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Subject: Support Madison Water Fluoridation
Date: Friday, August 21, 2020 7:36:01 AM
Attachments: [image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[Madison Ltr of Support CWF 8.21.20.pdf](#)
[Community water fluoridation talking points.pdf](#)
[communitywaterfluoridationfactsheet.pdf](#)
[CommonQuestionsAboutFluoride.pdf](#)
[QandAonCommunityWaterFluoridation_v1b.pdf](#)
[Tap Into Healthy Teeth Toolkit.pdf](#)
Importance: High

Caution: This email was sent from an external source. Avoid unknown links and attachments.

Dear Madison Water Utility Board Members and other leaders of the City of Madison,

On behalf the Wisconsin Dental Association, it's 3000 member dentists statewide and our Madison member dentists I send you a letter of support to maintain fluoridation in the Madison water supply.

I have also attached additional information about the benefits of community water fluoridation for your review. I hope every aspect of how the citizens of Madison benefit from this public health measure is taken into consideration before and during the Tuesday August 25th meeting where this is going to be discussed.

Please do not hesitate to contact me if you have further questions and or need anything else.

Thank you!

Erika

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To view the latest guidance for dental practitioners,

visit [WDA's coronavirus hub](#). Additional information can be found on the [ADA website](#).



August 20, 2020

Dear Madison Water Utility Board Members,

It has come to our attention that Madison Water utility will be discussing the future of fluoridating the local water system. Fluoridation of community water supplies is considered one of the most significant public health advances of the 20th century and one of the safest, most cost-effective ways to increase overall oral health. Since its introduction over 65 years ago, fluoridation has dramatically improved the dental health of tens of millions of Americans. Time and again, public opinion polls show an overwhelming majority of Americans support water fluoridation.

Established in 1870, the Wisconsin Dental Association (WDA) is the state's largest organization representing dentistry. The WDA has over 2,900 members statewide who are committed to promoting professional excellence and quality oral health care. We ask you to please consider:

- The June 2000 Surgeon General's Report on Oral Health in America stated fluoridation is "an inexpensive means of improving oral health that benefits all residents of a community, young and old, rich and poor alike." This public health measure benefits individuals of all socioeconomic groups, especially those without access to regular dental care.
- Under the Safe Drinking Water Act, the Environmental Protection Agency has established drinking water standards for a number of substances, including fluoride, to protect the public's health.
- 75 years of studies from more than 125 national and international organizations recognize the public health benefit of fluoridation, including the American and Canadian Dental Associations, US. Public Health Service, American Medical Association, American Cancer Society, American Academy of Pediatrics, the CDC and the World Health Organization. Best information with peer-reviewed studies is hosted by the American Academy of Pediatrics at <https://iilikemyteeth.org/>
- Residents who receive the benefits of water fluoridation experience approximately 30 percent less tooth decay.
- Every \$1 invested in water fluoridation saves \$38 in dental treatment costs for most cities.

On behalf of all the adults and children living in Madison, the WDA urges local officials to maintain fluoride to the municipal water system.

Sincerely,

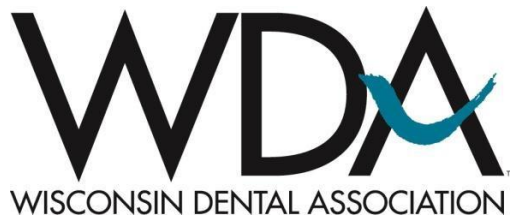
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Community water fluoridation talking points

For almost 70 years, community water fluoridation has proven to be a safe, effective and economical way to prevent tooth decay in children and adults – regardless of an individual’s age, income or education. The Wisconsin Dental Association and its more than 3,000 member dentist and dental hygienists are committed to promoting quality oral health care and support this public health achievement.

Quick facts

- On Feb. 27, the Environmental Protection Agency issued a 50-page, scientifically-sound decision denying a request to ban community water fluoridation nationwide and saying the health benefits of fluoride include, “...having fewer cavities, less severe cavities, less need for fillings and removing teeth and less pain and suffering due to tooth decay.”
- The Centers for Disease Control and Prevention have proclaimed fluoridation of community water supplies one of the most significant public health advances of the 20th century and one of the safest, most cost-effective ways to increase overall oral health.
- More than 125 national and international health, service and professional organizations recognize the public health benefits of fluoridation, including the U. S. Surgeon General, American Dental Association, U.S. Public Health Service, American Medical Association, American Academy of Pediatrics (physicians) and the World Health Organization.
- Tooth decay remains a significant public health problem in Wisconsin with an estimated 55 percent of third-graders having had cavities, according to the state Department of Health Services.
- National health care statistics show oral disease causes children to miss 51-54 million school hours and adults to lose 164 million work hours each year.
- Community water fluoridation is adjusting a naturally occurring mineral in public water systems to an optimal level for oral health benefits.
- Regardless of age, income or education, optimally fluoridated water benefits whole communities by strengthening tooth enamel and preventing tooth decay.
- Approximately 90 percent of the population in Wisconsin on public water supplies has access to the benefits of optimal levels of fluoride.

Safe

- Adding fluoride to drinking water is like adding vitamin D to milk, iodine to table salt and folic acid to breads and cereals.
- Scientific research has found that most causes of fluorosis (white spots on tooth surfaces) is caused by misuse of fluoridated toothpaste.
- New recommendation of the optimal level of fluoride in public water systems of 0.7 ppm recognizes that federal and state health officials are reviewing research and relying on the best science available.

Effective

- Drinking fluoridated water reduces tooth decay over a lifetime by a minimum 25 percent, even in an era with widespread availability of fluoride from other sources, such as fluoride toothpaste and in office treatments.
- Fluoride helps to re-materialize tooth surfaces and prevents cavities from continuing to form.
- With older Americans keeping their teeth longer, fluoride continues to be important for preventing tooth decay among seniors. Older Americans are especially susceptible to tooth decay, because of exposed root surfaces and mouth dryness.

Economical

- The estimated return on investment for community water fluoridation ranges from \$4 per person in small communities of 5,000 people or less to \$27 per person in large communities of 200,000 people or more.
- An individual can have a lifetime of fluoridated water for less than the cost of one dental filling.

Community Water Fluoridation



Tooth decay is one of the most common chronic diseases among American children. One of four children living below the federal poverty level experience untreated tooth decay.¹



Tooth decay and its complications are preventable.²

Community water fluoridation (CWF) is “the controlled addition of a fluoride compound to a public water supply to achieve a concentration optimal for dental caries prevention.”²

Safe

- The safety and benefits of fluoride are well documented and have been reviewed comprehensively by several scientific and public health organizations.³⁻⁵
- No convincing scientific evidence has been found linking community water fluoridation (CWF) with any potential adverse health effect or systemic disorder such as an increased risk for cancer, Down syndrome, heart disease, osteoporosis and bone fracture, immune disorders, low intelligence, renal disorders, Alzheimer’s disease, or allergic reactions.^{4,6}
- Documented risks of CWF are limited to dental fluorosis, a change in dental enamel that is primarily cosmetic in its most common form. In the United States today, most dental fluorosis is of the mildest form, with no effect on how teeth look or function.⁷

Effective

- The US Community Preventive Services Task Force issued a strong recommendation in 2001 and again in 2013 for CWF for the prevention and control of tooth decay.^{6,8}
- Water fluoridation prevents tooth decay by providing frequent and consistent contact with low levels of fluoride, ultimately reducing tooth decay by about 25% in children and adults.⁹⁻¹²
- Schoolchildren living in fluoridated communities on average have 2.25 fewer decayed teeth compared with similar children not living in fluoridated communities.⁶

Reduce Disparities

- CWF has been identified as the most cost-effective method of delivering fluoride to all members of the community regardless of age, educational attainment, or income level.^{13,14}

Cost-Saving

- By preventing tooth decay, CWF has been shown to save money, both for families and the health care system.^{11,15}
- The return on investment for CWF varies with size of the community, increasing as the community size increases. CWF is cost-saving—even for small communities.^{15,16}

Public Health Achievement

- Because of its contribution to the dramatic decline in tooth decay over the past 70 years, CDC named CWF 1 of 10 great public health achievements of the 20th century.¹³
- In 2012, more than 210 million people, or nearly 75% of the U.S. population served by public water supplies, drank water with optimal fluoride levels to prevent tooth decay.¹⁷

International Fluoride Use

- Nearly all developed countries practice fluoridation, just not always through water. Instead, salt is often used as the primary way of providing fluoride to the public.¹⁸
- The World Health Organization supports fluoridation of water, salt, and milk as a way to reduce dental decay.^{19,20}



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COMMON QUESTIONS ABOUT FLUORIDE:

A Resource for Parents and Caregivers

1. Why do children need fluoride?

Fluoride is an important mineral for all children. Our mouths contain bacteria that combine with sugars in the foods we eat and the beverages we drink. The acid that is produced harms tooth enamel and damages teeth. Fluoride protects teeth by making them more resistant to acid and can even help reverse early signs of decay.

2. Is fluoridated water safe for me and my children to drink?

Yes. Decades of research and practical experience have confirmed the safety of fluoride. Based on what has been learned from both science and our years of experience, the world's leading health, dental, and medical organizations recognize water fluoridation as an effective way to reduce tooth decay for everyone – children and adults alike.

3. We brush our teeth with fluoride toothpaste every day. Do we still need fluoridated water?

Yes. For most people, brushing with fluoridated toothpaste is not enough. Drinking fluoridated water throughout the day bathes our teeth in low levels of fluoride to help them stay strong. That, combined with the more concentrated fluoride in dental products, prevents more tooth decay than toothpaste alone. That is why it is so important to make sure your children are drinking fluoridated water and brushing properly with fluoride toothpaste at least twice a day.

4. Are there health risks associated with these forms of fluoride?

No. There is no credible scientific evidence that fluoridated water or dental products contribute to or cause illness or disease. The only proven risk associated with excess fluoride is a cosmetic condition known as dental fluorosis.

5. What exactly is dental fluorosis? Should I be concerned about fluorosis from drinking fluoridated water?

Dental fluorosis is a change in the appearance of the teeth, usually in the form of very faint white markings. It is usually detectable only by a dental expert during an exam. Most fluorosis does not affect the function or health of the teeth. In fact, teeth with mild fluorosis are more resistant to cavities.

Most fluorosis is the result of consuming too much fluoride while teeth are forming, before the age of 8. To reduce this possibility, supervise brushing so that children do not use too much toothpaste or mouth rinse and learn to spit, not swallow.



The American Academy of Pediatrics, the American Dental Association, and the American Academy of Pediatric Dentistry all support the use of fluoride to protect children's teeth.



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6. Is it safe to mix infant formula with fluoridated water?

According to the American Dental Association, it is safe to mix infant formula with fluoridated water.

7. Are the fluoride additives used to fluoridate drinking water safe?

Yes. The fluoride that is added to public water supplies conforms to stringent safety standards and results in water that complies with the Safe Drinking Water Act. The quality and safety of fluoride additives are ensured by Standard 60, a program that was commissioned by the U.S. Environmental Protection Agency (EPA). This program is monitored by an independent committee of experts, including the Association of State Health Officials and other key organizations.

8. How much fluoride should my child have to protect his/her teeth?

Children who consume a nutritious diet, drink fluoridated water, and use fluoridated toothpaste properly will get all the fluoride they need for healthy teeth. It is not necessary to monitor water or food consumption since your child ingests low levels of fluoride from these sources. Parents will want to assure that children are not swallowing mouth rinse or toothpaste, which contain more concentrated amounts of this important mineral. Your health or dental provider can help you determine if your child is getting an adequate amount of fluoride to protect his/her teeth.

Sources of Fluoride



Beverages, including fluoridated tap water



Foods processed with fluoridated water



Toothpaste and other oral care products



Topical fluoride & dietary supplements

9. I have heard fluoride can cause all kinds of things, from lower IQ to cancer. Can that be true?

No. There is no credible scientific evidence that water fluoridated at the levels used in the United States contributes to or causes disease or poor health. The only proven risk associated with fluoride intake from any source is dental fluorosis which can be lowered with proper use of fluoridated products like toothpaste and mouth rinse.

10. Is bottled water fluoridated?

Most bottled water is not fluoridated. If it is, it will say so on the label. Many bottled waters are filled from municipal water supplies, and some of those sources may be fluoridated. But if fluoride was not added as part of the bottling process, it will not appear on the label. To be sure, call the number on the label for more information.

The information contained in this publication should not be used as a substitute for the medical care and advice of your pediatrician. There may be variations in treatment that your pediatrician may recommend based on individual facts and circumstances.

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Common Questions about Community Water Fluoridation

1. What do we know about fluoride and community water fluoridation (CWF)?

- Fluoride exists naturally in nearly all water supplies. Water is “fluoridated” when a public water system adjusts the fluoride to a level that is optimal for preventing tooth decay.¹
- 74.6 percent of Americans whose homes are connected to public water systems receive fluoridated water.² However, more than 72 million Americans do not have access to drinking water that is fluoridated to prevent decay.³

2. Does fluoridated water prevent tooth decay?

- Yes. Research proves that fluoridation reduces tooth decay by at least 25 percent.⁴ As the rate of fluoridation steadily increased in the U.S., the average number of decayed, filled or missing teeth among 12-year-olds fell 68 percent between 1966 and 1994.⁵
- The evidence supporting fluoridated water’s effectiveness continues has been building for decades—and recent studies strengthen earlier findings:
 - A New York study (2010) revealed that low-income children in less fluoridated counties needed 33 percent more fillings, root canals, and extractions than those in counties where fluoridated water was common.⁶
 - A study of Alaska children (2011) showed that kids living in non-fluoridated areas had a 32 percent higher rate of decayed, missing or filled teeth than kids in fluoridated communities.⁷
 - A Nevada study (2010) examined teenagers’ oral health and found that living in a community *without* fluoridated water was one of the top three factors associated with high rates of decay and other dental problems.⁸
 - A study of Illinois communities (1995) reviewed changes in decay rates during the 1980s. This study concluded that water fluoridation was “the dominant factor” in the decline of cavities.⁹
 - Teenagers living in non-fluoridated areas of Northern Ireland had an average rate of decayed, missing or filled teeth that was 71 percent higher than those living in fluoridated communities of Ireland.¹⁰
- Research demonstrates the long-term benefits of fluoridation. A 2010 study confirmed that the fluoridated water consumed as a young child makes the loss of teeth (due to decay) less likely 40 or 50 years later when that child is a middle-aged adult. The co-authors wrote that this study “suggests that the benefits of [fluoridation] may be larger than previously believed and that [fluoridation] has a lasting improvement in racial/ethnic and economic disparities in oral health.”¹¹

3. Decay is more of a problem for low-income people. Does fluoridated water help address this gap in oral health?

- Yes, it does. Fluoridation reduces the disparities in tooth decay rates that exist by race, ethnicity and income.
- A 2002 study called water fluoridation “the most effective and practical method” for reducing the gap in decay rates between low-income and upper-income Americans. The study concluded, “There is no practical alternative to water fluoridation for reducing these disparities in the United States.”¹²

4. Does fluoridation also benefit adults or only children?

- Tooth decay is a health problem throughout the lifespan. Nearly all (96 percent) of middle-aged adults have had tooth decay and the rate of new decay per year is at least as high for adults as it is for children.¹³
- Fluoridation benefits people of all ages. A 2007 report examined 20 studies to estimate fluoride’s impact on adult teeth, and the report concluded that fluoridated water reduced decay by 27 percent.¹⁴

Common Questions about Community Water Fluoridation

- Seniors benefit from fluoridation, partly because it helps prevent decay on the exposed root surfaces of teeth—a condition that especially affects older adults.¹⁵

5. Is fluoridated water still needed?

- Yes. Fluoridation remains critically important. Tooth decay is widespread, affecting more than 90 percent of Americans by the time they reach their adult years.¹⁶
- At a time when more than 100 million Americans lack dental insurance, fluoridation offers an easy, inexpensive preventive strategy that everyone benefits from simply by turning on their tap.
- Although Americans' dental health has improved considerably in recent decades, tooth decay and other oral health issues remain a challenge. A 2010 study revealed that nearly one out of seven children aged 6 to 12 years had suffered a toothache over the previous six months.¹⁷
- Even the U.S. armed forces recognize the need for fluoridated water. A senior official with the Department of Defense called tooth decay "a major problem for military personnel" and notes that fluoridation will "directly reduce their risk for dental decay and improve [military] readiness." Most military bases have provided fluoridated water for decades.¹⁸
- Fluoridated water is also the most inexpensive way to provide fluoride. The per-person annual cost of fluoride rinse programs is roughly double the cost of fluoridated water. The per-person annual cost of fluoride supplements is more than 70 times higher than fluoridated water. Fluoride varnishes or gels also cost more than providing fluoridated water.¹⁹

6. Isn't using fluoride toothpaste enough?

- No. Many years after fluoride toothpaste became widely used, an independent panel of experts examined the specific impact of water fluoridation and determined that fluoridation reduces tooth decay by about 29 percent.²⁰ Even today, fluoridated water plays a critical role of maximizing protection against decay.
- A study of Illinois and Nebraska communities found that the tooth decay rate among children in the fluoridated town was 45 percent lower than the rate among kids in the non-fluoridated communities. This benefit occurred even though the vast majority of children in *all* of these communities had been brushing with fluoride toothpaste.²¹
- The co-author of a 2010 study noted that research has confirmed "the most effective source of fluoride to be water fluoridation."²²

7. Exactly how does fluoride work to prevent tooth decay?

- The fluoride in drinking water works in two ways. For people of all ages, it works *topically* on tooth surfaces. Fluoride mixes with saliva, and when the saliva neutralizes acids produced by bacteria on teeth, the fluoride joins the enamel crystals on the tooth surfaces, healing and protecting the teeth from further decay.²³
- Fluoridated water works *systemically* when it's swallowed by young children while teeth are forming. Fluoride combines with the calcium and phosphate of the developing teeth and makes them more resistant to decay, especially during the first few years after they come into the mouth.²⁴ Research has confirmed that systemic use of fluoride increases the concentration of fluoride in the surface enamel of teeth.²⁵

8. If fluoridation is effective, why are people still getting cavities?

- Fluoride in various forms has reduced tooth decay, but fluoride *alone* cannot guarantee someone a life without any cavities. Diet and nutrition play a role, and so do other factors — like the frequency with which people get routine dental care. But we know from decades of research that fluoridation does reduce the rate of decay.

Common Questions about Community Water Fluoridation

- More than 100 million Americans have a drinking water supply that is not fluoridated to the optimal level that helps prevent decay.²⁶ Getting fluoridated water to more U.S. residents would help reduce the incidence of decay.

