General Benefits of Community Water Fluoridation

- Water fluoridation is a safe, effective and cost-saving public health measure to prevent tooth decay. The U.S. Public Health Service recommends an optimal fluoride concentration of 0.7 milligrams per liter (mg/L) in drinking water to prevent tooth decay. This level is designed to maximize dental health benefits while minimizing the risk of dental fluorosis. To visualize this concentration, 0.7 mg/L is approximately equivalent to three drops of fluoride in a 55-gallon barrel of water. Reference: CDC's How Water Fluoridation Works.
- It benefits individuals of all ages and socio-economic backgrounds. Reference: CDC's Fast Facts About Water Fluoridation.
- **Basics of Water Fluoridation (CDC)**: Explain to patients how fluoride in water strengthens enamel and prevents cavities.

Fluoride primarily works through topical mechanisms. Low levels of fluoride in the oral environment help inhibit demineralization by binding to hydroxyapatite crystals in tooth enamel, thereby reducing their solubility in acid. Fluoride also enhances remineralization by accelerating the uptake of calcium and phosphate from saliva. The newly formed mineral, fluoridated hydroxyapatite (or fluorapatite), is more resistant to acid attack than the original enamel. Ingested fluoride contributes systemically by being secreted back into the oral cavity through saliva and gingival crevicular fluid, maintaining a low but effective concentration of fluoride around the teeth. While the main benefits of fluoride are topical, some cohort studies provide evidence of a modest pre-eruptive protective effect, particularly on the pit and fissure surfaces of permanent first molars. Reference: Buzalaf et al, Monogr. Oral. Sci., 2011.

- **Cost-Effectiveness**: Emphasize the economic benefits of water fluoridation for communities, according to a study by O'Connell et al, Health Affairs, 2016: optimally fluoridated water saves 6.5 billion dollars in dental treatment costs per year, by preventing caries and teeth decay. Highlight the return on investment (ROI) from optimally fluoridated water, which reduces dental treatment costs: for every $1 spent on water fluoridation, there are $20 in benefits (savings in dental treatment).

- **Prevalence of Tooth Decay**: Stress that tooth decay is the most prevalent chronic disease, preventable with fluoride. Reference: Heng C, Federal Practitioner, 2016.

Addressing Patient Concerns

- **Safety and Efficacy:** Provide evidence-based reassurances about the safety of fluoride. Reference: Reference: NIH's "Fluoride—Fact Sheet for Health Professionals."
- Supported by decades of research, communities with water fluoridations experience 25% fewer cavities, reducing the need for dental treatment in children and adults. Reference: Iheozor-Ejiofor et al, Cochrane, 2024.
- Fluoride levels in water are carefully monitored to ensure they remain within safe and effective ranges.
- **Fluoridation Myths**: Counter misinformation with resources like ADEA's "Community Water Fluoridation", ADA's "Fluoridation Facts", CareQuest Community Water Fluoridation Facts and Myths, and CDC's Scientific Statement on CWF.
- **Fluoride and Health Risks**: Address specific concerns, such as osteosarcoma risk, with findings from peer-reviewed literature (e.g., Hayes et al., JADA, 2021).
- **It's important to note**:
  - While fluoride has clear benefits for dental health, excessive intake can lead to dental fluorosis which affects the appearance of tooth enamel. Therefore, maintaining the recommended fluoride concentration is crucial to ensure public health and safety.
  - The existing literature does not establish a causal relationship between community water fluoridation and harmful effects on human health as its practice levels in the United States, primarily due to biases and limitations in study designs. However, the ongoing debate regarding the potential impacts of early-life fluoride exposure on cognitive neurodevelopment underscores the urgent need for high-quality scientific research to address these concerns.
- **Why other countries do not fluoridate their water?**
  - About 25 countries fluoridate their drinking water, providing safe fluoride levels to more than 400 million people worldwide (Pollick, 2013, JCDA). Many countries choose not to fluoridate their water supplies, but typically not due to concerns about safety. Common reasons include naturally high levels of fluoride in the water (e.g., parts of Italy and India; Vinceti et al, 2024, Ann Ig), or the use of

alternative delivery methods such as fluoridated salt (e.g., Switzerland, Mexico, Colombia; Marthaler, 2013, AMA), milk (e.g., Thailand, Chile; Yeung et al, 2015, Cochrane), and fluoride toothpaste or school-based rinses (e.g., Japan; Yonezawa and Yagi, 2022, Int Dent J). Public opposition has also played a role, with some countries ending fluoridation in response to concerns over personal choice and medical consent. Therefore, the claim that many countries do not fluoridate their water can be misleading, as fluoride is often delivered through other means or is naturally present.

