Health Impact Review of SHB 1684
Concerning public health and fluoridation of drinking water (2022 Legislative Session)

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WASHINGTON STATE BOARD OF HEALTH

HEALTH EQUITY
Governor's Interagency Council on Health Disparities

Full review
The full Health Impact Review report is available at:
https://sboh.wa.gov/Portals/7/Doc/HealthImpactReviews/HIR-2022-04-HB1684.pdf

Acknowledgements
We would like to thank the key informants who provided consultation and technical support during this Health Impact Review.

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(2022 Legislative Session)

Evidence indicates that SHB 1684 would likely result in Group A Water Systems serving 5,000 or more people per day that do not fluoridate conducting a cost analysis of community water fluoridation as part of water system planning, which would likely have no impact on community water fluoridation. The bill would also likely result in specified water systems seeking public health information and notifying customers prior to discontinuing community water fluoridation, and it is unclear how this would impact a water system's decision to discontinue or continue fluoridation. Based on these findings, the pathway to health impacts could not be completed.

BILL INFORMATION

Sponsors: Harris, Bateman, Fitzgibbon, Leavitt, Cody, Macri, Simmons, Pollet, Riccelli

Summary of Bill:

- Requires Group A Water Systems that serve 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation when the system engages in water system planning. Allows other Group A water systems to elect into this requirement.
- Requires State Board of Health (SBOH) to adopt rules to support water systems to include community water fluoridation.
- Requires Washington State Department of Health (DOH) to create a program (subject to the availability of appropriated funding) within the Office of Drinking Water to provide engineering assistance to water systems related to upgrades, modifications, or expansions to implement or upgrade a community water fluoridation system, as long as the water system includes an engineering analysis. Allows DOH to receive funding from private sources to assist with this program.
- Requires Group A Water Systems that serve 5,000 or more people per day considering discontinuation of community water fluoridation to seek public health information from DOH and local health jurisdictions and to notify customers of this intention at least 90 days prior to a vote or decision to discontinue fluoridation. Allows other Group A water systems to elect into this requirement.
- Directs DOH to conduct an oral health equity assessment and provide recommendations to increase access to community water fluoridation to the Legislature by June 30, 2023.

HEALTH IMPACT REVIEW

Summary of Findings:
This Health Impact Review found the following evidence for provisions in SHB 1684:

Pathway 1: Cost analysis for community water fluoridation

- **Informed assumption** that requiring Group A Water Systems serving 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning would result in water systems conducting this cost analysis. This assumption is based on information from key informants representing water systems.
- **Informed assumption** that water systems conducting a cost analysis of community water fluoridation as part of water system planning would have no impact on community water fluoridation. This assumption is based on information from key informants representing water systems. Therefore, the pathway to health impacts could not be completed.

Pathway 2: Customer notification

- **Informed assumption** that requiring Group A Water Systems serving 5,000 or more people per day to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation would result in water systems taking these actions before discontinuing community water fluoridation. This assumption is based on information from key informants representing water systems.
- **Unclear evidence** how seeking public health information and notifying customers 90 days prior to a vote or decision to discontinue community water fluoridation would impact a water system's decision to discontinue or continue fluoridation due to variations in water system governance and political and community contexts. Therefore, the pathway to health impacts could not be completed.

Introduction and Methods

A Health Impact Review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington State (RCW 43.20.285). For the purpose of this review 'health disparities' have been defined as differences in disease, death, and other adverse health conditions that exist between populations (RCW 43.20.270). Differences in health conditions are not intrinsic to a population; rather, inequities are related to social determinants (e.g., access to healthcare, economic stability, racism). This document provides summaries of the evidence analyzed by State Board of Health staff during the Health Impact Review of Substitute House Bill 1684 (SHB 1684).

Staff analyzed the content of SHB 1684 and created a logic model depicting possible pathways leading from the provisions of the bill to health outcomes. We consulted with experts and contacted key informants about the provisions and potential impacts of the bill. We conducted an objective review of published literature for each pathway using databases including PubMed, Google Scholar, and University of Washington Libraries. We evaluated evidence using set criteria and determined a strength-of-evidence for each step in the pathway. More information about key informants and detailed methods are available upon request.

