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EVIDENCE HIGHLIGHTS | Highlighting the Evidence

Community Water Fluoridation Programs

Key Messages

The intention of community water fluoridation (CWF) programs in Canada is to improve the oral health of the population.

The CADTH Health Technology Assessment (HTA) looked at the health outcomes, budget impact, environmental issues, implementation issues, and ethical issues associated with CWF programs. The purpose of this HTA is to provide evidence-based guidance to policy-makers and decision-makers to help orient discussions and decisions about CWF in Canada.

CWF programs are complex, and the decision to fluoridate community water usually lies with municipalities. However, there are many different stakeholders from all levels of government, public health, and the general public who may have very different opinions on water fluoridation, with many different issues to consider.

There is consistent evidence that CWF protects against dental caries in children and adults and leads to improved oral health outcomes with very uncommon and minor side effects, and that CWF programs are cost saving from a societal perspective.

This summary is based on an HTA[1] conducted by CADTH and includes:

- a brief background on the history of CWF in Canada, the use of fluoride in dental caries prevention, and the controversy over CWF
- evidence highlights from the review of CWF effects on dental caries and other health outcomes,[2] findings from the budget impact analysis[3] and environmental assessment,[4] as well as ethical[5] and implementation considerations.[6]

Background

Fluoride and Dental Caries

Cavities and tooth decay — often referred to as dental caries — is a common public health problem in Canada. It affects 57% of children aged six to 11 and 59% of adolescents aged 12 to 18. By adulthood, almost all (96%) Canadians have experienced dental caries. Untreated dental caries can result in pain, infection, premature tooth loss, and misaligned teeth. It can often be difficult for people to visit the dentist to treat dental caries, as they may need to take time off of work or school, and it can be costly if they have to pay out of pocket. This is why it is important to prevent dental caries before they happen.

Epidemiological studies in the 1930s and 1940s found that people living in areas with high naturally occurring fluoride levels in water had a lower incidence of dental caries; this finding led to the addition of low levels of fluoride to community drinking water. Fluoride can prevent dental caries before the teeth emerge through ingesting fluoridated water and foods and beverages produced and processed with fluoridated water, and topically through direct contact with the exposed tooth surface using toothpaste, mouth rinses, gels, and other oral health products.

Community Water Fluoridation in Canada

Community water fluoridation (CWF) is a process of adjusting fluoride levels in the public water supply to a level that prevents dental caries. Municipal governments make the decision to fluoridate water sometimes by means of a community vote or referendum, while the federal, provincial, and territorial governments set guidelines for fluoridation. According to the 2010 Health Canada Guidelines for Drinking Water Quality,[7] the maximum acceptable concentration of fluoride in drinking water is 1.5 ppm (parts per million or mg/L), while the optimal level of fluoride in drinking water is 0.7 ppm. Municipalities with fluoridated drinking water adjust fluoride levels to fall within this Health Canada range, as well as within their own provincial or territorial guidelines.

The majority of Canadians (88.9%) receive their water from municipal water supplies (from water piped into their homes), while 10.5% of Canadians get their water from private wells, and the remainder (0.6%) have their water hauled in (e.g., water trucked into the community). CWF is only available to Canadians who drink from municipal water supplies and, as of 2017, roughly 39% of Canadians have access to fluoridated water. However, in 2007, this estimate was 45% of the population. This decrease is most likely the result of several large Canadian cities having discontinued water fluoridation.

Decisions regarding CWF programs are complex, with many stakeholders and issues to consider. While public health and oral health organizations, and about 60% of the Canadian public, view CWF as an effective, safe, and equitable means of improving and protecting the oral health of populations, CWF is a controversial topic, with strong feelings both in favour of and against water fluoridation. Additionally, implementing CWF programs requires a multi-level process, with involvement and different roles and responsibilities from all levels of government. Regulators are often different from those who decide whether CWF programs will be started (or stopped), who in turn are often different from those who pay for oral health care. With these considerations in mind, CADTH undertook a Health Technology Assessment (HTA) to review the evidence surrounding CWF.

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Evidence Highlights

CADTH undertook an HTA to comprehensively review the multi-disciplinary evidence related to CWF in order to provide guidance to policy- and decision-makers in discussions and decisions about water fluoridation in Canada. The review sought to address whether CWF should be encouraged and maintained in Canada through an assessment of its effectiveness and safety, economic considerations, implementation issues, environmental impact, and ethical considerations. Highlights from the evidence found in the CADTH review are provided as follows.

Bottom Line

There is consistent evidence to support CWF's benefits in reducing dental caries, and insufficient or no evidence to suggest that it leads to adverse health outcomes.

Review of Dental Caries and Other Health Outcomes

The review of the health outcomes literature found consistent evidence that water fluoridation at current Canadian levels was associated with a reduction in dental caries in children and adults. The rates of tooth loss in children and adults, and hospital admissions for removing decayed teeth under a general anesthetic in children tended to be lower in areas with water fluoridation. There was insufficient evidence — meaning few studies that showed mixed results — to assess the extent to which CWF may reduce the difference in dental caries experience across socioeconomic status.

The review found that with increasing levels of fluoride in the drinking water, there was an increase in the prevalence of dental fluorosis (i.e., a side effect from fluoride that can cause teeth to become discoloured). However, dental fluorosis among Canadian children is rare. There was insufficient evidence — meaning few studies that showed mixed results — to evaluate the impact of CWF cessation on children's dental caries experience.