- In countries with widespread access to dental care, such as Germany and Denmark, reliance on water fluoridation may be lower (Manski et al, 2015, IDJ). However, in countries like the U.S., where dental coverage is less universal, fluoridation acts as a public health equalizer, especially benefiting low-income communities.
- Calgary, Canada halted water fluoridation in 2011 which led to a significant rise in tooth decay and consequence reinstatement of fluoridation in 2025 (Strasser, 2025, Calgary Herald).
- **Key Takeway:** While some countries have ended or never implemented water fluoridation, these decisions are primarily based on logistical, cultural or geographic factors, and not a scientific rejection of its benefits. Removing fluoridation risks widening health inequalities, particularly for vulnerable populations.

Community Water fluoridation & lower IQ in children

The NTP's Fluoride Exposure: Neurodevelopment and Cognition study:

The NTP review was designed to evaluate total fluoride exposure from all sources and was not designed to evaluate the health effects of fluoridated drinking water alone.

The determination about lower IQs in children was based primarily on epidemiologic studies in non-U.S. countries such as China, India, Iran, and Pakistan where some pregnant women, infants, and children received total fluoride exposure amounts higher than 1.5 mg fluoride/L of drinking water. Further, almost all studies that found an association were poor quality studies at high risk of bias. The U.S. Public Health Service currently recommends 0.7 mg/L, and the World Health Organization has set a safe limit for fluoride in drinking water of 1.5 mg/L.

It concluded with moderate confidence that higher levels of fluoride exposure, such as drinking water containing more than 1.5 milligrams of fluoride per liter, are associated with lower IQ in children. **It is important to note that there were insufficient data to determine if the low fluoride level of 0.7 mg/L currently recommended for U.S.**

community water supplies has a negative effect on children's IQ. The NTP found no evidence that fluoride exposure had adverse effects on adult cognition.

Additional information:

- The **U.S. Public Health Service (USPHS) Review (1991, 2015)** reviewed numerous epidemiological studies and concluded that there is **no evidence of significant adverse health effects** from community water fluoridation (CWF) at recommended levels (0.7 mg/L). The review reaffirmed that **fluoridation is safe and effective** in reducing dental caries (tooth decay). Reference: U.S. Public Health Service. (2015). "U.S. Public Health Service Recommendation for Fluoride Concentration in Drinking Water for the Prevention of Dental Caries."
- A California court decision in a case against the Environmental Protection Agency (EPA) heavily relied on NTP's report and stated, "does not conclude with certainty that fluoridated water is injurious to public health". Reference: Case No. 17-cv-02162-EMC.

Kumar et al, Public Health, 2023

The authors conducted a meta-analysis of eight studies of standardized mean differences in IQ scores and found that fluoride exposure to community water fluoridation was not associated with lower IQ scores in children. Reference: Kumar JV, et al., Public Health. 2023; 219:73-84.

National Research Council (NRC) 2006 Report. The **NRC's 2006 report** examined fluoride exposure and potential health effects. It found **no conclusive evidence** linking optimally fluoridated water to **cancer, kidney disease, endocrine disruption, or neurological effects** at recommended levels. However, it suggested further research on high fluoride exposures from natural sources. Reference: National Research Council. (2006). Fluoride in Drinking Water: A Scientific Review of EPA's Standards. National Academies Press.

National Toxicology Program (NTP) 2019 Report

The **NTP reviewed over 60 studies** related to fluoride exposure and human health and found that the **evidence does not support a causal link** between CWF and neurodevelopmental harm, such as lower IQ. Reference: National Toxicology Program. (2019). Systematic Review of Fluoride Exposure and Neurodevelopmental and Cognitive Health Effects.