The following pages provide a detailed analysis of the bill, including the logic model, summaries of evidence, and annotated references. The logic model is presented both in text and through a flowchart (Figure 1). The logic model includes information on the strength-of-evidence for each pathway. The strength-of-evidence has been established using set criteria and summarized as:

- **Very strong evidence:** There is a very large body of robust, published evidence and some qualitative primary research with all or almost all evidence supporting the association. There is consensus between all data sources and types, indicating that the premise is well accepted by the scientific community.
- **Strong evidence:** There is a large body of published evidence and some qualitative primary research with the majority of evidence supporting the association, though some sources may have less robust study design or execution. There is consensus between data sources and types.
- **A fair amount of evidence:** There is some published evidence and some qualitative primary research with the majority of evidence supporting the association. The body of evidence may include sources with less robust design and execution and there may be some level of disagreement between data sources and types.
- **Expert opinion:** There is limited or no published evidence; however, rigorous qualitative primary research is available supporting the association, with an attempt to include viewpoints from multiple types of informants. There is consensus among the majority of informants.
- **Informed assumption:** There is limited or no published evidence; however, some qualitative primary research is available. Rigorous qualitative primary research was not possible due to time or other constraints. There is consensus among the majority of informants.

- **No association:** There is some published evidence and some qualitative primary research with the majority of evidence supporting no association or no relationship. The body of evidence may include sources with less robust design and execution and there may be some level of disagreement between data sources and types.
- **Not well researched:** There is limited or no published evidence and limited or no qualitative primary research and the body of evidence has inconsistent or mixed findings, with some supporting the association, some disagreeing, and some finding no connection. There is a lack of consensus between data sources and types.
- **Unclear:** There is a lack of consensus between data sources and types, and the directionality of the association is ambiguous due to potential unintended consequences or other variables.

This review was completed during Legislative Session and was subject to the 10-day turnaround required in statute. This review was subject to time constraints, which influenced the scope of work for this review. The annotated references are only a representation of the evidence and provide examples of current research. In some cases, only a few review articles or meta-analyses are referenced. One article may cite or provide analysis of dozens of other articles. Therefore, the number of references included in the bibliography does not necessarily reflect the strength-of-evidence. In addition, some articles provide evidence for more than one research question, so are referenced multiple times.

Analysis of SHB 1684 and the Scientific Evidence

Summary of relevant background information

- Fluoride is a naturally-occurring mineral commonly found in soil, water, and plants.[1] People typically consume fluoride from fluoridated drinking water, foods and beverages prepared with fluoridated drinking water, and toothpaste and other dental products that contain fluoride.[1]
- The 1974 Safe Drinking Water Act (SDWA) regulates public drinking water supplies to protect public health.[2] The SDWA authorized the U.S. Environmental Protection Agency (U.S. EPA) "to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water."[2]
    - Under the SDWA, fluoride is regulated as an inorganic chemical contaminant, with a maximum contaminant level (MCL) of 4 milligrams per liter (mg/L) to protect human health.[3] MCLs are enforceable under federal regulations.[3]
    - Community water fluoridation is not required under federal law.
- The U.S. Public Health Service's (PHS) recommended fluoride concentration in drinking water is 0.7 mg/L "to prevent tooth decay in children and adults while reducing the risks for children to develop dental fluorosis."[4] This concentration was updated in 2015.[4] The PHS recommendation is not an enforceable federal regulation.[4]
    - Healthy People 2030 states that, "[f]luoride can stop or even reverse the tooth decay process — it can help re-mineralize tooth surfaces and prevent cavities from forming."[5] According to the Surgeon General's 2021 report *Oral Health in America: Advances and Challenges*, "[a]lthough dental caries is largely preventable, if untreated it can lead to pain, inflammation, and the spread of infection to bone and soft tissue."[6] Dental caries are one of the most common chronic diseases across the lifespan.[6,7]
- Under RCW 43.20.050, the Washington State Board of Health (SBOH) has the authority to maintain the state's rules related to public drinking water systems, including requirements that Group A Water Systems must meet to provide safe and reliable public drinking water and to protect public health.
    - WAC 246-290-460 pertains to the fluoridation of drinking water.[8] In 2016, SBOH updated the rule to reflect the updated 0.7 mg/L recommended fluoride concentration. The rule sets related requirements for monitoring, record keeping, and reporting.[8] The rule specifies that water systems must obtain approval from the Washington State Department of Health (DOH) before implementing community water fluoridation and notify DOH before discontinuing fluoridation.[8]
- Community water fluoridation is not required in Washington State.[9]
- Chapter 70A.125 RCW specifies that public drinking water systems must comply with all applicable federal, state, and local rules.[10] The statute outlines requirements for public drinking water systems, including planning for operating, maintenance, and future growth of public water system facilities.[10] The rule defines a public water system as "any system, excluding a system serving only one single-family residence and a system with four or

fewer connections all of which serve residences on the same farm, providing water for human consumption through pipes or other constructed conveyances."[10] Further:

