Washington State Department of HEALTH

FLUORIDE SCIENCE REVIEW

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Oral Health is Essential

- Oral health impacts physical and mental health, school and work attendance, and many aspects of quality of life.
- There are strong associations between dental caries and stroke and all-cause mortality.
- Oral disorder costs make up about 3.8% of US health care spending, with an estimated cost of $93 billion.

Fluoride and Oral Health

- Fluoride is a naturally occurring mineral
- Today fluoride is present in drinking water, food, and consumer products.
- Oral health interventions include community water fluoridation, fluoridated toothpaste, and fluoride varnishes.
- Community water fluoridation began in 1945 resulting in dramatic declines in dental decay in school children
- In WA, 64% of the population drinks optimally fluoridated water provided by a public water system

Role of Department of Health

Office of Drinking Water

- Provides technical assistance to water systems that decide to optimally fluoridate their water.
- Ensures that naturally occurring fluoride in the water stays below the EPA's maximum contaminant level (MCL).

Office of Healthy and Safe Communities, State Oral Health Program:

- Promotes strategies that protect oral health, including the benefits of fluoride for the prevention and management of dental decay.
- Occasionally provides technical assistance to communities about community water fluoridation.

Prevention and Community Health Division:

- Works to prevent disease and promote a healthy start, healthy choices, and access to services for children and families, including during pregnancy.

Role of the State Board of Health

In Washington state law (RCW 57.08.012) allows, but does not require, community water fluoridation.

The State Board of Health sets an optimal level of fluoridation for water systems that choose to provide fluoridated water.

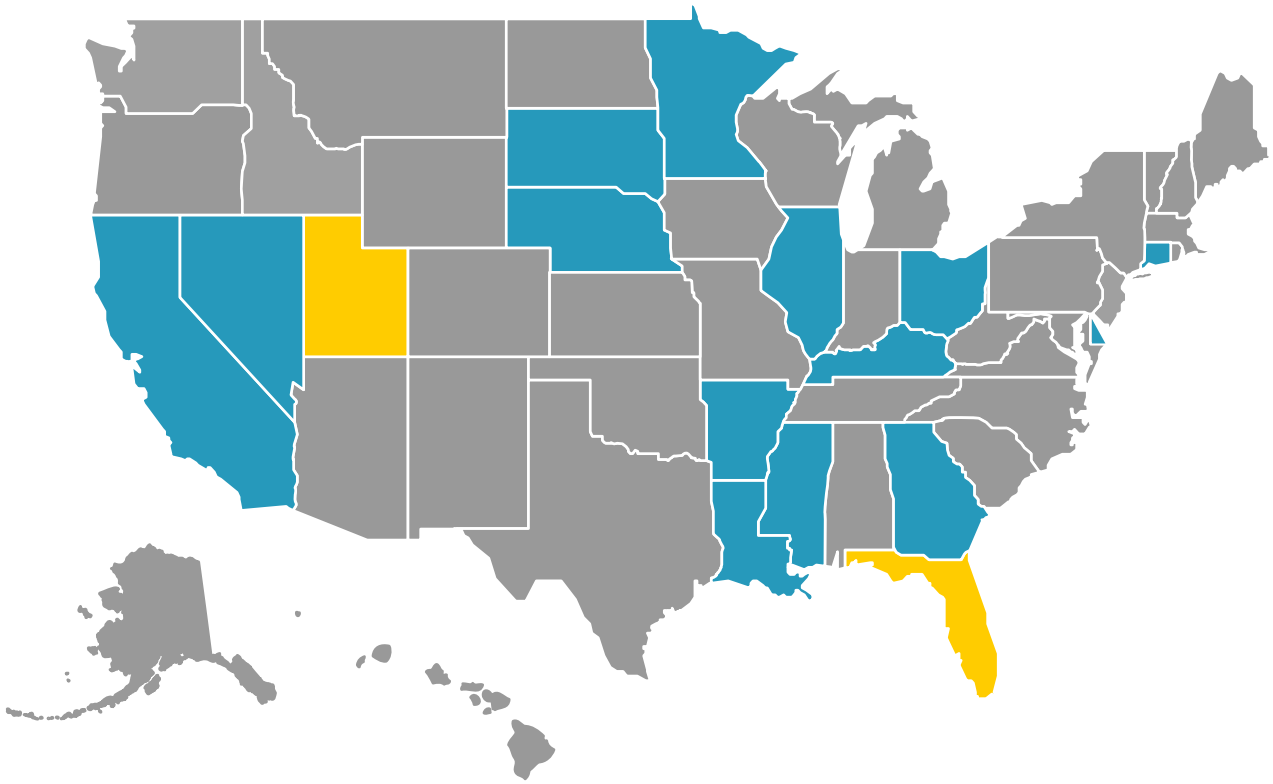
The State Board of Health sets a maximum contaminant level, or a state action level.