9. Is it right to add something to water without getting individuals' consent?

- America has a tradition of fortifying foods and beverages to protect human health. Adjusting fluoride in water is only one example of this. Here are other examples:
 - Vitamin D is added to milk to prevent a disease called rickets.
 - Iodine is added to salt to prevent goiter, which affects the thyroid gland.
 - Folic acid is added to many breads and cereals to strengthen the health of red blood cells.
- Our society respects individual rights, but there are certain public health policies we adopt communitywide or nationwide because they are more effective and efficient ways to strengthen health and security. Fluoridation is one good example of this approach.
- Chlorine is added to drinking water to prevent outbreaks of E. coli or other forms of bacteria. Having a community water system means a city or town cannot pick and choose which households receive chlorinated water and which ones do not. The same is true for fluoride. Adding it to the whole water system is exactly what makes fluoridation so effective and affordable.
- When we fail to use proven strategies like fluoridation, the consequences are felt by nearly everyone — not just those who say they don't want fluoridated water. Low-fluoride water is associated with more tooth decay, and studies show that dental problems undermine children's performance in school.²⁷ Each year, hundreds of thousands of people seek emergency room treatment for toothaches or other dental problems that were preventable. Many of these ER patients are enrolled in Medicaid or other taxpayer-funded programs.²⁸ In one way or another, the cost and impact of tooth decay affects virtually everyone in the community.
- Courts have consistently held that it is legal and appropriate for a community to adopt a fluoridation program.²⁹

10. Is ending fluoridation a way to save tax dollars?

- No. In fact, ending fluoridation imposes a hidden "tax" on families and taxpayers because it is likely to increase their dental expenses to treat decayed teeth. The evidence proves that fluoridation is inexpensive to maintain and saves money down the road. The typical cost of fluoridating a local water system is between 40 cents and \$2.70 per person, per year—less than the cost of medium-sized latte from Starbucks.³⁰
- For most cities, every \$1 invested in water fluoridation saves \$38 in dental treatment costs.³¹ A 2003 study in Fort Collins, Colorado, estimated that if the city discontinued fluoridation, it would cost its residents more than \$534,000 per year.³² In 2003, water fluoridation saved Colorado nearly \$149 million by avoiding unnecessary treatment costs. The study found that the average savings in these fluoridated communities were roughly \$61 per person.³³
- Scientists who testified before Congress in 1995 estimated that national savings from water fluoridation totaled more than \$3.8 billion each year.³⁴
- Taxpayers save money because fluoridation reduces Medicaid expenses on dental treatments. Studies in Texas and New York have shown that states save approximately \$24 per person, per year in Medicaid expenditures because of the cavities that were prevented by drinking fluoridated water.³⁵

11. Has the momentum shifted against water fluoridation?

- No. Although it's true that some communities have chosen to stop fluoridating over the past few years, the overall trend shows a continued increase in the number of Americans who receive

Common Questions about Community Water Fluoridation

fluoridated water. Between 2008 and 2012, an additional 151 million Americans gained access to fluoridated drinking water.³⁶

- Since 1992, the percentage of people on public water systems who receive fluoridated drinking water has risen from 62 percent to 74 percent. The rate of this increase has picked up in the past decade.³⁷
- Since January 2011, Arkansas has enacted a state law guaranteeing access to fluoridated water for an additional 640,000 residents, and a water board in San Jose, Calif., has voted to fluoridate its water. The California vote means that more than 280,000 additional people will eventually gain access to fluoridated water.

12. Is fluoridated drinking water safe?

- Yes. Over the past several decades, hundreds of studies have confirmed the safety of fluoride. According to the Centers for Disease Control and Prevention (CDC), "panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective." This issue has been studied thoroughly, and there is no credible evidence to support the claims that anti-fluoride activists make.³⁸
- The new recommended level for fluoridating water (0.7 milligrams per liter) should strengthen the public's confidence that health officials are periodically reviewing standards and—when appropriate—updating them.³⁹ The American Dental Association welcomed the new fluoride recommendation, noting that fluoridation remains "one of our most potent weapons in disease prevention."⁴⁰
- The American Academy of Family Physicians, the World Health Organization, the Institute of Medicine and many other respected health and medical authorities have endorsed water fluoridation as a safe and effective practice.^{41, 42}
- What is true for calcium and potassium is also true for fluoride—even a beneficial mineral, if consumed at extraordinarily high levels, can potentially be detrimental to one's health. The good news is that federal health standards guide local water companies, enabling them to fluoridate water at levels that are safe and effective.

13. Should we do more studies on fluoridation before continuing this practice?

- More than 3,000 studies or research papers have been published on the subject of fluoride or fluoridation.⁴³ Few topics have been as thoroughly researched as fluoridation. The overwhelming weight of the evidence—plus more than 65 years of experience—supports the safety and effectiveness of this public health practice.
- It's doubtful that even a hundred new studies would convince the anti-fluoride activists to reconsider the misleading attacks they make against fluoridation.
- Although additional studies are always welcomed, the existing research—including several studies in the past decade—provides solid support for fluoridation. As the Centers for Disease Control and Prevention has written, "For many years, panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective."^{44, 45}

14. I found an article on the Internet about something called "fluorosis." Is that a reason not to fluoridate drinking water?

- No. Fluorosis is a change in the appearance of tooth enamel. The vast majority of fluorosis in the U.S. is a mild, cosmetic condition that leaves faint white streaks on teeth. It doesn't cause pain, and it doesn't affect the health or function of the teeth. In fact, it's so subtle that it usually takes a dentist to even notice it.⁴⁶
- Fluorosis can only develop during the first eight years of a child's life — the tooth-forming years.⁴⁷ Experts believe that in most instances fluorosis occurs because young children

Common Questions about Community Water Fluoridation

consume toothpaste while brushing their teeth.⁴⁸ This is why dentists and health officials recommend that parents supervise young children while they are brushing their teeth.⁴⁹

- A study published in 2010 found that mild fluorosis was *not* an adverse health condition and that it might even have “favorable” effects on overall health. That’s why the study’s authors said there was no reason why parents should be advised not to use fluoridated water in infant formula.⁵⁰

15. I heard that the federal government reduced the level of fluoride recommended for drinking water in 2011. What was the reason for that change?

- In January 2011, the U.S. Department of Health and Human Services (HHS) recommended that the optimal level of fluoride in public water systems should be 0.7 milligrams per liter of water. The new HHS level reflects the fact that Americans today get fluoride from more sources—such as toothpaste and mouth rinses—than they received when the original level was set.⁵¹
- The HHS recommendation will continue to protect Americans’ dental health while minimizing the chance of fluorosis—a typically mild, cosmetic condition that causes faint white streaks on teeth. The effect of mild fluorosis is so subtle that only a dentist would notice it while doing an examination. This condition does *not* cause pain and does *not* affect the function or health of the teeth.^{52, 53}

16. Should the public vote on whether to fluoridate local water systems?

- The health and well-being of Americans is a national concern. However, state laws and city ordinances determine the process for how a community decides whether to fluoridate. The key is to ensure that those making this decision are relying on sound, scientifically accurate information.
- Elected officials make a wide range of decisions about health issues. We feel comfortable having them set policies on water fluoridation, and we want to ensure they understand fully what the science shows before setting those policies.

17. How do we know the fluoride additives used to fluoridate drinking water are safe?

- The quality and safety of fluoride additives are ensured by NSF/ANSI Standard 60, a program that was commissioned by the Environmental Protection Agency (EPA) and managed by NSF International. Standard 60 is a set of standards created and monitored by an independent committee of experts, involving the Association of State Health Officials and other key organizations. This committee provides regular reports to the EPA.
- More than 80 percent of fluoride additives are produced by U.S. companies, but no matter where they come from, Standard 60 certification operates worldwide and uses on-site inspections and even surprise “spot checks” and independent analyses to confirm these additives meet quality and safety standards.⁵⁴

Common Questions about Community Water Fluoridation

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TAP INTO HEALTHY TEETH

COMMUNITY WATER FLUORIDATION TOOLKIT



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The WOHC is a dedicated group of more than 170 individuals, organizations and agencies addressing oral health access issues and working to improve oral health for all residents statewide.

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CANCER

DENTAL FLUOROSIS

IQ

INFANT FORMULA

MYTHS

INTRODUCTION

Oral health plays an important role in the overall health of the body throughout a person's life. Community water fluoridation (CWF) is an evidence-based method for the prevention of tooth decay that has improved the oral health of Wisconsin residents since 1946.¹

CWF is the process of adjusting the natural fluoride concentration of a community's water supply to a level that is best for the prevention of tooth decay. The Centers for Disease Control and Prevention (CDC) has recognized CWF as one of the 10 greatest public health achievements of the 20th century.² CWF is credited with significant cavity reduction and the evidence continues to show that CWF not only reduces tooth decay, but that it is safe and cost-effective.³ Even with widespread availability of fluoride from other sources, studies prove CWF continues to be effective in reducing tooth decay by about 25 percent.⁴

Despite the overwhelming scientific evidence that supports the benefits and safety, opposition to CWF still persists. In Wisconsin, we have seen inaccurate information prevent communities from adopting a CWF program or lead some communities to stop this beneficial public health measure. Both of these outcomes ultimately deprive many Wisconsin residents of optimal oral health.

USING THE TOOLKIT

In Wisconsin, the decision to fluoridate is determined at the local level. Community leaders must prioritize both the well-being of their constituents and the financial situation of the community. Community water fluoridation (CWF) may not be a familiar topic for community leaders. There are thousands of evidence-based studies that support both the safety and effectiveness of CWF. Unfortunately, there is a significant amount of misinformation floating around on the internet, which has led to an increase in citizens raising concerns with community leaders.

As a local resident and professional in the community, city officials and community members value your knowledge and expertise. It is important to get involved at the local level and connect with community leaders to make them aware of the local, statewide and national support CWF has, along with the health benefits and cost savings. Many people are now turning to the internet for information and often struggle with identifying credible information. It is essential that the oral health workforce (health professionals, public health practitioners, community leaders, and water operators and engineers) provide accurate and reliable information to the community. Some medical, dental, public health professionals, as well as community leaders, may not be familiar with the research on the public health benefits of CWF or may not feel comfortable educating others about these benefits. Use the Tap into Healthy Teeth Toolkit to find resources that will help start the conversation about CWF in your community.

The toolkit is a compilation of documents and information from multiple sources. It is not intended to be read cover to cover. Instead, it has easy-to-locate information, organized by topic, including a tabbed reference section and a Take Action section. The tabbed reference section is designed to be a quick resource if you need facts that support CWF and research related to a particular concern. Utilize the Take Action section to find ways to engage your organization or community. For more information and resources, visit the Tap into Healthy Teeth website at www.tapintohealthyteeth.org.

FLUORIDE BASICS



FAST FACTS

01



What is fluoride?

Fluoride is a mineral that exists naturally in rocks, soil, foods and nearly all water sources.

02



How does fluoride work to protect teeth?

Teeth are stronger when fluoride is added to developing tooth enamel. In addition, fluoride can reverse or slow down tooth decay when it is absorbed into the outer tooth surface, remineralizing enamel that has been weakened by acids that cause tooth decay.

03



Who benefits from fluoride?

Everyone! Fluoride benefits us when our teeth are developing and throughout our lifetime to keep a healthy balance of minerals in our permanent teeth.

WHAT IS FLUORIDE?

Fluorine is the 13th most abundant element in earth's crust but it is rarely found in its elemental state. The term fluoride refers to all combined forms of the element. Fluoride is a mineral that naturally occurs in rocks, soil, foods and water. However, the level of fluoride in most water sources is too low to protect teeth. That is why many communities choose to fortify their water with additional fluoride to reach the optimal level for reducing tooth decay.

FLUORIDE AT WORK

Tooth decay begins when the outer surface of the tooth, known as the enamel, is attacked by acids. Bacteria in the mouth convert sugars from foods and drinks into acid. This acid begins to dissolve the calcium and phosphate minerals in enamel, a process called demineralization. Once the acids have neutralized, the enamel can be re-mineralized. However, if enamel is frequently exposed to an acidic environment, the loss of minerals can result in a break in the enamel that allows bacteria to penetrate and infect the tooth, a process called tooth decay.

Fluoride is instrumental in preventing, reversing and slowing down the tooth decay process. Teeth benefit from a combination of both systemic and topical fluoride. Systemic fluorides are those that are swallowed via food, water and dietary supplements. When children under the age of eight swallow fluoride, the fluoride is added into the developing enamel of teeth that have not yet erupted in the mouth, resulting in strong teeth that are more resistant to the acids that demineralize enamel. Systemic fluoride also becomes incorporated into saliva, which constantly covers teeth, working to protect teeth topically. This means that fluoride in drinking water works both systemically and topically. Toothpaste, mouth rinses and treatments provided by a dental professional are also topical fluorides. Topical fluoride strengthens teeth, in both children and adults, as it comes into contact with demineralized enamel and is added to the outer enamel surface. This topical exposure to fluoride can reverse early demineralization or slow down the development of tooth decay. The benefits of fluoride in drinking water build on the benefits provided by topical fluoride. Using both forms of fluoride provides maximum protection against tooth decay.

HOW FLUORIDE WORKS

FLUORIDE
IN DRINKING WATER



IS TAKEN IN BY
TEETH
STILL DEVELOPING
BELOW THE GUMS



TO HELP CREATE A
STRONG SURFACE

PROTECTING THE
TEETH FROM CAVITIES

IN CHILDREN AND ADULTS
TEETH ARE BATHED
IN FLUORIDE WHEN DRINKING WATER



GIVING TEETH THE
FLUORIDE THEY NEED
ALL DAY LONG

ACID PRODUCED BY BACTERIA
IN THE MOUTH CAN CREATE
HOLES ON THE SURFACE
OF THE TEETH



FLUORIDE HELPS PROTECT
& REBUILD THIS SURFACE

PREVENTING
ABOUT 25% OF CAVITIES

Build a better foundation for healthy teeth and keep your teeth stronger, longer. Fluoride in water. 70 years and going strong. At a faucet near you. Visit www.CDC.gov/Fluoridation for more information.





Chace Wolff, RDH

Walworth County Seal-A-Smile Program Coordinator

Walworth County Health and Human Services –
Public Health Department

The benefits of fluoride in the developing teeth of children are tremendous. Tooth decay continues to be a problem in school-age children. There are approximately 11,409 children in the public schools and 900 in the private schools in Walworth County, a mostly rural county in the southeastern part of the state. Our Seal-A-Smile program refers over 200 children for restorative care each year. It is, therefore, important that families have the opportunity of exposure to community water fluoridation (CWF) for the prevention of tooth decay.

Working as a dental hygienist in the county for 34 years, I have seen and still see the difference in the occurrence of tooth decay in children that grew up without fluoride supplements of any kind, to those children that grew up in a community with adjusted fluoride in their water. As communities grow here, it is important to me that CWF continues to be the foundation in the fight against tooth decay for Walworth County's children.

TESTIMONIAL



COMMUNITY WATER FLUORIDATION 101

FAST FACTS

01



What is community water fluoridation?

Community water fluoridation is the controlled adjustment of fluoride in a public water system to levels recommended for optimal oral health.

02



What is the recommended optimal fluoride level?

The recommended optimal fluoride level is 0.7 mg/L.

03



Who benefits from community water fluoridation?

Community water fluoridation is a major factor responsible for the decline in prevalence and severity of tooth decay for people of all ages.

WHAT IS COMMUNITY WATER FLUORIDATION?

In the United States (U.S.), one of the most common sources of fluoride comes from fluoridated community drinking water. Community water fluoridation (CWF) modifies the natural fluoride in water to be optimal for oral health. In this way, levels of fluoride in drinking water are not too high or low.

Local water departments add fluoride to their community's public water system. The most common fluoride additive used in Wisconsin and the U.S. is fluorosilicic acid.⁵ Fluoride additives, like fluorosilicic acid, meet Environmental Protection Agency (EPA) safety standards. The EPA is exclusively charged with regulating drinking water additives in the U.S. to ensure the safety of products added to water.⁶ The Food and Drug Administration has jurisdiction over bottled drinking water used in food or food processing.

In addition to fluoride additives meeting EPA standards, fluoride levels are monitored daily by local water departments.⁷ Water departments send monthly samples to the Wisconsin State Laboratory of Hygiene to verify the accuracy of their testing equipment.⁸ Water department staff strive to meet or exceed water quality standards and consistently devote efforts to bring the benefits of optimally fluoridated water to the residents of their community. This dedication results in a community that has better oral health than those communities that do not fluoridate the water supply. Water operators are public health agents that are improving the dental health of their community and saving residents from unnecessary dental disease.

The World Health Organization website states, "fluoridation is the single most important intervention to reduce dental tooth decay, not least because water is an essential part of the diet for everyone in the community, regardless of their motivation to maintain oral hygiene or their willingness to attend or pay for dental treatment."⁹

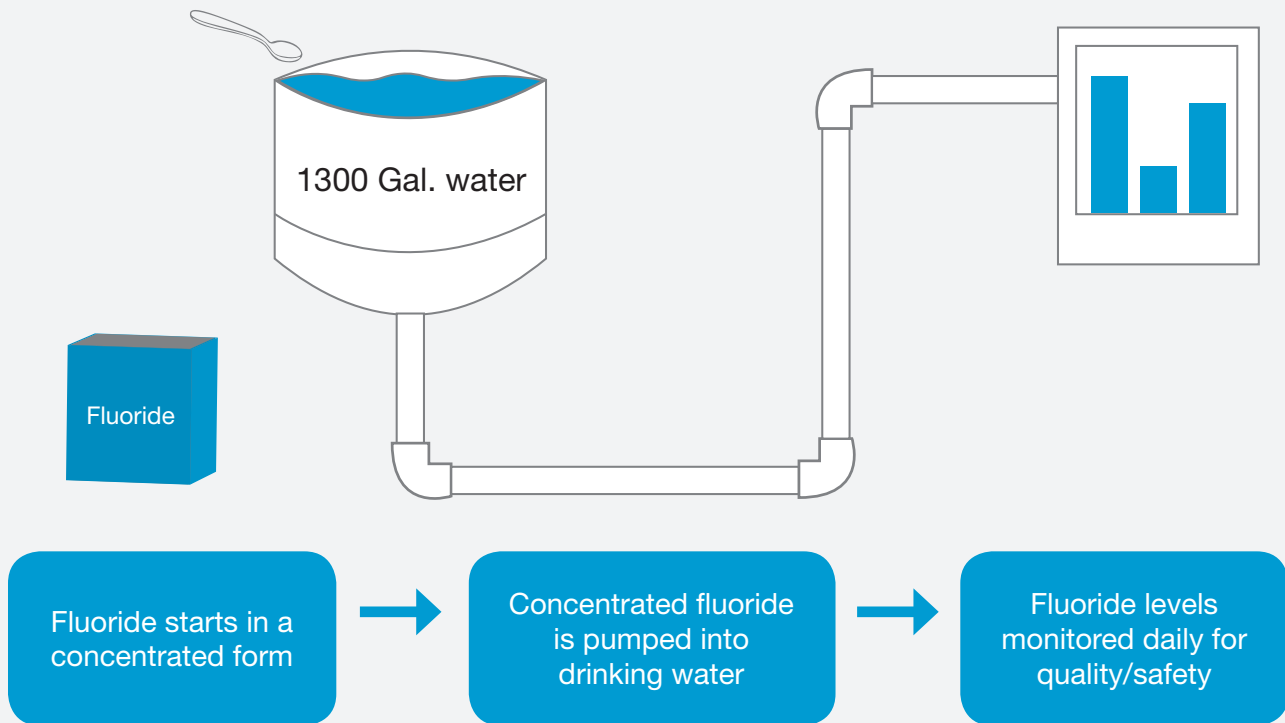


RECOMMENDED OPTIMAL FLUORIDE LEVEL

The recommended optimal level for community water fluoridation (CWF) is 0.7 milligrams per liter (mg/L) of water.¹⁰ The optimal level is so small that if this level were measured in time, it would represent 42 seconds out of two years.¹¹ This recommendation is based on the latest scientific research and guidelines established by the United States (U.S.) Public Health Service, a division of Department of Health and Human Services (HHS). It is the lowest effective level of fluoride that will ensure optimal oral health benefits.

In 2015, HHS updated the recommended optimal level from a range of 0.7 to 1.2 mg/L to a single level of 0.7 mg/L.¹² The change was a result of a panel of scientists reviewing new information related to fluoride intake. The range of 0.7 to 1.2 mg/L was originally set by taking into account different levels of children's fluid intake, according to the average annual temperature in different regions of the country.¹³ Less fluoride was added in warmer, southern climates where it was believed that people drank more water, and more was added in cooler, northern climates where it was believed that people drank less. Over the past several decades, many factors, including the advent of air conditioning, have reduced geographical differences in water intake.