  - Group A Water Systems are those "with [15] or more service connections, regardless of the number of people; or a system serving an average of [25] or more people per day for [60] or more days within a calendar year, regardless of the number of service connections; or a system serving [1,000] or more people for [2] or more consecutive days."[10]
  - Group B Water Systems are those that do not meet the definition of a Group A Water System.[10]

- WAC 246-290-100 requires a Group A community water system to submit a Water System Plan (WSP) if it serves 1,000 or more connections, is a new Group A Water System, or proposes changes to expand or increase connections or geography not previously approved.[11] The purpose of a WSP is to demonstrate system capacity as defined in WAC 246-290-010, explain how the water system will address present and future needs, and establish eligibility for funding.[11]
- Four states require notification of the public or customers prior to discontinuing community water fluoridation:
  - Iowa (House File 390, effective 2021)[12] and Missouri (Chapter 640.136, effective 2016)[13] require a water system to notify customers 90 days prior to taking a vote or action to discontinue community water fluoridation.
  - Tennessee (Code § 68-221-708, effective 2019) requires a water system to notify customers 30 days prior to a vote to discontinue community water fluoridation.[14]
  - New York State (N.Y. Public Health § 1100-a, effective 2015) requires a water system to notify the public prior to discontinuing community water fluoridation and to provide justification for discontinuing fluoridation, available alternatives to fluoridation, and a summary of public health information.[15]

Summary of SHB 1684

- Requires Group A Water Systems that serve 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation when the system engages in water system planning. Allows other Group A water systems to elect into this requirement.
- Requires SBOH to adopt rules to support water systems to include community water fluoridation. Rules must specify the:
  - Recommended fluoride concentration to be maintained by the water system; and
  - Procedures to maintain the recommended concentration of fluoride, including treatment facilities; cost-benefit analysis of start-up costs; recordkeeping, reporting, and testing requirements; and enforcement procedures.
- Requires DOH to create a program (subject to the availability of appropriated funding) within the Office of Drinking Water to provide engineering assistance to water systems related to upgrades, modifications, or expansions to implement or upgrade a community water fluoridation system, as long as the water system includes an engineering analysis. Allows DOH to receive funding from private sources to assist with this program.

- Requires Group A Water Systems that serve 5,000 or more people per day considering discontinuation of community water fluoridation to seek public health information from DOH and local health jurisdictions and to notify customers of this intention at least 90 days prior to a vote or decision to discontinue fluoridation. Allows other Group A water systems to elect into this requirement.
    - Specifies that public notification must include language approved by DOH about the public health impacts of fluoride and be disseminated through radio, television, newspaper, mail, electronic means, or any combination of methods.
    - States that any water system that violates notification requirements must continue community water fluoridation until provisions are met.
- Directs DOH to conduct an oral health equity assessment and provide recommendations to increase access to community water fluoridation to the Legislature by June 30, 2023.

Health impact of SHB 1684

Evidence indicates that SHB 1684 would likely result in Group A Water Systems serving 5,000 or more people per day that do not fluoridate conducting a cost analysis of community water fluoridation as part of water system planning, which would likely have no impact on community water fluoridation. The bill would also likely result in specified water systems seeking public health information and notifying customers prior to discontinuing community water fluoridation, and it is unclear how this would impact a water system's decision to discontinue or continue fluoridation. Based on these findings, the pathway to health impacts could not be completed.

Pathway to health impacts

The potential pathway leading from the provisions of SHB 1684 to decreased health inequities are depicted in Figure 1.

Pathway 1: Cost analysis for community water fluoridation

We have made the informed assumption that requiring Group A Water Systems serving 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning would result in water systems conducting this cost analysis. We have also made the informed assumption that water systems conducting a cost analysis of community water fluoridation as part of water system planning would have no impact on community water fluoridation. Both assumptions are based on information from key informants representing water systems. Since we have made the informed assumption that conducting a cost analysis would not impact community water fluoridation, the pathway to health impacts could not be completed.

Pathway 2: Customer notification

We have also made the informed assumption that requiring Group A Water Systems serving 5,000 or more people per day to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation would result in water systems taking these actions before discontinuing community water fluoridation. This assumption is based on information from key informants representing water systems. There is unclear evidence how seeking public health information and notifying customers 90 days prior to a vote or decision to discontinue community water fluoridation would impact a water system's

decision to discontinue or continue fluoridation due to variations in water system governance and political and community contexts. Since it is unclear how seeking public health information and notifying customers would impact a water system's decision to continue or discontinue fluoridation, the pathway to health impacts could not be completed.