SAL Exceedance:	MCL exceedance:
• Notify DOH • Notify water users • Continue monitoring • Investigate cause of contamination • Take action as directed by department	• Notify DOH • Notify consumers • Investigate cause of contamination • Take action as directed

Fluoridation Policy by State

States which require or prohibit fluoridation in some form

(July 2025)



Controversy

Community water fluoridation has been controversial since it began. Some residents of Grand Rapids complained of adverse health effects due to fluoride before the intervention even started.

People who oppose community water fluoridation generally do so based on:

- Concerns for public safety
- The value for bodily autonomy
- Concerns about the proper role of government.

People who support community water fluoridation generally do so based on:

- The long history of apparently safe water fluoridation in the U.S.
- The belief that community water fluoridation prevents dental decay
- The value for equitable public health approaches to disease prevention that do not depend on access to care or other resources.

Current Situation

- In 2024, the State Board of Health received multiple petitions for rulemaking regarding fluoride exposure for pregnant people, infants, and children, and recommendations against adding chemicals such as fluoride to drinking water to treat or prevent disease in humans or animals.
- The petitions cited findings reported by the National Toxicology Program.
- The Department of Health (DOH) convened a panel to review the science and advise the State Board of Health.

FLUORIDE SCIENCE REVIEW PANEL

Fluoride Science Review Panel

- The panel was charged with listening, learning, and considering all relevant science in their discussions of community water fluoridation.
- Convened January through June 2025
- Panel members represented governmental public health in Washington:
  - Department of Health
  - Local Health Jurisdictions
  - The State Board of Health
  - Tribal Health Organizations

Fluoride Science Review Panel

PROCESS

Information Reviewed

- Literature on the benefits and risks of community water fluoridation
- Presentations from subject matter experts both internal and external to the Department of Health
- Community input from dentists, advocates, researchers, and concerned members of the public

Consensus Statements

DOH staff drafted potential consensus statements

Panel reviewed, discussed, edited

Vote in Zoom chat from 1-5

Votes of 4, 5 considered consensus

More discussion and another round of voting until consensus reached

Limitations

- Did not assess evidence around other strategies for prevention of tooth decay
- Did not assess evidence around healthy brain development or measurement of IQ in children
- Did not assess potentially less risky methods of getting benefits of fluoride
- Did not consider changes to the health care system or dental care system

Fluoride Science Review Panel

INFORMATION REVIEWED

Information Reviewed

2024 Cochrane Review: *Water fluoridation for the prevention of dental caries*

- Adding fluoride to water may slightly increase the number of children who have no tooth decay in either their baby teeth or permanent teeth. However, these results also included the possibility of little or no difference in tooth decay.
- **Unsure**: whether adding fluoride to water reduced tooth decay in children's permanent teeth.
- **Unsure**: whether there are any effects on tooth decay when fluoride is removed from a water supply.
- **Unsure**: whether fluoride reduces differences in tooth decay between people with higher incomes and people with lower incomes.

