**Oral Health: Community Water Systems and Fluoridation in Tier 1 Counties in North Carolina**

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**Introduction**

Community water fluoridation is a safe and effective method for delivering fluoride to all members of a community regardless of age, education, income level, oral health behavior, or access to dental care. Fluoridation strengthens developing teeth in utero prior to tooth eruption and continues to reduce tooth decay in children and adults by twenty-five percent (The American Dental Association, 2019). According to the North Carolina Oral Health Section, community water fluoridation in North Carolina parallels national recommendations based on the science and data that have emerged showing that fluoride in drinking water is both safe and effective. Eighty-eight percent of the North Carolina population served by community water systems receive fluoridated water (Centers for Disease Control and Prevention, 2014).

While the majority of North Carolina’s population receive community water fluoridation, there are seventeen counties that do not currently have a fluoridated community water supply. Of the seventeen counties that do not have community water fluoridation, six are designated as Tier One counties by the North Carolina Department of Commerce. The counties designated as Tier One are the most economically distressed based on average unemployment rate, median household income, percentage growth in population, and adjusted property tax base per capita (North Carolina Department of Commerce, 2018). Due to community water fluoridation being one of the most effective oral health strategies, the aim of this project was to explore community water systems and fluoridation in Tier One counties in North Carolina.



**Methods**

The Centers for Disease Control and Prevention’s *My Water’s Fluoride* database is tool the public can use for determining their community’s drinking water fluoridation levels and provides the number of people served by each water system, the water source, and if the water system fluoridates its water supply. The research team conducted a comprehensive review of water systems for Tier One counties in North Carolina. During the review the six Tier One counties identified that do not have community water fluoridation included: Bladen, Duplin, Graham, Greene, Mitchell, and Perquimans. The six Tier One counties have a total of fifty-four public water systems with sixty-one percent of the water systems serving less than 1,000 people. Bladen has eleven public water systems, Duplin has seventeen, Graham has six, Greene has ten, Mitchell has seven, and Perquimans has three. The public water systems have some fluoride from natural sources, but at a level below what is recommended for the prevention of tooth decay. The public water systems in the six counties serve approximately 112,000 people (Centers for Disease Control and Prevention, 2019).

Following the identification of the six Tier One counties without community water fluoridation, the research team determined that additional information was needed to provide insight and understanding into the decision to not fluoridate community water systems within those six counties. In North Carolina, the decision to fluoridate public water supplies rests with local governance. Guidelines from the North Carolina Department of Environmental Quality gives local entities the allowance for the practice (2019). As the decision to fluoridate community water sources remains with local government, the factors that community leaders use to choose community water fluoridation must be considered.

The research team developed survey questions to gather information from local public health dental hygienists and those considered to be the local community water fluoridation stakeholders from the six Tier One counties. Phone interviews and online survey were conducted from March to June 2019. The questions included:

* What county or counties do you work?
* Does your county have community water fluoridation?
* If your county does not have community water fluoridation, did it have it in the past?
* If you represent a county or counties that do not have community water fluoridation, what barriers do you believe are preventing implementation?
* Are you aware of any efforts made to implement a community water fluoridation?
* Do you know who in your community, either an individual, agency or working group, has the decision making ability to implement community water fluoridation?
* Are there publicly available fluoride programs available in your community?
* What programs are in your community that provide access to fluoride (for example: into the mouths of babes, the Swish program, or other programs)

**Results**

Phone interviews were conducted with six stakeholders, including North Carolina Department of Health and Human Services Oral Health Section staff at the regional and state level. Survey responses were collected from eleven stakeholders within Bladen, Duplin, Graham, Greene, Mitchell, and Perquimans counties. None of the stakeholders reported that the counties had ever, to their knowledge, had community water fluoridation in the past.

Survey respondents were asked to identify barriers to preventing the implementation of community water fluoridation; options included, lack of funding or financial resources, rural population status, community resistance, satisfactory natural fluoride levels, lack of cooperation from other agencies or other. Stakeholders from five of the six counties identified their primary barrier for community water fluoridation being related to a lack of funding or financial resources. One county stakeholder identified their county as being supplied by sufficient natural fluoride, however, this could not be substantiated based on the fluoride levels reported in the Centers for Disease Control and Preventions *My Water’s Fluoride* database.