Scope

Due to time limitations, we only researched the most direct connections between provisions of the bill and health inequities and did not explore the evidence for all possible pathways. For example, we did not evaluate potential impacts related to:

- Costs related to SBOH rulemaking.
- Requirements that DOH create a program to provide engineering technical assistance related to fluoridation implementation. SHB 1684 stipulates that this provision is subject to the appropriation of funds and that water systems would need to provide an engineering analysis to work with DOH in this capacity. DOH currently provides technical assistance for water systems, especially to support water systems as they prepare for and complete water system planning (personal communication, DOH, February 2022).
- Requirements that DOH conduct an oral health equity assessment.

Magnitude of impact

SHB 1684 would impact Group A Water Systems serving 5,000 or more people per day. Other Group A Water Systems would be able to elect to meet requirements in the bill. Therefore, SHB 1684 has the potential to impact all Group A state-regulated water systems in Washington State. Provisions of the bill would not apply to Group B Water Systems, tribal water systems, or private water supplies.

There are 17,657 water systems in Washington State; 4,146 of these systems are Group A Water Systems (unpublished data, DOH, February 2022). Of the 4,146 Group A Water Systems:

- 2,216 are community water systems (i.e., with [15] or more service connections, regardless of the number of people);
- 1,615 are transient, non-community water systems (i.e., serving 25 or more people per day for 60 or more days within a calendar year or 1,000 or more people for 2 or more consecutive days [e.g., a gas station, campground, fairground]); and,
- 315 are non-transient, non-community water systems (i.e., serving 25 or more of the same people per day for 180 or more days within a calendar year, regardless of the number of service connections [e.g., a school]) (unpublished data, DOH, February 2022).

There are 160 Group A Water Systems serving 5,000 or more people per day in Washington State. These systems serve a total of 5,732,548 people (74% of the state population) (unpublished data, DOH, February 2022). Of these Group A Water Systems, 64 systems (40%) provide fluoridated water to their customers (unpublished data, DOH, February 2022). Specifically, 41 water systems operate a community water fluoridation system and 23 additional water systems receive fluoridated water through intertie systems (i.e., purchasing water from another system that fluoridates) (unpublished data, DOH, February 2022). Combined, these

Group A Water Systems serve a full-time residential population of 3,456,942 (45% of the state population) (unpublished data, DOH, February 2022).

The range of people living in Washington State receiving fluoridated drinking water varies by county. In some counties, as few as 2% of people receive fluoridated water.[16] In other counties, 80% of people receive fluoridated water.[16] Nineteen counties have at least 1 Group A Water System that provides fluoridated water.[16] Naturally-occurring fluoride is common in parts of Eastern Washington.[16] Two water systems reduce natural fluoride to reach the recommended fluoride concentration of 0.7 mg/L, including 1 system that removes fluoride from the water system and 1 that blends water sources (unpublished data, DOH, February 2022).

While the provisions of SHB 1684 specifies a certain subset of Group A Water Systems that must meet each requirement, the bill has the potential to impact all Group A state-regulated water systems.

Logic Model

Pathway 1: Cost analysis for community water fluoridation

Requires specified water systems to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning

Water systems conduct a cost analysis of community water fluoridation as part of water system planning

No impact on community water fluoridation

Since we have made the informed assumption that conducting a cost analysis would not impact community water fluoridation, the pathway to health impacts could not be completed.

See discussion in Summaries of Findings.

Pathway 2: Customer notification

Requires specified water systems to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation

Water systems seek public health information and notify customers prior to discontinuing community water fluoridation

Water systems decide whether to continue or discontinue community water fluoridation*

Since it is unclear how seeking public health information and notifying customers would impact a water system's decision to continue or discontinue fluoridation, the pathway to health impacts could not be completed.

See discussion in Summaries of Findings.

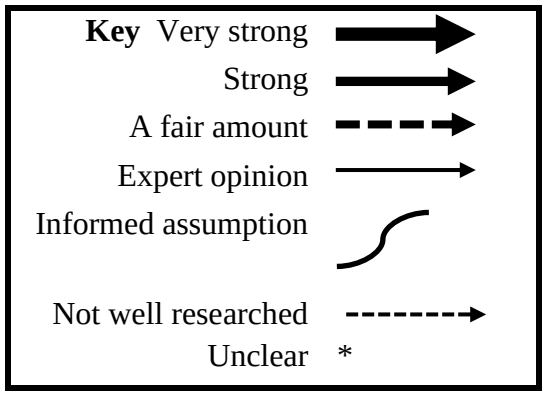

Figure 1:

Concerning public health and fluoridation of drinking water

SHB 1684

Summaries of Findings

Pathway 1: Cost analysis for community water fluoridation

Would requiring specified water systems to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning result in water systems conducting this cost analysis?