In addition to water intake not varying by climate or region, today, Americans have access to several sources of fluoride; including toothpaste, supplements and mouth rinses. While considering the final recommendation, HHS took into account current levels of tooth decay and dental fluorosis, the lack of geographical differences in water intake, and the Environmental Protection Agency's (EPA) new assessments of cumulative sources of fluoride exposure.¹⁴ The optimal fluoride concentration of 0.7 mg/L provides the best balance of protection from tooth decay while limiting the risk of dental fluorosis.¹⁵ See [tab two](#) "Fluorosis" for more information.



Adapted from image courtesy of Campaign for Dental Health - www.ilikemyteeth.org

This updated fluoride level demonstrates that national health officials are periodically reviewing research and relying on the best science to make recommendations.¹⁶ Updating a recommendation like this is not unusual. In the past, health experts have updated recommendations such as vitamin D intake. These changes for fluoride and vitamin D were made to reflect the most recent research.

WHO BENEFITS?

Everyone benefits from community water fluoridation (CWF) regardless of age, income level or insurance status. It is a common misperception that CWF only benefits children, but it also benefits adults. CWF reduces tooth decay by about 25 percent in both children and adults. By drinking fluoridated water at home, work or school, people get the benefits of fluoride.

Untreated tooth decay can cause pain and infection that can affect a person's ability to eat, speak and sleep. The pain caused by tooth decay can result in missing time from school or performing poorly on tests. Research has linked oral health with how well children and teens perform in school. A 2011 study found that students with poor oral health were nearly three times more likely than their healthy peers to miss school due to dental pain.¹⁷ According to the *2013 Healthy Smiles/ Healthy Growth Wisconsin's Third Grade Children* report, 53 percent of Wisconsin's third graders have experienced tooth decay, with roughly 2,000 having pain or dental infections severe enough to require urgent care.¹⁸ Children benefit from fluoride by having less tooth decay. When children are healthy and able to concentrate in school, our schools also benefit.

Adults benefit from fluoride in several ways. Research shows that people with unhealthy or missing teeth are less likely to be hired for a job.¹⁹ Not only can oral health impact a person's ability to get a good job, CWF prevents tooth decay and ultimately saves money on dental treatment costs. In addition, employers benefit when they have healthy employees who are contributing to productivity and not missing work due to tooth pain or dental visits.

Findings suggest that Medicaid-eligible children in communities without water fluoridation had an increased cost for dental treatment per child that was twice as high as those children living in fluoridated communities.²³

Nine studies were analyzed (2007) in the *Journal of Dental Research* to estimate water fluoridation's impact on adult teeth. This report concluded that water fluoridation reduced decay by 27 percent.²⁰ Similarly, a study of nearly 3,800 adults in Australia (2013) determined that fluoridated water reduced tooth decay throughout the life course.²¹

Fluoridation benefits people of all ages, including older adults. These benefits come in the form of reduced costs during a time in their life when they lack dental insurance. CWF also helps prevent decay on exposed root surfaces of teeth, commonly seen in older adults. For example, the prevalence of decay on root surfaces of teeth is inversely related to fluoride levels in the drinking water.²² In other words, the higher the level of fluoride in water, the lower the level of tooth decay. This finding is important because with increasing tooth retention and an aging population, the prevalence of dental root decay would be expected to be higher in the absence of fluoridation.

Communities benefit by overall better oral health and less burden on the publicly funded dental programs. Findings suggest that Medicaid-eligible children in communities without water fluoridation had an increased cost for dental treatment per child that was twice as high as those children living in fluoridated communities.²³ Communities should take advantage of this simple and proven prevention strategy that has been used to prevent tooth decay for more than 70 years to realize cost savings and reduce the burden of dental disease in the community.

Although there has been a notable decline in tooth decay, it still remains one of the most common chronic diseases of childhood. CWF is a major factor in the overall decline of tooth decay. Even with other available forms of fluoride, the effects of water fluoridation are still measurable. Americans benefit from multiple sources of fluoride. Studies continue to show that water fluoridation prevents tooth decay and saves money for both families and the health care system.²⁴ See [page 24](#) for more information on cost savings.



Gretchen Sampson RN, MPH

Director/Health Officer
Polk County Health
Department

Polk County is a rural community of 44,000 located in northwestern Wisconsin. Several factors influence the oral health status of Polk residents. Of the 12 public water systems in the county, only half are adjusted for optimal fluoride content. Many residents live in areas of the county with no public water systems and private wells are used. This situation results in only 25.5 percent of the total population having access to optimally fluoridated water. In Polk County, 12.5 percent of residents live below the poverty level and 21 percent of the population is on Medicaid/BadgerCare+. Another barrier to oral health care is the limited number of dentists who accept new Medicaid/BadgerCare+ patients. The result is that only 45 percent of continuously enrolled Medicaid/BadgerCare+ recipients received dental services in 2010. All these elements contribute to dental decay problems in the population.

Community water fluoridation (CWF) is pure prevention and does not involve an active effort to realize the benefits. Poor oral health causes loss of work time, missed school days, pain and suffering, and ultimately high health care costs for treatment. CWF is cost effective and there are estimates that for every dollar spent, \$38 is saved. It is hard to argue with those economics.

I grew up in Wisconsin Rapids in a family of eight children and my dad practiced dentistry for many years. We lived outside of town in an area that was not on city water. Every day my dad would bring home numerous milk jugs full of "city water" for us to use for drinking so that we could have the benefit of fluoridated water. Believe me, with eight kids and two adults, plus all the associated friends that were in our household at any given time that was a lot of water hauling! That effort my dad put forth for our family's oral health has inspired me to promote CWF in my own community.

TESTIMONIAL

A close-up photograph of a chrome faucet with water flowing from it. The background is a soft, out-of-focus blue. A teal horizontal bar is overlaid on the upper portion of the image, containing the title text.

WATER FLUORIDATION IN WISCONSIN

FAST FACTS

01



When did Wisconsin start fluoridating its municipal drinking water?

In 1946, the Sheboygan Water Utility became the first public water system in Wisconsin to fluoridate municipal drinking water for the prevention of tooth decay.

02



What percent of Wisconsin's population on public water systems receive fluoridated water?

In Wisconsin, approximately 90 percent of the population on public water systems receive fluoridated water.

HISTORY OF WATER FLUORIDATION IN WISCONSIN

Community water fluoridation (CWF) is not a new idea in Wisconsin. It is a health strategy that has been successfully used since 1946 to reduce the pain and cost of tooth decay.²⁵ In the mid 1940s, researchers conducted clinical trials that compared the dental records of fluoridated Grand Rapids, Michigan with those from non-fluoridated Muskegon, Michigan.²⁶ During the 15-year project, researchers monitored the rate of tooth decay among almost 30,000 Grand Rapids schoolchildren.²⁷ After just 11 years, the rate of tooth decay among Grand Rapids children born after fluoride was added to the water supply dropped more than 60 percent. Similar comparisons were made in trials conducted in New York and Ontario, Canada.²⁸

The early clinical data were so impressive in the reduction of tooth decay that other cities began fluoridating. Among these cities was Sheboygan, Wisconsin. In 1946, Sheboygan Water Utility became the first public water system in Wisconsin (and third in the United States) to fluoridate municipal drinking water for the prevention of tooth decay.²⁹

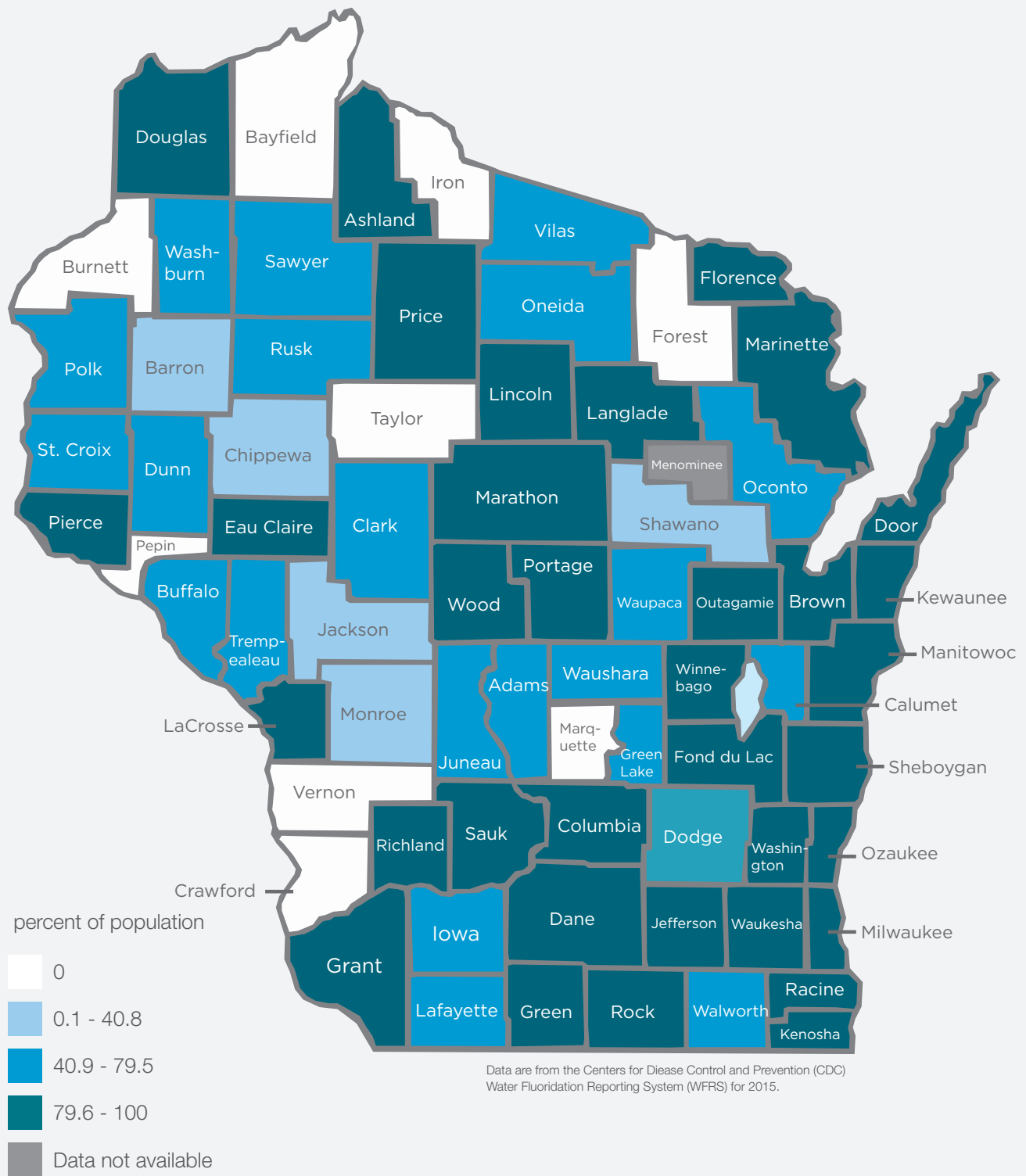
WISCONSIN'S CURRENT FLUORIDATION PRACTICE

A large proportion of Wisconsin's population receives the dental benefits of optimally fluoridated water. Approximately 90 percent of the population in Wisconsin on public water systems has access to fluoridated water.³⁰

The best source of information on fluoride levels in public water systems is the local water utility. All water utilities must provide their consumers with an annual Consumer Confidence Report that provides information on a system's water quality, including its fluoridation level. For a quick and easy way to learn if a community's drinking water is optimally fluoridated for oral health, visit the Centers for Disease Control and Prevention's (CDC) "My Water's Fluoride" website at https://nccd.cdc.gov/DOH_MWF/Default/Default.aspx.

Another resource is the Wisconsin Public Water Supply Fluoridation Census found at <https://www.dhs.wisconsin.gov/oral-health/fluoride-census.htm>.

The following map shows the percent of the population served by public water systems in each Wisconsin county who have access to fluoridated water. In Wisconsin there are 72 counties, 35 of which have 79.5 percent or more of their population with access to fluoridated water. While a large proportion of Wisconsin's population on public water systems receive fluoridated water, it is important to note there are nine counties at zero percent.



Data are from the Centers for Disease Control and Prevention (CDC) Water Fluoridation Reporting System (WFRS) for 2015.



Tamim Sifri, DDS

Greater Dane County Society

Madison, Wisconsin has benefited from community water fluoridation since 1948. This program has been beneficial to the oral health of the patients we serve. Like many of Wisconsin's larger cities, Madison has a wealth of diversity in educational and socioeconomic status. Thus, all of our residents - regardless of background - benefit from community water fluoridation every time they turn on the tap. In 2014, the Madison Water Utility Board recognized the overwhelming efficacy, safety and cost-effectiveness of community water fluoridation and voted to continue this program for the future.

TESTIMONIAL



COMMUNITY WATER
FLUORIDATION BENEFITS



FAST FACTS

01



Is tooth decay still a problem in Wisconsin?

Yes. In Wisconsin more than half (53 percent) of children have experienced tooth decay by the time they reach third grade.³¹

02



Is community water fluoridation still effective?

Yes. Even today, with other available sources of fluoride, community water fluoridation reduces tooth decay by about 25 percent over a person's lifetime.³² Community water fluoridation is the only source that reaches all members of a community regardless of their age, income level or insurance status.

03



Does community water fluoridation save money?

Yes, an analysis found that community water fluoridation saved Wisconsin residents more than \$6.1 million in 2011 by reducing the need for fillings, crowns or other costly procedures.³³

STATE OF ORAL HEALTH IN WISCONSIN

The implications of poor oral health can affect a person's overall health and well-being. Tooth decay can affect basic functions like eating, talking and sleeping. If left untreated, tooth decay can cause pain and lead to tooth loss, resulting in increased school absences and reduced productivity.³⁴ In rare instances, untreated tooth decay can even lead to death. This is exactly what happened in 2007 when a 12-year-old Maryland boy named Deamonte Driver died after bacteria from an abscessed tooth spread to his brain.³⁵

While Wisconsin has made significant progress in improving the oral health of Wisconsinites, untreated tooth decay continues to be a key health concern for the state affecting all populations.³⁶ The Wisconsin Department of Health Services Oral Health Program collects basic screening survey data across the life span. Among Wisconsin Head Start children ages three to five, 26 percent have untreated tooth decay and among third grade children in the state, over 18 percent have untreated decay.³⁷⁻³⁸ In Wisconsin, 15 percent of adults ages 21-74 have untreated tooth decay and 42 percent of older adults living in nursing homes have untreated decay.³⁹

The best approach to preventing tooth decay in Wisconsin is to use evidence-based prevention strategies like community water fluoridation (CWF). In fact, the Community Preventive Services Task Force recognizes CWF as an effective intervention to reduce tooth decay.

The Community Preventive Services Task Force recommends CWF based on strong evidence of effectiveness in reducing tooth decay across the population. Evidence shows the prevalence of tooth decay is substantially lower in communities with CWF.⁴⁰



COMMUNITY WATER FLUORIDATION IS EFFECTIVE

Community water fluoridation (CWF) has proven to be effective in lowering a person's risk of tooth decay. Many years of research and thousands of studies show that CWF is effective at reducing the prevalence and severity of tooth decay in both children and adults. CWF is a public health measure that is a cost effective way for communities to ensure all residents receive the lifelong benefits that fluoridated water provides.⁴¹

Today, water is one of several sources of fluoride Americans have access to; others include toothpaste, supplements and mouth rinses. CWF is the only source of fluoride that reaches all members of a community regardless of their age, income level or insurance status. Most importantly, recent research confirms the need for teeth to be exposed to fluoride steadily over the course of a day — the kind of exposure provided by fluoridated water. As the Centers for Disease Control and Prevention (CDC) explains:

"Water fluoridation prevents tooth decay mainly by providing teeth with frequent contact with low levels of fluoride throughout each day and throughout life. Even today, with other available sources of fluoride, studies show that water fluoridation reduces tooth decay by about 25 percent over a person's lifetime."⁴²

WHAT CAN HAPPEN AFTER COMMUNITY WATER FLUORIDATION STOPS?

A study conducted in Antigo, Wisconsin illustrates what can happen after CWF stops. Antigo, Wisconsin began CWF in June 1949, and ceased adding fluoride in November 1960.⁴³ After five and a half years without adequate fluoride, second grade children had 200 percent more decay, fourth graders 70 percent more and sixth graders 91 percent more than those of the same age groups in 1960. Residents of Antigo re-instituted fluoridation in October 1965, on the basis of the severe deterioration of their children's oral health. The Antigo example shows the rate of tooth decay would undoubtedly be higher without CWF and similar studies have been done across the country and throughout the world showing that CWF reduces tooth decay.⁴⁴ Most recently, a 2002 systematic review published in the American Journal of Preventive Medicine also demonstrated a rise in tooth decay rates when fluoride was removed from a public water system. The article was co-authored by the CDC's Barbara Gooch, and they examined a group of studies and concluded that ceasing CWF would raise tooth decay rates by 17.9 percent.⁴⁵ Thus, even despite access to other sources of fluoride, CWF continues to reduce tooth decay.

LEADING HEALTH ORGANIZATIONS ENDORSE FLUORIDATION'S EFFECTIVENESS

Below are comments from just a few of the more than 100 organizations that endorse fluoridation's effectiveness.

American Academy of Family Physicians

*"The American Academy of Family Physicians supports fluoridation of public water supplies as a safe, economical and effective method to prevent dental caries [tooth decay]."*⁴⁶

American Academy of Pediatrics:

*"Water fluoridation is a cost-effective means of preventing dental tooth decay, with the lifetime cost per person equaling less than the cost of one dental restoration [filling]. In short, fluoridated water is the cheapest and most effective way to deliver antitooth decay benefits to communities."*⁴⁷

American Dental Association:

*"Studies conducted throughout the past 65 years have consistently shown that fluoridation of community water supplies is safe and effective in preventing dental decay in both children and adults. Simply by drinking water, children and adults can benefit from fluoridation's cavity protection whether they are at home, work or school."*⁴⁸

American Public Health Association

*"Recommends that federal, state and local agencies and organizations in the United States promote water fluoridation as the foundation for better health."*⁴⁹

American Water Works Association:

*"The goal of community water fluoridation is to achieve the desired oral health benefit while minimizing potential health risks. That is why water providers undergo thorough and extensive training to safely apply fluoride in the amount recommended by the world's most respected public health authorities."*⁵⁰

Centers for Disease Control and Prevention (CDC):

*"The CDC named the "fluoridation of drinking water" as one of "10 great public health achievements" of the 20th century."*⁵¹

Institute of Medicine

*"Community water fluoridation is credited with significantly reducing caries incidence in the United States, and it was recognized as one of the 10 great public health achievements of the 20th century. Evidence continues to show that community water fluoridation is effective, safe, and inexpensive, and is associated with significant cost savings."*⁵²

World Health Organization

*"People of all ages, including the elderly, benefit from community water fluoridation. Fluoridation of water supplies, where possible, is the most effective public health measure for the prevention of dental decay. The consensus among dental experts is that fluoridation is the single most important intervention to reduce dental caries, not least because water is an essential part of the diet for everyone in the community, regardless of their motivation to maintain oral hygiene or their willingness to attend or pay for dental treatment."*⁵³



Fluoridation saved
Wisconsin residents
more than \$6.1 million
in 2011.

