

2018-08-15

# Exploring Parental Views on Community Water Fluoridation and Alternative Policy Options in the Context of Cessation

Lang, Rebecca

---

Lang, R. (2018). Exploring Parental Views on Community Water Fluoridation and Alternative Policy Options in the Context of Cessation (Master's thesis, University of Calgary, Calgary, Canada). Retrieved from <https://prism.ucalgary.ca>. doi:10.11575/PRISM/32819

<http://hdl.handle.net/1880/107639>

*Downloaded from PRISM Repository, University of Calgary*

UNIVERSITY OF CALGARY

Exploring Parental Views on Community Water Fluoridation and Alternative Policy  
Options in the Context of Cessation

by

Rebecca Lang

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF SCIENCE

GRADUATE PROGRAM IN COMMUNITY HEALTH SCIENCES

CALGARY, ALBERTA

AUGUST, 2018

© Rebecca Lang 2018

## **Abstract**

**Background and Rationale:** Instances of cessation of community water fluoridation (hereafter ‘fluoridation’), such as the decision to cease fluoridation in Calgary in 2011, have raised broader questions about the acceptability, to members of the public, of population-level preventive measures in public health. In the wake of fluoridation cessation in Calgary, it is important to gain an understanding of how members of the public view population-level interventions in dental health, to ensure that future policies best align with the views of those served by those policies.

**Conceptual Frameworks:** We approached this work through the lenses of public health ethics and public engagement of science. Public health ethics focuses on populations, considering the collective rather than the individual. A public engagement with science lens explores the roles of the scientific community and of the public in framing scientific discussion.

**Research Objective:** We sought to explore perspectives on several possible population-level dental public health interventions held by parents of young children in Calgary, Canada, where fluoridation was previously but is no longer in place.

**Methods:** The target population was parents of young children. Using focus groups and pre- and post-focus group questionnaires, four policy approaches to preventive dental health for populations (i.e., municipal-level fluoridation; state/provincial-level fluoridation; universal dental care; and salt or milk fluoridation) were introduced and discussed. Focus group data were analyzed using thematic analysis.

**Results:** Three themes were developed: 1. *Expert/lay relations* explores how the public regards and behaves toward others who are understood to have different levels of expertise, knowledge, or credentials, vis-à-vis dental public health policy; 2. *Ways of knowing* explores how people use different forms and sources of information to determine whether a belief is valid; and 3. *Values*

*in public health* focuses on people's core principles regarding the importance and worth of dental public health interventions.

**Conclusion:** Our research confirms the importance of engaging these publics in developing dental public health policies. We also found that of the four policy options presented, universal dental care was preferred, which provides some insight into attributes of population-level interventions that are acceptable to members of the public in Calgary.

## **Preface**

This thesis is original, unpublished, independent work by the author, R. Lang. The study conducted is covered by Ethics Certificate Number REB17-0800, issued by the University of Calgary Conjoint Health Ethics Board for the project “Exploring Parental Views on Community Water Fluoridation and Alternative Policy Options in the Context of Cessation” on October 10, 2017.

## Acknowledgements

First and foremost, I would like to express my deepest gratitude to my supervisor, Dr. Lindsay McLaren. I could not have asked for a more supportive, encouraging and inspiring supervisor. I would like to thank Dr. Cynthia Weijs for her unwavering dedication to my pursuits, and for her mentorship at every stage of my thesis. I could not have done this without you. I would also like to express appreciation to my supervisory committee, Dr. Rafael Figueiredo and Dr. Gwendolyn Blue, for their support, invaluable guidance, and dedication to helping my thesis become a reality.

Thank you to the study's participants, parents of young children in Calgary, who took time out of their busy schedules to engage in discussion around dental public health policy. Thank you for sharing your stories, and contributing your knowledge and sophisticated ideas.

I am also ever grateful and thankful for the unconditional love and support from my family and friends: to my dad, who has shown me the meaning of a successful career; to my mom, pour ses conseils, ses encouragements et son soutien continu; thank you to both of you for being the most loving, supportive parents; to my brother and sisters, Ben, Naomie and Sarah-Michelle, for providing comic relief and venting gates when it was needed most; to my partner, Bryce, for his unparalleled patience, support when I didn't even know I needed it, for being my role model and best friend all wrapped into one; my Community Health Sciences friends, Celina, Chelsea, Kyla, Manal and Tona, for showing me unconditional support both as a peer and a friend; to my dogs, Sadie, Maisie, and Scarlett, who have provided me with more support than they will ever know.

In loving memory of my grandfather, Karol Lang.

*I've lived a life that's full  
I've traveled each and every highway  
But more, much more than this  
I did it my way.  
- Frank Sinatra*

# Table of Contents

Abstract.....	2
Preface.....	4
Acknowledgements .....	5
Table of Contents .....	7
List of Illustrations, Figures, & Graphics.....	9
<b>Chapter 1: Background.....</b>	<b>10</b>
1.1 Overview.....	10
1.2 Literature Review .....	12
1.2.1 Dental Decay in Children .....	12
1.2.2 Impacts of Poor Oral Health .....	13
1.2.3 Parents and Oral Health.....	14
1.2.4 Oral Health Inequities .....	14
1.2.5 Public Opinion.....	15
1.2.6 Similar Study Design.....	16
1.2.7 History of Public Health .....	18
1.2.8 Conceptual Frameworks.....	20
i) Public health ethics.....	20
ii) Public engagement of science.....	22
1.2.9 Local Context.....	24
1.2.10 Policy Alternatives for Improving Dental Health in Populations .....	25
1.3 Knowledge Gaps and Significance .....	32
1.4 Purpose and Research Question.....	33
<b>Chapter 2: Methods and Methodology .....</b>	<b>34</b>
2.1 Methodological Approach.....	34
2.2 Conceptual Frameworks.....	35
2.3 Sample .....	36
2.3.1 Sampling.....	36
2.3.2 Recruitment .....	36
2.3.3 Reimbursement.....	37
2.4 Data Collection.....	37
2.4.1 Pre-Focus Group Questionnaire .....	37
2.4.2 Focus Group Interviews.....	38
2.4.3 Post-Focus Group Questionnaire.....	40
2.5 Data Analysis.....	40
2.5.1 Ethics and Data Handling.....	42
2.6 Methodological Rigour .....	43
2.6.1 Validity .....	43
2.6.2 Reliability .....	43
2.6.3 Transferability.....	44
2.6.4 Reflexivity .....	45



<b>Chapter 3: Results</b> .....	<b>48</b>
<b>3.1 Study Participants</b> .....	<b>48</b>
<b>3.2 Pre-Focus Group Questionnaire</b> .....	<b>50</b>
<b>3.3 Focus Groups</b> .....	<b>52</b>
<b>3.3.1 Expert/Lay Relations</b> .....	<b>53</b>
<b>3.3.2 Ways of Knowing</b> .....	<b>62</b>
<b>3.3.3 Values in Public Health</b> .....	<b>70</b>
<b>3.4 Post-Focus Group Questionnaire</b> .....	<b>76</b>
<b>Chapter 4: Discussion and Conclusions</b> .....	<b>77</b>
<b>4.1 Summary of Results</b> .....	<b>77</b>
<b>4.2 Implications</b> .....	<b>78</b>
<b>4.2.1 Dental Public Health Policy Decision-Making Should Balance the Views from Key Stakeholders</b> .....	<b>78</b>
<b>4.2.2 Universal dental care as a preferred policy option</b> .....	<b>81</b>
<b>4.3 Strengths and Limitations</b> .....	<b>85</b>
<b>4.3.1 Strengths</b> .....	<b>85</b>
<b>4.3.2 Limitations</b> .....	<b>86</b>
<b>4.4 Conclusions</b> .....	<b>87</b>
<b>References</b> .....	<b>89</b>
<b>Appendices:</b> .....	<b>96</b>
<b>Appendix A. Consent Form</b> .....	<b>96</b>
<b>Appendix B: Demographic Questionnaire</b> .....	<b>100</b>
<b>Appendix C: Pre-Focus Group Questionnaire</b> .....	<b>102</b>
<b>Appendix D: Focus Group Discussion Guide</b> .....	<b>106</b>
<b>Appendix E: Focus Group Presentation Slides</b> .....	<b>111</b>
<b>Appendix F: Post-Focus Group Questionnaire</b> .....	<b>121</b>
<b>Appendix G: Collection of quotes for each of the themes and sub-themes developed from the data</b> .....	<b>123</b>

## List of Illustrations, Figures, & Graphics

### Tables

<b>Table 1. The advantages and disadvantages of each policy option presented during the focus group presentation, as outlined for participants.....</b>	<b>39</b>
<b>Table 2. Aggregated results from the demographics questionnaire.....</b>	<b>49</b>
<b>Table 3. Aggregated results from the pre-focus group questionnaire .....</b>	<b>51</b>
<b>Table 4. Aggregated results from the post-focus group questionnaire.....</b>	<b>76</b>
<b>Table 5. Collection of quotes for each of the themes and sub-themes developed from the data.....</b>	<b>123</b>

### Figures

<b>Figure 1. Visual depiction of themes and subthemes developed in this study.....</b>	<b>52</b>
<b>Figure 3. Participants' level of support for each policy option prior to the focus group.....</b>	<b>83</b>
<b>Figure 4. Participants' ranking of each of the policy options after the focus group discussion. ....</b>	<b>84</b>

# Chapter 1: Background

## 1.1 Overview

Community water fluoridation (hereafter, fluoridation) involves the controlled adjustment of fluoride in public drinking water supplies to prevent tooth decay in populations (1). Though fluoridation benefits populations of all ages, it is believed to be especially important in children due to the high prevalence of tooth decay (2), and its added benefits during tooth formation (3, 4). A recent review has shown that fluoridation can lead to a 30 to 60% reduction in tooth decay in children's primary teeth, and a 15 to 35% reduction in their permanent teeth (5). Although reviews have shown the benefits of fluoridation for oral health (6), a 2015 Cochrane review concluded that the current evidence is outdated, with available data mostly coming from studies prior to 1975 (6).

Despite its effectiveness, fluoridation cessation has occurred with increasing frequency in some regions, particularly in Canada (7). In Calgary, the practice of fluoridation was ceased in 2011 (7). Gaining an understanding of how members of the public understand and make sense of fluoridation as a policy option is important because fluoridation is a public resource: something that will or will not be implemented via democratic decision-making. In the aftermath of cessation, it is imperative to examine how a key stakeholder group, parents of young children in Calgary, perceives fluoridation and, importantly, alternative policy options to prevent childhood tooth decay.

The purpose of this study was to explore perspectives on population-wide dental public health interventions held by parents of young children in the context of fluoridation cessation in Calgary, Canada. We did this by investigating views of fluoridation and alternative dental public health policy options. The research question was: what are the views held by parents of young

children on population-wide dental public health interventions, in Calgary, Canada, in the context of fluoridation cessation?

We used public health ethics and public engagement with science as conceptual frameworks to guide our research. This study used qualitative methods to answer the research question, and is modelled on a published study that used similar methods to explore a different subject (stem cells) (8). Focus groups (n=4) were held and questionnaires administered prior to and following each focus group. The target population was parents of young children. The pre-focus group questionnaire included questions on background knowledge about fluoridation and other dental public health policy options. During the focus group, different policy approaches for fluoride delivery to populations were introduced (i.e. fluoridation as a municipal decision, fluoridation as a state/provincial decision, universal dental care, and salt or milk fluoridation), along with the key strengths and weaknesses of each. Data were collected and analyzed through public health ethics and public engagement with science as conceptual frameworks. To do so, the discussion incorporated the three ethical considerations discussed in the San Diego Dialogues; namely, 1. personal choice vs. community responsibility, 2. science and the environment, and 3. cost vs benefit.

The rest of the thesis is organized as follows. Chapter 1 presents the research background, which includes a literature review to better situate our research, knowledge gaps and significance, as well as the purpose and research objective. Chapter 2 outlines our methods, including the methodological approach used, the research design and data analysis. In Chapter 3, we outline the research results while Chapter 4 includes the discussion and conclusion, where we summarize our results, outline strengths and weaknesses of the study, and identify broader implications for this research.

## **1.2 Literature Review**

### **1.2.1 Dental Decay in Children**

Dental decay is the single most common chronic childhood disease, and is an important public health issue in Canada (9). It is an infectious, transmissible, diet-dependent disease that can have lasting detrimental effects on both primary and permanent teeth (2). Some potential consequences of dental decay in children include: acute and chronic pain, interference with the child's eating, sleeping and proper growth, tooth loss and malocclusion, increased expenses of dental care throughout life, and compromised general health (10). Community water fluoridation (hereafter 'fluoridation') is a key factor in the prevention of tooth decay, contributing to an overall decrease in prevalence in populations (1, 11).

The best available evidence suggests that fluoridation reduces the prevalence of caries (5). However, a 2015 Cochrane review stated that it is difficult to quantify the contemporary contribution of water fluoridation due to the widespread availability of other sources of fluoride, such as fluoride toothpaste, which appeared in the 1970s (5, 6). As such, fluoridation's contribution to caries prevention based on more recent evidence is weaker than the historical estimates (12). Studies examining dental caries following cessation of fluoridation are few in number, highly diverse, and differ in methodological quality (5, 6). Most studies of fluoridation and dental caries are cross-sectional comparisons of fluoridated and non-fluoridated communities (13). Because they are cross-sectional, they do not account for other factors such as other caries prevention strategies, diet and consumption of tap water, as well as the migration of the population that may impact caries rates (5). Additionally, different biomarkers have been used to measure fluoride exposure, and are not equally accurate; it has been suggested that recent

fluoride biomarkers (i.e., fingernails, hair) may be more accurate than contemporary fluoride biomarkers (urine) (14).

Fluoride acts primarily through topical, or post-eruptive mechanisms to prevent dental decay in three ways: decreased demineralization, increased remineralization and inhibited enzyme activity of plaque bacteria (15). However, studies have also suggested some systemic, or pre-eruptive mechanisms by which fluoride is incorporated on the tooth structure during tooth development (3). Because permanent tooth formation occurs between 0-5 years of age, fluoridation is especially beneficial in children younger than 6 years of age (4).

### **1.2.2 Impacts of Poor Oral Health**

There are a range of health consequences of poor oral health, from chronic disease to overall quality of life (16). Oral health has been empirically linked to diabetes, coronary heart disease, chronic respiratory disease, and pneumonia (16). Periodontal disease, which includes gum diseases such as gingivitis and periodontitis, has been bi-directionally linked to poor control of diabetes (16). Adults with diabetes are almost three times as likely to have periodontitis compared to non-diabetic adults, and diabetic adults demonstrate improved glycemic control in diabetes after treatment of periodontal disease (16). There is also consistent evidence of increased risk of coronary heart disease attributed to periodontitis, and poor oral hygiene has been shown to cause or aggravate pneumonia and respiratory infection in the elderly (16).