We have made the informed assumption that requiring Group A Water Systems serving 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning would result in water systems conducting this cost analysis. This assumption is based on information from key informants representing water systems, including 3 people representing 3 water system associations (which each represent multiple water systems) and 4 people representing 3 individual water systems. Key informants represented a variety of water systems, including small and large systems and systems that do and do not currently provide community water fluoridation.

Under Washington State law, Group A Water Systems must submit a Water System Plan (WSP) to the Washington State Department of Health (DOH) for review and approval.[17] Once approved, the WSP is effective for up to 10 years unless DOH requests an updated plan.[17] DOH guidance notes that "[s]ome WSP elements are best developed by water system staff, while other plan elements must be completed by a [licensed Professional Engineer]" as required by WAC 246-290-040.[17] Although some water systems employ engineers who can do this work, many systems contract with engineering firms to complete engineering components of their WSP (personal communications, February 2022).

Provisions of SHB 1684 would require Group A Water Systems serving 5,000 or more people per day and that do not currently fluoridate to conduct an analysis of the cost to design, install, operate, and maintain community water fluoridation as part of water system planning. The bill does not require water systems to consider benefits to public health or potential healthcare cost savings across the lifespan as part of this cost analysis. There are 119 Group A Water Systems serving 5,000 or more people per day that do not currently fluoridate (unpublished data, DOH, February 2022). However, 23 of these are intertied systems that provide fluoridated water to their customers by purchasing water from fluoridated systems (unpublished data, DOH, February 2022). Therefore, 96 Group A Water Systems serving 5,000 or more people per day do not currently fluoridate and would be required to meet this bill provision.

The bill also directs the State Board of Health (SBOH) to modify rules to support water systems to include community water fluoridation. Specifically, rules must include the recommended fluoride concentration as well as standards and procedures for maintaining the recommended fluoride concentration (i.e., necessary treatment facilities; a cost-benefit analysis of estimated capital start-up costs; record keeping, reporting, and testing requirements; and enforcement procedures). Key informants noted that SBOH rules already address many of the elements listed in the bill (e.g., recommended fluoride concentration; monitoring, record keeping, and reporting requirements) (personal communications, February 2022).

If passed, key informants expect that most water systems would contract out the required analysis to an engineering firm, which may be an added cost for water system planning (personal communication, February 2022). Most Group A Water Systems have multiple water sources (an average of 2 sources per system, ranging from 1 to 65 sources per system), including both surface water and groundwater sources (personal communications, February 2022). In instances where sources are interconnected, it may be possible for water systems to fluoridate at a single point. However, in many cases, sources may need to be treated individually (personal communications, February 2022). Water systems will likely need to contract with an engineering firm to determine the appropriate design, process, and equipment needs for a fluoridation system (personal communications, February 2022). The cost of this work would likely vary by the size, capacity, and complexity of a water system (personal communications, February 2022).

The associated planning costs may also depend on whether an in-depth analysis is required or if a general estimate from a consultant is acceptable (personal communications, February 2022). For example, key informants noted a cost-benefit analysis could consider questions, including: what type of fluoridation system would make the most sense for the system (e.g., based on water source and chemistry); where would the equipment go; what types of space would be required; could the system be added to an existing structure; what equipment costs are involved; what maintenance is required; what type of monitoring would be required; are there security requirements; what energy costs are expected; and how much does fluoride cost? (personal communications, February 2022). Alternatively, the analysis could involve a few general assumptions to inform a high-level estimate (personal communications, February 2022). The Local Government Fiscal Note on the original version of the bill indicated that "the amount of additional work would vary between jurisdictions due to size of the jurisdiction, experience in similar kinds of analyses […] Therefore, the increase [in cost] to local government expenditures cannot be determined at this time."[18]

Lastly, key informants would not expect systems to conduct a cost analysis for community water fluoridation unless required to do so (personal communications, February 2022). Therefore, they would expect few, if any, systems not required by provisions in the bill to elect into this requirement (personal communications, February 2022). All key informants agreed that Group A Water Systems serving less than 5,000 people per day would not elect into provisions requiring an analysis of the cost to design, install, operate, and maintain community water fluoridation (personal communications, February 2022).