Information Reviewed

Case Study: Calgary, Canada

- Fluoride was introduced to drinking water in 1991, removed in 2011, and reintroduced in 2021.
  - Discontinuing community water fluoridation was associated with increased dental treatment under general anesthesia, especially among children 0-5 years old.
  - Odds of untreated dental decay increased more among those without dental insurance from 2009/2010 to 2013/2014, showing an increase in disparity.
  - The authors present multiple possible causes, one of which is the end of community water fluoridation.

Information Reviewed

Case Study: Juneau, Alaska

- Increased dental care costs were correlated with the stopping of community water fluoridation
  - After stopping community water fluoridation, there were significant differences in the mean number of Medicaid eligible dental procedures among 0-6, 0-7, and 0-18 year-olds, but not significant in ages 7-13 or 13-18.
  - This indicates a significant difference in treatment of primary teeth but not permanent teeth.

Information Reviewed

Oral Health Disparities and Access

- Oral health impacts physical and mental health, school and work attendance, and many aspects of quality of life.
- Exposure to fluoride hardens the tooth enamel and is protective against tooth decay in children and adults.
- Community water fluoridation is a long-standing intervention intended to help large portions of the community, regardless of access to dental care or fluoride-containing hygiene products.
- Access to dental care varies by employment and income and location in the state. Many children and adults in the state lack adequate access to dental care.

Information Reviewed

Economic Analysis

Most studies about fluoride and economic costs focus on:

- Saving on dental care costs.
- Avoiding lost work time.
- How much it costs water systems to add fluoride.
- Two recent papers call for inclusion of the costs of treating fluorosis and/or lost IQ points and demonstrate a reduction in the historical return on investment.

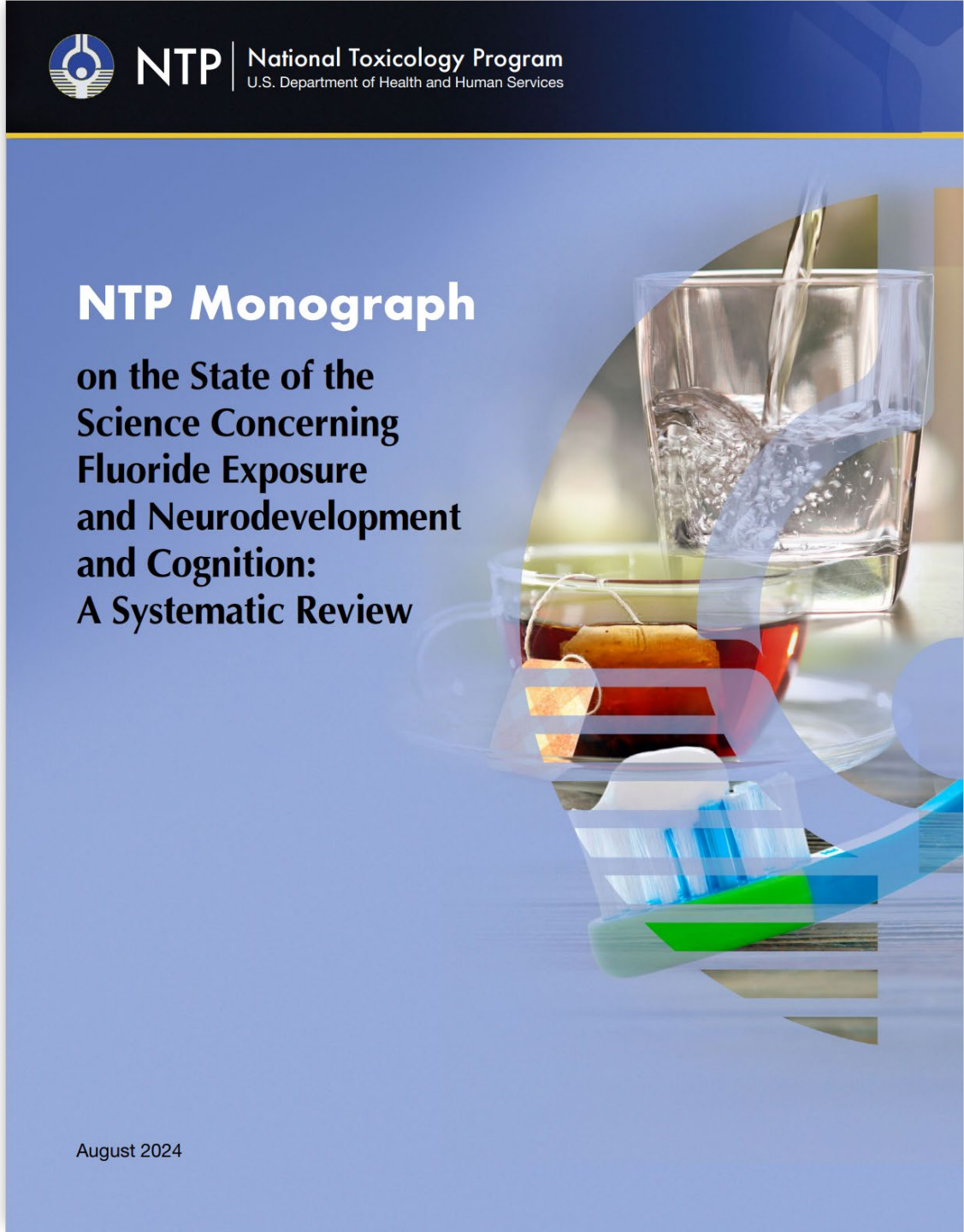
Most studies do not count the cost of treating fluorosis or possible IQ loss.