Good oral health is very important for children under the age of 6 years. Preschoolers who suffer from dental decay in their deciduous (baby) teeth have an increased risk for decay in permanent teeth later in life. Poor oral health can also negatively impact a child's quality of life, including declining performance at school, malnutrition, poor self-esteem, as well as overall cognitive development (17).

### **1.2.3 Parents and Oral Health**

Both parents and healthcare workers sometimes minimize the potential contribution of oral and dental health on the general health of their young children (18). Studies have shown that there is poor awareness among parents and guardians of preschool children pertaining to their child's oral health (19). Low parental knowledge and poor attitudes toward their child's oral health have been shown to translate to a higher rate of caries experience in these children (20). Notably, greater knowledge and higher level of education in parents were both shown to be significantly associated with better oral health practices in their children (21). Lower household education, along with low family income, racial/ethnic minority status and lack of private dental insurance have all been associated with a higher rate of dental caries among children in Canada (22).

Importantly, parents are the guardians and decision-makers for children, and will have a large impact on their oral health (23). Because of this, it is important for parents to be engaged in policy-level decisions around population-wide dental health interventions.

### **1.2.4 Oral Health Inequities**

Because of its equitable impact on dental caries, fluoridation has been argued to be an important option for prevention of dental decay at the population level (24). It has been described as the most cost-effective method for tooth decay prevention as a population approach, and a practical method for reducing disparities in socio-economic status in the burden of dental caries, because of its universal and passive modality (24). It is a universal measure because it is accessible to the entire community, regardless of socio-economic status, education, income, race or ethnicity, and a passive measure because the benefits of fluoridation can be obtained without individuals needing to change their behavior (25). Water fluoridation is the most economical

method to reduce the burden of dental disease in the population; in most cities, with one U.S. study estimating that every \$1 invested in water fluoridation saves \$38 in dental treatment (26). Additionally, given that the annual cost of fluoridation ranges from approximately \$0.77 to \$4 per person per year, the average lifetime cost per person to fluoridate a water system is less than the cost of one dental filling (27).

### **1.2.5 Public Opinion**

Since its initial implementation in 1945, fluoridation has been a polarized and contentious issue (28). Within the dental profession, there is consensus around the effectiveness of fluoridation, and minimal debate on its implementation in communities (29). However, there is considerable debate regarding the safety and value of fluoridation in popular culture (30). A study conducted by Quiñonez et al. established that approximately one in two Canadians are aware of fluoridation (30); of those who were familiar with fluoridation, the majority considered it safe and supported its use (30). Despite this, it appears that an increasing number of municipalities in Canada are choosing to cease fluoridation (31). Consequently, policy leaders are questioning whether the practice of fluoridation remains acceptable in Canada (30). Quiñonez and colleagues suggested that studies be conducted to better understand the public's beliefs regarding fluoridation (30).

Current studies that aim to understand the public's beliefs regarding fluoridation often discuss one public view of fluoridation as compulsory mass medication, viewing it as a means by which the government is abusing its rights over its citizens (32). The increasing cessation of fluoridation comes at a time when several democratic liberal countries are moving towards a post-materialistic society (33). This type of society is characterized as being critical towards both the authority of the government and scientific communities because the public wants assurances



of a higher quality of life beyond mere survival and limited welfare (33). In these societies, there is also a tendency to challenge the effectiveness of institutions, and individuals are not willing to compromise their individual freedoms and rights (33). This trend highlights an important aspect of the public's opinions toward fluoridation: addition of fluoride to drinking water may be experienced as taking away their freedom to choose not to drink fluoridated water.

One study which aimed to better understand public views on the issue of fluoridation, which was considered a 'science-intensive issue', is the San Diego dialogues study (34). Citizens were questioned on whether or not San Diego should introduce fluoridated water (34). Notably, this study aimed to understand which considerations are most important in forming and changing people's views on fluoridation (34). It also aimed to develop insights on how members of the public process information, form their attitudes and reach judgment on policy issues with a strong scientific component (34). The study demonstrated that scientists can no longer expect the public to defer to their expertise when a controversial issue arises (34). Even if the scientific evidence overwhelmingly points towards fluoridation as effective and safe, a handful of rogue or misleading results can undercut the authority of science in the public eye (34). Additionally, any efforts to undermine these rogue studies by scientific authorities only lead to more public mistrust (34). The study states that resolving science-intensive questions will require open-dialogue with the public to understand values and frameworks, and a more effective way of responding to public concerns (34).

### **1.2.6 Similar Study Design**

Another study that used open dialogue strategies with members of the public to understand a different science-intensive question, that of policy related to stem cells, was done by Einsiedel et al. (8). Our study's methods were modeled on that stem cell study. That study's

principal investigator is also from the University of Calgary, which is how we were made aware of this study. That study was furthermore selected as a model for our research because it also aimed to gather public insights on a controversial health-related topic, and did so in an effective and rigorous manner (8).

In that study, a series of focus group interviews were conducted with Canadian adults to examine their views on different stem cell sources (8). Participants were asked about various sources of stem cells, which included stem cells derived from donated embryos and using both human and non-human eggs to obtain the cells (8). The researchers wanted to better understand what the ethical issues were behind those stem cell sources, and what participants would feel comfortable with in terms of policy alternatives (8). Three different policy models were introduced: a permissive approach, a model currently being used by the United Kingdom; a middle-of-the-road approach, a model used in Canada; and a restrictive policy approach, used in the United States (8). These policies ranged from allowing several different sources of stem cells to be used and publicly funded (permissive approach), to new stem cell sources being prohibited using public funds (restrictive approach) (8).

Einsiedel et al.'s study, because it examined people's perceptions of various policy alternatives, is an ideal model for our study, which focuses on a different, but arguably equally controversial, health issue. By introducing various policy alternatives regarding fluoridation, we can gather perceptions of fluoridation while also understanding why certain policies are more appealing than others to some members of the public.

### **1.2.7 History of Public Health**

In order to set the stage for the conceptual frameworks used in this study, and to situate our specific topic in its disciplinary and professional context, including recent trends, we include a brief history of public health.

The history of public health has been divided into distinct ‘revolutions’ by several authors (35-37), to indicate that public health as a discipline has undergone radical changes. Two of these revolutions, identified by Terris (36), include the infectious disease and the chronic disease revolutions. The infectious disease revolution encompassed the traditional responsibility of the State to protect the health of its citizens, aiming to control and eliminate threats posed by great epidemics that had decimated human populations and prevented a steady demographic growth (37). The infectious disease revolution in public health was spurred by the start of the Industrial Revolution (ca. 1760-1840), characterized by newly built cities that could not handle the influx of workers, leading to crowded and squalid housing conditions (37). This era was fueled by the emerging and fast-growing life sciences such as bacteriology, physiology and social statistics (37). In terms of practice, public health became integrated within the growing Nation-State bureaucratic regulatory system, embedding public health into government (38, 39). The expanding scientific knowledge of life sciences combined with the population management capacity of the nation-state gave public health the momentum it needed for the establishment of a practice founded on the authority of expert knowledge in the provision of the common good (37).

In the latter half of the 20<sup>th</sup> Century, transmissible diseases were mostly under control, and chronic diseases became the leading cause of death, forcing a second revolution for public health (35, 37). Now that the majority of children lived into adulthood, and that women were surviving childbirth, public health sought after a new goal: to increase human longevity through

the prevention of chronic disease (37). In this era, the knowledge base for public health grew as it encompassed the rapidly expanding clinical sciences and a deep professionalization movement, including the development of experimental medicine and a plethora of biochemical sub-specialties (37). Public health became integrated into the established medical professions, such as physicians and nurses as well as emerging ones such as health educators, rehabilitation specialists and nutritionists (37).

More recently, it has been argued by Breslow (40) that public health is undergoing a third revolution, seen as the “New Public Health” through the emergence of health promotion. In 1974, the Lalonde Report was released which focuses on health promotion and the process of enabling people to increase control over and improve their own health (41). Following this, the 1986 Ottawa Charter for Health Promotion demarcates the prerequisites for health, such as “peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice, and equity” (42). Since human life is reaching its upper limit in many countries, and individuals expect to live a long life, relatively disease-free life, a shift in the public health agenda has been observed with a focus on advancing health by maximizing it as a resource for living (40). In this sense, health is produced in everyday life and encompasses all aspects of life, rather than simply the ‘absence of disease’ (37). This revolution of public health also includes an expansion of the current knowledge base in public health to include social theories such as the social determinants of health (43).

This short history of public health is relevant to the topic of this thesis because if it is established, as per the current ‘revolution’ in public health (40) that health is produced in everyday life, then intervening on health requires knowledge about how individuals in society make decisions and act in a way that affects their health in everyday life (43). This “New Public

Health” revolution is characterized by a greater integration of knowledge from a wider range of the social sciences (43), as well as lay knowledge becoming increasingly valued as a legitimate source of knowledge that should complement scientific knowledge in the construction of evidence to evaluate and support action (44). Given this, it is important to conduct research that seeks lay knowledge in the construction of public health initiatives that affect individuals’ everyday lives, such as dental public health policy.

### **1.2.8 Conceptual Frameworks**

#### **i) Public health ethics**

One definition of public health is “the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society” (45, 46). This definition highlights the collective and communal nature of public health efforts. The societal-level interventions that accompany public health initiatives are largely governed by federal and state/provincial governments, municipalities, or regional health authorities (47). This focus on communities rather than individuals may infringe on individual rights, raising unique ethical challenges (47). Until relatively recently, the health care principles of autonomy, beneficence, non-maleficence and justice, were used as the appropriate framework to support ethical public health practice (48). However, due to the collective orientation and distinct goals of public health, the principles behind health care ethics do not provide an adequate theoretical foundation nor an appropriate normative justification for public health practice (47). While health care ethics focuses primarily on individuals, often in clinical settings, public health ethics is concerned primarily with populations, often in community settings (47).

When referring to public health ethics, one must consider who comprises “the public” (47). One important characteristic of the public is that it is much more complex than a simple

aggregate of individuals; there are added properties that arise in the complex system of the public (49). As argued by Jennings, instead of viewing public as an aggregate, it should reflect the relation between the individual and the individual's context, including their relationships with others (50). The concept of *the public* is complex, and it can be helpful to think about different forms of the concept. In the context of public health ethics, MacDonald et al. talks about “numerical, political, and communal publics” (47). The numerical public is the target population of a public health intervention (51), and are viewed as the aggregate members of the public (51). The political public refers to what is done through public agencies and governments cooperatively (51). Because of its collective responsibility to assume and implement public health initiatives, the government is a central player in the political public, and must be considered (51). Lastly, the communal public refers to non-governmental initiatives to undertake public health action (51, 52). For example, nonprofit, nongovernmental, voluntary, or social entities, including ethnic and cultural groups, and advocacy organizations (53, 54). Unlike the political public, this group does not necessarily need to justify their actions to the numerical public (51). Although one must be careful to avoid reifying these different forms of public, the three types provide a useful heuristic for thinking about the nuances that exist among the public, the added properties that accompany the complex system that is the public, and the relationships between individuals that make up the public.

One ethical framework for policy in public health is the Stewardship Model, developed by the Nuffield Council for Bioethics (55) to guide public policy in this area. As a concept, stewardship outlines that liberal states have responsibilities to look after important needs of people both at an individual and collective level (55, 56). In this way, they are stewards to individual people by taking into account different needs arising from factors such as age, gender,

ethnicity and socio-economic status, as well to populations as a whole and the concerns that arise when thinking of a population as a distinct entity (55).

Stewardship differs from paternalism, as it is less likely to support highly coercive universal measures, and is more sensitive to respecting individuality (57). It does so by seeking the least intrusive way of achieving policy goals while also taking into account the criteria of effectiveness and proportionality (55). Additionally, especially where issues involve complex scientific evidence, stewardship claims that simply following the public vote may not be enough, and rather, public policy should be compatible with the views and values of the public (55). Moreover, the government should create conditions that allow the public to evaluate and critique the appropriateness of proposed policies (55). As explained by the Nuffield Council on Bioethics' discussion of the intervention ladder (55), whether a public health measure is acceptable depends on whether or not it is 'proportionate'; namely, whether the benefits of the measure are enough to justify the interference in people's lives, and the financial cost. Interventions that are higher up the ladder are more intrusive, and therefore require a stronger justification (55).

## ii) Public engagement of science

The traditional approach to public engagement with science views the public as a passive, recipient audience in need of information(58), and is referred to as the deficit model. It involves the communication of science in a linear one-way process, where knowledge is transferred from a specialist context to a popular one (59). One aspect of the deficit model is that knowledge can be transferred without significant alterations from one context to another, suggesting that it is possible to take an idea or result from the scientific community and deliver it to the general public (59). However, scholars have argued that, instead, the communicative path from specialist

to popular science involves removal of the doubts and nuances that exist in specialist knowledge, reducing it to simple facts, attributed with certainty and incontrovertibility (59). In this way, thinking of communication of science as a simple transfer, simply taking an idea from the scientific community and bringing it to the general public, ignores the idea of scientific communication as a complex set of active transformative processes that can have an impact on the core scientific debate itself (60).

Because scientific communication and public discourse can impact the core scientific debate, it is necessary to move away from the deficit model, toward involving and engaging the public in the process of creating public health initiatives. One way to do this is through the dialogic model, proposed by Callon (58), who emphasizes shifting the priority from educating a scientifically illiterate, passive public to the need and right of the public to be embedded into the discussion. Substantive involvement of the public is important because the public has knowledge and important competencies which can work to enhance and complete the competencies of scientists and specialists and in some instances, challenge scientific framings (58).

A public engagement with science lens emphasizes the importance of communication of science between the scientific community and the public, seeing it as a fluid dynamic process (59). By viewing communication of science in the context of expert/citizen interactions, rather than communication as a linear process from knowledgeable experts to a passive, ignorant public, we acknowledge that the public can have an impact on the core scientific debate itself (59). In particular, this lens on engagement urges public health initiatives to stem from genuinely public or civic endeavors rather than prevailing structures of cultural attitudes and social power (49). Value pluralism, the idea of different citizens having diverse perspectives and worldviews being brought together to discuss and decide on different issues of common concern, is an



important idea within public engagement with science (61). By having open deliberations with a range of different perspectives, values and issue frames that might otherwise be absent from spheres of decision-making can help shape the policy process (62). This strive for genuine civic endeavors, and embracing value pluralism, permits consideration of issues of power relations in state- or government-driven interventions to promote well-being (47). In this study, we include key stakeholders from the numerical public and better understand their views on fluoridation and policy alternatives.