Overall, all key informants agreed that, if SHB 1684 were passed, Group A Water Systems serving 5,000 or more people per day and that do not currently fluoridate would conduct a cost analysis of community water fluoridation to meet the requirement.

Would water systems conducting this cost analysis impact community water fluoridation? We have made the informed assumption that water systems conducting a cost analysis of community water fluoridation as part of water system planning would have no impact on community water fluoridation. This informed assumption is based on information from key informants representing a variety of water systems.

SHB 1684 does not require community water fluoridation, and all key informants representing water systems stated that conducting a cost analysis would not result in a water system implementing community water fluoridation (personal communications, February 2022). While some key informants felt that a cost analysis could be necessary to inform future decision-making about community water fluoridation, all key informants stated that a cost analysis alone would be insufficient to result in a water system implementing community water fluoridation (personal communications, February 2022). One water system stated that, "absent a need or requirement to fluoridate either from a regulatory requirement, a policymaker decision, or a customer demand for it, it seems unlikely that conducting such an analysis alone would result in a water system implementing fluoridation" (personal communication, February 2022). Other key informants stated that water systems would not implement fluoridation unless required or mandated at the local, state, or federal level (personal communication, February 2022).

Since we have made the informed assumption that conducting a cost analysis would not impact community water fluoridation, the pathway to health impacts could not be completed.

Pathway 2: Customer notification

Would requiring specified water systems to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation result in water systems taking these actions before discontinuing community water fluoridation?

We have made the informed assumption that requiring Group A Water Systems serving 5,000 or more people per day to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation would result in water systems taking these actions before discontinuing fluoridation. This assumption is based on information from key informants representing a variety of water systems.

Under current Washington State law, a water system that decides to discontinue a community water fluoridation program is required to notify DOH.[8] Provisions in SHB 1684 would require Group A Water Systems serving 5,000 or more people per day that are considering discontinuation of community water fluoridation to seek related public health information about community water fluoridation from DOH or local health jurisdictions. Water systems would also be required to notify customers at least 90 days prior to a vote or decision to discontinue fluoridation and provide the results of the public health findings to customers. There are 64 Group A Water Systems serving 5,000 or more people per day that currently fluoridate (unpublished data, DOH, February 2022) and would need to meet these requirements if they were to consider discontinuing fluoridation.

Key informants stated that water systems typically have established working relationships with DOH and local heath jurisdictions. For example, water systems must work with DOH on a variety of reporting and monitoring procedures. Key informants explained that water systems work with local health jurisdictions around various water quality topics (boil water advisories, use of emergency water supplies, etc.) and are familiar with seeking public health information and language to inform public notification (personal communications, February 2022). Moreover, key informants felt that water systems that currently fluoridate are likely already

aware of public health information related to community water fluoridation (personal communications, February 2022). However, water systems expressed differing views on whether public health was a part of their mission (personal communications, February 2022), so the relationship with DOH and local health jurisdiction may vary by water system.

Key informants noted there may be specific instances that could result in consideration of discontinuation of community water fluoridation (e.g., aging structures and associated maintenance costs) (personal communications, February 2022). However, most key informants felt it is unlikely that water systems currently providing community water fluoridation would choose to discontinue fluoridation (personal communications, February 2022). Since 2013, 2 Group A Water Systems serving 5,000 or more people per day have discontinued community water fluoridation as a result of political or community actions (personal communication, February 2022).

Since all key informants stated that water systems would meet these provisions if required, we have made the informed assumption that requiring Group A Water Systems serving 5,000 or more people per day to seek public health information and notify customers 90 days prior to a vote or decision to discontinue community water fluoridation would result in water systems taking these actions before discontinuing community water fluoridation.

Would seeking public health information and notifying customers 90 days prior to a vote or decision to discontinue community water fluoridation impact a water system's decision to discontinue fluoridation?

There is unclear evidence for how seeking public health information and notifying customers 90 days prior to a vote or decision to discontinue community water fluoridation would impact a water system's decision to discontinue or continue fluoridation due to variations in water system governance and political and community contexts.

Generally, key informants felt that requiring customer notification 90 days prior to a vote or decision to discontinue fluoridation could inform or be considered in a water system's decision-making (personal communication, February 2022). However, key informants emphasized that authorizing environment and governance structure varies by water system, so the extent to which public input could impact decision-making would be difficult to quantify as decision-making and public involvement varies by governance structure (personal communications, February 2022). One water system stated that their governance structure would require a citizen's initiative for the water system to discontinue fluoridation (personal communication, February 2022). Another system stated that decisions about fluoridation would require a vote by an elected board that represents the community served by the water system (personal communication, February 2022). Yet another stated that, "if we already had the infrastructure for fluoridation in place, we would only discontinue fluoridation if we were regulated to do so" (personal communication, February 2022). Therefore, how a water system is structured and makes decisions may impact the extent to which public input is considered in the decision-making process.