COMMUNITY WATER FLUORIDATION SAVES MONEY

Community water fluoridation (CWF) is a cost-effective health measure for preventing tooth decay. A cost-effectiveness analysis compares the costs and health effects of an intervention to assess the extent to which it can be regarded as providing value for the money.⁵⁴ The cost of CWF depends on the size of the community and the amount of fluoride that needs to be added to the water supply to maintain the optimal level. In one study, the median cost per person per year ranged from \$2.70 among public water systems serving less than 5,000 people to \$0.40 among systems serving greater than or equal to 20,000 people.⁵⁵

CWF may save families money who would otherwise pay for more frequent fillings and other dental treatments. The estimated return on investment for CWF (including productivity losses) ranged from \$4 in small communities of 5,000 people or less, to \$27 in large communities of 200,000 people or more.⁵⁶ In fact, Delta Dental of Wisconsin, a not-for-profit dental service corporation, compared claims data from Delta Dental of Wisconsin members residing in communities with and without CWF. They estimate fluoridation saved Wisconsin residents more than \$6.1 million in 2011 by reducing the need for fillings, crowns or other costly procedures.⁵⁷

In addition, CWF saves money for taxpayers through Medicaid cost savings. Multiple studies have found a cost savings of around \$24 per child, per year in Medicaid costs because of the tooth decay that was prevented by CWF.⁵⁸ Wisconsin has over 430,000 children with Medicaid/BadgerCare+ coverage.⁵⁹ If similar cost saving per child are seen in Wisconsin, and approximately 90 percent of children have access to fluoridated water, then taxpayers are saving an estimated \$9 million per year.



Kelley Moran, MPH, RDH

Director, Dental Hygiene Program

Nicolet Area Technical College

I witnessed the benefits of community water fluoridation on a daily basis, as the director of a dental hygiene program, which provides community oral health outreach activities, and as a former public health dental hygienist, who served as the program coordinator for a multi-county school-based oral health program for many years. The majority of children and families we serve through our county programs have well water in their homes or live in non-fluoridated communities. During our programs, we are able to determine where a child or community member lives based on the presence of treated or untreated tooth decay.

On a personal level, my brother and I were fortunate to be raised in a fluoridated community. Water was our primary beverage growing up; soda and juice were scarce and expensive, not good economical choices for our family. We did not have dental insurance and went to the dentist whenever my parents could afford it. My brother and I fully experienced the benefits of fluoridated community water while growing up and as a result, have had limited restorative dental needs.

TESTIMONIAL

A close-up photograph of a hand pouring water from a glass pitcher into a glass filled with ice and a lime slice. The glass is on a dark wooden surface, and two more lime slices are visible nearby. The background is blurred, showing a hand holding the pitcher. A dark green banner is overlaid on the top half of the image, containing the text "SUPPORTERS OF COMMUNITY WATER FLUORIDATION" in white.

SUPPORTERS OF COMMUNITY WATER FLUORIDATION

FAST FACTS

01



Are there organizations that support community water fluoridation?

Yes, more than 100 national and international health, service and professional organizations support community water fluoridation, such as the Centers for Disease Control and Prevention.⁶⁰

02



Do leading health organizations in Wisconsin support community water fluoridation?

Yes, organizations such as the Wisconsin Dental Association, Children's Hospital of Wisconsin and the Wisconsin Department of Health Services support community water fluoridation as a public health measure to improve oral health.

NATIONAL SUPPORTERS

The Centers for Disease Control and Prevention (CDC) has recognized community water fluoridation (CWF) as one of the 10 greatest public health achievements of the 20th century.⁶¹ The CDC's mission is to protect America from health, safety and security threats. To accomplish its mission, the CDC conducts scientific research and provides critical health information, including the safety and effectiveness of CWF.⁶² In fact, the CDC states, "For many years, panels of experts from different health and scientific fields have provided strong evidence that CWF is safe and effective."⁶³

Along with the CDC, all major United States (U.S.) health organizations, such as the American Academy of Pediatrics, the American Dental Association, the American Medical Association, the American Public Health Association, the American Water Works Association and The U.S. Surgeon General give strong endorsements to CWF.



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta, GA 30341-3724

April 2, 2015

STATEMENT ON THE EVIDENCE SUPPORTING THE SAFETY AND EFFECTIVENESS OF COMMUNITY
WATER FLUORIDATION

On behalf of the Centers for Disease Control and Prevention (CDC), I am pleased to provide a statement on the evidence regarding the safety and benefits of community water fluoridation. For the record, this statement is not testimony for or against any specific legislative proposal.

Good oral health is an important part of good overall health and an essential part of our everyday lives. Diet, sleep, psychological status, social interaction, school, and work are all affected by impaired oral health. Over the past several decades, there have been major improvements in the nation's oral health that have benefitted most Americans.¹

However, profound disparities in oral health status remain for some population subgroups, such as the poor, the elderly, and many members of racial and ethnic minority groups.¹ Tooth decay is one of the most common chronic diseases among American children with 1 of 4 children living below the federal poverty level experiencing untreated tooth decay.² Untreated decay can cause pain, school absences, difficulty concentrating, and poor appearance—all contributing to decreased quality of life and ability to succeed.³

Tooth decay and its complications are preventable, and several preventive and early treatment options are safe, effective, and economical. The CDC leads national efforts to improve oral health by using proven strategies such as community water fluoridation and school-based dental sealant programs that prevent oral diseases.

An Effective Intervention

Community water fluoridation is "the controlled addition of a fluoride compound to a public water supply to achieve a concentration optimal for dental caries prevention."¹ The process of adding fluoride to public water systems in the United States began in 1945 in Grand Rapids, Michigan. Soon after, dramatic declines in dental caries were noted among school children in Grand Rapids compared with school children from surrounding areas. Since then, community water fluoridation has been adopted by communities across the country, providing the cornerstone of caries prevention in the United States.¹ In 2012, more than 210 million people, or 74.6% of the U.S. population served by public water supplies, drank water with optimal fluoride levels to prevent tooth decay.⁴

Water fluoridation is beneficial for reducing and controlling tooth decay and promoting oral health across the lifespan. Evidence shows that water fluoridation prevents tooth decay by providing frequent and consistent contact with low levels of fluoride, ultimately reducing tooth decay by 25% in children and adults.⁵⁻⁸ Additional evidence shows that schoolchildren living in communities

where water is fluoridated have, on average, 2.25 fewer decayed teeth compared to similar children not living in fluoridated communities.⁹

The safety and benefits of fluoride are well documented and have been reviewed comprehensively by several scientific and public health organizations. The U.S. Public Health Service; the United Kingdom's National Institute for Health Research, Centre for Reviews and Dissemination, at the University of York; and the National Health and Medical Research Council, Australia have all conducted scientific reviews by expert panels and concluded that community water fluoridation is a safe and effective way to promote good oral health and prevent decay.¹⁰⁻¹² The U.S. Community Preventive Services Task Force, on the basis of systematic reviews of scientific literature, issued a strong recommendation in 2001 and again in 2013, for community water fluoridation for the prevention and control of tooth decay.^{9,13}

A Cost-saving Intervention

Although other fluoride-containing products such as toothpaste, mouth rinses, and dietary supplements are available and contribute to the prevention and control of dental caries, community water fluoridation has been identified as the most cost-effective method of delivering fluoride to all members of the community regardless of age, educational attainment, or income level.^{14,15} Analyses have also shown that water fluoridation provides additional benefits across the lifespan beyond what is gained from using other fluoride-containing products.^{8,11,16}

By preventing tooth decay, community water fluoridation has been shown to save money, both for families and the health care system.^{7,17} The return on investment (ROI) for community water fluoridation varies with size of the community, increasing as community size increases, but, as noted by the U.S. Community Preventive Services Task Force, community water fluoridation is cost-saving even for small communities.^{17,18} The estimated annual ROI for community water fluoridation, excluding productivity losses, ranged from \$5.03 in small communities of 5,000 people or less, to \$31.88 in large communities of 20,000 or more people.⁷ The estimated ROI for community water fluoridation including productivity losses was \$6.71 in small communities and \$42.57 in large communities.¹⁹

A study of a community water fluoridation program in Colorado used an economic model to compare the program costs associated with community water fluoridation with treatment savings achieved through reduced tooth decay. The analysis, which included 172 public water systems, each serving populations of 1,000 individuals or more, found that 1 year of exposure to fluoridated water yielded an average savings of \$60 per person when the lifetime costs of maintaining a restoration were included.²⁰ Analyses of Medicaid claims data in 3 other states (Louisiana, New York, and Texas), have also found that children living in fluoridated communities have lower caries related treatment costs than do similar children living in non-fluoridated communities; the difference in annual per child treatment costs ranged from \$28 to \$67.²¹⁻²³

A Safe Intervention

Expert panels consisting of scientists from the United States and other countries, with expertise in various health and scientific disciplines, have considered the available evidence in peer-reviewed literature and have not found convincing scientific evidence linking community water fluoridation with any potential adverse health effect or systemic disorder such as an increased risk for cancer,

Down syndrome, heart disease, osteoporosis and bone fracture, immune disorders, low intelligence, renal disorders, Alzheimer disease, or allergic reactions.^{9,11}

Documented risks of community water fluoridation are limited to dental fluorosis, a change in dental enamel that is cosmetic in its most common form. Changes range from barely visible lacy white markings in milder cases to pitting of the teeth in the rare, severe form. In the United States, most dental fluorosis seen today is of the mildest form, affecting neither aesthetics nor dental function.²⁴ Fluorosis can occur when young children—typically less than 8 years of age, whose permanent teeth are still forming under the gums—take in fluoride from any source.^{9,11}

Conclusion

In the seminal report, *Oral Health in America: A Report of the Surgeon General*, Surgeon General David Satcher observed a “‘silent epidemic’ of dental and oral diseases [...] with those suffering the most found among the poor of all ages.”¹ The report affirms that community water fluoridation is “an inexpensive means of improving oral health that benefits all residents of a community, young and old, rich and poor alike.” Because of its contribution to the dramatic decline in tooth decay over the past 70 years, CDC named community water fluoridation 1 of 10 great public health achievements of the 20th century.¹⁴

Katherine Weno, DDS, JD
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 National Center for Chronic Disease Prevention
 and Health Promotion
 Centers for Disease Control and Prevention

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The Wisconsin DHS
supports Community
Water Fluoridation as a
public health measure.

STATE SUPPORTERS

The Wisconsin Department of Health Services (DHS) supports community water fluoridation (CWF) as a public health measure, providing protection against tooth decay for all populations.⁶⁴ The mission of DHS is to protect and promote the health and safety of the people of Wisconsin.⁶⁵

Along with the DHS, other Wisconsin health organizations that support CWF include the Wisconsin Chapter of the American Academy of Pediatrics, the Wisconsin Oral Health Coalition, the Wisconsin Public Health Association, the Wisconsin Dental Hygienists' Association, Wisconsin Primary Health Care Association, Children's Hospital of Wisconsin and the Wisconsin Dental Association. This is just a sample of the many Wisconsin health organizations that support CWF.

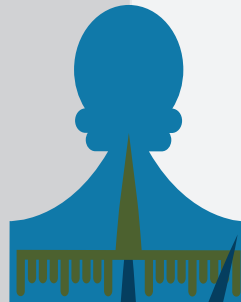


WEIGHING SUPPORT FOR COMMUNITY WATER FLUORIDATION IN WISCONSIN

100+

national and international health, service and professional organizations join these and other Wisconsin groups in recognizing the public health benefits of community water fluoridation in preventing dental decay.

Few organizations oppose fluoridation after reviewing 70+ years of scientific research and public health experience.





POSITION STATEMENTS

Many local, state and national organizations have developed position statements in support of community water fluoridation (CWF). Below are a few examples.

There is value in having your own position statement before opposition arises. Having a statement in place lets community members know your organization/group is committed to the health of their community. See the Take Action section for a template of a resolution drafted for use by an organization/governmental entity committed to supporting CWF.

American Academy of Family Physicians

<http://www.aafp.org/about/policies/all/fluoride.html>

American Academy of Pediatrics

<https://www.aap.org/en-us/about-the-aap/aap-press-room/pages/aap-recommends-fluoride-to-prevent-dental-caries.aspx>

American Dental Association

<http://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/american-dental-association-supports-fluoridation>

American Dental Hygienists' Association

http://www.adha.org/resources-docs/7614_Policy_Manual.pdf

American Water Works Association

<http://www.awwa.org/about-us/policy-statements/policy-statement/articleid/202/fluoridation-of-public-water-supplies.aspx>

Public Health Madison & Dane County

<http://www.publichealthmdc.com/documents/fluoridationpublicdrinkingwater.pdf>

Wisconsin Oral Health Coalition

<http://www.chawisconsin.org/documents/OH3resolution207.pdf>

Wisconsin Public Health Association

http://c.ymcdn.com/sites/www.wpha.org/resource/resmgr/Docs/Community_Water_Fluoridation.pdf



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Over 70 years of research and scrutiny attest to the safety and efficacy of community water fluoridation (CWF) in preventing tooth decay. The ease of delivering fluoride to everyone in the community at a very low cost, and its effectiveness in preventing decay among all the members in a community, regardless of age and income level, are CWF's greatest strengths. Several studies across various states have found that dental treatment costs for tooth decay are lower in fluoridated than non-fluoridated communities.

Research studies have also reported that people with lower access to regular dental care receive greater benefit from CWF than their affluent peers. Hence, people living in communities such as inner-city Milwaukee benefit greatly just by drinking fluoridated tap water.

TESTIMONIAL

A close-up photograph of water being poured from a glass. The water is captured in mid-pour, creating a dynamic scene with splashing and ripples. The color palette is dominated by various shades of blue and white, giving it a clean, fresh appearance. A green horizontal bar is overlaid on the upper portion of the image, containing the text.

AN INFORMED DECISION

FAST FACTS

01

***How should you respond when a patient, friend or neighbor shares a concern about fluoridation?***

Listen carefully and instead of reacting with frustration, validate the concern without validating the conclusion. See the fast facts throughout the toolkit for examples of positive messaging.

02

***How do organized groups raise concerns about fluoridation?***

They tend to circulate false or misleading claims, use questions to create fear, and misrepresent the conclusions of valid research and the position statements of governmental and health organizations.

03

***In Wisconsin, where is the decision to fluoridate determined?***

The decision to fluoridate is determined at the local level. Connect with community leaders, who value your knowledge and expertise, to educate them on the benefits of community water fluoridation.

HISTORY OF THE ANTI-FLUORIDATION MOVEMENT

Opponents of community water fluoridation (CWF) continue to disagree on the safety and effectiveness of CWF and whether CWF is a legitimate function of government. The debate over CWF goes back roughly 70 years to when communities began fluoridating water in the 1940s to prevent tooth decay.⁶⁶ In the 1950-60s, some opponents of CWF suggested that CWF was “socialized medicine,” a communist plot to undermine public health.⁶⁷ In recent years, however, opponents blame CWF for a long list of health concerns, often relying on faulty scientific arguments, disguised as evidence-based research.⁶⁸ Critics of CWF also take advantage of influences such as distrust of government, environmental concerns and fears of additives or contaminants in food and water.⁶⁹ The opponents of CWF make a lot of different claims. Instead of countering each claim made by the opposition, focus on the safety, effectiveness and dental benefits of CWF. See the [Take Action](#) section for effective communication tips.

RECOGNIZE DIFFERENT VIEWS

It is important not to view everyone who publicly expresses concerns about fluoride as having the same motivation or commitment. Some of these critics have made up their minds that fluoridated water is “poison” and are not open to explanations, data or research. Yet many people who send an email to local officials or show up to share their concerns at a community meeting are repeating what they have read online or heard from a friend or neighbor. Many of them have not had the time to explore the allegations about fluoride to confirm their accuracy. The people in this latter group are often open to new information or clarifications if they are offered in a respectful manner.

Health professionals should listen closely when a patient, friend or neighbor shares a concern about fluoride. Instead of reacting with frustration—“How could you believe a crazy claim like that?”—dentists, hygienists, nurses and physicians should listen carefully and take a different approach to responding.



Health professionals can validate the concern without validating the conclusion. For example:

- “I’m a parent too, so I can imagine your reaction when you read that claim about fluoride and children’s IQ scores. But I’ve looked into that claim, and I can share what we know about it ...”
- “Yeah, that concerned me too when I first read it. Then I looked at the actual study on which that assertion is based, and I found that the website distorted the study’s conclusions ...”

Keep in mind that by raising a concern like this, a patient or neighbor is demonstrating a basic level of trust in you. If they did not think you had helpful knowledge to share, they probably would not have even brought it up. Do not write them off as firm “opponents.” If they feel their concern is dismissed out of hand, they are more likely to embrace that concern. Talking with them can help strengthen and restore their confidence that fluoridation is a smart, safe way to protect teeth.

Despite the vast amount of scientific evidence that demonstrates the safety and effectiveness of water fluoridation, opposition to community water fluoridation persists. The opposition has had success in delaying the adoption of CWF in some communities, and even caused others to stop this beneficial public health measure, depriving tens of thousands of citizens optimal oral health and putting a heavy financial burden on the community’s health care resources.⁷⁰ Most opposition to CWF comes from a small number of very active people. Many times, local leaders receive emails and letters from opponents that are not from the local area.

It is imperative that public health decisions be based on credible scientific facts. While the internet makes access to information easily accessible, it also makes it difficult to identify reliable sources. This information highway has expanded the ability for those that are opposed to fluoridation to share their message. Often opinions are stated as facts and appear credible. It is not uncommon for a well-intentioned person to come across this information and begin to question the benefits of water fluoridation.

There are some organized groups that are opposed to water fluoridation. These activists tend to circulate false or misleading claims about fluoridation by leaving out critical facts, misrepresenting the conclusions of valid research, using questions to create fear, and misrepresenting the positions of governmental and health organizations. According to the Institute for Science in Medicine, several of the leading voices in the anti-fluoride movement have expressed radical views that place them at odds with the scientific and medical community.⁷¹

One of the main organizations opposed to water fluoridation is the Fluoride Action Network (FAN). Many people do not realize FAN's role in water fluoridation opposition. FAN has developed a marketing strategy that includes a well-designed website, use of social media and promotion of a book written by their leader, Paul Connett.

Over the years, hundreds of objections to water fluoridation have been made. According to the American Council on Science and Health, “historically, anti-fluoride activists have claimed, with no evidence, that fluoridation causes everything from cancer to mental disease.” More than 3,200 studies or reports have been published on the subject of fluoridation. Even after all this research, the best that opponents can do is claim that fluoride “could” cause or “may” cause one harm or another. They cannot go beyond speculating because the evidence does not back up their fears.⁷²

The value of water fluoridation is generally accepted by most Americans.⁷³ A 2010 national poll by the Pew Charitable Trusts showed that a majority of Americans support water fluoridation in the United States. Overcoming the misinformation promoted by the opponents to fluoridation is a challenge that will require the involvement of many individuals and organizations.

FLUORIDATION DECISION MAKERS IN WISCONSIN

In Wisconsin, the decision to fluoridate is determined at the local level. Unlike several other states, the State of Wisconsin does not mandate community water fluoridation (CWF). Instead, local officials can begin or discontinue CWF at their discretion, or by a referendum vote. Local leaders have a responsibility to make decisions for the greater public

Despite the vast amount of scientific evidence that demonstrates the safety and effectiveness of water fluoridation, opposition to community water fluoridation persists.

good. *Health in All Policies: A Guide for State and Local Governments* suggests all decision makers be informed about the health, equity and consequences of policy decisions and recommends the engagement of local public health agencies regarding health related policy decisions. Local officials are elected to make policy decisions on behalf of the entire community, typically making a referendum vote unnecessary. A referendum vote should be the last resort in communities with activity surrounding water fluoridation. For issues decided directly by voters via referendums; ballot wording, timing and monitoring public debates are all important factors.⁷⁴ As a local resident and professional in the community, city officials value your knowledge and expertise. It is, therefore, important to get involved at the local level and connect with local leaders.

