led studies on the subject.

After mining operations and industrial processes like lead smelters and waste incinerators, common sources of lead pollution include additives to gasoline and paints, as well as the production of batteries and utilities.

"We don't know what a society without lead in our soil, in our water, in our air looks like," says More.

What is lead used in?

Lead was one of the first metals humans ever extracted from ores thousands of years ago, and it's been used in a variety of ways ever since. Ancient coins, cosmetics, ceramics, and bullets were once made from the malleable metal. It was even used by ancient

Romans to distribute water, ferment wine and sweeten food.

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The dangerous health risks associated with lead exposure may have been identified as early as the Roman Empire, and yet the world continued to rely on the heavy metal for everything from the pursuit of alchemy in the Middle Ages to gasoline additives in the twentieth century. By the time the latter rolled around, the U.S. had emerged as both the foremost producer and consumer of refined lead, depositing millions of tons of lead in the environment through the fuel used to power America's vehicles.

It wasn't until the late twentieth century, shortly after Congress established the Clean Air Act, that the U.S. began to limit its lead use. In 1973, the Environmental Protection Agency implemented the first regulations to phase down the amount of lead in gasoline, but it would take almost half a century before leaded fuel for cars and trucks was banned from being sold anywhere in the world, according to the World Health Organization. Removing lead from gasoline resulted in significant declines of blood lead levels worldwide, including the U.S.

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But the use of leaded gasoline in transportation fuel was never regulated for aircraft engines, the largest remaining source of lead emissions nationwide. Last October, the EPA deemed the continued use of leaded gasoline by some smaller airplanes a danger to public health.

Unlike many other chemicals, lead does not biodegrade over time

—which is partly why lead exposure is a serious environmental justice issue, according to Tomás Guilarte, a neurotoxicologist and professor at Florida International University.

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Low-income communities and populations of color face the highest levels of lead exposure nationwide, primarily because of the environments and homes they live in, many of which are located closer to highways or areas where the soil is highly contaminated due to previous dispersion of lead in gasoline, he notes.

How does lead affect children?

"There is no safe level of lead," says Olivia Halabicky, an environmental health scientist at the University of Michigan who studies how early childhood lead exposure influences development.

In addition to asking a doctor to test your lead blood levels, she recommends everyone test their water sources, homes, and even nearby soil. Consumer products found laden with lead, like food, jewelry, and children's toys, are another point of concern. "We don't want people to be exposed to this at all," Halabicky adds.

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Children in particular are most vulnerable to the detrimental impacts of lead because of how the toxin disproportionately affects brains that are still developing, says Guilarte, who researches the impacts of lead on the human brain.

High levels of lead exposure can cause serious damage to a

child's brain and central nervous system, which can result in a coma, convulsions, and death. Children that survive severe lead poisoning may end up with lifelong intellectual impairments and behavioral disorders. Even low levels of exposure are known to reduce IQ and produce learning deficits, as well as poor academic performance.

"Think about a store full of fine glass. You have vases and very expensive glassware," Guilarte explains. "And all of a sudden, you let a bull in the door. That's exactly what happens in the brain with lead."

How else does lead harm the body?

Lead doesn't just harm the brain—researchers have also discovered that high levels of lead exposure can affect many other organs, like the heart.

And it's not just elevated concentrations that can be detrimental.

A 2018 study found that about 400,000 deaths in the U.S. can be attributable to "low-level" lead exposure annually—more than half from cardiovascular disease. Chronic exposure to low or moderate levels of lead is associated with an increased risk of cardiovascular disease, per a 2023 scientific statement by the American Heart Association.

Meanwhile, another 2022 study found that over 170 million American adults alive today—more than half of the population—were exposed to high lead levels in early childhood. Around 10 million Americans may have been exposed to levels that are seven times the current threshold of clinical concern.

Tackling a problem as ubiquitous as this one, according to

Guilarte, would require us to rethink how products are tested and how people are screened for exposure.

“There's regulation in the United States that every child, before two years of age, should be tested [for lead]. And many, many states don't do it,” he said. “There’s a lot more that needs to be done.”