Similarly, key informants also explained that, under some governance structures, not all customers may be able to impact decisions as some communities receive water from a system outside of their jurisdiction (personal communications, February 2022). For example, Tacoma

Public Utilities and Seattle Public Utilities provide water to some areas of Pierce and King Counties outside of their respective city limits. Under the provisions of SHB 1684, a water system would only be required to provide notification to the city or municipality purchasing their water as a customer. For instance, the City of Bellevue is intertied with Seattle Public Utilities and is their customer. The bill language would require Seattle Public Utilities to notify City of Bellevue before discontinuing fluoridation but would not require notification of customers receiving water from the City of Bellevue. Another water system shared that, if their system were considering a change, not all customers in the system would be represented in a vote, as some customers live outside of city limits (personal communication, February 2022). However, key informants felt that most water systems, especially systems serving 5,000 or more customers per day, would likely provide notification to all water system users regardless of the bill provisions (personal communication, February 2022). However, customers receiving water through intertied systems may not be able to vote or otherwise influence a water system's decision to discontinue or continue fluoridation unless the water system chose an approach that engaged those customers (personal communication, February 2022).

All key informants emphasized that community water fluoridation is a polarizing topic for communities (personal communications, February 2022). Key informants shared that public opinion on community water fluoridation has changed over time and varies community to community (personal communications, February 2022). A media article cited a report by the Centers for Disease Control and Prevention (CDC) which documented the history of fluoride referendums nationally and the fluctuation of support and opposition for community water fluordiation.[19] Their analysis found that 41% of proposed referendums related to fluoride were adopted in the 1950s and 1960s, 36% were adopted in the 1980s, 59% were adopted in the 1990s, and 39% were adopted in the 2000s.[19] Therefore, a water system's decision to discontinue or continue water fluoridation would likely depend in part on public opinion and whether the community was vested in discontinuing or continuing community water fluoridation.

Since customer notification and input may vary by governance structure and since public opinion may influence the directionality of a water system's decision to discontinue or continue fluoridation, it is unclear how seeking public health information and notifying customers 90 days prior to a vote or decision to discontinue community water fluoridation would impact a water system's decision to discontinue or continue fluoridation. Therefore, the pathway to health impacts could not be completed.

Annotated References

1. **Fluoride: Fact Sheet for Health Professionals. 2021; Available at: https://ods.od.nih.gov/factsheets/Fluoride-HealthProfessional/. Accessed 1/31/2022.**
The National Institutes of Health, Office of Dietary Supplements maintains a fact sheet about fluoride for health professionals, including background information, recommended intake levels, health benefits and risks, and dietary sources of fluoride.

2. **Overview of the Safe Drinking Water Act. 2021; Available at: https://www.epa.gov/sdwa/overview-safe-drinking-water-act. Accessed 1/31/2022.**
The U.S. Environmental Protection Agency (U.S. EPA) provides information about the 1974 Safe Drinking Water Act.

3. **National Primary Drinking Water Regulations. 2021; Available at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations. Accessed 1/31/2022.**
The U.S. Environmental Protection Agency (U.S. EPA) outlines contaminants regulated by the National Primary Drinking Water Regulations, including fluoride.

4. **Community Water Fluoridation--Public Health Service Recommendation. 2021; Available at: https://www.cdc.gov/fluoridation/faqs/public-service-recommendations.html. Accessed 1/31/2022.**
The U.S. Public Health Services recommended concentration of fluoride in drinking water is 0.7 mg/L "to prevent tooth decay in children and adults while reducing the risks for children to develop dental fluorosis."

5. **Healthy People 2030: Increase the proportion of people whose water systems have the recommended amount of fluoride -- OH-11. 2020; Available at: https://health.gov/healthypeople/objectives-and-data/browse-objectives/health-policy/increase-proportion-people-whose-water-systems-have-recommended-amount-fluoride-oh-11. Accessed 2/3/2022.**
Healthy People 2030 provides background information about tooth decay and fluoride.

6. **Murthy V.H., Collins F.S., D'Souza R. Oral Health in America: Advances and Challenges. National Institutes of Health; December 2021.**
This 2021 follow up to the Surgeon General's 2000 Report on Oral Health in America explores oral health in the U.S. over the last 20 years. It is the result of two years of research and the work of more than 400 contributors.