AMERICA'S TRADITION OF HEALTH PROMOTION

In the United States (U.S.), we have a tradition of fortifying foods and beverages to protect human health. Water fluoridation is only one example. Milk contains added vitamin D, bread and cereals have folic acid, and iodine is commonly found in table salt. Fluoride is a mineral that is found in all natural water sources; however the level of fluoride in most water sources is too low to protect teeth from decay. That is why many communities choose to fortify their water with additional fluoride to reach the optimal level for reducing tooth decay.

Fluoridation has been thoroughly tested in the U.S. court system, and found to be a proper means of furthering public health and welfare.⁷⁵ In the 1955 case *Froncek v. City of Milwaukee*, the Wisconsin Supreme Court affirmed the ruling of a circuit court, which held that the city's community water fluoridation (CWF) resolution was a public health measure, bearing a real, substantial and reasonable relation to the health of the city.⁷⁶ The U.S. Supreme Court has denied review of CWF cases 13 times, citing that there was no unconstitutional invasion of religious freedom or other individual rights guaranteed by the First, Fifth or Fourteenth Amendments to the U.S. Constitution.⁷⁷

To find out if your local community has any CWF ordinances, visit the Fluoride Legislative User Information Database (FLUID) at Fluidlaw.org. FLUID is a comprehensive database containing legal decisions and current information on federal, state and local policies related to CWF.⁷⁸

EVALUATING RESEARCH QUALITY

When making decisions that could affect the public's health, it is imperative to use evidence-based findings and quality research. It is difficult for most people to do their own research. However, leading health organizations have experts that have the knowledge, expertise and formal training. In fact, they have done a comprehensive review of the research (over 3,000 studies) and determined that community water fluoridation (CWF) is safe and effective.

Community leaders have the responsibility to implement policies that benefit and protect their community. Consequently, community leaders need to ensure they are making decisions about public health issues based on respected scientific sources.⁷⁹ It is recommended that Wisconsin community leaders without this expertise rely on leading health organization experts and the Centers for Disease Control and Prevention (CDC) recommendations.

Opponents of CWF sometimes guise misinformation as objective research. This is disturbing to scholars and harmful to people who unknowingly use such information. Opponents tend to rely on flawed studies or ones that have not gone through peer review. In fact, they have created their own “journal” because their article quality does not make it through the typical review of mainstream peer reviewed scientific journals.⁸⁰ One example is an often used study to link fluoridated water and lower intelligent quotient (IQ) scores. The study was conducted in China, Mongolia and Iran, which have excessively high levels of fluoride in their water. The levels of fluoride in these countries were more than 10 times the level used to fluoridate water in the United States.⁸¹

Another example is the Malin & Till (2015) study, often used to claim that CWF causes higher rates of medically-diagnosed attention-deficit/ hyperactivity disorder (ADHD) in children.⁸² The quality of the Malin & Till evidence is poor with important methodological limitations. The authors’ assessment of the evidence-base is unbalanced, misleading and lacks citation of key studies.⁸³ The results of this study do not support the consistent findings of three scientific reviews, which report no proof of an association between optimal fluoride consumptions and ADHD.⁸⁴ Unfortunately, opponents in Wisconsin continue to quote and use this information to influence friends, family, neighbors and community leaders to remove fluoride.

Key decision makers charged with making decisions around CWF, such as local officials and health professionals, rely heavily on the recommendations of respected organizations that have analyzed the best available scientific research. The more rigorous a study’s research design, the more compelling the research evidence.⁸⁵ Researchers agree that there are a number of key elements that characterize good scientific research (See infographic on [page 42](#)). Such compelling evidence produced by good scientific research, in turn enables health professionals and local officials to determine whether or not a practice is beneficial and safe for the public. One example of a public health practice that has been implemented based on the overwhelming weight of credible scientific evidence is CWF. The body of knowledge on CWF’s safety and effectiveness includes the efforts of nationally recognized scientists. These scientists employ the scientific method, draw appropriate balanced conclusions and publish their findings in peer reviewed journals.

A Rough Guide to

SPOTTING BAD SCIENCE

Being able to evaluate the evidence behind a scientific claim is important. Being able to recognise bad science reporting, or faults in scientific studies, is equally important. These 12 points will help you separate the science from the pseudoscience.

1. SENSATIONALISED HEADLINES



Article headlines are commonly designed to entice viewers into clicking on and reading the article. At times, they can over-simplify the findings of scientific research. At worst, they sensationalise and misrepresent them.

7. UNREPRESENTATIVE SAMPLES USED



In human trials, subjects are selected that are representative of a larger population. If the sample is different from the population as a whole, then the conclusions from the trial may be biased towards a particular outcome.

2. MISINTERPRETED RESULTS



News articles can distort or misinterpret the findings of research for the sake of a good story, whether intentionally or otherwise. If possible, try to read the original research, rather than relying on the article based on it for information.

8. NO CONTROL GROUP USED



In clinical trials, results from test subjects should be compared to a 'control group' not given the substance being tested. Groups should also be allocated randomly. In general experiments, a control test should be used where all variables are controlled.

3. CONFLICTS OF INTEREST



Many companies will employ scientists to carry out and publish research - whilst this doesn't necessarily invalidate the research, it should be analysed with this in mind. Research can also be misrepresented for personal or financial gain.

9. NO BLIND TESTING USED



To try and prevent bias, subjects should not know if they are in the test or the control group. In 'double blind' testing, even researchers don't know which group subjects are in until after testing. Note, blind testing isn't always feasible, or ethical.

4. CORRELATION & CAUSATION



Be wary of any confusion of correlation and causation. A correlation between variables doesn't always mean one causes the other. Global warming increased since the 1800s, and pirate numbers decreased, but lack of pirates doesn't cause global warming.

10. SELECTIVE REPORTING OF DATA



Also known as 'cherry picking', this involves selecting data from results which supports the conclusion of the research, whilst ignoring those that do not. If a research paper draws conclusions from a selection of its results, not all, it may be guilty of this.

5. UNSUPPORTED CONCLUSIONS



Speculation can often help to drive science forward. However, studies should be clear on the facts their study proves, and which conclusions are as yet unsupported ones. A statement framed by speculative language may require further evidence to confirm.

11. UNREPLICABLE RESULTS



Results should be replicable by independent research, and tested over a wide range of conditions (where possible) to ensure they are consistent. Extraordinary claims require extraordinary evidence - that is, much more than one independent study!

6. PROBLEMS WITH SAMPLE SIZE



In trials, the smaller a sample size, the lower the confidence in the results from that sample. Conclusions drawn can still be valid, and in some cases small samples are unavoidable, but larger samples often give more representative results.

12. NON-PEER REVIEWED MATERIAL



Peer review is an important part of the scientific process. Other scientists appraise and critique studies, before publication in a journal. Research that has not gone through this process is not as reputable, and may be flawed.



THE FACTS SUPPORT COMMUNITY WATER FLUORIDATION

Opponents of community water fluoridation often make claims lacking relevant research. They often will skew information or data to support their view and gain support. It is critical that accurate scientific information be shared. This section highlights a few of the common claims used by opponents and the scientific evidence that refutes those claims. For those interested in delving into the science, review the sample of relevant research articles from [fluorescience.org](https://www.fluorescience.org), found at the end of some tabbed sections. These sections are separated by a box and the text is taken directly from [fluorescience.org](https://www.fluorescience.org). These narratives explain in technical terms why the studies often used by opponents of fluoridation lack solid evidence or use only partial findings to make their case.

[Fluorescience.org](https://www.fluorescience.org) is a website developed by the Center for Fluoride Research Analysis (Center). The Center is an educational entity dedicated to communicating the quality of fluoride-related studies and is endorsed by the American Association of Public Health Dentistry. The Center utilizes graduate students and an expert committee of mentors with extensive research publication records to review the quality of research publications and other reports.

THE FACTS SUPPORT COMMUNITY
WATER FLUORIDATION

CANCER

FAST FACTS

01



Over 50 epidemiological studies have found no association between fluoride and cancer.

02



Reputable cancer advocacy groups, like the American Cancer Society, do not cite fluoride as a risk factor for cancer.

03



Leading health and medical organizations agree that fluoridated water is safe.

CANCER

The weight of scientific evidence does not provide adequate evidence for altering public health policy regarding water fluoridation because of cancer concerns. Even with the large amount of scientific evidence, claims continue to be made by opponents regarding a link between cancer and water fluoridation.⁸⁶

Over 50 epidemiological studies have found no association between fluoride and cancer, even after decades of exposure in some populations.⁸⁷ Multiple thorough systematic reviews conducted between 2000 and 2011 all concluded that based on the best available evidence, fluoride (at any level) could not be classified as carcinogenic in humans.⁸⁸ More recent studies, including a large and detailed study in the United Kingdom in 2014, have not changed this conclusion.⁸⁹

Opponents often cite a 2006 study when they raise the cancer issue, but they omit the fact that the author of this study called it “an exploratory analysis.” Instead of measuring the actual fluoride level in bone, this 2006 study relied on estimates of fluoride exposures that could not be confirmed, which undermines the reliability of the data.⁹⁰

The American Cancer Society (ACS) is a health organization focused specifically on cancer. In fact, ACS has worked for over 100 years to create a world with less cancer.⁹¹ In a document entitled, “Fluoride and Drinking Water Fluoridation,” the ACS states, “Scientific studies show no connection between cancer rates in humans and adding fluoride to drinking water.”⁹² The National Cancer Institutes's review of the available research also finds no association between fluoridated water and cancer.⁹³

Recent research has found no link between water fluoridation and cancer. In October 2011, California's Office of Environmental Health Hazard Assessment concluded that fluoride should not be classified as a cancer-causing substance. The expert panel reviewed the existing research and determined that no link exists between water fluoridation and cancer.

Similarly, a 2011 Harvard study found no link between fluoride and bone cancer. This study reviewed hundreds of bone samples, and the study's design was approved by the National Cancer Institute. The study is significant because the National Research Council reported that if there were any type of cancer that fluoride might possibly be linked to, it would probably be bone cancer (because fluoride is drawn to bones).⁹⁴ The fact that this Harvard study found no link to bone cancer strengthens confidence that fluoride is unlikely to cause any form of cancer.

The American Academy of Family Physicians, the Institute of Medicine and many other respected authorities support water fluoridation. The Centers for Disease Control and Prevention reports that, “panels of experts from different health and scientific fields have provided strong evidence that water fluoridation is safe and effective.”⁹⁵

CANCER: SAMPLE OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG⁹⁶

Kim FM, Hayes C, Williams PL et al. An assessment of bone fluoride and osteosarcoma. J Dent Res. 2011;90(10):1171-6.

The purpose of this study was to assess whether fluoride levels in bone were associated with osteosarcoma. A case-control design was used to compare bone fluoride levels in 137 subjects with primary osteosarcoma (cases) with 51 controls that had other malignant bone tumors. The median age of cases was 17.6 years old. The median age of controls was 41.3 years old. The gender distribution also differed with 53 percent of cases being male compared to 71 percent of controls. A subset of 32 cases was matched with controls based on gender and age. The study did not demonstrate an association between fluoride levels in bone and osteosarcoma. This was true even after adjusting for age and gender in the statistical analysis in the unmatched cases and controls.

The study provides assurance that fluoride exposure does not cause osteosarcoma. A limitation in the design is the small number of age-matched cases and controls. Since fluoride exposure over time may be related to bone fluoride accumulation, older subjects would have higher bone fluoride levels than younger subjects. When the age distribution is widely different in the two groups, statistical methods may be unable to adequately control for this. The small number of age-gender-matched cases may lack statistical power to show a difference. Fluoride measured in bone at time of diagnosis may not reflect fluoride exposure during tumor initiation.⁹⁷

Levy M, Leclerc BS. Fluoride in drinking water and osteosarcoma incidence rates in the continental United States among children and adolescents. Cancer Epidemiol. 2012;36(2):e83-8.

The authors conducted an ecological analysis using the cumulative osteosarcoma incidence rate data from the CDC Wonder database for 1999–2006, categorized by age group, sex, and states. States were categorized as low (30 percent) or high (85 percent) according to the percentage of the population receiving community water fluoridation (CWF) between 1992 and 2006. There was no statistical difference in the incidence rates between low and high fluoridation states.

The authors failed to confirm higher incidence rates of osteosarcoma among males in the 5 to 14 year age group, although incidence rates for males in the 15–19 year age group were significantly higher than for females. Also, there was no evidence of “peaking” in male incidence rates or risk ratio between ages 5 and 8 as reported in Bassin’s study described below.

The authors concluded that the water fluoridation status in the continental U.S. has no influence on osteosarcoma incidence rates during childhood and adolescence.⁹⁸

CANCER: SUMMARY OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG⁹⁹

Comber H, Deady S, Montgomery E, Gavin A. Drinking water fluoridation and osteosarcoma incidence on the island of Ireland. Cancer Causes Control. 2011;22:919–24.

The authors compared the incidence of osteosarcoma in Northern Ireland and the Republic of Ireland to examine if differences in incidence between the two regions could be related to their different drinking water fluoridation policies. While an estimated 70 percent of the population in the Republic of Ireland region receives fluoridated water, fluoridation is not implemented in Northern Ireland (NI). Data from the Northern Ireland Cancer Registry (NICR) and the National Cancer Registry of Ireland (NCRI) on osteosarcoma incidence in the respective populations were used to estimate the age standardized and age-specific incidence rates in areas with and without drinking water fluoridation. Osteosarcoma was rare and no significant differences were observed between fluoridated and non-fluoridated areas in either age-specific or age-standardized incidence rates of osteosarcoma. The authors concluded that this study did not support the hypothesis that osteosarcoma incidence in the island of Ireland is related to public water fluoridation.¹⁰⁰

Bassin EB, Wypij D, Davis RB, Mittleman MA. Age-specific fluoride exposure in drinking water and osteosarcoma (United States). Cancer Causes Control. 2006; 17:421–8.

The authors explored age-specific and gender-specific effects of fluoride levels in drinking water and the incidence of osteosarcoma using a matched case–control study design. The study was conducted in 11 hospitals in the United States and included a complete residential history for each patient and type of drinking water (public, private well, bottled) used at each address.

Their analysis, based on 103 cases under the age of 20 and 215 matched controls, showed an increased adjusted odds ratio for boys in the higher fluoride exposure group, reaching a peak of 5.46 (95 percent CI 1.50, 19.90) at age 7 years. This association was not apparent among girls.

The authors concluded that their exploratory analysis found an association between fluoride exposure in drinking water during childhood and the incidence of osteosarcoma among boys but not consistently among girls. The authors urged further research to confirm or refute this observation.¹⁰¹

For more information on topic specific cancer research, visit <http://goo.gl/fyKv2C>.

THE FACTS SUPPORT COMMUNITY
WATER FLUORIDATION

DENTAL FLUOROSIS

FAST FACTS

01



Dental fluorosis is a change in the appearance of the surface of the tooth. It does not cause pain and it does not harm the health or function of teeth.

02



The most common occurrences of fluorosis are “very mild” or “mild.” These individuals have a change in appearance of their teeth that is usually so subtle that only a dentist or dental hygienist will notice the condition.

03



Only about two percent of the United States population aged 6-49 has moderate fluorosis and less than 1 percent has severe fluorosis.

04



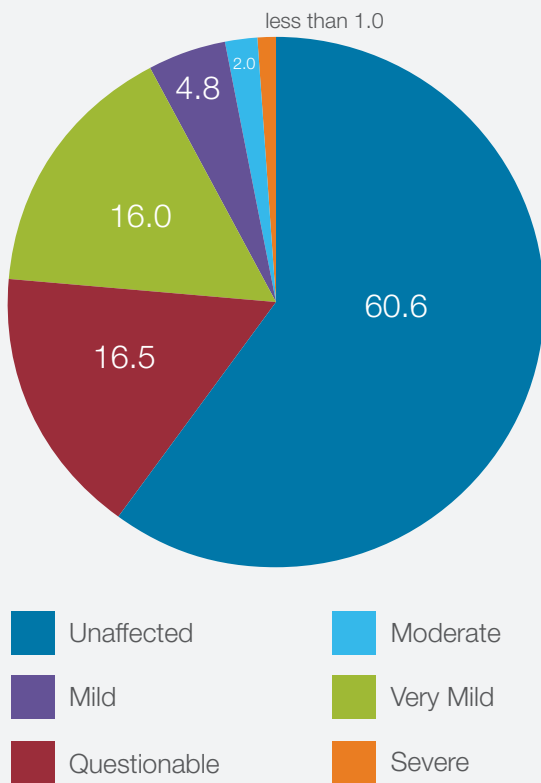
Children who drink fluoridated water as their teeth grow will have stronger, more decay resistant teeth over their lifetime.

DENTAL FLUOROSIS

Dental fluorosis is the change in appearance of tooth enamel, varying from barely noticeable white spots (mild fluorosis) to staining and pitting (severe fluorosis).¹⁰² Nearly all cases of fluorosis in the United States (U.S.) are mild with 21 percent of the population having mild to very mild fluorosis.¹⁰³ Only about two percent of the U.S. population aged 6-49 has moderate fluorosis and less than one percent has severe fluorosis.¹⁰⁴ Dental fluorosis can only occur when children under the age of eight consume an excessive amount of fluoride.¹⁰⁵ After tooth enamel is completely formed, dental fluorosis cannot develop, even if excessive fluoride is ingested. Mild to very mild fluorosis is usually so subtle that only a dentist or dental hygienist will notice the condition.¹⁰⁶ The majority of those who have the milder forms of dental fluorosis are unaware of this condition. Very mild to moderate fluorosis does not cause pain and it does not affect the health or function of the teeth.

Unfortunately, opponents try to get you to believe otherwise. They often post photos of people with severe dental fluorosis on their websites. These severe cases of fluorosis are not reflective of water fluoridation in the U.S. However, opponents use the photos to create fear and doubt and intentionally leave out information explaining that the photo they are showing is not representative of the majority of fluorosis found in the U.S.

PERCENT DISTRIBUTION OF DENTAL FLUOROSIS AMONG PERSONS AGED 6-49; UNITED STATES, 1999-2004



Notes: Dental Fluorosis is defined as having very mild, mild, moderate, or severe forms is based on Dean's Fluorosis Index. Percentages do not sum to 100 due to rounding. Source: DCD/NCHS, National Health and Nutrition Examination Survey, 1999-2004

According to the American Academy of Pediatrics, optimal exposure to fluoride is important to infants and children. Children who drink fluoridated water as their teeth grow will have stronger, more decay resistant teeth over their lifetime. A 2010 study confirmed that the fluoridated water consumed as a young child makes the loss of teeth less likely as a middle aged adult.¹⁰⁷

Dental fluorosis can occur among some people in all communities, even those that do not fluoridate their community water supply.¹⁰⁸ Experts believe that a key reason for fluorosis is that some young children swallow fluoride toothpaste. Toothpaste contains a concentration of fluoride that is roughly 1,000 times higher than the level in fluoridated water. This is why parents of children under the age of six are encouraged to supervise during brushing.

A study published in 2010 found that mild fluorosis was not an adverse health condition and that it might even have "favorable" effects on overall oral health.¹⁰⁹ The author of the study said there is no reason why parents should be advised not to use fluoridated water in infant formula. Water fluoridation gives children the best possible chance to grow up with healthy teeth.

If it occurs, fluorosis is usually very mild, invisible to the naked eye, and does not damage teeth. On the other hand, tooth decay is a disease which goes well beyond a cosmetic problem. Tooth decay causes pain, trauma and a significant financial burden. The benefits of fluoridation far outweigh any risks.

