

Fluoride and IQ

Steven Novella on November 1, 2023

The anti-fluoride movement continues to make dubious claims about the safety of fluoride in public drinking water. They are also expanding into new social media platforms, like [TikTok](#), where everything old is new again. These platforms give a second (or more) life to old debunked claims, which means we have to constantly be whacking these moles down again.

Recent anti-fluoride activism has been focusing on studies showing that high enough fluoride levels can be a neurotoxin. This tactic took off with the [Harvard study back in 2012](#). The Harvard study still gets prominent mention in anti-fluoride posts, as if it's still news, or somehow is being suppressed. The study was a meta-analysis of studies, mostly occurring in China. These were ecological studies comparing measures of IQ in children to see if there is a statistical correlation with fluoride exposure from drinking water. The study found a positive correlation, making it a permanent member of the anti-fluoride rhetoric.

However, details matter. The studies involved naturally occurring fluoride in drinking water, not communities where the levels of fluoride were controlled (which is why they took place in China, that largely does not control fluoride levels). They found that communities with high levels of fluoride in the drinking water had lower IQs on average than communities with low levels of fluoride. But here is the critical point missed in a lot of reporting and in anti-fluoride propaganda – the low-level communities had fluoride levels in their drinking water in the same range as fluoridated water in the US and other Western nations. Fluoridated water was the low-level control group that had the higher IQs.

Meanwhile, it should be pointed out that the association with lower IQs and very high levels of fluoride have not been definitely established. There are lots of confounding variables in the observational studies, and it takes some fancy statistics to tease out a small statistical effect. [A New Zealand study](#),

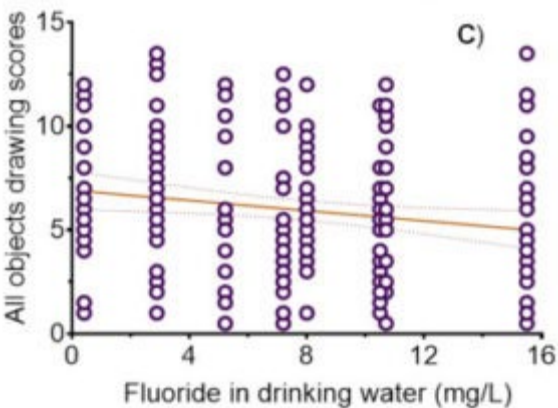
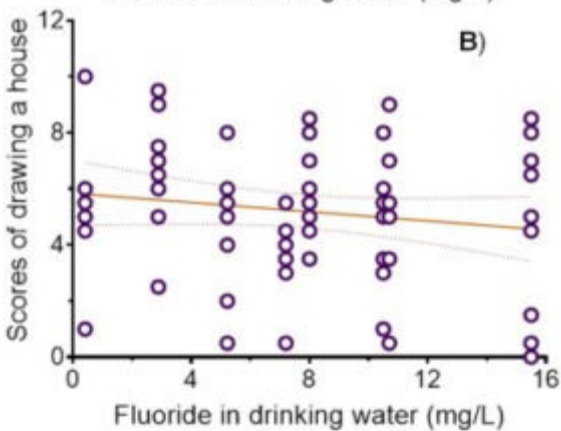
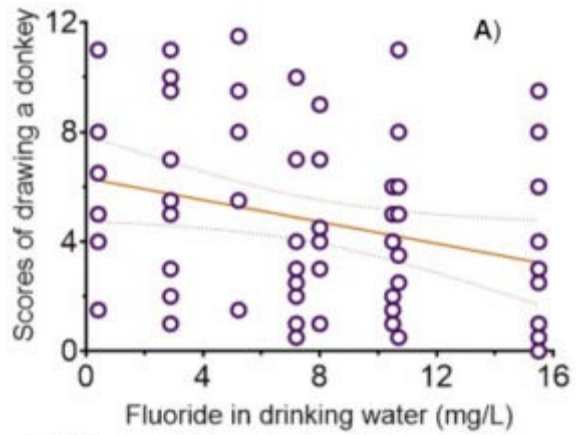
for example, found no association between IQ and fluoride once confounding variables were adequately taken into account.

[A 2023 systematic review](#) did find a correlation between fluoride levels and IQ, but generally found the quality of the evidence to be low.

The inverse association between fluoride exposure and IQ was particularly strong in the studies at high risk of bias, while no adverse effect emerged in the only study judged at low risk of bias. So the one study deemed high quality showed no association, and meanwhile there seems to be a correlation between low quality (high risk of bias) and a positive effect. This pattern of evidence does not lead to high confidence. The one thing that all studies appear to agree with is that better studies are needed to settle the question.

But it is plausible that at high doses there may be a neurotoxic effect from fluoride. As always – toxicity is all about dose. What we need are studies that look carefully at the range of fluoride levels that are contained in managed municipal water. Instead, we appear to be getting more of the same. The latest study to make the rounds in being presented with headlines such as: [“Water Worry: Excess Fluoride Linked to Cognitive Impairment in Children.”](#)

This study is similar to the China studies in that it takes place in a rural community, this one in Ethiopia, in which there is high levels of naturally occurring fluoride. This is also a pilot study, which the researchers hope will “spur further research”. The researchers broke the subjects into three categories based on fluoride levels, <3 mg/L, 3-8 mg/L, and 8-15.5 mg/L. [The recommended level](#) of fluoride in drinking water in the US is 0.7 mg/L. The WHO recommends level below 1.4 mg/L.



So once again the low fluoride level control group was in the range of fluoridated water, while the high-level groups were very high. Even if we take these results at face value, they show us, if anything, managed fluoride levels are safe. But in reality they don't tell us anything either way, because the data is not looking at a range of fluoride that covers deliberately fluoridated water.

The results are also not that compelling, even for a risk of high fluoride exposure. The researchers used three measures of cognitive function, a picture drawing test, a memory test, and a paired association learning test.

The findings were inconsistent but there was an overall statistically significant trend toward lower performance at the higher fluoride exposure levels. But as you can see from this graph of some of the data, the noise level appears to be far greater than the signal. Just looking at the data (if the trend lines were not present) it would not be possible to discern a trend.

The effect, in other words, if it is real, does not appear to be clinically dramatic.

Of course, all potential neurotoxicity to the developing brain should be taken very seriously. Every IQ point is a precious human resource. For this reason, we should err on the side of caution when it comes to potential toxicity. What the current data shows is that there is a potential of neurotoxicity from fluoride at high levels, significantly higher than in the drinking water. But the same data shows, if anything, the managed drinking water levels are safe. Further, the best quality evidence does not show any clinical effect.

What I think all this means is that current drinking water fluoridation levels (below 1.4 mg/L) are safe and provide a significant benefit for dental health. But also, we need to conduct higher quality studies to show if there even is a real neurotoxic effect, and to zoom in on the levels in managed drinking water (rather than just using that range as the low-level control).

And, as always, the media needs to do a better job of reporting this data and putting it into proper perspective.

Author

- [Steven Novella](#)

Founder and currently Executive Editor of Science-Based Medicine **Steven Novella, MD** is an academic clinical neurologist at the Yale University School of Medicine. He is also the host and producer of the popular weekly science podcast, [The Skeptics' Guide](#)

to the Universe, and the author of the [NeuroLogicaBlog](#), a daily blog that covers news and issues in neuroscience, but also general science, scientific skepticism, philosophy of science, critical thinking, and the intersection of science with the media and society. Dr. Novella also has produced two courses with The Great Courses, and published a book on critical thinking - also called *The Skeptics Guide to the Universe*.

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