Even with the decline of benefits from community water fluoridation, literature continues to report it as a cost-effective intervention.

Information Reviewed

Fluoride, Neurodevelopment, and Cognition: A National Toxicology Program Monograph

- Moderately sure: that higher estimated fluoride exposures are consistently associated with lower IQ in children.
- Unsure: whether low fluoride level of 0.7 mg/L currently recommended for US community water has a negative effect on children's IQ.
- No evidence: that fluoride exposure has adverse effects on adult cognition.



Information Reviewed

2004 EPA court judgement on fluoride:

Fluoridation of water at 0.7 mg/L poses an unreasonable risk of reduced IQ in children.

- Does not mean that the court found that fluoridated water is definitely harmful. Rather that the court found an unreasonable risk of harm, a standard used by EPA under TSCA.
- The court did not consider the benefits of fluoride in their review.
- A court finding is not a scientific finding. It is an interpretation of the science that exists in reference to current federal law

Information Reviewed

Dr. Christine Till presented an overview of the emerging science on fluoride toxicology:

A 1 mg/L increase in fluoride intake was associated with a 3.66 (95% CI,-7.16 to -0.15; p=.04) lower IQ score in boys and girls.

Formula-fed babies are at risk of lower IQ if their formula is made with fluoridated water.

Evidence of fluoride neurotoxicity at urine fluoride levels <1.5 mg/L is relevant to community water fluoridation because pregnant women and children can exceed an equivalent dose of fluoride even when drinking optimally fluoridated water depending on amount of fluoridated water they ingest and their exposure to other sources of fluoride.

Till stated, “Given that fluoride offers little benefit to the fetus and young infant, community-wide administration of systemic fluoride may pose an unfavorable risk-benefit ratio for the pregnant woman, fetus, and infant.”

Fluoride Science Review Panel

COMMUNITY VOICES

Endorsements

The Centers for Disease Control and Prevention

American Medical Association

American Academy of Pediatrics

American Dental Association

American Academy of Pediatric Dentistry

American Association for Dental, Oral, and Craniofacial Research

Fluoride is not a chemical; it’s a natural substance.