DENTAL FLUOROSIS: SAMPLE OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG¹¹⁰

Beltrán-Aguilar ED, Barker L, Dye BA. Prevalence and severity of dental fluorosis in the United States, 1999–2004. NCHS data brief, no 53. Hyattsville, MD: National Center for Health Statistics. 2010.

This report describes the prevalence of dental fluorosis in the United States and changes in the prevalence and severity of dental fluorosis among adolescents between 1986–1987 and 1999–2004. The authors analyzed data from the National Health and Nutrition Examination Survey, 1999–2004 and compared the findings with those of the earlier survey. The key findings are:

- Less than one-quarter of persons aged 6–49 in the United States had some form of dental fluorosis.
- Adolescents aged 12–15 had the highest prevalence of dental fluorosis (40.6 percent). The prevalence was lower among older age groups. The lowest prevalence was among those aged 40–49 (8.7 percent). The prevalence of dental fluorosis among children aged 6–11 (33.4 percent) was lower than the prevalence among those aged 12–15 (40.6 percent).
- Children aged 12–15 in 1999–2004 had higher prevalence of dental fluorosis compared with the same aged children in 1986–1987. In 1986–1987, 22.6 percent of adolescents aged 12–15 had dental fluorosis; whereas in 1999–2004, 40.7 percent of adolescents aged 12–15 had dental fluorosis. The estimates for severe alone were statistically unreliable. The prevalence of very mild fluorosis increased from 17.2 percent to 28.5 percent and mild fluorosis increased from 4.1 percent to 8.6 percent. The prevalence of moderate and severe fluorosis increased from 1.3 percent to 3.6 percent.¹¹¹

Levy SM, Broffitt B, Marshall TA, Eichenberger-Gilmore JM, Warren JJ. Associations between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. J Am Dent Assoc. 2010;141(10):1190-1201.

The authors described associations between dental fluorosis and fluoride intakes, with an emphasis on intake from fluoride in infant formula.

The authors administered periodic questionnaires to parents to assess children's early fluoride intake sources from beverages, selected foods, dentifrice and supplements. They later assessed relationships between fluorosis of the permanent maxillary incisors and fluoride intake from beverages and other sources. The authors determined effects associated with fluoride in reconstituted powdered infant formulas, along with risks associated with intake of fluoride from dentifrice and other sources.

Considering only fluoride intake from ages 3 to 9 months, the authors found that participants with fluorosis on the permanent upper incisors (97 percent of which was mild) had significantly greater cumulative fluoride intake from reconstituted powdered infant formula and other beverages with added water than did those without such fluorosis. Considering only intake from ages 16 to 36 months, participants with fluorosis had significantly higher fluoride intake from water by itself and dentifrice than did those without fluorosis. In a model combining both the 3- to 9-months and 16- to 36-months age groups, the significant variables were fluoride intake from reconstituted powdered concentrate formula (by participants at ages 3-9 months), other beverages with added water (also by participants at ages 3-9 months), and dentifrice (by participants at ages 16-36 months).

The authors concluded that greater fluoride intake from reconstituted powdered formulas and other water-added beverages, when participants were age 3-9 months, increased fluorosis risk, as did higher dentifrice intake by participants when age 16 to 36 months. The authors recommended that prevalence of mild dental fluorosis could be reduced by avoiding ingestion of large quantities of fluoride from reconstituted powdered concentrate infant formula and fluoridated dentifrice.¹¹²

Hiroko I, Kumar JV. The association between enamel fluorosis and dental tooth decay in U.S. school children. J Am Dent Assoc. 2009;140:855-62.

The purpose of the study was to investigate the relationship between enamel fluorosis and dental tooth decay at the tooth level. The authors obtained data from a 1986-1987 oral health survey of U.S. school children to determine the prevalence of tooth decay and enamel fluorosis in 7-17 year olds with a history of a single residence. To focus their analysis at the tooth level, they selected the permanent maxillary right first molar as the index tooth.

The result of the investigation showed the mean decayed, missing and filled permanent tooth surfaces (DMFS) in children with enamel fluorosis to be consistently lower than those without enamel fluorosis. Molars without fluorosis had a higher count of DMFS and higher tooth decay prevalence than molars with fluorosis.

The investigators' conclusion was that policy makers should consider the tooth decay preventive benefits associated with milder forms of enamel fluorosis when making policy changes to reduce the degree of fluoride exposure.¹¹³

Levy SM. An update on fluorides and fluorosis. J Can Dent Assoc. 2003;69(5):286-91.

The author reviewed the literature regarding dental fluorosis, its definition, its appearance, its prevalence based on the pre- and post-eruptive use of fluoride. The aesthetic perceptions, and of fluoride levels in foods and beverages. The author also discussed the findings in an Iowa Fluoride Study, the goal of which was to assess the patterns of fluoride intake and dental fluorosis over time. He also summarized the recommendations of the U.S Center for Disease Control and Prevention for using fluoride to prevent and control dental tooth decay in the United States. He stated that the need to balance the benefits of the different modalities of fluoride use with the risk of fluorosis had made decisions concerning the recommendations for its use more complex.

The overriding points highlighted from these studies was that total fluoride intake was the true risk factor for fluorosis, in spite of the acknowledgment that the value was difficult to quantify. Therefore, documented risk factors for children where the beginnings of fluorosis are important, are fluoride in water, in infant formula reconstituted with fluoridated water, dentifrice, and fluoride supplements. For liquid formulas, soy-based formulas tended to be higher in fluoride content than milk-based formulas.

The author stated further that the optimum level of fluoride intake, though not known with certainty, was on an average 0.05 – 0.07 mg/kg of body weight. With sources of fluoride topically being professionally applied gels, varnishes, foams, and dentifrice, and systemic sources being water, certain juices, and supplements, the intake of fluoride could easily exceed the suggested optimum level. From the Iowa Fluoride Study, for example, it was found that about 25 percent of the children

were ingesting an estimated 0.8 mg of fluoride daily, and 10 percent were ingesting more than 1 mg daily based on the days assessments were conducted. Approximately 12 percent of the children had mild fluorosis of the primary teeth.

The author concluded with the recommendation that supplemental fluoride should be prescribed on sound information about the patient, most importantly whether the patient was at high risk for dental tooth decay. Otherwise, fluoridated water and dentifrice should remain the mainstays of fluoride delivery for all.¹¹⁴

Beltrán-Aguilar ED, Griffin SO, Lockwood SA. The prevalence and trends in enamel fluorosis in the United States from the 1930s to the 1980s. J Am Dent Assoc. 2002;133:157-65.

The purpose of this article was to describe the prevalence and severity of enamel fluorosis since the classic epidemiological studies of H. Trendly Dean were published (1930s). The authors selected a sample from a data set compiled by the National Institute for Dental Research (NIDR) in 1986-1987 of U.S school children, ages 12-14, living in a household served by the public water system during the child's first eight years of life. Comparison of the two studies showed an increase in prevalence of dental fluorosis in the 1986-1987 period over the 1930s. The prevalence of fluorosis varied by the type of water system. The highest prevalence was seen in children living in areas whose public water system was naturally fluoridated (4.0 ppm fluoride ions), followed by those living in optimally fluoridated areas (0.7-1.2 ppm fluoride ions). Fluorosis prevalence was lowest in children living in sub-optimally fluoridated areas (< 0.7ppm fluoride ions). The dental fluorosis prevalence rates in the order of highest to lowest were 38.7 percent, 25.8 percent and 15.5 percent. However, the greatest relative increase in the prevalence of fluorosis since the 1930s was observed in children living in areas with sub-optimal water fluoride levels (6.5 percent in 1930 to 15.5 percent in 1986-87). This suggests that other sources of fluoride apart from water fluoridation may have contributed to this increase.

The authors concluded by stating that the increase in the prevalence of fluorosis from the 1930s to the 1980s may be explained by the increased exposure of children to multiple sources of fluoride.¹¹⁵

THE FACTS SUPPORT COMMUNITY
WATER FLUORIDATION

INTELLIGENCE QUOTIENT (IQ)

FAST FACTS

01



There is no accepted scientific evidence of a causal relationship between optimally fluoridated water and neurological impairments.

02



Studies linking fluoridated water and low intelligence quotient scores are conducted in countries that do not have fluoridation programs similar to what we have in the United States. They are often conducted in areas with very high fluoride levels (China and Iran) and have very poor research qualities that do not meet most peer reviewed journal standards.

INTELLIGENCE QUOTIENT

Various scientific reviews provide compelling evidence that community water fluoridation (CWF) is a safe and effective method for reducing tooth decay. CWF does not cause central nervous system disorders, attention deficit disorders or lowered intelligence quotient (IQ) scores. There is no accepted scientific evidence of a causal relationship between optimally fluoridated water and neurological impairments.¹¹⁶ The average IQ score in America rose 15 points between the 1940s and 1990s.¹¹⁷ This is the same time period when fluoridation rapidly expanded in the U.S.¹¹⁸ A recent study from New Zealand, with CWF programs similar to the U.S., found no link between fluoridated water and low IQ scores. In 2014, New Zealand investigators compared the IQs of research participants who lived in fluoridated areas during the first five years of life to those who did not. The analysis of the study showed no differences in IQ between the two groups.¹¹⁹

Opponents often cite Harvard researchers when trying to explain fluoride and IQ.¹²⁰ What they are citing is a review of 27 studies conducted by Harvard researchers. The researchers reviewed 27 studies from countries such as China, Mongolia and Iran. None of these countries have fluoridation programs similar to the U.S. These 27 studies compared the IQ of children living in areas with high levels of fluoride in their water with those living with low levels of fluoride. The high fluoride areas had more than 10 times the level used to fluoridate the water in the U.S. Many factors, including parents' education and arsenic exposure can affect a child's IQ score. Yet none of these factors were ruled out by the studies. Most of the studies were conducted in China, which has nearly 20 million people living in areas at high risk of arsenic contamination in their drinking water. The Harvard researchers have said that each of the studies they reviewed had flaws that were "in some cases rather serious" and "limit the conclusions that can be drawn."

Opponents cite many "studies" that were poorly designed, gathered unreliable data and were not peer reviewed by independent scientists. The foreign studies that opponents cite involve fluoride levels that are at much higher levels than those used to fluoridate drinking water in the U.S.¹²¹ It is irresponsible to claim these studies have any real meaning for our situation in the U.S. British researchers have pointed out that lower IQ's could be traced to other factors, such as arsenic exposure, the burning of high-fluoride coal inside homes and the eating of contaminated grain.

INTELLIGENCE QUOTIENT: SAMPLE OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG¹²²

Whitford GM, Whitford JL, Hobbs SH. Appetitive-based learning in rats: lack of effect of chronic exposure to fluoride. Neurotox Teratol. 2009;31:210-5.

The authors conducted a laboratory study using 32 female rats. These rats were provided with water containing different doses of fluoride (0, 2.9, 5.7, 11.5 mg/kg body weight/day) for eight months. These rats were tested for their ability to learn a response for food.

The authors observed that there was no evidence of learning deficits in any of the fluoride-exposed groups. Although not statistically significant, it was the non-fluoridated control group that took longer to reach criterion for acquiring the bar-press response ((0 fluoride 6.38 ± 0.38 days), (2.9mg/kg 5.75 ± 0.37 days), (5.7mg/kg 5.63 ± 0.46 days), (11.5mg/kg 5.63± 0.42)). The authors concluded that there were no significant differences among the groups in learning or performing the response. “Chronic ingestion of fluoride at levels up to 230 times more than that experienced by humans whose main source of fluoride is fluoridated water had no significant effect on appetitive-based learning.”¹²³

Wang SX, Wang ZH, Cheng XT, et al. Arsenic and fluoride exposure in drinking water: children's IQ and growth in Shanyin County, Shanxi Province, China. Environ Health Perspect. 2007;115(4):643-7.

The authors measured the intelligence quotient (IQ) in 720 school-age children, 8-12 years old, residing in rural villages in China. The study was conducted to determine the effect of high arsenic and high fluoride (190 ± 183 microgram/L As and 8.3 ± 1.9 mg/L F) on IQ. A control group of people receiving low arsenic and low fluoride (2 ± 3 micrograms/L As and 0.5 ± 0.2 mg F/L) was used as a comparison group. It should be noted that the level of fluoride in the control group is equivalent to a fluoridated community in the US. Hence, the study population in the high fluoride exposure is not representative of individuals drinking fluoridated water in the US. Also, the authors acknowledged the fact that the distribution of children's IQ is slightly skewed in the control group. The average IQ for the high fluoride group was 100.5, Standard Deviation(SD) ± 15.8 while the average IQ for the control group was 104.8, SD ± 14.7. The average IQ of Chinese children was reported to be 103.5, SD ±17.7. Children exposed to high arsenic had an average IQ of 95.1, SD ±16.6.

The authors observed a significant effect of arsenic exposure on children's intelligence. The authors also expressed caution in interpreting the results of the study by acknowledging that children's intelligence, growth and development can be influenced by many factors such as inheritance, nutrition, geography, education and society. The authors stated that they could not rule out the effect of arsenic in the high fluoride group as they did not assess the exposure in a large proportion of children in the high fluoride group.¹²⁴

INTELLIGENCE QUOTIENT: SAMPLE OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG¹²⁵

Bazian Ltd. Independent critical appraisal of selected studies reporting an association between fluoride in drinking water and IQ: a report for South Central Strategic Health Authority. London, UK: Bazian Ltd; 2009 February 11.

According to this report, the studies reporting an association between high fluoride level and IQ were conducted in China, Mexico, Iran and India. These studies used cross-sectional or ecological methods to investigate whether high environmental exposure to fluoride or arsenic or low exposure to iodine was associated with lower IQ.

According to this independent report, the lack of a thorough consideration of confounding as a source of bias means that, from these studies alone, it is uncertain how far fluoride is responsible for any impairment in intellectual development seen. Bazian acknowledged that these confounding factors (parental education, socioeconomic measures and environmental exposures to other chemicals such as arsenic and iodine in water) could explain some or all of the impairment in IQ. The report also mentioned that sources of fluoride exposure that exist in China and India do not exist in the UK, for example, the burning of high fluoride coal and the practice of eating contaminated grain, which can substantially contribute to fluoride exposure.¹²⁶

Choi AL, Sun G, Zhang Y, Grandjean P. Developmental fluoride neurotoxicity: a systematic review and meta-analysis. Environmen Health Perspect. 2012 July 20. [Epub ahead of print].

The authors specifically evaluated by meta-analysis 27 epidemiological studies on the relationship between high fluoride exposure in drinking water and delayed neurobehavioral development in children in rural areas of China, including 2 studies from Iran. The studies cited were carried out from 1989 through 2011 and compared high and reference fluoride exposures. The outcome measured for the individual studies was general intelligence using The Combined Raven's Test - The Rural edition in China (CRT-RC) (16 of the studies), the Weschler Intelligence Tests (3 of the studies), Binet IQ Test (2 of the studies, more specifically the Chinese Binet and the Binet-Siman), Raven's Test (2 of the studies), Japan IQ Test (2 of the studies), the Chinese Comparative Intelligence Test (1 of the studies), and the Mental Work Capacity Index (1 of the studies). The children ranged in age overall from 4 (2 of the studies) to 16 years old, and were not analyzed based on gender, parental education or income. Statistical analyses of the data included finding standardized weighted mean differences of the accumulated scores using fixed-effects and random-effects models, determining the presence of heterogeneity, and performing sensitivity analyses on studies that used similar tests to measure the outcome. The authors found the suggestion of an inverse relationship between high fluoride exposure and children's intelligence. They could not derive an exposure limit because the actual exposures and possible routes of exposure of the individual children were unknown. In addition, they found that the reports were quite brief, that complete information on variables was not available, that each of the articles reviewed had deficiencies and in some, quite serious deficiencies, that there were limitations on methodology, all of which influenced the extent to which any firm conclusion could be drawn from the results. However, they nevertheless stated the following: "Although the studies were generally of insufficient quality, the consistency of their findings adds support to existing evidence of fluoride-associated cognitive deficits, and suggest that potential developmental neurotoxicity of fluoride should be a high research priority."¹²⁷

THE FACTS SUPPORT COMMUNITY
WATER FLUORIDATION

INFANT FORMULA

FAST FACTS

01



It is safe to use fluoridated water to prepare infant formula.

02



A child exclusively consuming infant formula reconstituted with fluoridated water may have an increased chance for mild dental fluorosis. Mild dental fluorosis does not affect the health or function of the teeth.

INFANT FORMULA

Fluoride strengthens infants teeth as they grow, making them more resistant to tooth decay. Getting the right amount of fluoride is critical for people of all ages, including infants. The right amount of fluoride reduces tooth decay by about 25 percent. Fluoride is incorporated into the developing enamel of childrens' teeth, which ultimately makes the enamel stronger and more resistant to tooth decay. The American Academy of Pediatrics recommends breast milk for all infants (except for the few for whom breastfeeding is determined to be harmful). Breast milk is very low in fluoride. Nursing mothers or pregnant women who drink fluoridated water do not pass on significant amounts of fluoride to their child. The American Academy of Pediatrics supports water fluoridation as a safe and effective way to prevent tooth decay.¹²⁸

Parents and caregivers should consult with their pediatrician or family physician on the most appropriate formula for their child. Parents that choose to feed formula to their infant, may have some questions about what type of water to use when mixing the formula. According to the American Dental Association and the Centers for Disease Control and Prevention (CDC), it is safe to mix infant formula with fluoridated water.¹²⁹⁻³⁰

Three types of infant formula are available in the United States powdered formula, which comes in bulk or single-serve packets, concentrated liquid, and ready-to-feed formula. Ready-to-feed formula contains little fluoride and does not cause dental fluorosis. Powdered and concentrated liquid formulas both must be mixed with water. The type of water used to mix the formula determines how much fluoride the infant is getting. According to the CDC, there may be an increased chance for mild dental fluorosis if formula is the child's main source of food and if the water used to mix the formula is fluoridated.¹³¹

It is important to balance the benefits of fluoride with the increased chance for mild dental fluorosis, which is faint, white specks on the teeth. These specks are usually so subtle that only a dental professional will notice the condition. It does not cause pain and does not affect the health or function of teeth. If parents are concerned about mild dental fluorosis and the baby is not eating or drinking anything else besides formula, they can choose to purchase ready-to-feed formula. Another option when mixing infant formula would be to alternate between using fluoridated tap water and low-fluoride bottled water labeled as de-ionized, purified, demineralized, or distilled, and without any fluoride added after purification treatment. The U.S. Food and Drug Administration (FDA) require the label to indicate when fluoride is added.

A 2010 study examined the issue of fluorosis and infant formula, and reached the conclusion that “no general recommendations to avoid use of fluoridated water in reconstituting infant formula are warranted.”¹³² The researchers examined the condition’s impact on children and concluded that “the effect of mild fluorosis was not adverse and could even be favorable.”

INFANT FORMULA: SAMPLE OF RELEVANT RESEARCH ARTICLES FROM FLUORIDESCIENCE.ORG¹³³

Hujoel PP, Zina LG, Moimaz SAS, Cunha-Cruz J. Infant formula and enamel fluorosis: a systematic review. J Am Dent Assoc. 2009;140:841-54.

The authors conducted a systematic review of controlled studies regarding the risk of developing enamel fluorosis associated with use of infant formula.

After evaluating 969 potentially eligible published studies, the reviewers found that the authors of 17 of these 19 studies reported Odds Ratios (OR), and, among these, infant formula consumption was associated with a higher prevalence of enamel fluorosis in the permanent dentition (summary OR 1.8, 95 percent confidence interval [CI] 1.4–2.3). There was significant heterogeneity among studies (I² 66 percent) and evidence of publication bias ($P = .002$). A metaregression analysis indicated that the ORs associating infant formula with enamel fluorosis increased by five percent for each 0.1-part-per-million increase in the reported levels of fluoride in the water supply (OR 1.05, 95 percent CI 1.02–1.09). This suggests that infant formula consumption was associated with a higher prevalence of enamel fluorosis in the permanent dentition, more indicative of the level of the fluoride in the water supply.