7. **U.S. Department of Health & Human Services. Oral Health Conditions. 2020; Available at: https://www.cdc.gov/oralhealth/conditions/index.html. Accessed 3 February, 2022.**
This CDC web page provides a high-level overview of oral health conditions including cavities (tooth decay), gum (periodontal) disease, and oral cancer. For example, while "cavities are largely preventable, they are one of the most common chronic diseases throughout the lifespan."

It also notes that "[o]ral conditions are frequently considered separate from other chronic conditions, but these are actually inter-related."

8. **Washington State Board of Health. WAC 246-290-460 Group A Public Water Supplies, Part 5. Water System Operations, Fluoridation of drinking water. 2019.**
WAC 246-290-460 pertains to the fluoridation of drinking water.

9. **Washington State Department of Health, Office of Drinking Water. Fluoride: Is my drinking water fluoridated? Tumwater, WA. 2018.**
The document is a public-facing Question & Answer resource regarding fluoridated water in Washington State.

10. **Washington State Legislature. Chapter 70A.125 RCW--PUBLIC WATER SYSTEMS—PENALTIES AND COMPLIANCE. 2020.**
Chapter 70A.125 RCW outlines requirements for public drinking water systems.

11. **WAC 246-290-100 Group A Public Water Supplies, Part 2. Engineering and Planning Documents, Water system plan.**
WAS 246-290-100 pertains to requirements for water system plans.

12. **State of Iowa General Assembly. House File 390, An act relating to notice requirements prior to discontinuing fluoridation in a public water supply system. 2021.**
Iowa House File 390 requires water systems to notify customers 90 days prior to discontinuing community water fluoridation.

13. **Missouri General Assembly. Chapter 640.136. Fluoridation modification, notification to department and customers. 2016.**
Under Missouri law Chapter 640.136. Fluoridation modification, notification to department and customers, water systems are required to notify customers 90 days prior to a vote to modify community water fluoridation.

14. **State of Tennessee. Code 68-221-708 Notification to public and regulatory agencies. 2021.**
Tennessee Code 68-221-708 requires water systems to notify the public 30 days prior to discontinuing community water fluoridation.

15. **New York State Senate. Public Health Chapter 45, Article 11, Title 1: Section 1100-A Fluoridation. 2015.**
In 2015, New York State passed Public Health Chapter 45, Article 11, Title 1: Section 1100-A Fluoridation. Among other provisions, the law outlines requirements for public notification prior to discontinuing community water fluoridation.

16. **Washington State Department of Health, Office of Drinking Water. Fluoridated Drinking Water, 2018 Washington State Health Assessment. Tumwater, WA. 2018.**
The document provides an overview of fluoridation in Washington State's drinking water.

17. **Washington State Department of Health, Office of Drinking Water. Water System Planning Guidebook. Tumwater, WA. 2020.**
The Guidebook is a resource for developing Water System Plans covering technical, managerial, and financial elements.

18. **Duncan R. Local Government Fiscal Note - HB 1684 Concerning public health and fluoridation of drinking water. Olympia, WA: Washington State Office of Financial Management; 2022.**
Department of Commerce prepared The Local Government Fiscal Note included in the Multiple Agency Fiscal Note for HB 1684, Concerning public health and fluoridation of drinking water. The analysis determined that the legislative impacts for cities and special districts would result in an indeterminate increase in expenditures for municipal water systems and public utilities due to additional work on fluoridation analyses. Specifically, "[t]he amount of additional work would vary between jurisdictions due to the size of jurisdiction, experience in similar kinds of analyses...Therefore, the increase to local government expenditures cannot be determined at this time."

19. **Kliff S. A brief history of America's fluoride wars. *The Washington Post.* May 21, 2013, 2013; Economic Policy.**
The article discussed the controversy surrounding the use of fluoride in community water systems. The article cited a CDC report on fluoridation referendums, reporting that between 1950 and 1967 there were 1,009 fluoridation referendums across the United States. 41% of fluoride proposals were adopted and 59% were rejected. From 1980 to 1988 there were 150 fluoridation votes. 36% of fluoride proposals adopted and 64% were rejected. During the 1990s, of 32 referendums conducted, 59% of fluoride proposals were adopted and 41% were rejected. During the 2000 election cycle, there were 23 fluoridation ballot initiatives. 39% were adopted and 61% were rejected. San Antonio, TX and Clark County, NV passed fluoride referendums during the 2000 election cycle. The percentage of people in the United States receiving fluoridated water by community water systems increased from 62% in 1992 to 69% in 2006.