### **1.2.9 Local Context**

In Canada, dental care is not covered under universal Medicare and is almost wholly privately financed (63, 64). Approximately 62% of the population pays for their dental care through employment-based insurance, and 32% through out of pocket expenditures (65). This leaves 6% of dental care that is publicly financed, which is almost all targeted to socially marginalized groups (e.g., children in lower-income families) and delivered through public forms, including as a benefit through governmental social services (65).

Compared to other provinces, Alberta has the highest dental fees (16, 66), making dental care especially unaffordable in this province. Alberta has also recently moved from being one of the provinces with the highest proportions of the population served with fluoridation, with 75% of the province receiving fluoridation in 2007 (31), to only having 42% of Albertans receiving fluoridation (2016) (31, 67). This decrease in the proportion of the population served with fluoridation in Alberta was mostly due to the 2011 cessation of fluoridation in Calgary, one of the largest cities in Canada and the largest one in Alberta (68). This decision to cease occurred during a time period when other Canadian municipalities also ceased fluoridation, including Waterloo (2010), Windsor (2013), and Quebec City (2008) (31, 69). Following fluoridation

cessation in Calgary, several other cities in Alberta decided to review, and in some cases opted to cease, their fluoridation programming (31).

The municipal-level decision has been capricious in Calgary, Canada (70). There has been six plebiscites; four where the electorate voted “no” (1957, 1961, 1966, 1971) and one in 1989 where fluoridation was passed with 53% in favour (70). In 1998, a plebiscite over the continuation of fluoridation also passed with 55% in favour (70). The most recent decision, to remove fluoridation from the Calgary municipality, was a city council vote, where council voted 10-3 to remove fluoride in 2011(7).

In light of the challenges that face municipal-level fluoridation, we look to available alternative policies adopted in other locales worldwide for prevention of dental caries, which we describe below. It is important to note that we are not commenting here on a fine-grained analysis of which policy is more suitable within the Canadian or Albertan context, but rather, more broadly at what members of the public view as a potential or possible alternative to water fluoridation in the specific context of cessation, and in the more general context of the seeming rise in cessation in Canada.

#### **1.2.10 Policy Alternatives for Improving Dental Health in Populations**

There are several policy models used across the world to deliver preventive dental health interventions to populations. These policies differ in degree of interference, with some policy options ranking higher in degree of interference than others. The different degrees for interference can be understood by the Nuffield Council’s “Intervention Ladder” (55) as described above, which ranks the different kinds of intervention that the state may use to promote public health, from the least to the most coercive or intrusive measures.

I describe the four policy alternatives next. It is important to note that these four policy options differ in complexity and feasibility, where comparability is reasonable in some cases (e.g., water fluoridation vs. salt/milk fluoridation) and less so in others (e.g., water fluoridation vs. universal dental care). However, we felt the need to introduce these four policies because the goal of this study is to better understand the underlying values that help shape beliefs held by parents of young children around population-wide dental public health interventions, rather than to obtain a consensus on which of the four policies is preferred.

#### 1.2.11.a) Option 1. Community water fluoridation at the municipal level

The principal policy model for delivery of fluoride to populations in Canada is fluoridation. The goal of fluoridation is to reduce the prevalence of dental decay, ultimately improving dental health. In Canada, the decision to implement fluoridation rests with municipalities in collaboration with the appropriate provincial authority (71). In this way, fluoridation is implemented via a municipal council vote or a municipal plebiscite (72), and the provincial government issues licenses to the municipalities in order to operate a fluoridation system (except in Quebec) (71). Regulations in this license include continuous monitoring of the fluoridation process (71). The federal government is not responsible for the regulation of drinking water in Canada (25), but plays an advisory role. Fluoridation at the municipal level is similarly used in several other countries, including but not limited to the United States, Australia, Singapore, the United Kingdom, Ireland and Spain (73).

As highlighted above, fluoridation has been described as the most cost-effective population-level method for tooth decay prevention (24). In addition to being economical, it is a universal measure, and benefits of fluoridation are obtained without individuals needing to change their behavior (24).

While fluoridation is an effective measure, the apparently growing number of instances of fluoridation cessation in Canada highlights some of the challenges that accompany this policy. A prominent one is the ethical concern around individual choice, and in particular concerns around its intrusive nature (74). In reference to the Intervention Ladder (55), fluoridation would rank highly, because of this intrusiveness. Musto (75) highlights the increasingly prominent social norms around assertion of individuality and freedom of choice, that might explain the growing anti-fluoridation sentiment.

Another challenge that accompanies municipal-level fluoridation is that municipal-level policy makers reported feeling unequipped to make decisions on this science-intensive issue (76). For example, the Mayor of the City of Windsor, Ontario, Drew Dilkens, questions leaving this “public health decision” to municipal city councillors, “a vast majority of who have no science background, no real ability to make a truly informed decision whether it’s safe to have fluoride in the drinking water or not (77).” In Canada, where the province has jurisdictional authority for health care, it has been argued that the provincial government may be the more appropriate body to make decisions surrounding fluoridation (7, 78).

#### 1.2.11.b) Option 2. Community water fluoridation at the state/provincial level

The second option presented is fluoridation at the state/provincial level. Here, responsibility for decision-making on fluoridation would move from the municipal level of government to a higher level of (e.g., provincial-level in Canada, state-level in the United States). This type of legislation has been passed in other countries, including in 13 states in the US (79), and in five states in Australia (80). There are differences between the mandates in these states, including different population size thresholds and funding of equipment (78). However,

the mandating of fluoridation at a state-level has led to the expansion of fluoridation to serve significant percentages of their populations (78).

Recently, Ontario has explored the option of implementing fluoridation as a provincial policy (as opposed to municipal policy), which would lead to the decisions being made by Ontario's Ministry of Health and a requirement to provide fluoridation in every urban and rural area province-wide (78). Legislation would ideally be supported by the creation of a provincially-funded fluoridation office dedicated to continuously monitoring the scientific literature, and communicating the findings to policy-makers and the public (78).

This (currently hypothetical) fluoridation mandate in the province of Ontario would lead to a high percentage of the provincial population being exposed to fluoridation (78). Importantly, the legislation would move decision-making around fluoridation to a level of government with more resources (including expertise) to consider the practice, which is relevant in light of municipal council's reporting of feeling unequipped around this science-intensive issue (78).

Like fluoridation at the municipal level, this intervention can improve dental health outcomes at a population-wide level, and can be seen as equitable in its impact on dental health due to its universal and passive modality (24). However, this intervention may face similar challenges to those faced by municipal-level fluoridation. As this policy could be perceived as infringing on individual liberties of the province's population, it may encounter similarly strong opposition to that seen with municipal-level decision-making.

#### 1.2.11.c) Option 3. Universal dental care

Universal dental care represents another policy option to prevent tooth decay and improve dental health (81). Similar to universal health care, universal dental care would involve

a publicly funded system of prevention and treatment related to dental health. Some version of universal dental care exists in Austria, Mexico, Spain, Finland and Turkey, among other countries (82).

The principle of universal coverage could materialize by expanding the range of health care services currently included (e.g., hospital and physician visits in Canada) to include oral health care (including prevention and treatment). This could be done wholly or partially, where a set of services are extended to everyone, or a smaller set of services are extended to everyone, or a more robust set of services extended to certain populations, such as children (83).

One advantage of a universal dental care program is that services are available regardless of socio-economic status, potentially lowering some of the inequities that exist across different socio-economic levels. It is well established that there are socio-economic inequities in dental health (69), including access to treatment (84). In several countries including but not limited to Canada, Brazil (85), the UK (86) and Australia (87), socio-economic inequities such low family income, racial/ethnic minority status, and lack of private dental insurance have been associated with higher and more severe dental caries among children (65, 69). Another advantage of universal dental care is that, to the extent that persons have the choice to seek dental services (81) individual liberties are preserved. In that regard, universal dental care ranks relatively low on the intervention ladder, as it does not infringe on individual liberties in the same way as fluoridation (55).

Importantly, there are massive challenges that accompany this policy option, from a feasibility perspective. In particular, there would be a need for dramatic changes to the current infrastructure in Alberta and high costs associated with these changes, making it a much less economical option than fluoridation, at least in the short term (81). Finally, based on the curative

(vs. preventive) orientation of current health care systems, such as Canada's, it is reasonable to argue that universal dental care – if encompassed within an existing system – could be similarly dominated by a treatment orientation. Universal dental care, from that point of view, may not fulsomely address the reasons why some people have poor dental health in the first place (i.e., the causes of incidence, or the social determinants of health).

#### 1.2.11.d) Option 4. Alternative modes of fluoride delivery: salt or milk

The last population-wide dental public health policy is fluoride-fortified salt or milk. In this way, rather than fluoridating the water source, fluoride is added to either salt or milk during production.

Fluoride-fortified salt is used in several countries world-wide (88). There are two main methods of salt delivery: 1. domestic salt, which reaches individual households and small businesses (smaller reach); and 2. industrial-level salt, which includes salt used by bakeries, large institutional kitchens, and the food industry (larger reach) (89). Some countries, such as Jamaica and Costa Rica, use the industrial-level method, fluoridating essentially all salt for human consumption (includes domestic and industrial), therefore reaching entire populations, as is done with fluoridation (89). Other jurisdictions, such as most European countries that use the salt-fluoridated model, use the first (smaller reach) method, limiting fluoridated salt to domestic salt only (89). In such cases, there may be a large portion of the population that is not reached (89).

One advantage of the domestic approach is that it reduces some of the ethical concerns faced by fluoridation, as individuals are left with the choice to incorporate fluoride into their diet, by purchasing fluoridated salt or not (89). This choice reduces the level of intrusion of this intervention, therefore ranking lower on the intervention ladder than an intervention such as fluoridation. However, this approach also reduces the population-level impact of the measure, as

some individuals, possibly including those who would most benefit from fluoride, may choose not to purchase or consume fluoridated salt (89). Studies have indicated that distributing fluoridated salt through channels used by those occupying lower socio-economic strata is important in order to mitigate this (74). An additional potential challenge is that fluoridated salt may lead to increased salt consumption, because individuals might link increased salt intake with better dental health, which may lead to adverse salt-related health effects (55).

Milk fluoridation has also been adopted in several contexts (90). Unlike fluoridated salt, the practice of fluoridated milk seems to work through community-based schemes, either through schools or communities, rather than through commercial distribution (90). Accordingly, studies around the effectiveness of fluoridated-milk initiatives seem to focus on children, rather than entire populations (90).

In many countries, fluoridated milk was provided on an organized basis through the educational system (90). In the early 1990s, an international milk fluoridation program began across the world, including countries such as China, Chile, the United Kingdom and Peru (90). This program demonstrated the value of milk as an alternative vehicle for fluoride delivery, which may be appropriate in areas where water or salt fluoridation are not possible or desired (90). In this model, fluoride-fortified milk was provided to children of specific age groups (differed by country) via an already existing milk delivery program, as well as to any persons who chose to buy fluoridated milk instead of non-fluoridated milk (90).

Another mechanism for fluoridated milk delivery was through community centres (90). For example, in Peru, under the government-funded Programa del Vaso de Leche, fresh milk is distributed through local community centres (90). Unlike the school-based programming, this scheme enables children to consume fluoridated milk on a daily basis, compared to those



established through school systems, which are typically limited to approximately 200 days per year (90).

As with salt fluoridation, this modality of fluoride delivery reduces some of the ethical issues faced by fluoridation, specifically individual freedom of choice, since individuals can choose whether or not to purchase and consume fluoridated milk (91). Additionally, in countries where this policy has been implemented, it has been reported that the cost difference between fluoridated and non-fluoridated milk is marginal, such that it is generally absorbed by the milk producers and the cost is not passed on to those buying the milk (90).

Although milk fluoridation has some appeal, it also faces some challenges. For example, it is important to note that Canada does not have national school nutrition programming infrastructure and therefore delivery of fluoridated milk to school children in a consistent manner could be challenging (91). Although commercialized milk, similar to commercialized salt, could be a viable option, it does not appear to currently exist in other jurisdictions (90) and therefore a model or template is absent.

### **1.3 Knowledge Gaps and Significance**

Because of 1) the growing number of municipalities in Canada revisiting, and in some cases opting to cease, fluoridation, 2) knowledge of the considerable leverage of a population-level approach for improving health (92) and 3) the growing imperative to engage the public in a meaningful way in public health, it is important to understand if there are alternative policy options for dental public health that may be more acceptable to members of the public, and to thereby gain a better understanding of some of the considerations that make a population-level policy desirable to the public. This information would be especially useful to policy leaders making decisions on fluoridation and other policy decisions related to dental health.

## **1.4 Purpose and Research Question**

The overarching purpose of this research was to better understand parents' views on population-wide dental public health interventions, as a window into the broader issue of views on population-level measures in public health more generally. The research question was: What are the perspectives and viewpoints regarding population-wide dental public health interventions among parents of young children in Calgary, Canada, in the context of fluoridation cessation?

## Chapter 2: Methods and Methodology

### 2.1 Methodological Approach

Qualitative methods were used. Qualitative inquiry differs from quantitative inquiry in that it aims to gather in-depth, rich content and is often exploratory in nature (93). It is used to understand complex social processes and to capture essential aspects of a phenomenon from the perspective of study participants while taking context into consideration (93). Rather than obtaining a “thin” (surface-level) understanding across a large sample, our goal was to obtain a “thick” (in-depth) account among a smaller sample. As noted above, this study was modelled on the methods used in a published paper by Einsiedel et al. to explore a different, but arguably similarly “science-intensive” subject (stem cells) (8). Data were collected via focus groups and questionnaires.

Guiding questions for focus groups were informed by the San Diego Dialogues on Fluoridation (34), which identified several considerations that figure importantly in forming people’s views on fluoridation. These considerations are:

1. *Personal choice versus community responsibility.* In other words, autonomy versus collectivity, and the role of the state in health-related decisions such as fluoridation.
2. *Science and the environment.* How much weight should be given to science and information produced through academic research versus other sources of information from one’s environment that are derived differently, such as through personal relationships.
3. *Cost versus benefit.* How to appropriately weigh the costs versus the benefits for population-wide interventions such as fluoridation.

