

Decrease in lead exposure in early childhood significantly responsible for drop in crime rate

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Exposure to lead in the preschool years significantly increases the chance that children will be suspended or incarcerated during their school careers, according to research at Princeton University and Brown University. Conversely, a drop in exposure leads to less antisocial behavior and thus may well be a significant factor behind the drop in crime over the past few decades.

Given that children who are suspended or incarcerated are more likely to be involved in crime as adults, the finding supports the hypothesis that falling [crime rates](#) over the past few decades were caused largely by a sharp decline in childhood [lead exposure](#). Lead was banned from house paint in 1976, and leaded gasoline was phased out between 1979 and 1986.

People exposed to lead as young children (from 0 to 6 years old) are more likely to exhibit poor thinking skills and impulse control, to have trouble paying attention, and to behave aggressively. These traits can lead to antisocial or criminal behavior in adults. Studies seeking links between adult crime and early childhood [lead exposure](#) have suggested that the drop in lead exposure could explain up to 90 percent of the sharp downward trend in U.S. crime that started in the mid-1990s.

But other explanations have also been proposed. For example, said Princeton's Janet Currie—the Henry Putnam Professor of Economics and Public Affairs—falling crime rates have been tied to increased availability of abortions, improved policing, the growth of the prison population, and the waning of the crack-cocaine epidemic. Because these phenomena all occurred around the same time, it can be hard to distinguish their effects from one another. The researchers sought to find lead exposure's effect on school disciplinary

problems and juvenile incarceration, which could shed light on whether the decrease in lead exposure was in fact a contributing factor to the decline in the crime rate.

Currie and Anna Aizer, a professor of economics and public policy at Brown who did postdoctoral work at Princeton's Center for Health and Wellbeing (CHW), based their study on data covering about 120,000 children born in Rhode Island. The study appeared as a working paper on the *National Bureau of Economic Research* website.

"Rhode Island is an ideal place to study the effects of lead because of the state's aggressive lead screening program," Currie said. Nearly three-quarters of Rhode Island children have been screened at least once by the time they reach 18 months, far above the national average; by age six, children in the study had been screened an average of three times.

The state's expansive screening program conferred two advantages for the study, noted Currie, who is also chair of Princeton's Department of Economics and co-director of the CHW. First, because so many children in Rhode Island were screened, including many who were showing no obvious signs of lead exposure, the sample included a large percentage of children with low [blood lead levels](#) for comparison purposes. Second, because so many children received multiple screenings, the researchers were partially able to compensate for an inherent problem with blood level tests for lead. Lead doesn't stay in children's bloodstreams for long before it's deposited in organs like the brain, and multiple blood screenings increase the chances of detecting lead exposure.

The researchers examined children born from 1990, which was shortly after leaded gasoline was

phased out, until 2014. They accessed Rhode Island Department of Health blood lead level tests for preschool children conducted from 1994 to 2014. They linked those records to school suspension records beginning in the 2007-08 school year, as well as to juvenile detention records beginning in 2004.

likely to graduate from high school and more likely to commit crimes as adults. "Our results support the hypothesis that reductions in blood lead levels may have been responsible for a significant part of the observed decrease in [antisocial behavior](#) among youths and young adults in recent decades," Currie concluded.

Beyond the blood tests, Currie and Aizer were also able to estimate lead exposure by linking their data to records of the [children's](#) addresses. Because it is heavy, lead from vehicle exhaust pipes had settled in the soil within 25 to 50 meters of a road. Naturally, the busier the road, the more lead could be found in the surrounding soil. Children living nearby absorbed lead from the soil mostly by inhaling it.

Provided by Princeton University

In 1990, soil lead levels near busy roads remained high. By 2014, soil lead levels near busy roads were similar to lower soil lead levels elsewhere. Geographic information allowed the researchers to create a measure of "average traffic" and thus potential lead exposure near each child's home as their families moved from place to place over time.

With such a large sample and multiple types of linked data, Currie and Aizer were able to compensate for a number of factors that could have led to under- or overestimating lead's influence on school suspension and juvenile incarceration. In the end, they found that lead exposure had a powerful effect.

A one-unit increase in blood lead levels—which are measured in units of millionths of a gram per each tenth of a liter of blood—raised the probability that a child would be suspended from school by 6.4 to 9.3 percent.

Among boys, a one-unit increase in blood lead levels raised the probability of incarceration by 27 to 74 percent. Because few juveniles, and almost no girls, ever experience incarceration, estimates of lead's effect on incarceration were less accurate.

"Children who have been suspended are ten times more likely to be involved in criminal activity as adults," Currie said. Moreover, young people who are incarcerated for even a short period are less

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