Title
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Journal
Journal of Public Health Dentistry, 82(3)

ISSN
0022-4006

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Publication Date
2022-06-01

DOI
10.1111/jphd.12480

Peer reviewed

Community water fluoridation and the integrity of equitable public health infrastructure

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Keywords
community water fluoridation; fluoride; health equity; oral health; population health; prevention.

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Received: 2/5/2021; accepted 9/30/2021.

doi: 10.1111/jphd.12480

J Public Health Dent **82** (2022) 358–361

Abstract

Community water fluoridation is a population health program that is in a unique position to equitably prevent dental caries across all socioeconomic groups. A review of the 76-year long history of community water fluoridation shows that the challenges to expanding this program persist despite continued evidence of its efficacy. We offer dental health practitioners an opportunity to share the evidence of this oral disease prevention program with the communities they serve. While dental caries is still the most prevalent chronic disease that disproportionately effects lower socioeconomic status communities, community water fluoridation continues to decrease cavities by 25% at the population level. COVID-19 has reaffirmed the importance of disease prevention and valuing public health infrastructure. There is a continued need for community water fluoridation to offer equitable access to oral disease prevention interventions.

76 YEARS OF COMMUNITY WATER FLUORIDATION

As vaccinations for COVID-19 are rolled out to communities, offering new opportunities for disease prevention, we recognize another milestone across the United States: the 76th Anniversary of Community Water Fluoridation. Optimal community water fluoridation is designed to prevent dental caries (tooth decay) [1]. Even with fluoridated products such as toothpaste and mouth rinses, this public health practice can reduce an additional 25% of tooth decay in children and adults [1]. Almost all water contains some naturally occurring fluoride, but not all at recommended levels to prevent tooth decay. As a public health practice, water fluoridation is the adjustment of the amount of fluoride in public water to make teeth stronger and more resistant to caries [2]. In 1945, Grand Rapids, Michigan became the first U.S. city to fluoridate its public water supply [2]. Five years later, Grand Rapids schoolchildren were found to have significantly fewer cavities than children from the control community of Muskegon, and additional water districts, including Muskegon began fluoridating and seeing similar results [2]. What is startling is that although dental caries is a mostly preventable disease, it remains the most common chronic disease among youth aged 6–19 years [1]. The CDC's 2019 caries report found that the total caries prevalence (untreated and treated) was 52% in United States children aged 6–8 years [3]. According to this data report, dental caries prevalence is higher in Mexican-American (prevalence of 73%) and non-Hispanic Black children (prevalence of 54%); Non-Hispanic white children have the lowest dental caries prevalence at 44% [3]. During 2011–2016, caries prevalence among poor children was 62% while not poor children was 40% [3]. Addressing dental caries at the population level will impact all individuals equitably, especially the populations with the highest disease burden.

CHALLENGES TO COMMUNITY WATER FLUORIDATION

Dental caries in all adults ages 20–64 declined from the early 1970s until 1999–2004, according to the National Health and Nutrition Examination Survey [4]. Community water fluoridation in the U.S. population grew from 29.2% to 56.1% between 1964 and 1992 (about 1% increase per year) [5]. After 1992, the rate of community water fluoridation continued to increase to 63.4% in 2018, but at a lower rate of expansion to new populations (about 0.3%

per year) and has not really changed between 2008 and 2018 [5]. This slowing in the expansion of fluoridation is attributable to several factors, including (1) the public, some scientists, and policymakers sometimes perceive incorrectly that dental caries is no longer a public health problem and that fluoridation is no longer necessary or effective; (2) adoption of water fluoridation can require political processes that make institution of this public health measure difficult; and (3) opponents of water fluoridation often make unsubstantiated claims about adverse health effects of fluoridation in attempts to influence public opinion [6]. Barriers to an expansion of community water fluoridation are rooted in public perception, although research continues to show the safety and efficacy of this public health program [1,7]. COVID-19 has added an additional challenge and exposed the lack of adequate and equitable funding for public health budgets [7]. As health budgets are given a closer look, one of the most equitable and impactful public health programs is at risk in countless communities [8]. To overcome the challenges facing this preventive measure, health professionals at the national, state, and local levels will need to enhance their promotion of fluoridation and commit the necessary resources for equipment, personnel, and training. Evidence-based resources are available for community water fluoridation advocacy, such as the 2018 edition of "Fluoridation Facts" available at no cost to the public on ada.org/fluoride [7]. Another resource is the Centers for Disease Control and Prevention's repository of fluoridation information and innovations in technology, such as the new fluoride tablet and feeder system for typically smaller water systems serving rural communities [9]. The U.S. Department of Health and Human Services has a model for public health infrastructure values titled "Public Health 3.0" [10]. Public Health 3.0 recognized public health budgets should be enhanced for prevention initiatives with cross-sector collaboration to address social determinants of health [7]. Dental health professionals should engage with public health leaders as well as decision makers at the local level to share the evidence of dental disease prevention programs.