Pre- and post- focus group questionnaires were administered, which allowed for more than one form of data to be obtained, providing a richer account of participants' views on the topic.

## **2.2 Conceptual Frameworks**

Thematic analysis was guided by theories of public health ethics and public engagement with science which we used to help interpret the emerging data. Codes may be interpreted differently depending on the lens they are being presented with, the angle they are being looked at (94). We knew from the outset that we wanted to draw on those specific theoretical frameworks as a way to frame the study.

The lens on public health ethics urges public health initiatives to stem from genuinely public or civic endeavors rather than prevailing and sometimes unquestioned structures of cultural attitudes and social power (49). Although we acknowledge the complexity that accompanies the notion of the public, the heuristic nature of the public recognizes that there are numerical, communal and political dimensions to understanding the public. In the present study, we sought to engage key stakeholders aligned with the concept of numerical public, and better understand their views on fluoridation and policy alternatives. By engaging members of the public who do not necessarily have authority or expertise on the topic, if fluoridation and alternative dental policies serve their interests and align with their views, we aim to bring public health back to its social roots.

Studies such as the San Diego Dialogues (34) and Einsiedel et al.'s (8) study of public views on policy alternatives for stem cells, both seek to understand public judgment on science-intensive issues. Similarly, this study aimed to explore parental views on population-wide dental public health interventions (8) and to highlight the importance of engaging the public with

scientific issues such as fluoridation. Such research permits moving away from a research model where the lay public is not actively engaged (58).

## **2.3 Sample**

### **2.3.1 Sampling**

The target population was parents of young children in Calgary. We chose to look at parents who have children between the ages of 0 and 12 years, because children of those ages could benefit from exposure to fluoride during tooth development, including pre-eruptive effects (95). To be included in the study, parents needed to live in Calgary, be able to participate in the study in English, and be a parent of at least one child between the ages of 0 and 12 years.

### **2.3.2 Recruitment**

We sought a diverse sample from different areas of the city. To that end, five community centres were randomly selected from each quadrant in the city of Calgary (SW, SE, NW, NE), and we recruited from those centres (for a total of 20 centres). Centres from all quadrants enriched the focus group data, as we increased our chances of including parents from diverse groups of socio-economic status, ethnicities and neighborhoods. We advertised the study in community centre newsletters, and other avenues, such as community news boards, and public spaces (such as grocery stores).

Parents could contact our research team either by email or phone number to express interest in the study. The participant then received a follow-up phone call from me (RL), where I screened the caller to ensure that they were a parent of at least one young child (12 years or younger), and currently lived in Calgary. We also asked for each parents' availability to best accommodate their schedules. Parents were selected into the study on a first call, first serve basis regardless of which quadrant they lived in.

We conducted the focus groups at four community centres in the city, one in each quadrant, for a total of 4 focus groups. We offered childcare at the centres while parents participated in the focus group to increase the accessibility of our study. We held two focus groups during work hours and two during weekday evenings to further diversify the parents who attended the focus group. An experienced moderator, a post-doctoral fellow in Dr. McLaren's research group (CW), led all four focus group discussions. The principal investigator, Rebecca Lang, observed and took notes.

### **2.3.3 Reimbursement**

We provided a \$50 reimbursement to each participant for possible expenses associated with participation in the study, as well as a letter thanking them for their participation.

## **2.4 Data Collection**

The first questionnaire each participant filled out when they arrived at the focus group location was a demographics questionnaire. The questions themselves were modelled on existing high-quality questionnaires, such as the Canadian Community Health Survey (96). We included questions on age, gender, level and type of education, home ownership, number of children and age of each child (see Appendix B).

### **2.4.1 Pre-Focus Group Questionnaire**

The specific questions used in the pre-focus group questionnaire were designed by our research team to resemble those used in Einsiedel et al.'s study (8). The questionnaire included both closed and open-ended questions (see Appendix C for pre-focus group questionnaire).

Participants were first asked whether their community water is currently fluoridated. Participants were then asked some Likert scale questions surrounding general knowledge of fluoridation, including its effectiveness, fairness and acceptability.

Participants were also asked about each of the policy options we planned to introduce during the focus group discussion (fluoridation as a municipal decision, fluoridation as a provincial or state-level decision, universal dental care, and fluoride added to salt or milk), and their level of acceptability for each. We also asked participants where they have found their information on fluoridation, such as websites, local news, word of mouth, or other forms of media, as well as whether they have ever been involved in any form of fluoridation activism.

#### **2.4.2 Focus Group Interviews**

Focus groups were chosen specifically over other types of qualitative data procedures because they permit accrual of considerable information in a short period of time (94). They also allow for interaction between group participants as well as between the interviewer and the participants, which was beneficial in our case because it prompted arguments, further demanding that people explain, defend and possibly revise their viewpoint (97). While there are disadvantages to conducting focus groups, such as dominant and controlling viewpoints can emerge and irrelevant discussions taking place, one main advantage of choosing a group structure where there is some degree of homogeneity (e.g., all parents of young children) is that it created safer environments for the participants, and gave all participants something in common (young children).

Constructed focus groups, where participants have not met before, were preferred over natural groups. Researchers have argued that, in constructed groups, participants face less personal cost if they diverge from the group views, are more likely to be honest, and are less likely to set their own discussion agenda instead of following the agenda set by the researchers (98). We included between 4 and 7 individuals per focus group. These groups were large enough to include diverse perspectives, but still small enough to promote interaction between

participants (94). Because of the complexity of the topic and the inclusion of a presentation, smaller groups were preferred over large groups.

Each focus group began with an icebreaker (e.g. each participant was asked where they were from and to tell us something interesting about themselves) and some brief discussion around children’s tooth decay and fluoridation. Next, I gave a brief presentation (15 minutes) about fluoridation, which explained what fluoride is, how it affects teeth topically and systemically, and introduced participants to the four different policy approaches for fluoride delivery, along with the key strengths and weaknesses of each (see Table 1 below; see Appendix E for presentation slides). We ensured that the presentation and all focus group materials, used language suitable to a grade 8 education level.

**Table 1. The advantages and disadvantages of each policy option presented during the focus group presentation, as outlined for participants.**

<b>Policy Option</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>1. Municipal-level fluoridation</b>	1. Lowest level of government, closest to the people 2. Everyone receives it and therefore universal	1. Within each municipality, removing the element of individual choice
<b>2. Provincial-level fluoridation</b>	1. The government with the most resources – including expertise - to support the practice (many city councillors feel unequipped to make decision) 2. Everyone receives it and therefore universal	1. Moving even further away from any individual choice 2. Further away from local decision-making (from the people)
<b>3. Universal Dental Care</b>	1. Population wide: dental services and programs would be available to everyone 2. Individuals can still choose whether or not they want care	1. Massive challenges accompany this policy option from feasibility point of view (including dramatic changes to current infrastructure and high costs)



<p><b>4. Fluoridated salt or milk</b></p>	<p>1. People have the choice to eat salt or drink milk (unlike with water fluoridation)</p>	<p>1. Depending on the policy, may not be reaching every individual (unlike with water fluoridation)</p>
---	---	--

At the end of the focus group, the moderator (CW) opened the discussion to ask participants to offer any other alternative policy options for preventive dental health that may not have been mentioned in the group discussion.

### 2.4.3 Post-Focus Group Questionnaire

The post-focus group questionnaire (again following methods from Einsiedel et al.’s study (8) included questions on the perceived benefits and drawbacks of fluoridation, and participants’ ranking of the acceptability of each of the four policy approaches discussed. Information on perceived risks and benefits was gathered using an open-ended question, identical to that in the pre-focus group questionnaire. This questionnaire was developed by our research team (Appendix F).

## 2.5 Data Analysis

Quantitative data from the demographics questionnaire (Appendix B), and the pre- (Appendix C) and post-focus group (Appendix F) questionnaires, were analyzed using descriptive statistics. I (RL) transcribed all four focus groups. Following transcription, I entered transcripts as well as open-ended responses from the pre- and post-focus group questionnaires into a qualitative analysis software package (NVivo) for data management and thematic analysis.

Thematic analysis allowed commonly recurring themes in the data to be identified (94). Themes were then pushed further to interpret various aspects of the research topic (99). Though there is a lot of flexibility associated with thematic analysis, clear and concise guidelines around thematic analysis methods were applied. In particular, following verification of the transcripts,

we proceeded through the following steps (94). First, we familiarized ourselves with the data by listening to the focus groups, re-reading notes and transcripts, allowing them to get a feel for the data. Next, the principal researcher (RL) identified initial codes by looking for regularities in the data, and used them to categorize respondents' accounts in ways that can be summarized. This was done by having the researchers (RL, CW), code independently, and hold weekly meetings where codes and notes were compared, discussed, and modified as needed. Coding was done by using line-by-line analysis, and by looking at the data both within and across focus groups. Some codes that only appeared once were removed from the data, or were aggregated to create larger, more encompassing codes, referred to as sub-themes, which allowed for researchers to synthesize key themes from the data.

In a comparative process, we contrasted the various codes gathered from the data, and refined the themes by checking themes for coherence with the data. Next, themes were refined by reviewing the data once more to ensure the themes effectively captured the focus group data. This was done at weekly analysis and discussion meetings among the research team (RL, CW, LM), where themes were challenged, discussed, and modified as needed. The weekly discussions ensured that the themes were both data driven and interpreted through our chosen frameworks (public health ethics and public engagement with science).

One important step in data analysis was ensuring that our study informs our research question. In qualitative research, a research question is used as a positioning device for both apprehending the nature of the investigation and understanding its findings (100). Accordingly, a research question may change or evolve as the research proceeds. Our original research question, articulated prior to data collection, was: What are parents' perspectives and viewpoints on community water fluoridation and alternative policy options in the context of cessation in

Calgary, Canada? While we do answer this question (for example, the first question in the pre-focus group questionnaire asks about fluoridation directly), the process of analyzing the data prompted us to refine and reframe our question, as follows: What are the perspectives and viewpoints regarding population-wide dental public health interventions among parents of young children in Calgary, Canada, in the context of fluoridation cessation?

### **2.5.1 Ethics and Data Handling**

Once the proposal was approved by the thesis supervisory committee, an application was submitted to the Conjoint Health Research Ethics Board (CHREB) and approval was secured. Participants provided written informed consent (Appendix A).

During the focus group introduction (see discussion guide, Appendix D) we explained to participants which measures we took and what they could do to ensure confidentiality. Participants were informed of the limits to confidentiality in focus groups via the consent form (Appendix A).

All focus group data were audio recorded. The original audio recording from each focus group was uploaded as soon as possible after the focus groups to a secure, password protected computer belonging to Rebecca Lang. Only I (RL) had access to the audio files, and kept the files on my own password protected computer until the recordings were transcribed. Once transcribed accurately, audio files were deleted.

Focus group transcripts had no personally identifiable information as I (RL) replaced first names with letters (i.e. Participant A, B, etc.). Transcripts, consent forms and reimbursement tracking documents will be destroyed 5 years after the project has closed. Until then, they will be stored in a secure repository belonging to Lindsay McLaren at the University of Calgary.

## **2.6 Methodological Rigour**

Methodological rigour for this research was ensured by following the approaches proposed by Noble and Smith (2015) (101), and Green and Thorogood (2013) (94).

### **2.6.1 Validity**

In any type of research, the validity of an interpretation is the ‘truth’ or integrity of that interpretation (94). In the case of this research, validity was reinforced by the fact that the study is rooted in pre-existing theoretical frameworks, namely public health ethics and public engagement with science (94, 101). By identifying guiding theoretical frameworks a priori, the researchers (RL, CW, LM) are transparent in acknowledging that these frameworks influenced the research from the very start, namely developing the research questions and the study methods, to the end, such as data analysis and interpretation (101)

Validity is enhanced by continually questioning emerging findings (94). For example, when an idea emerged, we looked for data that might disconfirm that emerging idea, and thought carefully about whether or the extent to which that idea was robust to different or contrary data (101). As part of judging the robustness of ideas, we considered how frequently they occurred in our data. Specifically, quotes that we viewed as fitting with each theme and subtheme are compiled in Appendix G, which serves as a simple count of the popularity of certain views (101).

### **2.6.2 Reliability**

Reliability relates to the ‘repeatability’ of the interpretation, or the consistency of the analytical procedures, including accounting for personal and research method biases that may have influenced the findings (101). In qualitative work, this is often interpreted as the likelihood that a similar piece of research would elicit similar kinds of themes (101).

Reliability was improved in this study by paying close attention to ‘good practice’ (94, 101). For example, the consistency of this research was improved by including a transparent and clear description of the research process in the initial thesis proposal and ethics application. Additionally, we ensured accurate note-taking and transcriptions, and discussed coding methods with the research team, which included experienced qualitative researchers. Although the data was mostly coded by only one researcher, the pre-existing theoretical frameworks allowed us to have a coding scheme based on these frameworks that could be followed, further increasing reliability.

Reliability was also improved by holding team discussions about theme development. This was done repeatedly in an open process where assumptions could be challenged and consensus reached. We also included raw data (see Appendix G) so that the reader could assess how reliable our interpretations were, and to demonstrate how the data was linked to our interpretation.

### **2.6.3 Transferability**

Transferability involves the extent to which findings from a study might apply to a wider population or to different contexts (94). It involves thinking through what kind of relationship the study findings have to other populations and settings and unpacking what inferences can be drawn from the data analysis (101). In addition, transferability involves the researcher to provide sufficient detail and context to permit the reader to decide how transferable the findings are (101).

Although the findings in this study focused on parents of young children in Calgary, Canada, we believe the discussions and overarching concepts developed may represent ways of thinking more generally from other parents both inside and outside of Calgary. The underlying

views presented here might transfer to similar contexts, given the greater trend of fluoridation cessation occurring across Canada (31).

#### **2.6.4 Reflexivity**

In qualitative research, reflexivity refers to the recognition that the researcher is part of the process of producing the data and their meanings (94).

Focus group moderators (CW, RL) were as reflexive as possible to minimize their influence on participants' responses and discussion and maximize the quality and rigor of data (102). Because fluoridation is a contentious issue, it was important for moderators to stay as neutral as possible, and to allow fulsome discussion of all viewpoints, to permit the group to have a reasoned and respectful conversation. We ensured that the focus group moderators were aware of their own positioning and views on fluoridation. The focus group discussion guide (Appendix D) was also organized in a manner that minimized polarization early in the interview. Memos also aided in reflexivity as they documented the moderator's thoughts and feelings during the focus group discussion.

This study provided methodological openness by being explicit about the steps taken in both data production and analysis phases. Additionally, we explicitly outlined our theoretical starting points (i.e. our conceptual frameworks: public health ethics and public engagement with science) and assumptions made because of those theoretical frameworks.