CADTH examined 22 additional, non-dental outcomes to determine whether CWF is associated with other health conditions. For hip fracture, bone cancer, rates of cancer, and cancer-related death, there was consistent evidence that these conditions are not associated with CWF. For Down syndrome, IQ, and cognitive function, there was limited evidence that these outcomes are not associated with CWF at the current Canadian levels. For the remaining 16 potential non-dental outcomes, which included death, heart attack, and other conditions, there was insufficient evidence — few studies and of poor quality, or mixed results — to determine if there is an association between CWF and these outcomes.

Bottom Line

The CADTH budget impact analysis found that introducing or continuing a CWF program in Canadian municipalities resulted in cost savings compared with not introducing a CWF program or stopping an existing CWF program, under a broad societal perspective.

Implementing CWF programs is cost saving for federal, provincial, territorial, and private budgets, but often at the expense of municipalities.

Budget Impact Analysis

The HTA looked at both the budget impact of introducing water fluoridation in a Canadian municipality without an existing CWF program, and the impact of stopping water fluoridation in a Canadian municipality that currently has a CWF program. CADTH's review took a societal perspective and considered costs from federal, provincial, and territorial budgets (e.g., public health insurance plans); municipal budgets (e.g., CWF operations, municipal public dental programs); and private budgets (e.g., private dental insurance and out-of-pocket costs for individuals). Infrastructure and operation costs related to CWF, medical costs, productivity loss (e.g., taking time off for dentist's appointments), and travel costs were considered in the budget impact analysis.

For a Canadian municipality that currently does not have a CWF program, introducing CWF was found to be less costly (with savings from prevented caries) compared with not introducing a program. Overall, the cost of CWF introduction was typically recovered within the first year of starting a fluoridation program.

For a Canadian municipality that currently has CWF, stopping fluoridation was found to be more costly compared with continuing to fluoridate municipal waters, even if the current system had to be renovated. Overall, net cost savings were noted typically within the first three years of continuing CWF.

Municipalities were found to be responsible for the largest cost of introducing or continuing a CWF program but benefited the least given that they usually cover the smallest amount of dental care costs for their citizens. Private insurance and individual patients were found to gain the largest financial benefit given that most dental care is paid for by these groups. Smaller cost savings were noted for provincial and territorial governments, with even smaller gains for the federal government.

Bottom Line

Decisions about CWF programs are complex and involve many different stakeholders from all levels of government, public health, and the general public — all of whom may have very different opinions on water fluoridation. Issues of access to municipal water and oral health care, as well as oral health status, should be considered when discussing and making decisions regarding CWF.

Implementation Issues

For the review of implementation considerations in this HTA, CADTH reviewed the literature and conducted consultations with stakeholders in the field of CWF and oral health. Several relevant populations of interest were identified of those who often have special oral health needs, including children, Indigenous children, new Canadians, and the working poor.

CWF programs are available to those who use municipal water supplies, but not all Canadians have access to municipal water, and not every municipal water supply is fluoridated. Also, while it is up to municipal governments to decide if they will fund the implementation of CWF programs, the burden of paying for dental care often falls on the individual patient.

Rural and remote areas may be challenged in their access to fluoridated water and often have less access to oral health care (e.g., fewer oral health providers). The access to fluoridated water by Indigenous communities is particularly limited and this is especially troublesome considering Indigenous children bear a disproportionate risk and burden of dental caries.

Oral health care providers should be aware of the water fluoridation status, and understand the current oral health conditions of the community they serve.

Bottom Line

Even though there are strong ethical arguments in favour of CWF, it will remain ethically controversial. CADTH's review found that CWF was ethically justifiable from a public health perspective because of its health benefits and equitable approach.

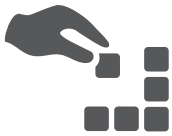
Ethical Considerations

The ethics analysis identified and evaluated key ethical concerns when comparing the benefits and drawbacks of CWF program introduction with stopping CWF. The systematic review of the ethics literature uncovered very different views regarding the benefits and harms of CWF.

A common view of those opposing CWF was that the addition of fluoride to drinking water is done without the consent of people who might drink that water. Some argue that there is little evidence of benefit for CWF or that there is evidence that CWF is harmful. Also, there is the view that CWF does not help certain groups who lack access, and that it is not the role of governments to provide CWF programs.

Those in favour of CWF often view the restrictions on individual choice as justified because of its benefits. They also believe that there is good evidence that CWF is beneficial and has few harms. Also, that CWF improves the health of those in society who are less well off, and that it is appropriate for governments to take steps to promote the health of the populations they serve.

The review found that CWF is ethically justified because in communities where it is available, it is provided to all households. CWF effectively improves oral health at the population level with few harms or side effects.



Bottom Line

While fluoride is common in the environment, very little of the total fluoride found in the environment is from CWF.

Environmental Assessment

CADTH conducted a review of the environmental literature to explore environmental issues associated with CWF.

Fluoride is very common in the environment, and can come from natural sources or human sources. CWF contributes to fluoride in the environment, but this contribution is not a large source. It's estimated that CWF contributes less than 1% of the total fluoride released into Canadian waters and soils.

Based on the literature, fluoride from community water supplies can be released into soil, groundwater, surface waters, and sediment, and many different organisms can be exposed to fluoride. At high enough concentrations, fluoride can have negative effects on plants and animals. However, these concentrations are typically not associated with CWF.

Based on the environmental assessment, unacceptable risks to plants and animals exposed to fluoride from CWF are not expected. CWF is not a large source of fluoride and it may take a very long time to build up significant amounts of fluoride in the environment. The long-term impact of the continual addition of fluoride from community water in the environment is unknown.

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