EQUITABLE DISEASE PREVENTION

Community water fluoridation is one such program that addresses social and environmental determinants of health by offering safe public drinking water that has an additional oral health benefit. Communities across our nation have recently transformed themselves to prioritize the protection of the public's health in order to prevent the spread of infectious disease. Mask mandates and social distancing have been encouraged by public health leaders to reduce the rate of infectious disease spread. The oral cavity is a unique and significant reservoir for respiratory pathogens and improving oral hygiene may reduce the risk of other diseases, including respiratory complications [11]. COVID-19 interrupted many community services and public health initiatives, such as access to routine dental care in community health centers and school-based programs [10]. These interruptions disproportionally affected communities of color and lower socioeconomic communities [8]. Studies have shown that populations from lower socioeconomic groups within fluoridated communities have less tooth decay when compared to peers in non-fluoridated communities [12,13]. To protect the integrity of equitable public health infrastructure, community water fluoridation is imperative.

CULTURE OF DOUBT

Scientists across the globe have studied the safety and benefits of fluoridated water and have not found consistent and convincing evidence to link community water fluoridation with any harmful health effects [2]. The public will raise questions, and health professionals should respond to concerns with evidence, rather than dismissal. For example, there are voices that claim the disproportionate burden of kidney disease and diabetes in Black Americans could put them at risk of adverse effects from fluoride in water. The best available scientific evidence indicates that those with chronic kidney disease or diabetes can consume optimally fluoridated water without negative consequences [14]. Agnotologists, or those that study culturally induced ignorance, find that the current culture of doubt is characterized by an active rejection or manipulation of scientific data [15]. A culture of doubt is rooted in uncertainty and distrust; and communities that have a history of distrust in health systems may be more likely to be distrustful of public health programs [15]. Those distrustful of experts in the scientific fields that inform communities of the climate crisis and safety of vaccinations are also likely to be distrustful of fluoridation experts [16]. To clearly address concerns spread by a culture of mistrust, clear explanation of the technical data and questions about the efficacy of such programs should be shared for lay audience populations in a health literate manner.

EVIDENCE-BASED SCIENCE

Ongoing promotion of fluoridation by health professionals is a key factor in protecting this population health practice as communities receive misleading information from social media and other Internet sources that are not always rooted in evidence-based science. Patients seek health education from their providers as a trusted source, yet anecdotal reports suggest that many dentists are reluctant to

advocate for fluoridation to avoid confrontation [17]. At the community level, public knowledge of oral diseases has been shown to directly impact the adoption of public health outcomes, such as water fluoridation [18]. Misinformation regarding water fluoridation is a serious public health concern, as some cities across the nation are calling for the discontinuation of this practice. Dental associations are a key resource for health professionals to receive information that can help them become advocates for water fluoridation [18]. Our national organizations, such as the Centers for Disease Control and Prevention (CDC) and the American Dental Association (ADA), are outstanding sources of evidence-based community water fluoridation information. Ongoing research is encouraged, and the best science on fluoridation practice continues to be interpreted by experts for public health practice. The U.S. Public Health Service recommends an optimal water fluoridation concentration of 0.7 milligrams per liter of water, which is similar to 1 inch in 23 miles [18]. This recommended concentration offers the greatest oral health benefit without risk to other parts of the body [18].

COST-EFFECTIVE

Community water fluoridation programs are the most cost-effective population-based tools to reduce tooth decay, and they put the emphasis on prevention versus costlier dental treatment [7]. The cost of a lifetime of water fluoridation for one person is less than the cost of one filling [7]. As Surgeon General Vivek H. Murthy stated, "Water fluoridation is the best method for delivering fluoride to all members of the community, regardless of age, education, income level or access to routine dental care [7]." In July 2020, former Chief Dental Officers of the US Public Health Service, with a combined 350 years of public health experience, signed a letter in support of community water fluoridation as a cornerstone to the prevention of dental caries and improvement of both oral health and overall health [19]. They shared that water fluoridation is "the great equalizer in prevention of dental caries because all individuals regardless of income or education are able to access their public tap water". More than 75 years of scientific research has echoed these sentiments, and, without changing behavior, most Americans can benefit from fluoride's cavity protection.

INTERPROFESSIONAL ADVOCACY

There is a continued need for community water fluoridation to maintain and continue to reduce dental caries prevalence and severity in the United States. While there are several oral health disparities, community water fluoridation is still the most cost-effective public health measure for the primary prevention of dental caries [7]. The U.S. public is generally uninformed about the appropriate use of fluoride and community water fluoridation, and information available to the public on this practice is not always evidence-based [18]. The 2008 APHA Community Water Fluoridation policy statement emphasized the need for public health and health professionals to improve their education of community water fluoridation safety and its efficacy [20]. In the 13 years since the policy statement was released, the recommendation for federal, state, and local agencies and organizations to promote water fluoridation and its adequate infrastructure is especially important in a time where public health challenges at the population level are intertwined and health misinformation is spreading [16,21]. Health professionals can connect with water utility managers and environmental engineers to discuss the public health policies that could benefit the communities they serve. Dental professionals promoting community water fluoridation is a key factor in sustaining and expanding this health program [17]. Interprofessional collaboration at the local, state, and federal level with trusted community partners could address health literacy, the culture of doubt, and the spectrum of hesitancy [15,17,21]. It is imperative that dental public health advocates obtain the best evidence on community water fluoridation and continue to share the science of this important decay-preventing practice.

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How to cite this article: Zokaie T, Pollick H. Community water fluoridation and the integrity of equitable public health infrastructure. *J Public Health Dent*. 2022;82:358–361. https://doi.org/10.1111/jphd.12480