It was also important to bring awareness to the social setting of the research itself (94). In focus groups, the 'data' were largely the result of interactions between the researcher and the focus group participants, and were produced by the context (94). Additionally, by providing a presentation that informed participants on the key aspects of fluoridation and alternative policy options during the focus group, we inevitably shaped the data by setting parameters around what

was discussed. Although we aimed to make this presentation as neutral as possible, the presentation inevitably had an impact on the flow and content of the conversation.

i) About the researcher

Reflexivity also involves a more personal consideration of the researcher's own role in generating and analyzing the data (94). By being clear on my own values and background, I hope to help the readers understand some potential and inherent biases that may have affected my interpretation of the findings.

I grew up in a suburb of Montreal, Quebec, with a Jewish, second-generation Canadian father, and a French-Canadian mother. My household was bilingual, and although my family identified as Jewish, we celebrated Christmas and other Catholic traditions with our extended family. Montreal itself is a highly diverse city, known for its culture. From an early age, I learned the importance of diversity, and appreciated differing world views. I believe that my upbringing sparked my interest in learning more about people.

My father is an emergency medicine physician, and my mother, an elementary school teacher. Although both extremely hard-working, I do acknowledge the privileges and values that generally accompany a white, upper-middle class upbringing. We were on the lucky side of the socio-economic distribution and benefitted from the opportunities it afforded us.

Growing up with a father in medicine, I was always very comfortable with the health care system, which treated me more than fairly. I trusted medical professionals and scientific evidence, relying heavily on health care professionals and their opinions as "truths".

Inspired by scientific discovery and knowledge, I decided to pursue an undergraduate degree in Biochemistry, at Queen's University. I studied the human body at the molecular level, learning about different organs and systems, and how they interact with one another. Although I

am grateful for my time as an undergraduate student, I felt that my degree lacked a connection to the whole and wanted to learn more about what made populations healthy or unhealthy.

This led me to pursue a Master's in Community Health Sciences at the University of Calgary, specializing in Population and Public Health. Here, I was afforded interactions with exemplary critical scholars. During my first week of school, I heard a quote that greatly influenced me as a Master's student: "When it comes to health, your zip code matters more than your genetic code." These concepts of a social gradient in health and health inequities shaped my entire Master's program. Next year, I will be attending law school, with the hopes to learn more about, and be positioned to act on, the social determinants of health from a legal perspective.



## Chapter 3: Results

### 3.1 Study Participants

Four focus groups were conducted over the course of three months (December to February 2018). Each group was held in a different quadrant of the city of Calgary (SW, SE, NW, NE). Each group consisted of four to seven participants and ran for a total of two hours.

There were a total of 20 participants. A detailed summary of the study sample can be found in Table 2. Briefly, participants varied in age, ranging from 20 to 42 years old, with a median and average age of 37 years. Participants reported having lived in Calgary, Alberta on average 15 years (range 2 to 37 years). Fourteen participants identified as females, and six identified as male. Level of education varied within and across focus groups, with the modes being university undergraduate degree (30%) and college degree (30%). Half the participants reported having permanent full-time work, 15% reported not working at this time, and the rest (35%) reported having temporary or part time work. Eleven participants (55%) were born in Canada, and other participants were born in France (5%), USA (5%), Iran (5%), El Salvador (5%), Tahiti (5%), India (5%) and China (15%).

**Table 2. Aggregated results from the demographics questionnaire**

Age		Lived in Calgary for (years)		Identify as		Marital status		# of children		Ages of children
Average	37	Average	15	Female	14	Single	2	Average	2.05	Ranged from 0 to 14
Median	37	Median	15	Male	6	Married	15	Median	2	
						Divorced	1			
						Common Law	1			
Home ownership		Level of education			Employment		Born in			
Owned by one of the adults living in it	16	Some high school		1	Permanent full-time work	10	Canada	11		
Rented by our family	4	High School		1	Permanent part-time work	4	China	3		
		College		6	Temporary full-time work	1	US	1		
		University undergraduate degree		6	Temporary part-time work	2	Other	5		
		University graduate degree		3	None	2				
		Professional School		3	N/A	1				

### **3.2 Pre-Focus Group Questionnaire**

A detailed summary of the pre-focus group questionnaire results can be found in Table 3. Briefly, while most participants (70%) knew that Calgary does not currently practice fluoridation, two (10%) responded that Calgary is currently fluoridated, and four (20%) responded that they did not know whether or not Calgary was currently fluoridated.

The majority of respondents (85%) agreed (strongly or somewhat) that fluoridation is effective in preventing tooth decay in populations, with only two (10%) disagreeing with this statement. When asked if fluoridation may be harmful to people, half disagreed, while the other half either agreed (20%) or did not know (30%). An equal percentage of people (35%) agreed and disagreed that fluoridation infringes on individuals' rights. However, most participants (80%) agreed that fluoridation is equitable and fair to the population.

Participants ranged in their reported levels of knowledge on each of the policy options that were going to be discussed during the focus group. Most (75%) reported having knowledge (a lot or some) of fluoridation, but few (10%) reported having knowledge of fluoridated salt or milk. Similarly, participants ranged in their level of support for each of the four policy options. They were most supportive of universal dental care (70% supportive), slightly less supportive of fluoridation at the municipal and provincial levels (65% supportive for each), and least supportive of fluoridation of salt or milk (20%).

**Table 3. Aggregated results from the pre-focus group questionnaire**

	<b>Yes</b>	<b>No</b>	<b>Don't Know</b>	<b>Total</b>
<b>To your knowledge, is your municipality fluoridated?</b>	2	14	4	<b>20</b>
	<b>Agree</b>	<b>Disagree</b>	<b>Neither/Don't Know</b>	<b>Total</b>
<b>Community Water Fluoridation is effective in preventing tooth decay in populations</b>	16	3	1	<b>20</b>
<b>Community Water Fluoridation May be Harmful to People</b>	4	10	6	<b>20</b>
<b>Community Water Fluoridation infringes on individuals' freedoms</b>	7	7	6	<b>20</b>
<b>Community Water Fluoridation should be implemented because it is equitable, and fair to everyone in the community</b>	16	3	1	<b>20</b>
	<b>I know a lot about this</b>	<b>I have some knowledge of this</b>	<b>I have little to no knowledge of this</b>	<b>Total</b>
<b>Community Water Fluoridation</b>	1	14	5	<b>20</b>
<b>No community water fluoridation, but universal dental care</b>	2	6	12	<b>20</b>
<b>No Community Water Fluoridation, but fluoride added to salt or milk</b>	1	1	18	<b>20</b>
	<b>Supportive</b>	<b>Unsupportive</b>	<b>Neither/Don't Know</b>	<b>Total</b>
<b>Municipal-level fluoridation</b>	13	5	2	<b>20</b>
<b>Provincial-level fluoridation</b>	13	5	2	<b>20</b>
<b>Universal dental care</b>	14	4	2	<b>20</b>
<b>Fluoridated salt or milk</b>	4	11	5	<b>20</b>
	<b>Yes, several times or more</b>	<b>Yes, once or twice</b>	<b>No, Never</b>	<b>Total</b>
<b>Have you been involved in activism regarding fluoridation</b>	0	1	19	<b>20</b>

### 3.3 Focus Groups

Informed by our conceptual frameworks, we developed three themes: expert/lay relations, ways of knowing, and values in public health (Figure 1). All of the data supporting the themes can be found in the table in Appendix G.

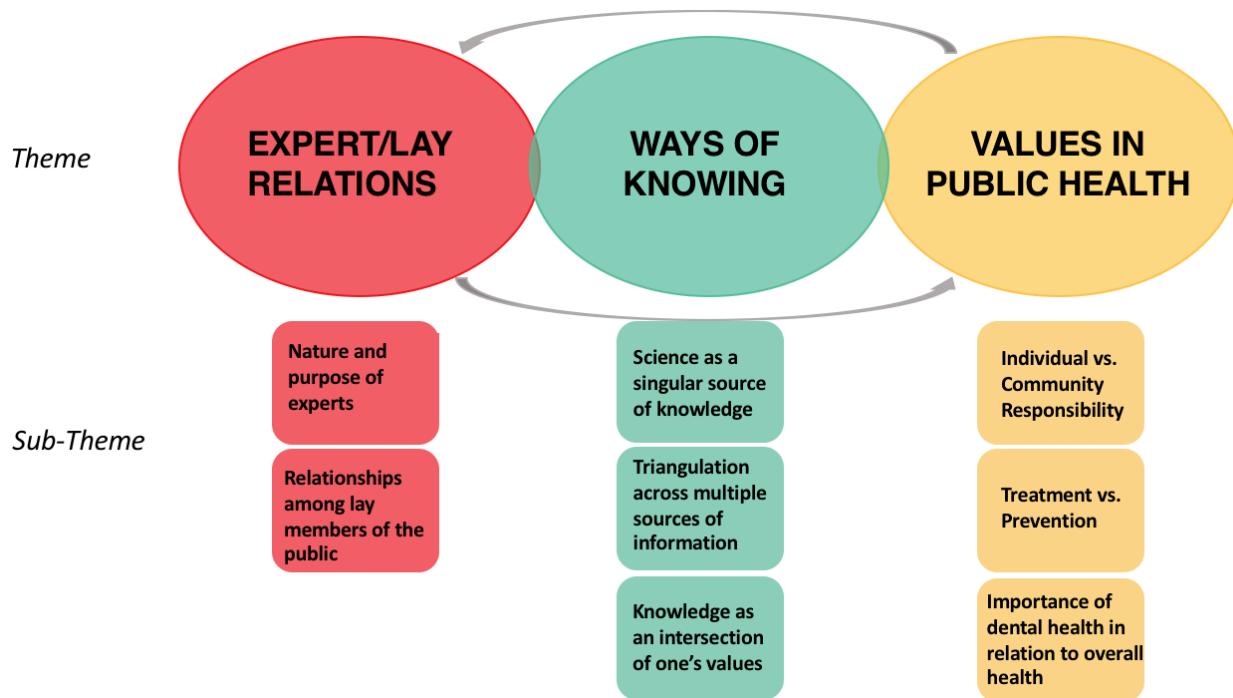


Figure 1. Visual depiction of themes and subthemes developed in this study

For the purpose of orienting the reader to the findings below, the four policy options presented are outlined. A more detailed description of each policy option can be found in section [1.2.10](#):

Option 1. Community Water Fluoridation at the municipal level: water is fluoridated at the municipal level: any individual who lives in the municipality has fluoridated tap water.

Option 2. Community Water Fluoridation at the provincial level: decisions about water fluoridation in municipalities are made at the provincial level. Most individuals, who live in the province in rural and urban settings, have fluoridated tap water.

Option 3. Universal dental care: dental services are included in publicly funded health care. This option could take different forms, e.g., a robust set of dental health services (including preventive services) are offered to a sub-set of the population (i.e. children), or a small set of services are offered to the whole population. In both scenarios, individuals choose whether or not to seek the services.

Option 4. Fluoridated salt or milk: Fluoride is added to salt or milk at the time of production, and individuals choose whether or not to purchase and consume it.

### **3.3.1 Expert/Lay Relations**

This theme relates to how members of the *numerical public* (47) (i.e. the aggregate of individuals to which the population health measures refer) regard and behave toward actors in public health policy who are considered to be ‘experts’, and how the numerical public regard and behave among themselves. As described earlier, the public engagement with science conceptual framework acknowledges that many publics exist (59). In participants’ discussions about dental health policy, the data seem to support this idea of multiple publics.

To explore and explain this theme, we describe two subthemes: i) the nature and purpose of ‘experts’ (and, by extension, ‘non-experts’) — in which participants described views about who is an ‘expert’ and what their function is in dental health policy-making and ii) relationships among the public, in which participants described others in the public and what their role and function should be in dental health policy-making.

i) Nature and purpose of ‘experts’

a) Who is an expert

In discussion about policy options to prevent tooth decay, and especially fluoridation, participants’ conversations easily turned to the notion of expertise. Participants discussed whom they considered to be trustworthy sources of knowledge. In doing so, participants often referred to themselves as members of the public, as distinct from other groups, such as Alberta Health Services, dentists, and physicians, whom they saw as experts.

Comparison of participants’ preferences for fluoridation as a provincial (Option 2) versus a municipal (Option 1) policy option seemed to elicit attributes that participants believed were important for those making policy decisions. These attributes included formal background or training in a relevant field, ‘factual knowledge’ about fluoridation, or having done their ‘homework’ on the issue of fluoridation. Because fluoridation is currently a municipal level decision, participants often commented about city councillors’ (in)abilities to understand and evaluate information and research on fluoridation:

*“ID: [Alberta Health Services] also offers a little bit more buy-in from the public, versus a city councillor whose background is in real estate and car sales.”*

*"2B: I don't know if [city councillors] are the right people or not. What do they know? Who taught them? Are they just like me and just, ignorant of the whole fact, or have they done their homework and know lots?"*

*"1C: I feel there is more knowledge and background when you're doing research from a provincial standpoint [i.e., Ministry of Health] versus a city council type of thing. So yeah, I would say provincial, state (Option 2)."*

As illustrated by the above quotes, participants frequently pointed to councillors' lack of scientific training, or educational background, to enable them to properly evaluate fluoridation research.

Some participants placed value on education and credentials. For example, the participant below discusses why she values her family physician:

*"1D: I trust that the doctor went to school, 8 to 12 years, and I trust their education, and so my sources are to go to the family physician, or go to my friends with expertise."*

At the same time, while most participants seemed to view education/training as central to being 'expert', one participant questioned the premise:

*"1A: I would say I don't necessarily listen to my own doctor because you know, I know people who went to medical school, some people who barely got through, right? I've had doctors tell me things, I'm like, no, I don't need that knee surgery, but I know you're gonna do it for me because you know, you'll get your insurance reimbursed. So I don't necessarily listen to whatever my doctor has to say."*

*"1A: Just because you know plenty of PhDs or physicians, just because they have a lot of years of education, it doesn't mean I need to trust their judgment if it doesn't match up with what I think is best for me and our family. "*



These two quotes above came from the same participant at two separate occasions (in the same focus group). The participant is wary of trusting individuals simply because their degree may label them as ‘expert’, and suggests that other factors, such as their own profit motive, may influence an ‘expert’ recommendation.

b) The role of ‘experts’ in dental public health policy-making

In conversation about how ‘experts’ should function in dental health policy-making, participants discussed the decision-making process, including expectations of involvement or transparency between ‘experts’ and the publics. Traditionally in public health, policy makers and health professionals have been perceived as having the knowledge necessary, and could be relied upon, to choose appropriate policies. This view, which involves respect for authoritative knowledge, seemed to resonate for some participants, who felt that expertise was an important characteristic in delivering population-wide interventions such as fluoridation.

