Executive Summary

Community water fluoridation is widely accepted by the scientific community to be the safest, most cost effective, and most equitable method to prevent tooth decay in children and adults. The Washington State Board of Health recommends an optimal level for fluoride in drinking water of 0.7 mg/L; at these levels there is no evidence of negative health outcomes or toxicity. Spokane is the largest city in the State of Washington without fluoridated drinking water. This brief summarizes recent scientific literature, provides local contextual details, and offers a characterization of predicted health impacts of water fluoridation.

Background

Healthy teeth and mouths play a surprisingly important role in people’s ability to learn and thrive. Everyday activities such as smiling, eating, speaking, concentrating, and sleeping can be painful and embarrassing for individuals with unhealthy teeth and mouths, impacting confidence, attendance and performance at school and work, and long-term health outcomes. Children with chronic tooth pain have difficulty learning and eating healthy. Studies link tooth disease early in life with lower graduation rates, lower lifetime earnings, and lower quality of life. Adults with missing, visibly decayed, and painful teeth and mouths have trouble with speech, social connections, and finding and keeping jobs. Cavities, gum
disease, and other oral health issues also carry a financial burden, costing American taxpayers billions of dollars every year.\(^5\)

Fortunately, tooth decay and gum disease are largely preventable. Over 50 years of epidemiological studies support the naturally-occurring mineral fluoride as the most effective way to prevent cavities.\(^6\) Fluoride works by strengthening tooth enamel and preventing its breakdown—a process called demineralization.\(^7\) Children who visit a dental care provider today can effectively prevent tooth decay with a professionally applied fluoride varnish.\(^8\) Not all children have equal access to dental care though, and kids without a regular dentist miss this important preventive step.

Due to its health and economic benefits, community water fluoridation is considered to be the most effective and equitable public health measure for the prevention of tooth decay.\(^9\) Providing consistent, low-levels of fluoride in drinking water—called community water fluoridation—can reduce tooth decay by 25% in children and adults and save communities an average of $20 for every dollar invested.\(^10\) Cities and states began adding fluoride to drinking water over 70 years ago; today nearly three out of four people in the United States access fluoridated water in their homes.\(^11\) Though studies show that lower income children still have more cavities than children in higher income families regardless of level of fluoride, this approach allows all children barrier-free access to cavity prevention regardless of dental coverage.\(^12\) In fact, the American Public Health Association summarized, “Children with the greatest dental need and who are at highest risk for tooth decay benefit the most from water fluoridation.”\(^13\)

Despite widespread scientific support for community water fluoridation, some individuals oppose adding fluoride to drinking water. Oral fluoride does come with a minimal risk of a condition called enamel fluorosis.\(^14\) Fluorosis results from high fluoride levels during the time that tooth enamel is forming. Cases of fluorosis range from mild—white specks on the teeth—to severe—rough, pitted teeth surfaces.\(^15\) Most cases of fluorosis in the United States are mild and don’t have serious health impacts, though children affected by fluorosis might be judged by their peers or afraid to smile and show their teeth.\(^16\)

The US Environmental Protection Agency’s current enforceable drinking water standard for fluoride—the maximum amount allowed in public water systems—is 4.0 milligrams per liter (mg/L), though water systems must notify customers if levels exceed 2.0 mg/L.\(^17\) The federal Department of Health and Human Services and the Washington State Board of Health recommend an optimal level for fluoride in drinking water of 0.7 mg/L.\(^18\) These lower recommendations take into account the total daily intake of fluoride from various sources for children under age 8 (the age group most at risk for fluorosis).
Local Context

Fluoridated water systems serve over half of Washington State residents. According to Smile Spokane, Spokane is the largest city in the state without fluoridated water. Nearby, the City of Cheney and Fairchild Airforce Base add fluoride to their public water supply, as do Boise, Yakima, and Tacoma. The City of Spokane monitors levels of naturally occurring fluoride in groundwater throughout the city. In 2016, their survey of seven well stations measured levels ranging from 0.01 to 0.5 mg/L.

More than six out of every ten third graders in Spokane had a cavity in a permanent tooth in 2015, compared to 53% in the state of Washington as a whole, and nearly one in six have rampant decay affecting seven or more teeth. Dental decay was higher among Black, American Indian and Alaskan Native, Asian, Pacific Islander, and Hispanic children than white children. Lower income children—those eligible for free- and reduced-price school meals—similarly were more likely to have cavities than their higher-income peers, according to local data (Figure 1).

Figure 1. Low-income and children of color have disproportionately more tooth decay

Percent of third grade students who have had a cavity in a primary or permanent tooth, by race, 2015

<table>
<thead>
<tr>
<th>Race</th>
<th>White</th>
<th>Black</th>
<th>AIAN</th>
<th>Asian</th>
<th>Pacific Islander</th>
<th>Hispanic</th>
<th>Multi-Racial</th>
<th>Eligible for FRL</th>
<th>Not Eligible for FRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AIAN = American Indian/Alaska Native, FRL = Free/Reduced Lunch
In Spokane County, low-income adults, people of color, and those with lower educational attainment are significantly less likely to have visited a dentist in the last 12 months and more likely to be missing six or more teeth due to decay.\textsuperscript{32}

**Characterization of Predicted Health Effects**

<table>
<thead>
<tr>
<th>Health Outcomes</th>
<th>Likelihood</th>
<th>Quality of Evidence</th>
<th>Affected or Vulnerable Population</th>
<th>Equity Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced tooth decay</td>
<td>Definite</td>
<td>Strong</td>
<td>Low-income individuals and people of color; individuals without access to regular dental care.</td>
<td>Reduces inequities</td>
</tr>
<tr>
<td>Mild dental fluorosis</td>
<td>Probable</td>
<td>Strong</td>
<td>Individuals exposed to multiple sources of low levels of fluoride.</td>
<td>None</td>
</tr>
<tr>
<td>Moderate dental fluorosis</td>
<td>Possible</td>
<td>Strong</td>
<td>Individuals exposed to multiple sources of high levels of fluoride.</td>
<td>None</td>
</tr>
<tr>
<td>Severe dental fluorosis</td>
<td>Unlikely</td>
<td>Strong</td>
<td>Individuals exposed to multiple sources of high levels of fluoride.</td>
<td>None</td>
</tr>
<tr>
<td>Skeletal fluorosis</td>
<td>Very unlikely</td>
<td>Strong</td>
<td>Not predicted</td>
<td>None</td>
</tr>
<tr>
<td>Thyroid impairment</td>
<td>Very unlikely</td>
<td>Moderate</td>
<td>Not predicted</td>
<td>None</td>
</tr>
<tr>
<td>Neurocognitive impairment</td>
<td>Very unlikely</td>
<td>Moderate</td>
<td>Not predicted</td>
<td>None</td>
</tr>
<tr>
<td>Kidney injury</td>
<td>Very unlikely</td>
<td>Moderate</td>
<td>Not predicted</td>
<td>None</td>
</tr>
<tr>
<td>Heart injury</td>
<td>Very unlikely</td>
<td>Moderate</td>
<td>Not predicted</td>
<td>None</td>
</tr>
</tbody>
</table>
Endnotes


5 Ibid.


15 Carey, C M. Focus on Fluorides.


20 Ibid.

21 Ibid.