Centers for Disease Control and Prevention (CDC)

The **CDC has consistently stated** that community water fluoridation is a **safe and effective public health intervention** with no proven adverse health effects. Reference: CDC. "Community Water Fluoridation: Frequently Asked Questions."

The **Cochrane Collaboration**, known for rigorous reviews, examined studies on fluoridation and health. It **found no evidence** of a **causal relationship** between CWF and adverse health effects. Reference: Iheozor-Ejiofor Z, et al., Cochrane Database Syst Rev. 2024;10(10):CD010856; The University of Sydney (2016); Office of the Prime Minister's Chief Science Advisor, New Zealand (2021)

Advocacy and Community Benefits

- **Community Fluoridation**: Highlight the societal benefits of water fluoridation, including reduced income-related disparities in dental health. Reference: Sanders et al., JAMA Peds, 2019.
- **Role of Oral Health Professionals**: Encourage active involvement in promoting community water fluoridation initiatives. Reference: Melbye & Armfield, JADA, 2013.

Evidence-Based Insights

- **Reduction in Tooth Loss**: Explain how community water fluoridation is associated with lower rates of adult tooth loss. Reference: Neidell et al., AJPH, 2010.
- **Effectiveness in Adults**: Share data on fluoride's effectiveness in preventing caries across age groups. Reference: Griffin et al., J Dent Res, 2007.

Practical Resources

- FactCheck.org piece on water fluoridation safety
- Parents magazine. A guide for parents on water fluoridation

Call to Action

- Encourage patients to support water fluoridation in their communities.
- Remind them of the significant role it plays in maintaining lifelong oral health.

In the words of an expert.

A conversation with **Scott L. Tomar, DMD, DrPH,** Associate Dean for Prevention and Public Health Sciences, University of Illinois Chicago (UIC) College of Dentistry.

Community Water Fluoridation Questions. ADEA. March 7, 2025.

What scientific evidence supports the safety and effectiveness of the current CDC-recommended levels of fluoride in public drinking water for preventing tooth decay?

Much attention has been focused on the possible effect of fluoride exposure on children's IQ, a claim that goes back decades but was highlighted by several recent publications. The National Toxicology Program (NTP) issued a monograph on fluoride exposure and neurodevelopment in August 2024 (NTP, 2025), and the primary authors of that monograph published a meta-analysis that had been removed from an earlier draft of the NTP Monograph as a stand-alone paper in January 2025 (Taylor et al., 2025). The NTP monograph and paper shared the same fundamental weakness: about three-fourths of the included studies were ranked as low quality and high risk for bias, and nearly all were from parts of China, India, and Iran with very high levels of fluoride and unknown contaminants in the water. Importantly, the NTP Monograph and meta-analysis found no association between exposure to fluoride at the levels used in community water fluoridation and children's IQ. A more recent prospective cohort study from Australia also found no association between water fluoridation and children's IQ (Do et al. 2024), nor did other recent systematic reviews on IQ and levels of fluoride exposure relevant to water fluoridation (Kumar et al., 2023; Miranda et al., 2021). The judge in the recent court case brought against the Environmental Protection Agency relied heavily on the NTP report but acknowledged that there was no evidence of any harm associated with the levels of fluoride used in community water fluoridation (Case No. 17-cv-02162-EMC). The available evidence indicates that the level of fluoride used in community water fluoridation is not associated with changes in IQ or any other measure of neurodevelopment.

The Cochrane Library issued its latest systematic review on the effectiveness of water fluoridation in October 2023 (Iheozor-Ejiofor et al. 2024). That review's stringent inclusion criteria limited it to prospective cohort studies that were started before the initiation of a new fluoridation program, and just one new study was added to its 2015 systematic review on the topic. The authors concluded that contemporary studies of initiation of community water fluoridation show slightly greater reduction in the severity of dental caries and a slightly greater increase in the proportion of caries-free children, but with smaller effect sizes than pre-1975 studies. That conclusion has been misinterpreted as meaning that community water fluoridation is no longer effective, but the recent studies included in that systematic review suggest the proportion of disease

incidence prevented by water fluoridation is still in the range of 25%–40%, even during a time of widespread use of fluoride toothpaste. The absolute number of teeth or tooth surfaces spared from caries may be smaller than it once was, but the prevented fraction remains clinically and financially significant. Many recent cross-sectional studies that did not meet the stringent inclusion criteria for the main analysis were summarized in the report's Discussion section. The studies were remarkably consistent across countries in showing significantly lower caries severity in fluoridated communities compared with non-fluoridated comparison communities, for both primary and permanent dentitions.

