

Children exposed to higher fluoride levels have lower IQs, a government study finds

By Brenda Goodman, CNN
 8 minute read · Updated 2:38 PM EST, Mon January 6, 2025



A small NY town removed fluoride from their water. Hear what residents are arguing about

04:38 · Source: CNN

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(CNN) — A rigorous nine-year research review looking at the relationship between fluoride and intelligence in children concludes that as fluoride levels rise, IQ drops.

Every 1 part per million increase in fluoride in urine — a way of measuring all the sources of fluoride a person consumes — was associated with a roughly 1 point drop in a child's IQ score, the review concluded.

Although an impact like that may seem small for any one person, on a wider scale, the study authors note, the consequences are significant, especially for those who are vulnerable because of risk factors like poverty and nutrition.

"A 5-point decrease in a population's IQ would nearly double the number of people classified as intellectually disabled," they write in their conclusions.

The study, which was published Monday in the journal *JAMA Pediatrics*, comes with a backstory. It was conducted by scientists at the government's National Toxicology Program, which evaluates chemicals and other things people are exposed to, like cell phone radiation, for their potential to harm health. It began in 2015 and was subject to several rounds of reviews in a process that some critics charge was designed to delay its public release.



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The full review was finally published as a lengthy monograph in August, and in September, the study became the basis of a federal judge's ruling ordering the US Environmental Protection Agency to further regulate fluoride to protect children's intellectual development.

"Simply put, the risk to health at exposure levels in United States drinking water is sufficiently high to trigger regulatory response by the EPA" under federal law, US District Judge Edward Chen wrote in the ruling.

In November, Robert F. Kennedy Jr., President-elect Donald Trump's pick for US Health and Human Services secretary, made headlines after he called fluoride "an industrial waste" and pledged that the Trump administration would advise utilities to stop adding to public water supplies.

Fluoride is a naturally occurring mineral that's found in soil, rocks and water to varying degrees. It is also a byproduct of fertilizer production. On the recommendation of the US Centers for Disease Control and Prevention and the World Health Organization, many cities have added fluoride to their treated drinking water for decades to protect teeth from cavities.

As it washes over teeth, fluoride can stop early decay by putting minerals back into tooth enamel. It also makes teeth more resistant to acid and interferes with bacteria's ability erode teeth.

In some places, including areas that have well water that's naturally high in fluoride, children were getting so much fluoride that it left streaks and spots on their teeth, a condition called dental fluorosis. In 2015, HHS lowered its recommended levels for fluoride in drinking water from a range of 0.7 parts per million to 1.2 parts per million to 0.7 parts per million, to prevent fluorosis.

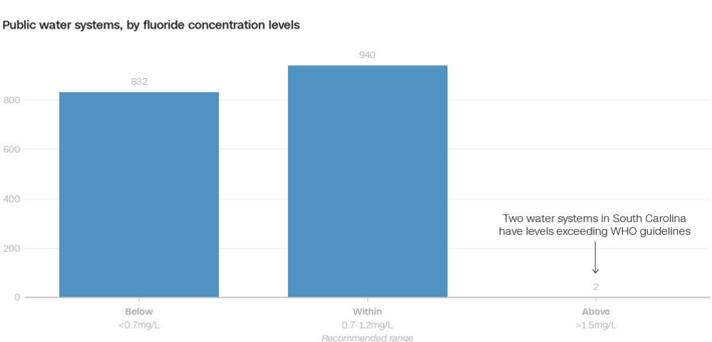
The CDC reiterated its faith in the health benefits of fluoride in 2015, naming water fluoridation one of the "10 Greatest Public Health Achievements of the 21st Century."

Now, though, environmental health experts say health agencies need to reassess the risks and benefits of fluoride, because of its potential neurotoxicity.

Most US water systems have the recommended concentration of fluoride

Just over half of US water systems with publicly-available fluoride level data have concentrations within the recommended levels for drinking water. The World Health Organization states that long-term exposure to fluoride levels above 1.5mg/L can lead to health problems.

Public water systems, by fluoride concentration levels



Note: Data is average fluoride concentration across 2023. The data is limited to what each state has voluntarily chosen to share publicly - some states have not shared any. As a result, the data is not inclusive of all states and communities.

Source: My Water's Fluoride
 Graphic: Soph Warnes, CNN

"The evidence is sufficient. It's not definitive," says Dr. Bruce Lanphear, an epidemiologist and professor at Simon Fraser University in Canada. Lanphear wrote a commentary on the new paper, and one of his studies was included in the review, but he was not involved in the report's conclusions.

"We need to pause," he said. "We need to review the evidence, rather than just stick their head in the sand."

In a separate commentary on the study, Dr. ((Steven Levy)), a professor of preventive and community dentistry at the University of Iowa, questions the conclusions of the research and the way *JAMA Pediatrics* is presenting them, since the study itself doesn't talk about the rounds of reviews and the delay in its public release.