The extent to which finances impacts the local decision to fluoridate was difficult to measure. Verbal interviews and survey responses primarily indicated finances as a concern. However, all of those verbally interviewed by phone who also completed the online survey had not been actively involved in historical fluoridation decisions and could not speak to the historical cost component. Based on estimates from the North Carolina Department of Health and Human Services, Division of Public Health, Oral Health Section, the annual cost for a community in the United States to fluoridate its water is estimated to range from approximately fifty cents per person in large communities to approximately three dollars per person in small communities (2013). The average lifetime cost per person is less than the cost of one dental filling. While smaller communities saved less than larger counterparts, on average sixteen dollars was saved per person in cost due to water fluoridation (O’Connell, Rockwell, Tomar & Maas, 2016).

Additional barriers to implementing community water fluoridation were identified by two stakeholders as a lack of cooperation from other community agencies and county commissioners not seeing community water fluoridation as a priority. The respondent who identified county commissioners do not see it as a priority stated that several years ago water fluoridation was discussed, but the issue was not seen a health priority. Respondents shared that the decision making ability to implement community water fluoridation within their counties included county commissioners, directors of public works, and local county and municipal governments.

Growing community resistance to additives in food and water, including fluoride, was also reporting as a barrier to implementing community water fluoridation. Additional interview responses from stakeholders indicated a growing resistance of the public to the use of fluoride. Respondents shared that misinformation on the effects of fluoride abound online including the claims that fluoride can cause arthritis, cancer, hypothyroidism, and detrimental IQ impact to developing brains.

Phone interviewees and survey respondents for Bladen, Duplin, Graham, Greene, Mitchell, and Perquimans, did state that there were alternative evidence-based programs available within those counties that provide access to fluoride to prevent tooth decay and promote oral health. Evidence-based strategies included safety net dental clinics, school-based weekly fluoride mouth rinse programs, and *Into the Mouths of Babes.*

The Safety Net Dental Clinics include both public and private non-profit facilities providing ongoing, comprehensive dental care to low-income patients. Safety Net Dental Clinics are available in Bladen County at CommWell Health Dublin, Duplin County at Faison Dental Service, Graham County at Graham County Health Department, Greene County at Greene County Dental Care, Mitchell County at the East Carolina University Community Service Learning Center and Toe River Project Access, and in Perquimans at the Perquimans County Health Department.

The weekly school based fluoride mouth rinse program has been available across North Carolina for over thirty years, primarily targeting schools with 60 percent of more of students eligible for free and reduced lunch. At the time of this survey Bladen, Duplin and Mitchell counties had either all or a portion of their elementary schools participating in the swish program. As well, both Graham and Perquimans counties were anticipating initiating the program. However, per the North Carolina Oral Health Section, as of August 8, 2019 the school based fluoride swish program is suspended for the 2019-2010 school year due to increase in cost of the fluoride swish product.

The *Into the Mouths of Babes* program trains medical providers to deliver preventive oral health services to children insured by North Carolina Medicaid from the time of tooth eruption until the age of forty-two months. Services include oral evaluation and risk assessment, parent/caregiver counseling, fluoride varnish application, and referral to a dental home. There are four dental practices in Bladen, two in Duplin, two in Greene and one in Perquimans that currently bill Medicaid for *Into the Mouth of Babes* services. There are not any dental practices in Graham County that currently bill for *Into the Mouths of Babes.*

**Conclusions**

For more than seventy years, scientific evidence consistently indicates that community water fluoridation is safe and effective. Multiple United States Surgeons Generals, the Centers for Disease Control and Prevention, the American Medical Association, the World Health Organization, the American Dental Association, and the American Academy of Pediatrics have all recognized and endorsed the health benefits of water fluoridation for preventing dental decay. Based on the responses received from stakeholders in Bladen, Duplin, Graham, Greene, Mitchell, and Perquimans counties, financial and community support are the main barriers to community water fluoridation. While these six counties have community water systems that lack fluoridation, stakeholders did identify that residents of their counties did have access to fluoride through two evidence-based programs. The evidence-based strategies in place included safety net dental clinics and *Into the Mouths of Babes.*

While exploring community water systems and fluoridation in Tier One Counties in North Carolina, the research team found that county-level oral health data was not available. Regional data was available, however, comparisons could not be made between the six identified counties and other counties with the same or other tier designations. In order to fully understand the impact a lack of community water fluoridation has on a community additional data would need to be collected. Communities may need to focus on education and consider a cost analysis of community water fluoridation versus investing in expansion of existing local public health programs targeting oral health. Local boards of health are key stakeholders in initiating fluoridation resolutions within their counties. Communities may find it beneficial to include fluoride levels and oral health initiatives in their state of the county health reports and community health assessments to support the need for community fluoridation. Additional education of the general population regarding fluoridation and fluoride safety may also be needed at the local and state level to expand community water fluoridation into smaller communities.

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