Does fluoride lower IQ scores?

America has been preventing tooth decay with fluoridated water for over 80 years. Fluoridation is effective, safe and benefits *everyone* regardless of age or income. About 3 out of 4 people in U.S. communities enjoy fluoridated water. So, until recently, questions about fluoride and IQ were rare.

Studies conducted in New Zealand and Sweden showed that the IQ scores of adolescents and adults living in fluoridated communities during infancy and childhood were *no different* than the scores of people who lived in unfluoridated communities. These two studies are uniquely robust because they tracked IQ and other possible effects in large numbers of participants over a long period of time, well into adulthood.

Opponents of fluoridation began focusing on IQ after the 2012 publication of a systematic review of 27 studies from around the world. Opponents claimed that this review showed that lower IQ scores in children were "caused" by fluoride. There are many reasons why the evidence does not support this claim.

- This research review did not test cause and effect. The authors examined a variety of dissimilar studies from China, Mongolia and Iran and reported what was observed. None of these studies followed children into adulthood.
- The authors warned that the studies they reviewed "had deficiencies, in some cases rather serious, which limit the conclusions that can be drawn." They cautioned that further research would be needed to rule out other factors affecting test scores, such as nutrition, the quality of schools, and the presence of contaminants such as lead.
- The studies did not describe the water that American children drink. The fluoride in these countries was in some cases more than 5 times the level used for water fluoridation in the United States.
- The authors did not consider the possibility of reverse causality. In other words, parents of above-average IQ and financial means, who could create home conditions that favor higher IQ, may have relocated from high fluoride areas before having children. Likewise, families may have departed areas with fluoride levels that markedly exceed the standards of the World Health Organization (WHO) to avoid dental and skeletal fluorosis that can occur in those places. As a result, the average IQ in those communities could appear to be lower simply because these families were absent, not because of any neurological effects of the fluoride.

The Research Focus Shifts

In recent years, opponents have focused on prenatal exposure to fluoride, with studies from Mexico City and Canada, where fluoride exposure is similar to U.S. and Canadian communities. These studies reported some differences in the IQ scores of 3 and 4 year olds related to the level of fluoride their mothers were exposed to. However, the Canadian study showed a significant difference only for boys — and only on one of the two tests.

Many issues have been raised about the quality of the studies from Mexico City and Canada and, importantly, the results have not been confirmed by other research teams.

The Canadian studies are based on a single data set that was not designed to measure a mother's exposure to fluoride and how it might affect the IQ of offspring. This recently published analysis cites authoritative sources that dismiss the validity of *both* the measure of the individual mothers' exposures to fluoride and how the IQ of their children were tested.

Any study of IQ differences must take into account the many factors that affect intelligence scores. Some of these include breastfeeding, nutrition, and mothers' IQ. Researchers work to account for these factors to increase confidence that a study's results are not skewed or otherwise affected.

The studies from Mexico City and Canada accounted for some but not all these factors. They relied on IQ testing that was conducted at only one age. By contrast, the New Zealand study tested IQ several times, starting at age 7 and ending at age 38. The fact that multiple test scores were collected, and over 31 year a period time, means that we can have more confidence in these results over others.

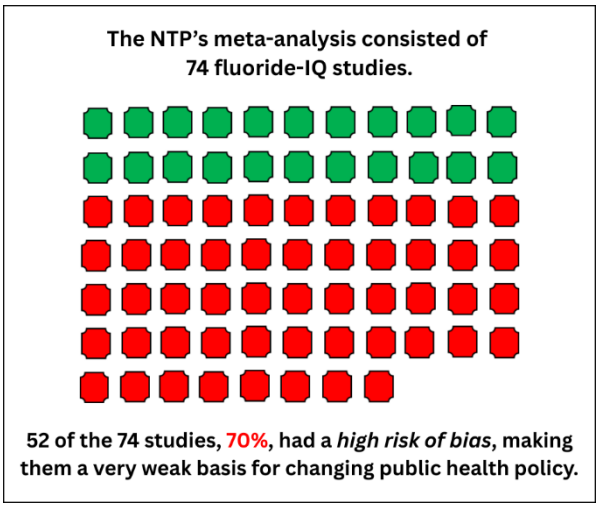
The National Toxicology Program Report

In 2015, the National Toxicology Program (NTP) initiated a review of studies on fluoride and possible effects on neurodevelopment. Before its publication in 2024, the NTP sought peer-review of its work, choosing the National Academies of Sciences, Engineering and Medicine. After performing two reviews, the National Academies concluded that the NTP had not identified "clear and convincing" evidence to support its initial claim that fluoride causes low IQ. As a result, the NTP had to remove its classification of fluoride as a "hazard".

Going one step further, the National Academies instructed the NTP to state very clearly that the studies it reviewed did not adequately examine exposure to low levels of fluoride, "including those typically associated with drinking-water fluoridation." Although NTP's report found an association between high fluoride concentrations and lower IQ in children where fluoride levels exceeded WHO guidelines (1.5 mg/L), that is more than twice the 0.7 mg/L level of fluoridation in the U.S. and Canada.

The NTP Meta-analysis

The authors of the NTP report also publish a meta-analysis within which they acknowledged that three low-risk-of-bias studies on fluoride levels under 1.5 mg/L showed no association of fluoride with children's IQ. These findings are consistent with a meta-analysis conducted by other researchers who examined eight studies conducted in areas with water fluoridation comparable to the U.S., below 1.5 mg/L. They, too, found no association between fluoride exposure and IQ.



Nonetheless, publication of the meta-analysis spurred immediate criticism. Defects serious enough to call for retraction of the meta-analysis were enumerated in another such critique which concluded. "We further find major problems with the sources employed, including reliance on studies from non-MEDLINE indexed publications with an anti-fluoridation editorial stance, and major underlying issues with the data reported in several instances, indicative of impossible or unreliable data. Taylor et al is not reliable nor are its errors remediable. It should be retracted to avoid harms to public health and scientific discourse."

Science Relies on Finding Patterns

In 2021, a study from Spain agreed with the 2019 Canadian study that mothers' prenatal fluoride exposure was not associated with any difference in girls' IQ. However, it had an opposite finding regarding boys, finding *higher* cognitive scores in boys at age 4, not lower. A much larger 2022 study in Australia followed boys and girls with different lifetime fluoride exposures from birth to age 5. This study assessed the children's emotional and behavioral development later, before they reached age 18. Their conclusion? Exposure to fluoridated water during the first five years of life was not associated with altered measures of child emotional and behavioral development and executive functioning.

More than 6,800 studies and research papers have been conducted on fluoridation, and the overwhelming evidence demonstrates its safety and benefits. This enormous body of research and over 80 years of public health practice consistently point to the effectiveness and safety of fluoride use in the U.S.

Science looks for patterns. The public is well-served when research – from process to data to analysis – is challenged through peer review and tested through replication. Parents, take comfort. The few studies suggesting an association between fluoridation and neurodevelopmental effects in children have thus far resulted in contradictions, not patterns.