Community water fluoridation is endorsed by CDC, AMA, AAP, ADA, AAPD.

Community water fluoridation is a population-based intervention that helps everyone.

There is no association between community water fluoridation and IQ.

As feds cut Medicaid, community water fluoridation will be more important for high-risk communities.

Epidemiologic evidence informs our understanding that fluoride is beneficial throughout the lifespan.

Community Input

Dentists, advocates, researchers, and concerned members of the public shared their views with the panel.

> The State Board of Health must ensure safe drinking water.

> Fluoride is not good for everyone. Some people experience unique toxic effects.

> Putting fluoride in water is not effective at preventing cavities, but it presents an unacceptable neurodevelopmental risk.

> We should follow the precautionary principle and not expose people to a chemical we cannot prove is safe for everyone.

> People should be able to opt out of fluoride if they don't want it.

> There is no reason for babies under 6 months of age to get any fluoride.

Community Input

Dentists, advocates, researchers, and concerned members of the public shared their views with the panel.

Fluoride Science Review Panel

CONSENSUS STATEMENTS

Oral health and fluoride

- Oral Health is essential for overall health and well-being, with connections to quality of life, self-esteem, employment, and school and learning.
- Fluoride is an effective tool in preventing tooth decay.
- Dental decay is a preventable disease. Health behaviors related to a combination of diet, oral hygiene, use of fluorides, and regular dental care are key factors. Health education and other public health interventions designed to improve these health behaviors are important for good oral health.

Oral health and fluoride

- When properly used, topical application of fluoride to teeth, including at low levels in saliva, and at higher levels from fluoridated toothpaste, varnishes, and professional fluoride treatments is clearly beneficial to teeth and helps to prevent dental decay.
- Systemic effects of fluoride include both dose-dependent benefits and harms.
- The burden of dental decay is inequitably distributed due to economic and social inequities and lack of access to dental care.

Benefits of Community Water Fluoridation

- Community Water Fluoridation began in the US in 1945 in Grand Rapids, Michigan. Dental decay among school aged children was greatly reduced in the fluoridated area. This led to the expansion of community water fluoridation throughout most of the U.S. As a result, in 2000, the Centers for Disease Control and Prevention named community water fluoridation as one of the top ten greatest public health interventions from the twentieth century.
- Community Water Fluoridation is an effective tool in the prevention of tooth decay.
- Since about 1975, access to fluoride in consumer dental products such as toothpastes and rinses has become more widespread.

Benefits of Community Water Fluoridation

- As more of the population has access to fluoride in consumer dental products, the magnitude of the added preventive benefit of community water fluoridation for dental decay is lower, as compared to before 1975 when community water fluoridation was the primary way for most people to be exposed to fluoride.
- Some communities that have stopped community water fluoridation have seen increases in dental decay in their communities. The way researchers have measured those increases and the magnitude of these increases has varied.
- The issue of the added benefits of community water fluoridation to reducing oral health inequities is unresolved. Worsening oral health inequities should community water fluoridation be discontinued would be a concern.

Risks of Community Water Fluoridation

- In risk assessment, it is typical to have a margin of safety between the level we know to be harmful and the level people are exposed to. This margin accounts for uncertainties and is usually protective of susceptible or vulnerable populations.
- Optimally fluoridated drinking water can increase the risk of mild, cosmetic dental fluorosis.
- In 2024, the National Toxicology Program found with moderate confidence, that higher estimated fluoride exposures (e.g., as in approximations of exposure such as drinking water fluoride concentrations that exceed the World Health Organization Guidelines for Drinking-water Quality of 1.5 mg/L of fluoride) are consistently associated with lower IQ in children.