Key takeaways:

- **Fluoride at CDC-recommended levels is not linked to IQ reduction**: Studies show that the amount of fluoride used in U.S. tap water does not lower children's IQ.
- **Water fluoridation remains effective in preventing tooth decay and cavities**: Water fluoridation reduces tooth decay by 25–40%, even with fluoride toothpaste in use.
- **Scientific consensus supports the safety and efficacy of water fluoridation**: Experts and courts agree that water fluoridation at current levels is both safe and helpful for dental health.

How do the levels of fluoride in public water systems compare to recommended safety guidelines, and what measures are in place to prevent overexposure?

The recommended fluoride concentration in community water fluoridation is 0.7 mg/L (U.S. HHS Panel on CWF, 2015). That concentration is less than one-fifth of the maximum contaminant level (MCL) for fluoride set by the US Environmental Protection Agency (EPA), which is the enforceable standard of the level of contaminants in drinking water at which no adverse health effects are likely to occur (40 CFR 141.51). The recommendation level is about one-third of EPA's secondary maximum contaminant level (SMCL) for fluoride (2.0 mg/L) (EPA, 2024), which is the guideline for contaminant that may cause cosmetic effects, such as fluorosis.

Water systems are required to comply with EPA's standards on the MCL for fluoride, and EPA requires consumer notification by the water supplier if the naturally occurring fluoride level exceeds 2.0 mg/L. The SMCL, while not federally enforceable, is intended to alert families that regular consumption of water with natural levels of fluoride greater

than 2.0 mg/L by young children could cause moderate to severe dental fluorosis in the developing permanent teeth. The Centers for Disease Control and Prevention (CDC) provides technical assistance to state fluoridation programs for fluoride engineering, facility management, and monitoring coverage and quality of fluoridation practice (CDC, 2024). CDC also provides fluoridation training for water operators and engineers to improve their knowledge and skills for adherence to standards and best practices.

Key takeaways:

- **Fluoride levels in public water are well below safety limits:** The recommended level for community water fluoridation is 0.7 mg/L—far below the EPA's enforceable limit of 4.0 mg/L and also below the 2.0 mg/L guideline for avoiding cosmetic effects like fluorosis.
- **Regulations help prevent overexposure:** Water systems must follow EPA standards, and consumers are notified if fluoride levels exceed 2.0 mg/L to protect young children from dental fluorosis.
- **CDC supports safe fluoridation practices:** The CDC provides training, technical assistance, and monitoring tools to help water systems maintain safe and effective fluoridation.

What are the potential public health consequences of removing fluoride from community water supplies, particularly for vulnerable populations such as children and low-income families?

Recent evidence from Calgary, Canada, indicates that discontinuation of community water fluoridation was associated with significantly greater caries prevalence among its children compared with fluoridated Edmonton (McLaren et al., 2022). Because community water fluoridation reduces income-related disparities in dental caries experience (Sanders et al., 2019), stopping community water fluoridation also will increase such inequities.

At contemporary estimates of the prevented fraction of caries associated with community water fluoridation, this public health measure saves money. On average, each dollar spent on community water fluoridation in the United States saves about $20 in averted treatment (O'Connell et al., 2016). Consequently, stopping fluoridation can be expected to result in increased rates of restorative dental care and increased treatment costs. Indeed, those experiences were reported when fluoridation was discontinued in Juneau, Alaska (Meyer et al., 2022) and Israel (Nezihovski et al., 2024).

Key takeaways

- **Ending fluoridation increases tooth decay:** Studies show higher rates of cavities in children after fluoridation stopped.
- **Vulnerable groups are hit hardest:** Low-income families and children are especially affected, as fluoridation helps reduce dental health disparities.
- **Fluoridation is cost-saving:** For every $1 spent on fluoridation, about $20 is saved in dental treatment costs—removing it leads to higher dental care expenses.