The evidence that the fluoride in the infant formula caused enamel fluorosis was weak, as other mechanisms could explain the observed association.¹³⁴

Levy SM, Broffitt B, Marshall TA, Eichenberger-Gilmore JM, Warren JJ. Associations between fluorosis of permanent incisors and fluoride intake from infant formula, other dietary sources and dentifrice during early childhood. J Am Dent Assoc. 2010;141(10):1190-1201.¹³⁵

In this paper, the authors describe associations between dental fluorosis and fluoride intake based on a study conducted in Iowa.

The authors administered periodic questionnaires to parents to assess children's early fluoride intake sources from beverages, selected foods, dentifrice, and supplements. They later assessed relationships between fluorosis of the permanent maxillary incisors and fluoride intake from beverages and other sources.

Considering only fluoride intake from ages three to nine months, the authors found that participants with fluorosis (97 percent of which was mild) had significantly greater cumulative fluoride intake (AUC) from reconstituted powdered infant formula and other beverages with added water than did those without fluorosis.

Greater fluoride intakes from reconstituted powdered formulas (when participants were aged three to nine months) and other water-added beverages (when participants were aged three to nine months) increased fluorosis risk, as did higher dentifrice intake by participants when aged 16 to 36 months.¹³⁶

THE FACTS SUPPORT COMMUNITY
WATER FLUORIDATION

OTHER COMMON MYTHS

FAST FACTS

01



THYROID GLAND: Review of studies suggests there is no link between optimal fluoride levels and change in size or function of the thyroid gland.

02



EUROPE: Fluoridated water is provided to 13 million Europeans. Countries in which it is logistically difficult to add fluoride to the water add fluoride to salt or milk.

03



TOOTHPASTE: Fluoride in saliva, combined with the more concentrated fluoride in toothpaste, work together to prevent more tooth decay than using either alone.

04



TOOTHPASTE: The American Dental Association recommends the appropriate amount of fluoride toothpaste should be used by all children regardless of age.

MYTHS

OTHER COMMON MYTHS

THYROID GLAND

Reviews of studies suggest there is no link between optimal fluoride levels and a change in size or function of the thyroid gland.¹³⁷ In fact, the American Thyroid Association's list of the major causes of hypothyroidism does not even include fluoride.¹³⁸ Studies have not found evidence of fluoride being linked to any disorders of the thyroid.¹³⁹⁻⁴⁰

Many major reviews of the relevant scientific literature around the world support this conclusion. Of particular importance are:

- An exhaustive review conducted in 1976 by an expert scientific committee of the Royal College of Physicians of England;
- A systematic review in 2000 by the NHS Centre for Reviews and Dissemination at the University of York; and,
- A 2002 review by an international group of experts for the International Programme on Chemical Safety, under the joint sponsorship of the World Health Organization, the United Nations Environment Programme, and the International Labour Organization.¹⁴¹

COMMUNITY WATER FLUORIDATION IN EUROPE

Fluoridated water is provided to 13 million Europeans, such as residents of Great Britain, Ireland and Spain.¹⁴² Other European countries such as France and Italy have a number of regions with natural levels of fluoride that are high enough to prevent tooth decay.¹⁴³ For some European countries, however, the infrastructure and terrain do not make it practical to engage in community water fluoridation (CWF). Switzerland is one example, and salt fluoridation reaches the majority of Swiss residents. Fluoridated salt, fluoridated milk and fluoride rinse programs are examples of the alternative ways in which nearly all European countries provide fluoride to their people.¹⁴⁴

The United States (U.S.) has used research and implemented strategies that improve population health. Water fluoridation is one example. Many nations have followed our lead. Although there are alternative options to water fluoridation, the World Health Organization states that "fluoridation of water supplies, where possible, is the most

When consuming water with fluoride in it, the low concentration of fluoride becomes incorporated in saliva, providing constant protection throughout the day and helping keep teeth strong.

effective public health measure for the prevention of dental decay.” In many parts of the world, fluoridation is not feasible or a high priority, usually due to the lack of a central water supply, the existence of more life threatening health needs or the lack of trained technical personnel or sufficient funds for implementation and maintenance costs.¹⁴⁵ However, in the U.S., CWF is the best option because it is cost effective, no compliance is required and it serves everyone.

TOOTHPASTE

Most toothpaste purchased today contains fluoride, as a result, some people question the need for getting fluoride from other sources, including fluoride in drinking water. According to the Centers for Disease Control and Prevention (CDC), both drinking water and toothpaste with fluoride provide important and complementary benefits.¹⁴⁶ Fluoride toothpaste contains a much higher concentration of fluoride (1000-1500 ppm) than optimally fluoridated water (0.7 ppm). The equivalent of mg/L when you measure fluoride in toothpaste is ppm. However, the fluoride from toothpaste only stays in the mouth for one to two hours after using toothpaste, leaving the teeth unprotected from acid attacks until toothpaste is used again.¹⁴⁷ Unfortunately, for many people, brushing with fluoride toothpaste is not enough to prevent tooth decay. When consuming water with fluoride in it, the low concentration of fluoride becomes incorporated in saliva, providing constant protection throughout the day and helping keep teeth strong. That low concentration of fluoride in saliva combined with the more concentrated fluoride in toothpaste work together to prevent more tooth decay than using either alone. Think of it this way: we are safest in our cars with seat belts and air bags, too.¹⁴⁸ Research on fluoridated water was carried out well before fluoride toothpaste became available and research has continued since fluoride toothpaste has been used broadly. The CDC reports that schoolchildren living in fluoridated communities on average have 2.25 fewer decayed teeth compared with similar children not living in fluoridated communities.¹⁴⁹ Many other studies show fluoridated water continues to protect against tooth decay. Here are a few examples:

- A study of communities in Illinois and Nebraska (1998) found that the tooth decay rate among children in the fluoridated town was 45 percent lower than the rate among kids in the non-fluoridated communities. This benefit occurred even though more than 94 percent of children in all of these communities were using fluoridated toothpaste.¹⁵⁰
- A New York study (2010) revealed that low-income children in less fluoridated counties needed 33 percent more fillings, root canals and extractions than those in counties where fluoridated water was common.¹⁵¹
- A study of Alaska children (2011) showed that kids living in non-fluoridated areas had a 32 percent higher rate of decayed, missing or filled teeth than kids in fluoridated communities.¹⁵²
- A Nevada study (2010) examined teenagers’ oral health and found that living in a community without fluoridated water was one of the top three factors associated with high rates of decay and other dental problems.¹⁵³



Frank Miller

Superintendent

City of Cudahy Water Utility

The Cudahy Water Utility (Utility) feels it is important for public health to feed fluoride to the public drinking water supply and our plant operators feel it is important to feed the recommended levels in order to achieve the best health results for Cudahy. The Cudahy Board of Health has been consistent in its recommendation that the Utility add fluoride to the public water supply and the Utility Commission has always supported that recommendation.

By receiving the Centers for Disease Control and Prevention (CDC) Water Fluoridation Quality Award, the plant operators feel it shows their commitment to public health and to high quality plant operations. When looking for quality resources on fluoride, the plant staff utilizes information from the Wisconsin Department of Health Services, CDC and the American Dental Association.

TESTIMONIAL

A high-speed photograph of water being poured into a clear glass. The water is captured in mid-pour, creating a dynamic stream of water that splashes and bubbles as it enters the glass. The background is a solid, vibrant blue. A horizontal green bar is overlaid across the middle of the image, containing the title text.

FLUORIDATION PRACTICE

FAST FACTS

01



Do most Wisconsin residents living on public water systems have access to the benefits of community water fluoridation?

Yes, in Wisconsin, over three million people, or about 90 percent of the population living on public water systems, have the advantages of fluoridated water.¹⁵⁴

02



In 2010, why was there a change in the recommended optimal fluoride level?

More recent studies show that cooler states do not consume less water per capita than warmer states.¹⁵² Moreover, Americans now have access to more sources of fluoride, such as toothpaste and mouth rinses, than they did when water fluoridation was first introduced in the United States (U.S.).¹⁵⁵

03



What role do water operators play?

Water operators are public health agents, preventing a tremendous amount of tooth decay by adjusting the fluoride concentration of fluoride deficient water supplies to reach the optimal level.

FLUORIDATION PRACTICE IN WISCONSIN

Community water fluoridation (CWF) is the process of adjusting the fluoride content that occurs naturally in a community's water to the best level for preventing tooth decay. Almost all water contains some naturally occurring fluoride, but usually at levels too low to prevent tooth decay.¹⁵⁶ Water operators play an important role in the public's health by ensuring safe water supplies. One component of this responsibility might be adjusting the fluoride concentration of fluoride-deficient water supplies to reach the optimal level. This responsibility plays an enormous role in improving the oral health of residents with access to fluoridated water. In the United States, nearly 75 percent of people on public water systems receive fluoridated water. In Wisconsin, over three million people, or almost 90 percent of the population living on public water systems, have the advantages of fluoridated water.

RECOMMENDED OPTIMAL FLUORIDE LEVELS

In 2015, the United States (U.S.) Public Health Service, a division of Department of Health and Human Services (HHS), updated the recommended optimal level from a range of 0.7 to 1.2 mg/L to a single level of 0.7 mg/L. For community water systems that add fluoride to their water, HHS recommends a fluoride concentration of 0.7 mg/L to maintain tooth decay prevention benefits.¹⁵⁷ While considering the final recommendation, HHS took into account current levels of tooth decay and dental fluorosis, the lack of geographical differences in water intake and the Environmental Protection Agency's new assessments of cumulative sources of fluoride exposure.¹⁵⁸ The optimal fluoride concentration of 0.7 mg/L provides the best balance of protection from tooth decay, while limiting the risk of dental fluorosis.¹⁵⁹ Both the 1962 Public Health Service recommendation and the current updated recommendation for fluoride concentration in community drinking water were set to achieve a reduction in tooth decay while minimizing the risk of dental fluorosis. Implementation of the new recommendation is expected to lead to a reduction of approximately 25 percent (range: 12 percent to 42 percent) in fluoride intake from drinking water alone and a reduction of approximately 14 percent (range: 5 percent to 29 percent) in total fluoride intake.¹⁶⁰



FLUORIDATION REGULATION

The Environmental Protection Agency's (EPA) mission is to protect human health and the environment.¹⁶¹ Under the Safe Drinking Water Act, the EPA sets standards for drinking water quality. The EPA is exclusively charged with regulating drinking water additives in the U.S. to ensure the safety of products added to water for its treatment. Because water fluoridation has been demonstrated as effective in reducing dental tooth decay, the United States Public Health Service, a division of the Department of Health and Human Services (HHS) provides recommendations regarding optimal fluoride concentrations in drinking water for community water systems.¹⁶² The mission of HHS is to enhance and protect the health and well-being of all Americans.¹⁶³ HHS manages programs that impact health, public health, and human services outcomes throughout the life span, especially for those who are least able to help themselves.¹⁶⁴ HHS has the responsibility for administering a wide variety of health and human services and conducting research for the nation. HHS has the largest source of funding for medical research in the world and has the ability to leverage health information and data to improve quality of care to drive innovative solutions to health, public health and human services challenges.

EPA's drinking water standard differs from the HHS recommended optimal fluoridation level because the two benchmarks have different purposes and are set under different authorities. The EPA's enforceable standard for the highest level of fluoride that is allowed in public water systems is 4.0 mg/L.¹⁶⁵ The standard is set to protect against possible health risks from exposure to too much fluoride. The HHS recommended level of 0.7 mg/L is set to promote public health benefits of fluoride for preventing tooth decay, while minimizing the chance for dental fluorosis.¹⁶⁶

WATER FLUORIDATION QUALITY AWARD

Each year, Wisconsin drinking water programs and professional associations related to the drinking water industry have quality award programs. Many water utilities strive to qualify for these awards. Earning these awards represents a high level of operator care and accomplishment. To recognize local drinking water programs providing a consistent level of fluoride in the water supply, the Centers for Disease Control and Prevention (CDC) recognizes public water systems that achieve optimal fluoridation levels with an annual Water Fluoridation Quality Award. For a water system to be eligible, its performance must be documented by the state in the Water Fluoridation Reporting System (WFRS).

The Wisconsin Oral Health Program reviews monthly operating data submitted to the Department of Natural Resources (DNR). The water systems are evaluated to identify those that meet strict standards for accuracy in water fluoride treatment, daily monitoring and reporting. The information from these reports is entered into WFRS and used to identify systems that qualify for the Water Fluoridation Quality Award. Once systems are identified, CDC issues the Water Fluoridation Quality Award. The annual award certificates are mailed to the Wisconsin Oral Health Program, who is responsible for distributing the award certificates to the recipient communities.

WATER FLUORIDATION QUALITY AWARD CRITERIA

Award criteria

Adequate daily samples:

- Sample required to be taken daily
- Must be optimally fluoridating for 12 months within a year
- 75 percent of daily samples must be in the recommended optimal operating range

Optimal fluoride concentration control range:

- Optimal fluoride concentration is 0.7 mg/L
- Monthly average is a minimum of 0.7 mg/L
- Lowest optimal concentration is 0.6 mg/L
- Highest optimal concentration is 0.8 mg/L

Adequate split samples:

- Monthly split sample must be submitted to Wisconsin State Laboratory of Hygiene (WSLH) 12 months out of the year
- Operator and lab split sample results must correlate
- Split +/- tolerance is 0.20 mg/L

To be eligible for the awards, all monthly data must be correctly entered into the DNR Electronic Monthly Operating Report by February 1 of each year.

A vertical photograph of water droplets falling into a pool of water. The background is a clear, bright blue sky. The water surface is dark blue with white highlights from the falling droplets. The droplets are in various stages of descent, with some just starting to fall and others creating ripples on the surface. A solid green horizontal bar is overlaid on the right side of the image, containing the text 'TAKE ACTION' in white.

TAKE
ACTION

WHY GET INVOLVED?

Some medical, dental, public health professionals, as well as community leaders, may not be familiar with the research on the public health benefits of community water fluoridation or may not feel comfortable educating others about these benefits. In Wisconsin, the decision to fluoridate is determined at the local level. Community leaders are concerned with both the well-being of their constituents and the financial situation of the community. Some may have concerns about CWF related to what they have heard from a concerned citizen or read online. Many of them may not have had the time to explore the potentially false allegations about fluoride made by community members.

As a local resident and professional in the community, city officials and community members value your knowledge and expertise. It is important to get involved at the local level and connect with community leaders to make them aware of the local, statewide and national support CWF has, along with the health benefits and cost savings. Community leaders are hearing about this topic from community members and often times they are misinformed. It is critical that accurate scientific information be shared. Many people are now turning to the internet for information and often struggle with identifying credible information. It is essential that the oral health workforce (health professionals, public health practitioners, and water operators & engineers) and other advocates provide accurate and reliable information to the community before they turn to the internet. Use the “Take Action” section to find resources that will help start the conversation about CWF in your community. [Pages 69 to 74](#) outline proactive strategies and [pages 75 to 85](#) will guide you to responding to a local concern.

COMMUNICATION STRATEGIES

Being up-to-date on community water fluoridation (CWF) science as well as having a keen awareness of strategies used by those opposed to CWF may seem daunting. The first step in taking action on CWF in your community is to educate yourself on communication strategies. Some community members and leaders may not be familiar with the topic and others may be relying on inaccurate information. A tactic often used by those opposed to CWF is to take words out of context. For example, while scientifically correct the word “chemical” can have a negative

It is essential that the oral health workforce (health professionals, public health practitioners, and water operators and engineers) and other advocates provide accurate and reliable information to the community before they turn to the internet.



connotation. Instead of using the term chemical, a better approach would be to point out that fluoride is a naturally occurring mineral found in almost all water supplies and adjusted to the right amount to prevent tooth decay.

Be prepared for other individuals and/or groups who want to turn the topic of CWF into a debate. When talking about CWF do not engage in a back and forth discussion. It perpetuates the myth that CWF is a debatable topic. There is no debate to be had. As demonstrated throughout this toolkit, the science and facts support CWF. To form comfortable, productive conversations about CWF use plain language, keep the message positive and simple, and acknowledge concerns.

BE PROACTIVE

Provide CWF education before it becomes a topic of concern in your community. Be proactive and start the conversation with community members and leaders to make them aware of the local, statewide and national support CWF has, along with the health benefits, and cost savings. While in the office or out in the community start brief conversations with patients, community members, other health professionals and community leaders about CWF. Educate as many people as possible. For example, parents and caregivers are especially concerned for the well-being of their children and want what is best for them. Talking with them and explaining the benefits of CWF can help strengthen their confidence that fluoridation is a smart, safe way to protect teeth. Visit <http://tapintohealthyteeth.org/health-professionals/#patient> for a parent and caregiver handout explaining the importance

and safety of fluoride in an easy to follow question and answer format. Leave handouts in your patient waiting rooms or office reception area so that patients and community members can leave with accurate information in hand. Infographics can be a useful tool for sharing information and data on CWF. An infographic uses images and minimal text to visually display information. See the “Weighing Support for Community Water Fluoridation in Wisconsin” infographic on [page 33](#) of the Toolkit. Visit <http://tapintohealthyteeth.org/health-professionals/> for additional, free resources that can be printed and shared. Discuss with the local health officer the possibility of the local board of health having a position statement. If a position statement is already in place, you are immediately prepared to respond to questions from community leaders, patients, etc. See [page 34](#) of the toolkit for more information on position statements.

USE PLAIN LANGUAGE

When talking about CWF it is important to use plain language and avoid clinical or complex engineering terms. For example, use the term cavities instead of caries and fillings instead of restorations. When talking about the fluoride added to public water systems, instead of using the term optimal level say “the right amount to benefit teeth.” Use the term additive instead of chemical. Visit <http://tapintohealthyteeth.org> for resources that offer tips for how to most effectively talk about CWF.

KEEP MESSAGE SIMPLE & POSITIVE

The benefits of CWF are proven through rigorous scientific study. Individuals and organizations opposed to CWF often frame CWF as a debatable topic and use fear and doubt to gain support. Rather than responding to this, keep your message about CWF simple and positive by focusing on the scientifically proven benefits and widespread support from all major health organizations. See the fast facts throughout the toolkit for examples of positive messaging.

ACKNOWLEDGE CONCERNS

Many people with concerns about CWF are repeating what they have read online or heard from a friend or neighbor. Some of them have not had the time to explore the allegations about fluoride to confirm their accuracy and others may not have the ability to critically review the information. Listen closely when a patient, community member, friend or neighbor shares a concern about fluoride. Acknowledging the concerns of others gives you an opportunity to share sound information. It is important to be attentive and to avoid using conversation stoppers. For example, try using the phrase “I understand your concerns and I had the same ones until I looked into the issues further.” This phrase can be used at any point in the conversation when concerns are raised. Visit the “Recognize Different Views” section on [page 37](#) for other examples of how to validate the concern without validating the conclusion.

ELEVATOR SPEECHES

An elevator speech is a concise, yet convincing statement used to generate interest in a topic. The speech should last a short elevator ride, no longer than one minute. Having a prepared elevator speech on the topic of community water fluoridation (CWF) allows proponents of CWF to be ready at any time to succinctly state the benefits of CWF and its importance for the community. An elevator speech may be used when seeing a local leader or decision maker out in the community. It may also be used when talking to patients, clients or community members about the importance of CWF. See below for one minute messages developed by the Wisconsin Oral Health Coalition about the oral health benefits of optimally fluoridated water.