((Levy)) says that just publishing the meta-analysis of human studies doesn't give readers important context about animal studies conducted by the National Toxicology Program, which found no apparent decrease in learning and memory in rodents exposed to low to moderate fluoride levels. He points out that all of the human studies included in the review were from countries outside the US and that the majority are classified by the study authors as having a high risk of bias.

"Thus, despite the presentation of some evidence of a possible association between IQ and high fluoride levels in water, there is no evidence of an adverse effect at the lower fluoride levels commonly used in [community water fluoridation] systems," he wrote.

The study authors agree with him on that point.

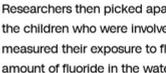
In a statement, they say they didn't have enough data to know whether the level of fluoride that's recommended for drinking water has any effect on children's IQ.

Study findings

The new review includes 74 studies from 10 countries. Most of the studies – 45 – come from China, where researchers first noticed differences in intelligence between communities exposed to high fluoride levels and those that were not.

Researchers then picked apart the methods of each study, looking at factors like the age of the children who were involved, how they were tested for intelligence and how researchers measured their exposure to fluoride, whether they estimated it from less exact metrics like amount of fluoride in the water where they lived, or whether it came from more precise measures such as lab testing fluoride in urine.

Some of the strongest studies, from Canada and Mexico, looked at measures of fluoride in the urine of pregnant women and then tested the IQ of their children years later.



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The researchers sliced the data in three meta-analyses, or studies of studies.

In their first study, which included nearly 21,000 children from 59 studies, they found significant differences in IQ between children with the highest and lowest fluoride exposures. Children exposed to the highest fluoride levels scored about 7 points lower on IQ tests than those exposed to the lowest fluoride. When researchers restricted their analysis to only the highest-quality studies, the difference remained, though it was not as large: about 3 IQ points.

In a second analysis of studies with group-level measurements of fluoride in urine and water, the researchers found a slightly more than 2-point drop in IQ between the highest and lowest fluoride levels. When they restricted their analysis to the four studies with the lowest risk of bias in their data, they found that children drinking water with 2 parts per million of fluoride had IQ scores that were almost 5 points lower, on average, compared with those who weren't exposed to lower levels. When the researchers looked at water below 1.5 parts per million, however, there were no significant differences in IQ.

In a group of four studies with a low risk of bias that reported group-level measures of fluoride in urine, they found that people with less than 1.5 parts per million in their urine – a measure of all the sources they consume, not just water – had IQ scores that were about 1 point lower on average than those exposed to lower levels.

In a final meta-analysis of studies that reported individual measures of fluoride in urine and IQ scores in nearly 4,500 children, they found that a 1 part per million increase in fluoride was linked to a 1.63 drop in IQ score.

A consistent link

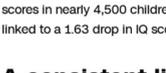
Lanphear says the consistency of the finding is striking across all these analyses.

"Children who had higher fluoride exposure – whether that was measured with fluorosis, which is kind of a crude measure, or fluoride in water or fluoride in urine – they found consistent evidence that higher exposure was associated with diminished IQ," he said.

Lanphear was involved in a particularly influential study from Canada that was published in *JAMA Pediatrics* in 2019. The conclusions were so surprising, the editors of the journal attached a note to the study letting their readers know that they carefully considered whether to publish it.

The study measured fluoride in the urine of 600 pregnant women and then measured their children's IQ scores at 3 to 4 years of age. About half of the women lived in communities with fluoride added to their water. The researchers found that every 1 part per million increase in fluoride in urine was associated with about a 5 point drop in IQ in boys but not girls. Lanphear says they don't know why they saw the association only in males.

He says the levels of fluoride measured in their study were comparable to levels measured in communities with fluoridated water in the United States, and the difference, somewhere between 3 to 5 IQ points, wasn't subtle.



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The drop in IQ linked to fluoride is on par with the estimated loss of intellect from exposure to leaded gasoline, said Dr. Howard Hu, a professor of preventive medicine at the Keck School of Medicine at the University of Southern California. Hu was not involved in the current research.

But weighing the benefits and risks of fluoride isn't as easy, perhaps, as it was for lead, Hu said. Cavities are an important public health problem, too.

"Cavities are not just an issue about cosmetics or going to the dentist. Increasing dental cavities has other downstream effects," including inflammation and oral health, which can affect overall physical health, he said.

What seems to be coming into focus about fluoride is the risk early in life, when the brain is still developing. Emerging evidence suggests that in addition to IQ, fluoride might be associated with behavioral problems in children, Hu said.

Infancy is the stage when fluoride appears to have little to no effect on dental health, so it might make sense to counsel pregnant women to limit their exposure to all sources. Fluoride can be found in a range of things including soft drinks, pesticides and black tea – since it the plant bioaccumulates it, Lanphear said.

"We absolutely need to advise pregnant women that they may want to avoid fluoride, not only in drinking water but also in black tea during pregnancy, and they certainly don't want to mix fluoride [in fluoridated water] with their formula, because infants absorb fluoride much more readily than older children and adults," Lanphear said.

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