Risks of Community Water Fluoridation

- The primary populations of concern for neurodevelopmental risk from fluoride exposure are pregnant people and infants. Developing fetuses and infants are known to be particularly vulnerable to neurodevelopmental hazards.
- Higher fluoride exposure results in more serious health effects. The science is not clear on whether there is a threshold, below which there are no neurodevelopmental risks in vulnerable populations.
- Some people may be getting too much fluoride. The risks of fluoride come from the total amount consumed from a combination of sources, including water, food, black tea and fluoridated dental products.

MCL

- Naturally occurring high levels of fluoride in drinking water have been linked to skeletal and dental fluorosis.
- Under the federal Safe Drinking Water Act, a Maximum Contaminant Level (MCL) is the highest allowable concentration of a contaminant in drinking water.
- Two health hazards are the basis for the primary and secondary maximum contaminant levels (MCL) for fluoride recognized by the Environmental Protection Agency: the primary MCL of 4 mg/L was established to protect against skeletal fluorosis and the secondary MCL of 2 mg/L protects against dental fluorosis.

MCL

- Neurodevelopmental effects are associated with fluoride drinking water levels between 1.5 mg/L and the current MCLs of 4 mg/L and 2 mg/L
- In February 2024, the EPA Office of Water calculated a new potential MCL (Goal) of 0.9 mg/L to protect against dental fluorosis. They used revised exposure metrics for 1 to <11 years of age because that life stage was identified as a potential critical window of exposure in the development of primary and secondary teeth. This MCLG has not yet been formally proposed.

Next Steps

- Future risk/benefit analyses on community water fluoridation should carefully weigh potential neurodevelopmental hazards to vulnerable populations alongside the oral health benefit attributed to the intervention.
- More research is needed to better understand potential neurodevelopmental risks from community water fluoridation at current recommended levels, 0.7 mg/L.
- Additional research on the contribution of community water fluoridation to reducing oral health inequities is needed.
- The science surrounding fluoride and toxicity continues to evolve and should be monitored.

Fluoride Science Review Panel

CONCLUSIONS

Conclusions

- Community water fluoridation is an effective tool to prevent tooth decay.
- As more of the population has access to fluoride in consumer dental products, the benefit of community water fluoridation for dental decay is smaller. Before 1975, community water fluoridation was the primary way people were exposed to fluoride.
- Some communities that have stopped community water fluoridation have seen increases in dental decay.
- More research is needed on the impact of community water fluoridation on reducing oral health inequities.

Conclusions

- In 2024, the National Toxicology Program found with moderate confidence, that higher estimated fluoride exposures (exposures equivalent to drinking water fluoride concentrations of 1.5 mg/L or higher) are consistently associated with lower IQ in children.
- Pregnant people and infants are the primary populations of concern for neurodevelopmental risk from fluoride exposure. Developing fetuses, and infants are particularly vulnerable to neurodevelopmental hazards.
- More research is needed on the potential neurodevelopmental risks from community water fluoridation at current recommended levels (0.7 mg/L).

Summary

The panel is:

SURE that fluoride prevents tooth decay.

LESS SURE that community water fluoridation contributes a significant added oral health benefit beyond other common exposures to fluoride.

LESS SURE that community water fluoridation has an impact on oral health inequities.

MODERATELY SURE that exposure to higher levels of fluoride coming from a combination of sources poses an IQ risk to developing fetuses and babies.

LESS SURE that optimally fluoridated water poses an IQ risk for developing fetuses and babies in today's environment that has additional sources of fluoride.

Fluoride Science Review Panel

RECOMMENDATIONS

Recommendations

The State Board of Health should:

- Keep the current optimal level of fluoride concentration for now. Community water fluoridation should remain a local decision. Communities should carefully weigh the benefits and risks of water fluoridation.
- Begin the rulemaking process to consider adopting a State Action Level of 1.5 mg/L for fluoride.
- Coordinate with the Department of Health and public health partners to update messaging on fluoride to include guidance to limit fluoride exposure for pregnant people, fetuses, and infants.

Next steps

- Ethics Review
- Prepare for an uncertain future

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