*"1D: You know, [Alberta Health Services] are the experts, they've done the research, and if their recommendation is to add it to the water, then that makes sense."*

*"4D: I think the reality is that, for most us who don't have a background, and then you mention the science of it, I can't read a scientific study about water fluoridation and make and sense of it. So I mean it's the same thing...I know that there are enough physicians out there and health experts that say, "don't be a fool. You should vaccinate your kids.""*

In these two quotes, the participants seemed content to rely on experts to decide on public health interventions such as fluoridation, and to trust that they are best equipped to make such decisions. However, this was not uniformly the case:

*“2B: I think they [policy-makers] should use what they learned to educate the public and let the public decide or at least have a good say in it.”*

*“3C: [Experts] need to do a better job using the sources of information people are using now and actually being open and accessible and transparent and providing the information and answering their questions. It won't change everybody's minds, but all these fence-sitters might feel more comfortable about the choices being made at the policy-level.”*

In these two quotes, the participants seemed to feel it was important for experts to share the evidence with the public, and to explain and defend their view. Rather than the historical top-down approach in public health, these participants seem to have an expectation that more transparency and engagement is required from experts, where the process and rationale for certain decisions must be at least shared with the public, or the decision should be made with the public's involvement.

c) Summary of sub-theme

Overall, the data suggest that with respect to the question of who counts as an 'expert', traditional training and education were a reliable marker of expertise for some participants, though there were different views around whether or the extent to which 'experts' should be trusted to make the right decision alone, versus with some level of involvement of the public. Transcending this nuance, the existence of 'expert' and 'expertise' seems unambiguous. In other words, it seemed clear that the participants believe in the notion of expert or expertise, even though it can take different forms and have different roles.

ii) Relations among the public

In contrast to the previous sub-theme that focused on relationships between “experts” and “non-experts”, this theme focuses solely of the relationships among members of the “non-expert” category, subsequently referred to as the ‘public’. Conversations around who should be eligible for universal dental care (Option 3), and the benefits of policy options that require individuals to choose a fluoridated product (milk or salt) (Option 4), revealed that participants understood there to be multiple publics. Across focus groups, some participants seemed to acknowledge members of the public whom they believed were more or less worthy or deserving of universal services; and more or less worthy or deserving of contributing to policy decisions about fluoridation. Similar to the “Nature and purpose of experts” theme, we describe two subthemes: a) the nature of the publics, in which participants described views about the existence of different groups within the public, and b) implications of these various publics for decision-making, in which participants describe the consequences of these publics on decisions about population-wide dental public health measures.

a) The nature of the publics

Participants held conversations around who comprised the public, identifying several different publics. For example, when discussing salt or milk fluoridation (Option 4), one participant inferred that there might be certain individuals or groups (e.g., new immigrants) who would be negatively impacted:

*"2F: If I go to the store and see fluoride salt or regular salt I'm going to get the regular salt. I don't know, I may or may not speak English, I may or may not understand what fluoride is."*

In this quote, the participant comments on how the policy option that removes water fluoridation but gives individuals the choice to buy fluoridated salt or milk may not be effective for certain ‘deserving’ populations, specifically new immigrants. It seems that she believes people who may experience barriers, such as language, won’t know to buy fluoridated milk or salt, as compared to people who do speak English, and may accordingly be unfairly disadvantaged.

Another example of the notion of members of the public who were seen by focus group participants as ‘deserving’ or not, is illustrated in the following quote:

*"4A: I'm okay with universal dental care up to the age of 16 or 18, it just, it just makes sense to me, because sometimes a kid doesn't always have a choice of what their parents do to be able to do it. So being able to give that child the opportunity to have full dental care that other kids have just based on, their well-being, just seems to make sense. After they turn 16 and choose to drink Coca-Cola three times a day for the next 10 years of their life and not brush their teeth, that's fine, they can pay for their own dentures when they hit 35. That's fine, I'm good with that [laughs]."*

As highlighted in the quote above, children were seen as a population that is deserving of public services such as universal dental care. However, once children reach a certain age, and are perceived to have more independence and control over their health, they may no longer merit the services provided through public health programming such as universal dental care.

This thread, of some publics being seen as un- or less deserving of public health programming, was common across several focus groups. The two quotes below go into more detail on why some publics are seen as not meriting free dental services:

*"2D: Because when its free and accessible to everybody, maybe people don't appreciate that much to look after their oral health because its free at the end of the day. If I don't brush, if I mis-brush, tonight, tomorrow, then its free, I can go and have it."*

*"2E: I guess it's you can say it's kind of like our health system. Its free, you still have the choice to either go, or not go to get your check-ups. So even though we're talking about being preventive, it really comes down to us, as human beings to take that responsibility to actually go do it or not do it. And its gonna cost us, the taxpayers, a lot more to come up with this program and is it worth it though? Would [universal dental care] be worth it? Because not everybody does what they should be doing."*

In the quotes above, the participants mention that with universal dental care in place, some people would be reluctant to perform preventive behaviours at home. In other words, universal dental care is seen as potentially reducing individuals' inclination to take care of their teeth. They furthermore caution that paying for something as expensive as universal dental care may not be worthwhile given that even with the program in place, some individuals may choose not to go ("not everybody does what they should be doing").

Interestingly, while both cautioning against universal dental care, these two points seem to hold contrasting views. While on one hand, the participant points out that we shouldn't have universal dental care because participants might lose incentive to take care of their teeth, the other cautions against universal dental care because some people won't use the services, making it wasteful.

Overall, the quotes above illustrate our finding that while participants feel that some publics, such as children, or those who experience language or cultural barriers, are deserving of collective responsibility; others are not, because, according to participants they cannot be trusted

to make the healthiest choices on an individual level, and might decide to take advantage of these free services.

b) Implication of these various publics for dental health policy-making

While the first key idea (the nature of the publics) seeks to identify who the various publics are, this second idea explores the actions that participants felt should arise in decision-making on account of the existence of these various publics, and the dynamics of their relationships.

*“4A: Well with the city level decision, when the last one came up, I was like, please don’t let people vote for it. Because I just don’t think, en masse, people make the right decisions.”*

*“4B: I’m not in favour of the plebiscite. You know, when you give everyone an opportunity to vote, when they’re poorly informed about things, that’s how people like Donald Trump get elected president. Everyone’s vote gets counted for the same thing.”*

When discussing the idea of a plebiscite (i.e., public vote) for fluoridation decision-making during the focus group, these participants did not agree with this idea, as they did not trust the voters to make the appropriate decision. In this way, some participants seem to feel unsettled at having certain publics voting for policies such as fluoridation. Participants suggested that the collective nature of democratic processes might not be advantageous for issues such as fluoridation, because there might be individuals who are poorly informed.

When it came to action around implementing universal dental care (Option 3), some participants seemed to have mixed feelings. In the quote below, the participant grapples with the benefits of universal care, versus the cost associated with it:

*“4B: Well [universal care] I think is great for supporting everyone, especially those that aren’t able to afford it. Absolutely. So that’s what that means, for all children to have it,*

*right? But, the other side, it's something that would cost a lot too. We would all end up paying, we'd all be paying for it. It's not a bad thing, everyone's pitching in and helping out, but at the same time, every dollar counts."*

Similar to the discussion above referring to some populations as 'deserving' (children, new immigrants) and others as 'underserving', participants felt that it was important to help others whom they viewed as disadvantaged. However, they also highlight the high costs associated with universal dental care. In linking back to implications this might have on decision-making, this quote suggests that while participants like the idea of universal dental care in theory, the costs might make it too difficult to practice.

#### c) Summary of sub-theme

Overall, this sub-theme confirms the notion of multiple publics, with participants viewing some of these publics, such as children and new immigrants, as warranting collective, population-wide services, such as universal dental care. On the other hand, other groups are seen as not having earned services such as universal dental care, possibly because of the choices they may make at an individual level, or an understanding that they might try to take advantage of these services. The existence of these different groups gives rise to nuance on what role the publics should have regarding decision-making around dental public health policy, with some participants demonstrating wariness toward democratic decision-making processes such as plebiscites because of the different publics that are seen to exist.

### **3.3.2 Ways of Knowing**

This second theme (see Figure 1) explores the sources of information, and the processes of understanding, that people use to determine whether a belief or proposition is true or valid. Across focus groups, participants seemed to use different sources and process information in

varied ways while discussing all four policy options (fluoridation at the municipal level, fluoridation at the provincial level, universal dental care, and fluoridated salt or milk) presented. The varying sources used, and by extension the differing processes of understanding, appeared to us to fall on a continuum, from relying on a singular source of knowledge; to collecting information from multiple sources; to integrating or linking information with values (see Figure 1). These three points on the continuum represent the subthemes that we developed in the “Ways of Knowing” theme. For each subtheme, we focused on both the sources of information used and the processes of understanding that emerged. These themes are as follows: 1) Science as a singular and linear source of information, 2) The triangulation of multiple sources of information, 3) Knowledge as an intersection of values.

i) Science as a singular and linear source of knowledge

Although the nature of scientific evidence, including in public health, is rarely certain, a large number of participants across focus groups seemed to strongly privilege ‘scientific evidence’ as the most important source of information, which alone should inform policy decisions. In the focus groups, we discussed that while on balance, the evidence is in favour of fluoridation, there is not 100% certainty around the intervention. Several participants, such as in the quote below, indicated disappointment in the uncertainty around the issue of fluoridation.

*“4D: Ya, and I think if the research was overwhelmingly in favour of being that beneficial, I think there’s more merit to the argument, but when it’s, when you talk to average Joe and Jane on the street and its 50-50, uh, it’s not very clear-cut. And nor is the science as you mentioned, you can find science on both sides of it. Which is really disheartening, to be honest with you. It’s hard to make a cogent argument when the science isn’t on your side, firmly planted on your side.”*



In the quote above, the participant comments on the importance of having science “firmly planted on your side” when trying to make any argument. This seems to be a singular way of formulating an opinion on fluoridation, as only science is needed to decide whether or not fluoridation should be implemented.

Similarly, several participants also asked questions about the scientific literature, wondering if there had been “a study”, and wanting to know that it is solid and certain.

*"2A: People will say oh my kids have [cavities], or I didn't get cavities until this age, but what about an actual study? What were the numbers when we only had 0.7, was it effective, was it not, is there any difference or is it just people that now know there isn't fluoridation saying there's a difference. What was it like at 0.7, if that's not effective according to the WHO then like, what's the difference between 0.4 and 0.7? I just don't know how this works."*

*"2B: Are there any studies that were done prior or post that actually show a decline in teeth, in children's teeth health [cavities]? Pre and post (fluoridation). Without that, it's hard to make a decision of whether or not I support [fluoridation], or don't support it."*

In the first quote, the participant asks about “an actual study”, seeming to expect that the scientific literature can singularly and definitively determine effectiveness, and then one should be able to conclude on the basis of such a study whether or not fluoridation should be implemented. Similarly, the second quote also demonstrates that the participant wants a simple answer based on science that they see being clear and certain, by asking for a study that compares children's level of tooth decay before and after fluoridation. In line with other participants in the focus groups, this participant turns to the scientific evidence to decide on whether or not he supports fluoridation, claiming it as vital to his opinion on fluoridation.

Other participants also seemed to wonder about the effectiveness of fluoridation.

Although they were often aware of the debate around the issue, they sought scientific evidence that would give them a complete understanding of the advantages and disadvantages surrounding fluoridation, such as the side effects that might accompany it:

*"2E: Nobody has really told anybody what [fluoridation] actually does and why it's good, and uhm, it, it's like, what are the what are the side effects of these things, is there even any side effects, uhm, and that's why its grey. It's like, you can't make a proper decision without the facts."*

This emphasis on the facts further suggests this idea of a singular and certain “truth” behind fluoridation, which can be uncovered by science. Although all focus groups included lengthy discussion about the “grey” or “uncertain” nature of scientific evidence on fluoridation, some participants demonstrated a strong desire for scientific evidence, which they viewed as “facts”, on which the policy decision should be based.

ii) The triangulation of multiple sources of information

While some participants privileged scientific evidence alone in formulating opinions around interventions such as community water fluoridation, other participants grappled with the importance of scientific evidence versus other sources of information and knowledge, and demonstrated a tendency to consider and triangulate across different sources. For example, in the quote below, the participant acknowledged the importance of research and evidence, but that her thoughts are highly influenced by her community, including her family and the professionals she knows personally.

*"1B: Well, I always search for evidence-based research, and health research too. No matter how much you read in the paper, it's like, what your mom says [laughs], its*

*evidence and also who is close to you, and regarding the dental professionals you have your own personal connection, what they say you trust more than what you see from dental association statements.”*

This participant also highlights that the ‘experts’ she knows personally, such as her own dentist, are a more reliable source of information than statements made by larger expert organizations, such as dental associations.

The internet and social media were also very prominent sources of information for several participants across focus groups. Participants often saw the internet as an additional source of information, which could be used to verify or refute claims made by experts known personally:

*"ID: I'll also go to Google and try to refute [what my doctor says]. I'll ask my doctor, and say, well I read about this [side effect] somewhere, what do you have to say about that?"*

In the quote above, the participant seems to value the opinion of her physician, but also uses Google and the internet to ascertain and/or challenge the physician’s view. Though in this quote, the participant was referring specifically to medication prescribed by a doctor and potential side effects that she found online, it also demonstrates a consideration of information across multiple sources, in contrast to a more singular reliance on science above. Quotes in this ‘triangulation’ section illustrate that some participants actively form their own opinion by accessing and navigating multiple, and sometimes conflicting, sources of information.

In discussing the cessation of fluoridation in Calgary in 2011, one participant mentioned that access to multiple sources of information, such as via social media and the internet, is a reason why it is contemporarily (vs. historically) no longer acceptable to impose population-wide

interventions, such as fluoridation. The contemporary role of the internet was seen as important in all focus groups. For example:

*"3D: I think that with our generation, we want individual choice a lot more. That's key difference. That's the difference about this generation from other generations. We have social media, we have the internet. We are more educated, we're more informed consumers than what people were centuries ago."*

In the quote, the participant seems to attribute increasing demands for individual choice to 'new' sources of information such as the internet. This quote might suggest that the present generation's ability to seek their own opinion on interventions such as fluoridation, because of their access to information, contributes to a desire for individualized interventions based on their knowledge and values.