ELEVATOR SPEECH I:

Why drink fluoridated tap water? Fluoridated water has many oral health benefits. Throughout a person's life, fluoride helps prevent cavities and rebuilds damaged tooth enamel. Adolescents and adults benefit when fluoride in the water becomes part of their saliva. Small amounts of fluoride in the saliva help protect teeth from cavities all day long. When children's teeth are developing, fluoride from tap water protects the teeth as they are forming to make them stronger. Most brands of bottled water do not have the right amount of fluoride to protect teeth from decay. Only fluoridated tap water gives the full benefits of good oral health and is better for the environment, cheaper and easier to access than bottled water.

ELEVATOR SPEECH II

(Utilize if a community is considering ending CWF):

Community water fluoridation should be continued in [city/municipality]. Fluoridation reduces tooth decay by approximately 25 percent over a person's lifetime. By ending water fluoridation, [this city] will see an increase in tooth decay, especially among children. This will result in expensive dental treatment, including fillings, crowns and other costly procedures that could have been prevented. Opponents to fluoridation have misconceptions about the safety and efficacy of this practice. Research over the past 70 years confirms that fluoridation, as practiced in the United States, is safe and provides substantial oral health benefits to all members of the public. We have made so much progress in reducing tooth decay among our residents. Let us not turn back the clock by ending fluoridation. I support water fluoridation for the health and well-being of this community.

POSITION STATEMENTS

Developing a policy statement/position statement/resolution on community water fluoridation (CWF) is a way for organizations or groups to show their commitment to the health of their community. Any organization, whether you are a local board of health, medical office or even the local grocery store, can have a position statement. Having a statement in place lets community members know the organization/group supports proven strategies to improve public health and they are dedicated to strengthening their community. Once a position statement is in place, be sure to share it with the community. Utilize social media, place it on a website, send out a press release or distribute it with other mailings. For examples of CWF resolutions, see [page 34](#) of the toolkit or visit the Tap into Healthy Teeth website at: <http://tapintohealthyteeth.org/helpful-links/>.

SOCIAL MEDIA

Utilizing social media networks can be an effective tool to promote the safety, effectiveness and cost-saving benefits of community water fluoridation (CWF). Social media is an increasingly popular and fast method of sharing information with a wide audience. In fact, the Centers for Disease Control and Prevention (CDC) states, *“Using social media tools has become an effective way to expand reach, foster engagement and increase access to credible, science-based health messages.”*¹⁶⁹ As social media has become increasingly popular, it is often where people turn to seek out information, including information on health related topics. This trend requires integrating social media into how we educate and communicate messages about CWF. There is especially one organization opposed to CWF that utilizes social media very effectively to communicate with the public. Traditional methods of communication (print materials, etc.) are still effective for some audiences, but in order to ensure accurate information and resources are available to the general public, trusted health professionals need to share information via various social media outlets. Presenting information in various formats will expand the reach of key messages and ultimately, help improve the availability of reliable and trusted content.

One way to share information is to use your existing website and simply provide links to CWF information. This ensures that visitors to your website are directed to credible sources of information. We recommend these websites:

- <http://tapintohealthyteeth.org/>
- <http://ilikemyteeth.org/>
- <http://www.cdc.gov/fluoridation/>

Badges or buttons, which are small web graphics or images created specifically for organizations to post on their websites, direct visitors to additional information. This is another option for sharing CWF information that requires little resources. Many national partners offer these as a way to share information, promote activities and increase awareness. Using badges or buttons allows viewers to see a visually appealing picture that when clicked, takes them directly to the information. To add a button or badge to your website, social networking profile or blog, simply copy and paste the code assigned to the image. There are several websites that offer specific code to embed a button on your website.

Widgets, offered by some well-respected health organizations, allow you to display featured content directly on your web page, blog or social network profile. The content can easily be embedded in your website. Once the widget has been added to your website, there is no technical maintenance required as the organization that created the widget updates the content automatically. Visit <http://tapintohealthyteeth.org/helpful-links/> to see examples of a button from the CDC and a widget from the Campaign for Dental Health.

Social networking sites are online communities used by millions of people to interact with family, friends and acquaintances. They offer a way to engage with other users, share content and learn. Some examples of popular social networking sites include Facebook, LinkedIn and Twitter. Using these sites may allow you to reach a wider audience. It is important to consider your overall communication strategies and objectives prior to launching one of these sites. Other considerations include who will write posts that engage the audience, how frequently information will be communicated, and how you will encourage the audience to share and cross-promote your posts. One example of a social media campaign is Fluoride Fridays, from the Wisconsin Dental Association (WDA). They use Facebook and Twitter to educate the oral health community and general public about the science behind CWF. An alternative option to creating your own campaign would be to follow the WDA and other organizations that support CWF and routinely “like,” “share” and “retweet” what they have posted.

The CDC has developed *The Health Communicator's Social Media Toolkit* for a beginner audience, designed to provide guidance and share lessons on using social media. Visit *The Health Communicator's Social Media Toolkit*, at <http://www.cdc.gov/socialmedia/tools/guidelines/socialmediatoolkit.html>. Here you will find more detailed information on social media tools, buttons and badges, RSS feeds, Podcasts, online video sharing, eCards, content syndication, image sharing, blogs, etc.

Use the fast facts throughout the toolkit for examples of positive messaging to share through social media. Also, see the examples of social media messages developed by Children's Dental Health Project (below).

SOCIAL MEDIA MESSAGES

OVERALL MESSAGES

Learn why @CDCgov named water fluoridation one of "10 great public health achievements"

<http://1.usa.gov/1gl6SLY> #factsfavorfluoridation

#Fluoride toothpaste helps prevent tooth decay, but fluoridated water adds more protection <http://bit.ly/1n7iIWM> #factsfavorfluoridation

A toast to healthier teeth: 3/4 of Americans on public water systems get fluoridated water <http://bit.ly/1HSPbWo> #factsfavorfluoridation

FLUORIDATION IS SAFE AND EFFECTIVE

After reviewing 161 studies, expert panel found that #factsfavorfluoridation <http://bit.ly/OiYLf> #fluoride

Studies prove that adults also benefit from drinking fluoridated water <http://bit.ly/15MXLqV> #factsfavorfluoridation #fluoride

British study links hospital visits for severe tooth decay to lack of water fluoridation <http://bit.ly/ZSxgxD> #factsfavorfluoridation

IT'S INEXPENSIVE AND SAVES MONEY

@CDCgov: Fluoridation is "least expensive way" for all ppl in a city to get fluoride's benefits <http://1.usa.gov/1j28kdd> #factsfavorfluoridation

Is water fluoridation expensive or not? Learn more at <http://bit.ly/1vYwDPs> #factsfavorfluoridation #fluoride

These messages were prepared by the Children's Dental Health Project.

For more social media messages visit:

<http://www.ilikemyteeth.org/wp-content/uploads/2015/01/Social-Media-Kit-70-Years-of-CWF.pdf>

ADDRESSING COMMUNITY WATER FLUORIDATION CONCERNS?

1. Gather Information

- a. Connect with community leaders (local health officer, city leaders, water operator, etc.) to share what you know and learn more about the concern.
 - i. Use the Community Assessment Worksheet [page 76](#) to track information.

2. Develop a Plan

- a. Contact the Wisconsin Oral Health Coalition at <http://tapintohealthyteeth.org/contact/> for support coordinating efforts to address community water fluoridation (CWF)
- b. Reach out to local health professionals and community members to attend meetings and/or write letters of support or make phone calls to community leaders.

3. Take Action

- a. Coordinate local efforts. Track what activity each person or organization has committed to doing.
- b. Send a letter of support to decision makers. See [page 83](#) for guidance on letters of support.
- c. If the topic of CWF is on a public meeting agenda:
 - i. Draft testimony and have someone review it to ensure a strong, clear message that focuses on the values of the community. [See below](#) for guidance on public testimony.
 - ii. Provide resources to those who will be attending a meeting or contacting community leaders. Visit <http://tapintohealthyteeth.org> for CWF resources.
 - iii. Ensure local advocates have a copy of the meeting agenda and the time/location prior to the meeting.

4. Monitor

- a. Monitor community news and council agendas to remain informed of future activity

PUBLIC TESTIMONY

Providing public testimony is an effective way to help decision makers understand how an issue or policy affects the community. As a local resident and a professional in the community, city officials respect your knowledge and expertise. Providing testimony at a public meeting is a valuable way to connect with community leaders and make them aware of the support community water fluoridation (CWF) has, along with educating them about the health benefits and cost savings. When providing public testimony at a community meeting make sure you have all of the meeting details in advance. Not all meetings are created equal, different communities and groups (city council, water utility, etc.) may have varying formats. Gather as much information as you can in advance of the meeting. To help you prepare for providing public testimony, utilize the community assessment worksheet [page 76](#), reference the Communication Strategies section [page 69](#), and review the sample testimony [page 77](#) developed by the Campaign for Dental Health for a health professional (dentist, dental hygienist, physician, nurse, etc.) speaking in support of CWF at a city council or local board meeting.

COMMUNITY ASSESSMENT WORKSHEET

Does my community currently fluoridate their public water supply?

Yes No

If **yes**, are they considering discontinuing CWF?

Yes No

If they are considering discontinuing CWF, what is the primary reason?

- Health Concerns
- Financial Concerns
- Other

Other Comments:

What entity or individual in this community is the decision-maker re: CWF?

Who is leading the effort to discontinue CWF in the community?

Is a meeting planned to discuss CWF in the community?

Yes No

If yes, please note the following details:

Meeting Date _____ Meeting Location _____

Who is the convening body?

- City Council Water Utility Other

Other Comments:

Is the public allowed to attend?

Yes No

If yes, is the public allowed to present information or provide comment?

Yes No

If yes, what are the details (how long can you speak, do you need permission to be on the agenda or can you show up the day of to speak, can you present a PowerPoint, etc.)?

Will a vote be taken on CWF at this meeting?

Yes No



Remarks to a City Council or Local Board

Health Professional Version

(+/- 5 minutes, 40 seconds)

NOTE: *This version is written for a health professional (dentist, dental hygienist, physician, nurse, etc.). Read these remarks carefully to ensure that all of the details are appropriate for you and your community.*

Consider adding or deleting a few sentences to help make these remarks more closely reflect your views. Consider adding a personal story, but keep it as brief as possible. Be sure to deliver these remarks a couple of times and time yourself while speaking these remarks aloud. Your city council or other local body will probably have a time limit on remarks from the public, so make sure you keep your remarks within that limit. Be sure to stress certain phrases and to insert pauses when appropriate to draw attention to the key points. Don't speak in a hurry.

George Washington defeated the British, but he couldn't defeat tooth decay. By the time he took office as our nation's first president, Washington had lost all but one of his teeth. He suffered from frequent toothaches, and he wore dentures that made it difficult for him to eat. It was nearly 150 years after George Washington's death before American researchers discovered a successful way to protect teeth from decay. *It's called fluoride.* And it's been a part of American life for 70 years.

But before I talk about fluoride, let's consider what's at stake. As a [dentist/nurse/pediatrician/etc.] in our community, I can tell you that children today have much less tooth decay than they had 40 or 50 years ago. Still, tooth decay is the most common chronic childhood disease — even more common than asthma. By the way, you heard

me right: tooth decay is *a disease*. It's not like a cold or a flu, which often goes away with time and bed rest. Like other diseases, tooth decay gets progressively worse unless it is treated. Of course, the *best* approach is to prevent it from happening in the first place.

Within the past 5 years, studies have shown that children with dental problems are more likely to miss school and are more likely to earn below-average grades in school. But this isn't just about kids.

Adults will find it much harder to get a good job if they show up at an interview with unhealthy or missing teeth. In other words, the consequences of poor dental health can easily move *right from their mouths to their wallets*.

Now, for the good news. We have learned a lot about how to prevent cavities over the past 70 years. We've learned that protecting teeth is a lot like protecting passengers in cars. Sure — seatbelts are great, but should we do without airbags in cars? Should we drive without speed limits? It takes a multi-layered approach to protect passengers in a car, and it takes a multi-layered approach to protect teeth in a mouth.

Brushing with fluoride toothpaste is important. And so is eating a healthy diet by limiting sugar and carbohydrates. But fluoridated water is a *crucial part* of the approach to prevent cavities.

Don't take my word for it. Simply look at the research. Thousands of studies demonstrate the benefits and safety of fluoridated water. A number of those studies have been conducted within the past 5 years. For example, a Nevada study found that living in a community *without* fluoridated water was one of the three highest risk factors for dental problems. And a New York study compared low-income children in counties where fluoridation was prevalent with counties where it wasn't. The number of fillings, extractions and other dental treatments was *33% higher* for children in the less fluoridated counties.

The evidence is so strong that *all* leading health and medical organizations recommend fluoridation. The Centers for Disease Control and Prevention — the CDC — endorses fluoridation. So does a long line of U.S. Surgeons General, regardless of the party of the president who appointed them. Fluoridation supporters include the American Academy of Pediatrics, the American Dental Association and the American Medical Association. **[Mention your own affiliation/membership in these organizations, if appropriate.]**

The list of supporters is very long. *In fact, there is no major, national medical or scientific organization that opposes it.*

Perhaps I could see someone questioning the safety or effectiveness of fluoridation if this were a brand-new idea. *But it isn't.* For 70 years, fluoridation has been used safely and effectively to reduce tooth decay. This made-in-America approach has been so successful that tens of millions of people are using it around the globe — in countries like Britain, Spain, Canada, Brazil, Ireland, Australia and Singapore.

Let's not kid ourselves. Ending water fluoridation would invite more tooth decay into our community where it would create more pain and more shame. Why on earth would we do such a thing?

I know you all have seen or heard a variety of claims made about fluoride. If you look into those claims, most of them can be traced back to a handful of websites. They look reputable, but if you scratch beneath the surface, you learn how unreliable and inaccurate they are.

I want to point out that 3 common claims opponents make have been examined by PolitiFact, an independent, non-partisan fact-checker. It found that all 3 of these claims were false or misleading.

Is fluoride safe? *You bet it is.* I say that not only as a [dentist, nurse, pediatrician, etc.], but as a father of two children. These days, parents like me have a lot of things to worry about, but I can say with confidence that fluoride is not one of them. If you all voted to end fluoridation, *that* would truly be something to worry about. Ending fluoridation would impose a hidden tax on many parents because they would need to make up for this missing source of fluoride by purchasing fluoride supplements for their kids and many more would have to pay the cost of the increased amount of dental care their children would require.

Most communities in the U.S. fluoridate their drinking water. They respect and follow the science. They value health and wellness. Ending fluoridation could portray our community as backward and behind the times. What effect could this have on local businesses? How could this change the way our community is viewed or perceived by others around the state? I'm proud of our community, and I would hate to see that happen.

Don't deprive the children and adults in this community of fluoridated water — something we know is safe and effective. *Please preserve fluoridation*, a “Made-in-America” practice that has improved health all across our country. Thank you.

[Or consider using the following text as your closing paragraph:]

Council members have an important decision to make. Will you stand with the most respected health and medical organizations? I certainly hope so. Fluoridation has made such a big difference in reducing dental problems. I support it, and I sure hope you will support it too. Thank you.

#

LETTER OF SUPPORT

A letter of support lets decision makers know where you stand. As a local resident and a professional in the community, city officials respect your knowledge and expertise. Writing a letter of support for community water fluoridation (CWF) can help to increase support in your community and educate decision makers on the health benefits and cost savings of CWF. A well-crafted letter of support should be polite, use available facts and data, and concisely explain why you care about the issue. When a rollback attempt is occurring, the time window is often short and you want to prepare your letter as soon as possible. When sending letters of support key points to consider are:

- When should I send my letter of support?
 - o Ideally, after learning more about how to respond and what to say. The Wisconsin Oral Health Coalition (WOHC) can provide support; connect with the WOHC at <http://tapintohealthyteeth.org/contact/>.
 - o After having someone review the letter to ensure a strong, clear message that focuses on the values of the community.
 - o Several days in advance of an upcoming meeting so the recipient(s) have time to review.
- Who should I send my letter of support to?
 - o The group or individual who makes decisions related to CWF in the community. This could be a city council, water utility board, etc.
 - o Other groups or individuals working to educate the community on CWF. For example, the health officer or local board of health.
- What additional resources should I provide with my letter?
 - o Resources to address any specific concerns about CWF.
 - o Resources targeted to the audience of your letter.
 - o Visit <http://tapintohealthyteeth.org> for attachments or fact sheets to include with your letter.

See the example letter on [page 84](#) developed by the WOHC for an organization or individual wishing to support CWF, when addressing a city council or local board. Consider personalizing this letter of support by adding or deleting a few sentences. Contact the WOHC at <http://tapintohealthyteeth.org/contact/> for an editable document.

LETTER OF SUPPORT

(Date)

(Inside Address)

Dear *(Name)*:

Having healthy teeth is a significant factor in determining whether children in our/this community are able to eat, sleep, speak and learn. It's a key factor in whether the adults in our/this community can interview successfully for good-paying jobs.

Community water fluoridation helps to protect teeth from decay for people of all ages. It has been proclaimed by the Centers for Disease Control and Prevention (CDC) as one of 10 great public health achievements of the 20th century. According to the best available scientific evidence, community water fluoridation is safe, effective and economical in preventing tooth decay. Our community should maintain water fluoridation so that our residents continue receiving these decay-preventing benefits.

Community water fluoridation saves money. On an individual basis, the lifetime, per-person cost of community water fluoridation is less than the cost of one dental filling. The estimated return on investment for community water fluoridation (*including productivity losses*) ranged from \$4 in small communities of 5,000 people or less, to \$27 in large communities of 200,000 people or more. The benefits from water fluoridation build on those from fluoride in toothpaste. Fluoride toothpaste alone is insufficient, which is why pediatricians and dentists often prescribe fluoride tablets to children living in non-fluoridated areas. Simply by drinking water, people can benefit from water fluoridation's cavity protection, regardless of age, education, race or socio-economic status.

As a *(dentist, pediatrician, public health administrator, parent, citizen)*, my first concern is the health of my *(patients/family/community members)*. Discontinuing community water fluoridation may reduce expenses for the city in the short term. However, it will inevitably lead to higher dental costs for community members, as individuals and families pay for tooth fillings, extractions and emergency room services. We cannot afford to end community water fluoridation.

The bottom line is that community water fluoridation remains the single most effective public health measure to prevent tooth decay. That is why organizations such as the American Dental Association, Centers for Disease Control and Prevention, American Academy of Pediatrics, and the Wisconsin Department of Health Services, along with more than 100 major health and medical organizations recognize the public health benefits of community water fluoridation. Additional information regarding community water fluoridation is available from ilikemyteeth.org.

On behalf of my *(community, patients, family)*, I support community water fluoridation and I encourage *(name of community)* to continue this valuable prevention program for the benefit of all residents.

Sincerely,

(Your name, title)

SUBJECT MATTER EXPERTS

The Wisconsin Oral Health Coalition (WOHC) is here to support you in your efforts related to community water fluoridation (CWF). We can answer questions about CWF, provide resources, connect you to local CWF leaders that can offer assistance and educational opportunities, provide evidence-based science to support the safety and effectiveness of CWF, and provide support if you are working to promote CWF in your community. Connect with the WOHC at <http://tapintohealthyteeth.org/contact/>.

For more information on the public health benefits of CWF, you may contact the State of Wisconsin Oral Health Program at <https://www.dhs.wisconsin.gov/oral-health/contacts.htm>.

FOR MORE INFORMATION:

For more information on the oral health benefits of community water fluoridation (CWF), visit: <http://tapintohealthyteeth.org>. We encourage you to link to our website and to share it with patients and community members, as an accurate and easy-to-use tool to get timely information on CWF.

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*These references were valid as of December, 2016.

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