

# Community Water Fluoridation

POLICY BRIEF



August 2020



## 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.<sup>1</sup> Children with chronic tooth pain have difficulty learning and eating healthy.<sup>2</sup> Studies link tooth disease early in life with lower graduation rates, lower lifetime earnings, and lower quality of life.<sup>3</sup> Adults with missing, visibly decayed, and painful teeth and mouths have trouble with speech, social connections, and finding and keeping jobs.<sup>4</sup> Cavities, gum

disease, and other oral health issues also carry a financial burden, costing American taxpayers billions of dollars every year.<sup>5</sup>

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.<sup>6</sup> Fluoride works by strengthening tooth enamel and preventing its breakdown—a process called demineralization.<sup>7</sup> Children who visit a dental care provider today can effectively prevent tooth decay with a professionally applied fluoride varnish.<sup>8</sup> 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.<sup>9</sup> 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.<sup>10</sup> 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.<sup>11</sup> 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.<sup>12</sup> 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.”<sup>13</sup>

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.<sup>14</sup> 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.<sup>15</sup> 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.<sup>16</sup>

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.<sup>17</sup> 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.<sup>18</sup> 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).

Infants may be at an increased risk for overexposure to fluoride if fluoridated water is used to reconstitute formula.<sup>19</sup> Other sources of exposure to fluoride, such as mouthwash or toothpaste, can also increase a child’s risk of fluorosis.<sup>20</sup> Children exposed between ages two and three seem most vulnerable to fluorosis.<sup>21</sup>

Mild to moderate dental fluorosis is common at levels between 0.7 mg/L and 2 mg/L.<sup>22</sup> At very high levels, fluoride can cause skeletal defects, thyroid problems, and slightly lower IQ scores.<sup>23</sup> However, studies documenting these negative outcomes are limited to developing countries where fluoride levels in groundwater exceed the recommended level in the United States.<sup>24</sup> One systematic review found weak evidence of decreased IQ scores, early kidney injury, and thyroid effects in children, and atherosclerosis, hypertension, and cardiac dysfunction in adults at fluoride levels over 2 mg/L, but many of these studies did not control for other factors that could cause similar outcomes such as other groundwater contaminants or socio-economic status.<sup>25</sup> One systematic review that considered studies on animals, sometimes used as an imperfect proxy for humans, found low to moderate evidence of memory and learning impairments at fluoride levels greater than 0.7 mg/L.<sup>26</sup> There is no strong evidence of negative health effects at or below 0.7 mg/L, the optimal fluoride levels set by the Washington State Board of Health.<sup>27</sup>



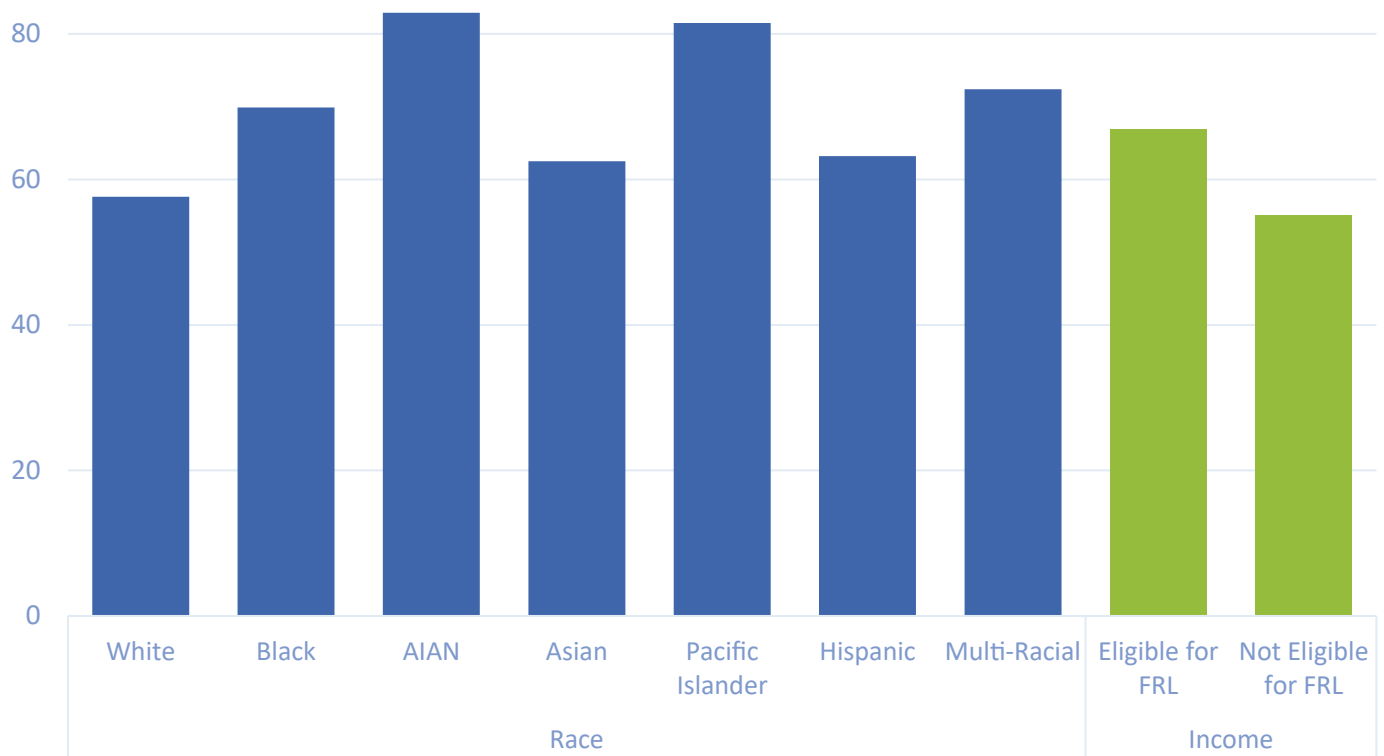
## Local Context

Fluoridated water systems serve over half of Washington State residents.<sup>28</sup> 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.<sup>29</sup> 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.<sup>30</sup>

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).<sup>31</sup>

**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



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.<sup>32</sup>

### Characterization of Predicted Health Effects

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

## Endnotes

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*Created: August 2020*