Another version of triangulating across multiple sources as a way of knowing involved considering, and comparing/contrasting, the dental public health interventions such as fluoridation to what participants viewed as a comparable issue—vaccination. For example, when evaluating different dental public health interventions that could be implemented to improve children's dental health, one participant suggested a strategy resembling one used for vaccine delivery; namely, using the school system to reach children:

*"3D: I know you're missing the 0 to 5 age group with something like this, but I know how effective having the vaccine in the school system is. I know that they get other things into the school system like speech and all these other methods of care. I think once kids are in school, if they could have the fluoride treatments and a dental assessment done, would be beautiful."*

This participant used her understanding of a method of vaccine delivery, which she viewed as successful, to identify potentially successful dental public health intervention strategies.

When compared to the first sub-theme (i.e., as a singular and linear source of knowledge), this second sub-theme of triangulating across multiple sources is characterized by multiple sources and perspectives (e.g., the internet, personal and professional experiences, scientific evidence) being pulled together to understand, and form an opinion about, the different interventions presented.

iii) Knowledge as an intersection of one's values

A less common view, only observed in one participant but still worth noting, was the recognition of the impacts someone's personal values and world views might have on their interpretation of evidence:

*"3A: Some of the knowledge that people may hold doesn't actually match the evidence that's available. We all have cognitive biases, we believe and take in information that fits with our belief system, because we work very hard to believe what we wanna believe, what fits with our natural worldview."*

The quote above highlights the role of scientific evidence within an individual's belief system, highlighting the impact both can have on an individual's opinion on issues such as fluoridation. Within the same thread of conversation, she makes a similar comment below:

*"3D: Dr. Google, it's the misinformation age. You can find, like you said, you can find studies to support or detract from what you're saying. You're gonna find what you're looking for.*

*3A: It's easy to exist in this silo of information that fits your cognitive beliefs."*

As previously mentioned, participants across focus groups discussed the multiple sources of information that are now at their fingertips, and how many of them triangulate the information across various sources to form an informed opinion. As the same participant from the quote above suggests, this often means looking for information that fits best with a person's previous beliefs. In this way, regardless of the sources of information a person uses when formulating an opinion on population-wide dental public health interventions, it may be that their process of understanding these sources will depend on their pre-existing values and worldviews.

iv) Summary of theme

In developing this theme, we observed what appeared to be a continuum, or ordered set, of views about sources and processes of understanding. On one end, we find participants who, amongst various sources of knowledge, privilege scientific evidence, and whose process of understanding find science to act as a reliable 'truth'. They seem to rely predominantly if not solely on science to answer questions around the effectiveness of fluoridation and alternative policies. In the middle, we observe participants who still relied on science and evidence when forming opinions around the effectiveness of each policy option, but combined this evidence with other sources in their environment, such as their doctors, friends, or the internet. Lastly, and more uniquely, we found one participant who pointed out that an opinion formed on dental health interventions such as fluoridation will be a result of an individual's values. In this way, the participant recognizes that a person's outlook on dental public health interventions depends less on the sources of information they use (e.g., scientific evidence, the internet, dentists), and more on how they interpret these sources of information based on their personal beliefs.

### 3.3.3 Values in Public Health

The third and final theme (Figure 1) explores people's core principles regarding the importance, worth and usefulness of dental public health interventions. As reflected in the public engagement with science literature (47), embracing public health's social roots will involve ensuring that dental public policies align with the numerical public's views and values. We identified three areas where values seemed prominent: 1) Individual choice vs. community responsibility, 2) Prevention vs. treatment, and 3) The importance of dental health relative to overall health.

#### i) Individual choice vs. community responsibility

While some participants agreed that there was a community responsibility to implement preventive measures such as fluoridation, others viewed this issue as a form of coercion that is no longer acceptable in the current context. These views were approximately equally common, with every group having participants who agreed and disagreed with the notion of community responsibility for dental health. In the following quote, the participant is commenting on society at large, and how highly personal choice is valued now versus in the past.

*“3D: I think whatever option is decided upon, given the century we're living in, that it does need to respect personal choice. Because that's a big thing for individuals, so uhm, I unfortunately don't think the city-level decision community water fluoridation is going to be a viable option as it doesn't respect personal choice.”*

This participant suggests that although fluoridation might have previously been an acceptable measure, it no longer is because it neglects individual choice. This quote suggests that preservation of individual choice will be a crucial attribute to ensuring the success of a dental public policy.

One participant, originally from China, also comments on the importance of individual choice, specifically using her experience in China with iodized salt, as a way to caution against population-wide interventions such as fluoridation. She refers to fortification of salt with iodine, and how in her experience, this procedure was mandatory in China (therefore removing choice) and led to an over-exposure to iodine.

*"1B: I don't want what happened in China to happen here. The salt is iodized, you didn't have a choice, same as the fluoride added in the water, you don't have choice. And now, people are saying, oh that's too much iodine. We want the choice to buy things like that. So, if fluoridated salt is available to buy, and labeled clearly, then that's good. You should have a choice."*

Indeed, this participant favoured the policy options that promoted individual choice (Option 4, fluoridation of salt or milk), on the basis of her experience of a population-level intervention that was not specific enough to the individual and therefore introduced new problems or risks. For this reason, she preferred to leave addition of fluoride up to the individual, rather than enforcing it through a population-wide measure.

In some contrast to the quotes above, other participants valued a more intrusive population-wide intervention. The following participant did so by pointing out what she saw as potential consequences that accompanied the removal of the population-wide intervention. She discussed the impact of dental problems on children's school attendance, referencing a statistic from our focus group presentation:

*"3A: But, some kids are going to suffer because we made this choice to take it out, and we can see it with the tooth decay, I think half the children have tooth decay in Calgary right now. So the people are paying consequences for our choice not to have it at the*



*community level, and its impacting people, like 2-whatever million sick days for children related to dental health care is a significant issue."*

In this quote, the participant focused on some of the consequences that she believes accompanied the removal of fluoridation, referring to the dental decay in Calgary. She discusses the population-wide attribute of fluoridation, and the impact that cessation may have on the population, specifically children.

Overall, this sub-theme demonstrates the presence of a core public health tension, between preserving individual choice and removing choice due to a greater community responsibility (something participants often referred to as the "greater good"), and participants in this study tended to align strongly with one or the other.

ii) Treatment vs. prevention

The four policy options (fluoridation at the municipal level, fluoridation at the provincial level, universal dental care, and fluoridated salt/milk) include a significant focus on prevention. Because of this, we encouraged participants in all focus groups to consider prevention, and we tried to bring the conversation back to prevention when it veered towards treatment. In the following quote, the participant grappled with whether health care dollars would be better spent on prevention in children, versus end-of-life care or highly specialized cancer treatments that is considered 'heroics' (i.e. specialized treatments that are expensive and do not necessarily deliver a high quality of life, typically delaying death).

*"4C: I would choose, I prefer to spend more money on next generations, [compared to] the cancer. I mean on the prevention for our next generation. Like you said, old people, they going to die. We are spending the most amount of money [on individuals] just to prevent death for 4 to 6 weeks, or one month."*

This participant suggested that prevention in the earlier years is his preferred way to spend health care dollars. Despite agreement from other participants that this view was sensible, others noted that it could also be unpopular and seem potentially insensitive, adding to the complexity of the prevention vs. treatment discussion.

Not all participants agreed that prevention was most important. In the next quote, the participant suggests that the dental ‘cleaning’ may not be so valuable, due to the high rates of dental decay that already exist, which suggested to them a need to focus resources on treatment.

*“2F: It’s not the cleaning, though. Its already the decaying in play. Like its already the decay, its already the, the hole in the tooth, the abscess growing in their gums. Its already, like we’ve already surpassed preventative.”*

The above quote illustrates one participant’s view that, in light of existing tooth decay, it is ‘too late’ for prevention.

The link between prevention and treatment was not clear for several participants across focus groups. The participant below was asked to think about the amount of money being spent on dental surgery and other downstream costs due to poor dental health, and how with more prevention in place, these costs could be reduced, freeing up some of the money currently spent on dental health.

*"4D: I just don't know that, that it's a linear relationship [between prevention and treatment]. I just don't know that it's that clear. Because I think there are so many other factors. I think what we're doing is isolating one factor and saying, you know, prevention, from a hygienist or public health or whatever, would equal less surgery time, and less hospital resources, and less whatever."*

The participant mentions struggling to see that prevention would necessarily mean less downstream costs such as surgery and hospital costs, again touching on the prevention vs treatment debate that appeared across all four focus group sessions.

In contrast, there were participants who seemed to value prevention, and appreciate and encourage prevention over treatment. For example, the following participant describes preventive policies such as universal dental care as a “long-term investment in the people”:

*"3C: But I think that [universal dental care] is also a long-term investment in the people.*

*Yeah, the initial cost upfront would be substantial, but I think there are the very long-term benefits to it as well."*

In the quote above, the participant identifies that although investing in prevention could be costly in the first place, it would be ‘worth it’ because of the potential benefits later on.

Overall, this sub-theme (“treatment vs prevention”) highlights that although individuals generally seem to support prevention, the link between prevention and the downstream effects it has on treatment are not immediately obvious. Whereas treatment is relatively easy for individuals to grasp, the benefits of prevention are more difficult to comprehend.

iii) The importance of dental health relative to overall health

Because all of these public health interventions focused on dental health, the importance of dental health relative to the health of other body systems (often referred to by participants as overall health), was discussed and questioned. Although certain participants did find dental health to be important, many compared it to overall health and thought of it as a separate entity. The participant in this quote discussed a ‘spectrum of overall health’, and seemed to emphasize that the gravity of a cavity is not as significant as other health problems that could develop in children.

*“2A: Where cavities fall on the spectrum of overall health, like you touched on, cavities are here (lower), and then like, [arterial] plaque in a ten-year-old is here (higher).”*

She compares cavities to artery plaque, seemingly to illustrate that there are much more important concerns than cavities when considering the health of children.

In the next quote, the participant discusses the relative importance of dental health by way of comparison/contrast with vaccination:

*“4D: Do you suspect, in comparing vaccination to fluoridation, do you suspect that [vaccines are viewed as more important] because people might consider dental health as a cosmetic type thing, whereas vaccination is, you know, your health and well-being.”*

Vaccination, in this quote, is connected with ‘health and well-being’, whereas fluoridation’s link with health is ‘cosmetic’ sense.

Overall, this sub-theme seems to indicate that some participants questioned the seriousness of dental decay, relative to other types of childhood disease. In this way, it seems to demonstrate that dental health may be thought of as separate from overall health, indicating a potential disconnect between dental public health interventions and other public health initiatives. These views, while not unusual, demonstrate some potential reasons around the difficulty of implementing population-wide interventions for dental health specifically.

iv) Summary of theme

In the ‘values in public health’ theme, we developed three distinct, but inter-related subthemes, each of which explores people’s core principles regarding dental public health interventions: 1) individual choice vs. community responsibility, 2) treatment vs. prevention, and 3) the importance of dental health relative to overall health. Each of these subthemes focuses on the nuances around key values that accompany dental public health interventions, and which

have implications for their acceptability. According to the public engagement with science literature (59), gaining an understanding of these values is an important aspect of choosing public health policies, including but not limited to dental public health.

### 3.4 Post-Focus Group Questionnaire

Following the focus group, participants were asked to rank all policy options in order of preference. Table 4 displays the rankings of each policy option, by indicating how frequently each policy was ranked first, second, third, and fourth (last). Universal dental was ranked first by 45% of participants (n=9), followed by fluoridation as a provincial level decision (35%, n=7). Fluoridation as a municipal decision was only ranked first by 15% of participants (n=3), and fluoridation of milk and salt was only ranked first by one participant (5%). Fluoridation of milk and salt was also most frequently ranked last, by 55% (n=11) participants.

**Table 4. Aggregated results from the post-focus group questionnaire.**

	Fluoridation at the Municipal Level	Fluoridation at the Provincial Level	Universal Dental Care	Fluoridated Salt/Milk
Ranked 1	3	7	9	1
Ranked 2	8	3	4	5
Ranked 3	4	8	5	3
Ranked 4	5	2	2	11

## **Chapter 4: Discussion and Conclusions**

### **4.1 Summary of Results**

We sought to explore parental perspectives and views on population-wide dental public health interventions in Calgary, Canada. We used fluoridation and alternative policy options as tangible examples to answer this larger, more encompassing question.

Through the data, three themes were developed: 1. Expert/Lay Relations, 2. Ways of Knowing, and 3. Values in Public Health.

Expert/Lay relations focus on the relationship between experts, referring to Alberta Health Services, dental professionals, and professional associations, and the lay public. When discussing the expert's role in delivering dental public health interventions, some participants preferred to have the expert choose which intervention was best, and trusted them to make the right choice. Others however, felt that these experts should be providing all of the information to the public, and letting them ultimately decide what interventions is best suited for the environment they live in. This demonstrates top-down hierarchy that has traditionally existed in public health, where public health experts deliver an intervention or information that the passive public 'receives', appears to be increasingly nuanced.

Additionally, this theme examined the relationship among lay members of the public. In developing this theme, we found that it would be flawed to think of the public as one, like-minded, monolithic entity. Participants identified various groups within the public, some of which warrant government-funded social services like universal dental care, such as children or new immigrants, and others who do not. This ultimately suggests that the implementation of population-wide dental public health interventions must acknowledge the nuances that exist in the public's minds around different groups.

The second theme, ways of knowing, developed focused on the public's different sources of information and processes used to understand dental public health interventions. Different members of the public used different sources of information to form opinions around population-wide dental public health interventions. These differing ways of knowing seemed to range on a continuum, from science as a singular and linear source of knowledge, to multiple sources of knowledge, to the recognition of knowledge as an intersection of one's values. Ultimately, this demonstrates a recognition that some publics acknowledge scientific evidence as only one of the many authorities needed to justify policy action. Additionally, these various sources of knowledge appear to represent a person's underlying values and world views, emphasizing the importance of understanding public values surrounding population-wide interventions in dental public health.

The last theme, values in public health, focuses on the public's underlying values, and how they apply to public health. Understanding the underlying values that exist in the public and ensuring that a population-wide dental public health intervention honours these values. Getting a better understanding of these underlying values will help support public health action. Tensions exist among the public between individual and community responsibility, the role of prevention versus the role of treatment, as well as whether dental health constitutes an important part of overall health, or whether it is rather aesthetic.

## **4.2 Implications**

### **4.2.1 Dental Public Health Policy Decision-Making Should Balance the Views from Key Stakeholders.**

As mentioned previously, our research seems to support the idea of multiple publics, or in other words, the idea that the public is not one monolithic entity. Jennings (50) sees the public as

much more than just an aggregate of individuals, but rather a complex system comprising a network of interacting and interrelated elements, leading to properties that are not reflected in its individual components (50). Accordingly, public health must recognize the existence and nature of relationships between and among actors involved in public health; namely, the numerical, political and communal publics (47, 50, 103). The concept of the public is complex, and we found this heuristic to be helpful for making sense of that complexity.

We aimed to understand the contextual social nature of these publics and the relationships among them. In the present study, we observed publics with different ways of knowing, different values, and different expectations of power relations. Although differences among these publics and nuances in their relationships with experts and among themselves, such as the role of experts in dental public health interventions, may complicate efforts to engage them in policy making, those differences present an important resource for public health. Among our sample of parents of young children, we found a diverse set of engaged, interested citizens, whose participation revealed clear concern about dental health policy. Participants held sophisticated views on the existing tensions between stakeholders in public health, different ways of knowing and the ability to triangulate across multiple sources of information, and values.

Furthermore, parents in these focus groups were enthusiastic during the discussions, happy to be consulted, and provided thoughtful contributions. Many participants thanked us for sharing the information with them. To that end, we concur with Bucchi (59), who suggests that lay knowledge is not an impoverished or quantitatively inferior version of expert knowledge; rather, it is qualitatively different (59). We find that the numerical publics are knowledgeable, thoughtful and sensible, bringing forward logical and important discussion points about health



policy. Overall, a main implication is that the public cannot and should not be ignored by public health practitioners and policy-makers, and should be considered a knowledgeable and important resource (104).

Additionally, we found that although the expert's role in public health interventions, as viewed by participants in our study, is varied and nuanced, the existence of expertise cannot be disputed. All participants in our focus groups referred to the need for expertise at one time or another, confirming its existence. Even where there was discordance about who was an expert, what their role should be in policy decisions, and how that decision-making should occur, all agreed that experts continue to play a key role in policy. Taken together, this seems to suggest that the public identify a need for experts, but also seem very engaged with and capable of considering and engaging with scientific information. Because of this, a balance should be sought that doesn't privilege lay views, but that truly engages the public including by understanding their underlying values.

In this way, our findings support a need, discussed elsewhere for critical public engagement (105), where a goal is to provide an opportunity for institutions and experts to rethink rather than reinforce existing power structures, institutional assumptions, and social practices (105). By identifying and rethinking existing structures, assumptions, and practices, we are able to draw attention to different forms and sources of expertise, all of which can be important when shaping policy decision-making. Our findings furthermore illustrate the importance of embracing value pluralism: developing a better understanding of the perceptions, cultural lenses, and worldviews that inform how people make sense of public health interventions such as fluoridation can provide a foundation for finding ways to bridge ideological differences (105).

#### 4.2.2 Universal dental care as a preferred policy option

This study's research purpose was to explore parental views on population-wide dental public health interventions. When analysing the questionnaire and focus group data, we found that Option 3, universal dental care, was the most acceptable intervention among parents. We also found Option 4, fluoridated salt/milk, to be the least acceptable option.

These four policy options differ in complexity and feasibility. Most notably, universal dental care is theoretically broad and multi-component, compared to a singular primary prevention intervention such as fluoridation. These differences have implications for how directly comparable the different policy options are, as identified by one of our focus group participants:

*“1B: I don't think [comparing between universal dental care and fluoridation] is fair [laughs], because fluoridation, as you said, even though its less than a million [dollars], it's still relatively cheap in prevention. And with universal dental care, you are talking about billions of dollars and its way broader. Of course [universal dental care] is good, you know? I would vote for [universal dental care]. But it's like, I would remove one tree and give you a forest, you know go for the forest, so I don't think that's a fair question, universal dental care.”*

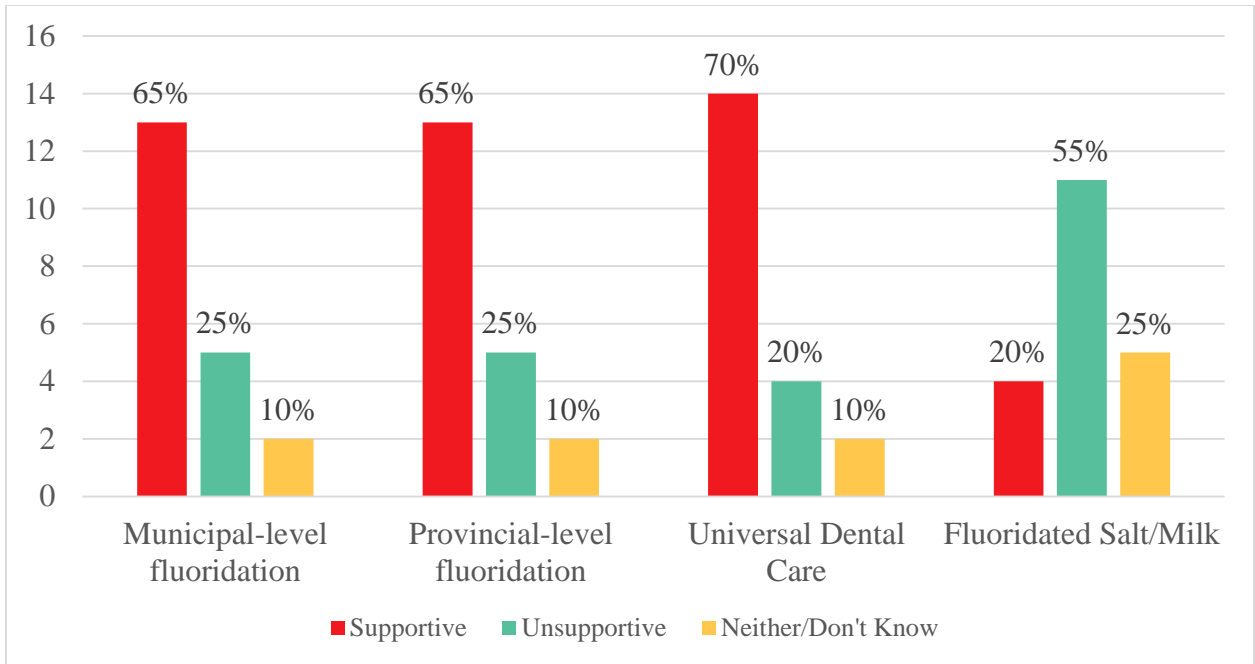
The participant uses a metaphor, where she compares fluoridation, representing “one tree” to universal dental care, representing “a forest”. She finds that being asked to compare fluoridation and universal dental care to be unfair, because the interventions are so different in nature, with universal dental care being much more encompassing, and expensive, than the fluoridation interventions. (combine) However, because the goal of this study was to better understand the underlying values that help shape parents of young children's beliefs around

population-wide dental public health interventions, and because all four represented theoretically viable approaches, we felt that introducing these four policies was appropriate.

Furthermore, the four policy options presented, though all collective in nature, had varying degrees of intrusiveness, as follows (presented from least to most intrusive):

1. Option 4. Fluoridation of salt or milk (domestic): individuals choose whether or not to buy fluoridated salt, accessible at the grocery store or anywhere salt is typically purchased.
2. Option 3. Universal dental care: a robust set of preventive dental health services are offered to a sub-set of the population (i.e. children), or a smaller set of services are offered to the whole population. In both scenarios, individuals choose whether or not to seek the services, but services are publicly paid.
3. Option 1. Municipal-level fluoridation: water is fluoridated at the municipal level. Any individual who lives in the municipality has fluoridated tap water.
4. Option 2. Provincial-level fluoridation: water is fluoridated at the provincial level. Any individual who lives in the province, both rural and urban, has fluoridated tap water.

Prior to the focus group discussion, participants were asked about their level of support for each of the four population-wide dental health interventions. The figure below (Figure 2) illustrates the level of support for each of the policy options prior to the focus group discussion:

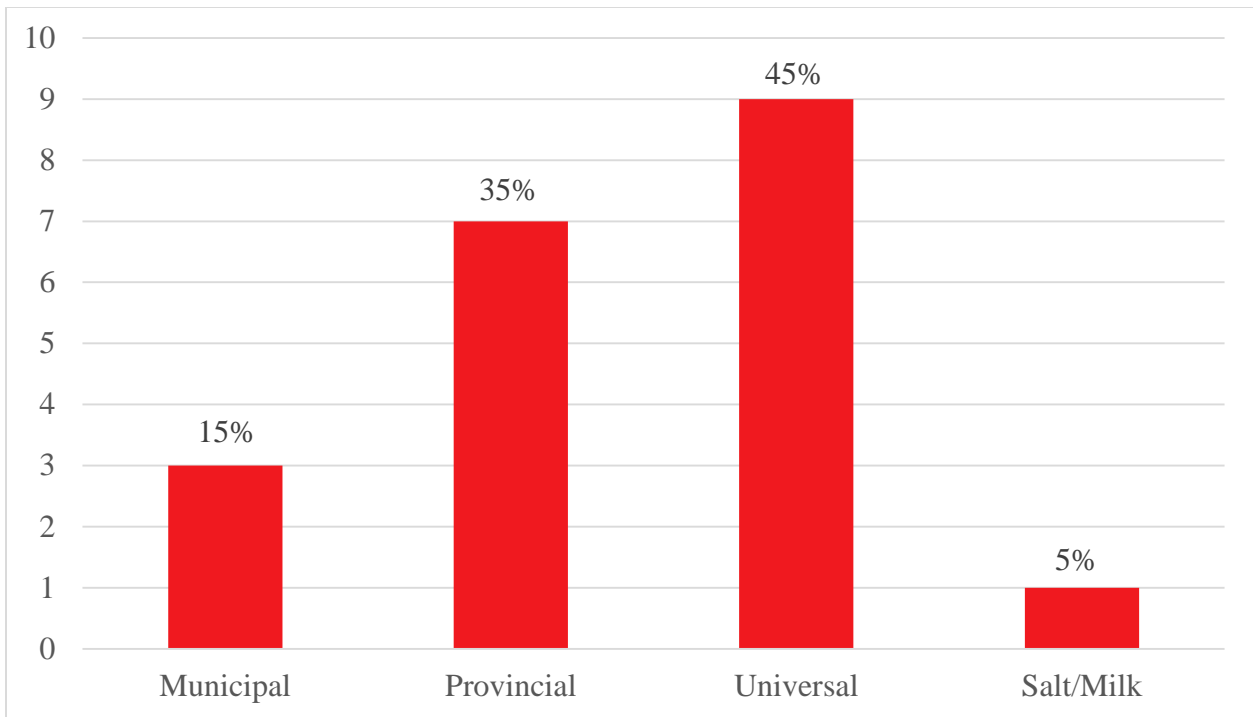


**Figure 2. Participants' level of support for each policy option prior to the focus group.**

For this question, participants were asked whether they were supportive, unsupportive, or neither/don't know about each of the four policy options; namely, municipal-level fluoridation, provincial-level fluoridation, universal dental care, or fluoridated salt/milk.

Of the four options, universal dental care had the most support (70%), followed by both fluoridation at the municipal and provincial levels (both 65% support).

During the focus groups discussion, participants discussed the tension that exists around population-wide interventions such as fluoridation, universal dental care or fluoridated salt/milk, which may infringe on individual liberties in different ways. In the post-focus group questionnaire, participants were asked to rank each of the four policy options. The figure below (Figure 3) illustrates the number of times each of the policies were ranked first by participants in the post-focus group questionnaire:



**Figure 3. Participants' ranking of each of the policy options after the focus group discussion.**

In this question, participants were asked to rank each of the four policy options from most to least preferred. The policy options were: municipal-level fluoridation, provincial-level fluoridation, universal dental care, or fluoridated salt/milk. This figure shows the number of times each policy was ranked first.

After the focus group discussion, universal dental care remained the most popular option and fluoridation of salt/milk remained the least popular option. Whereas provincial and municipal-level fluoridation were equally supported prior to the focus group discussion (Figure 5.1), provincial-level fluoridation was more popular than municipal-level fluoridation after the focus group discussion.

This may demonstrate that although the participants understood the potential infringement that exists with coercive interventions such as fluoridation, they still believe in its importance as policy options, and find it valuable despite the potential intrusiveness. Universal dental care, the most acceptable policy option, may be seen by participants as a way to work as a

collective by offering population-wide services, while also preserving individual choice, in comparison to fluoridation. Because of the current universal Medicare practiced currently in Canada, it is possible that this allowed participants to feel some familiarity with the idea of universal dental care, and mostly agree with it.

Fluoridated salt or milk (Option 4), was consistently ranked as the least popular option, both before and after the focus group discussion. Interestingly, focus group data suggested that most participants resisted this option because they worried that it did not place enough emphasis on community responsibility, claiming that there were groups of individuals who might not know to choose the fluoridated salt/milk. This seems to suggest that although participants agree with the concept of individual choice and preserving individual liberties, they also understand and support the importance of community responsibility. Additionally, it is possible that because fluoridated salt and milk is not common in Canada, participants did not choose this option in part because they were less familiar with it.

## **4.3 Strengths and Limitations**

### **4.3.1 Strengths**

A main strength of this study is the unique focus group structure. Each focus group included a presentation that briefed participants on all four policy options, highlighting the pros and cons of each. Unlike other studies that have gauged individuals' views about fluoridation by asking only about fluoridation (26), we asked participants about their views on population-wide dental public health interventions in an innovative way, by getting them to compare and contrast several policy options including fluoridation. By introducing fluoridation as well as other policy options as tools for discussion around greater questions of population-level dental public health

interventions, we believe to have gained greater insights into their viewpoints than would have occurred with a traditional structured focus group discussion.

Another strength of this study was the population accessed. Parents of young children are often busy and not reachable. However, through extensive and diverse recruitment methods, which occurred in all four quadrants of Calgary, Canada, we obtained a highly diverse set of parents. For the most part, the participants were highly interested in the focus group topic, without having a strong, unwavering opinion with regards to dental public health and fluoridation. Many of the parents knew little about fluoridation, but were interested in and concerned about their children's dental health and wanted to share and discuss their experiences.

#### **4.3.2 Limitations**

This study's main weakness is the relatively small sample. We held four focus groups, which by some standards is not enough for a qualitative study (94). However, given our resources and time constraints, this small sample allowed us to obtain an in-depth view of a select group of people, rather than a more superficial account of many. Additionally, after having conducted four focus groups, we held a meeting where we discussed preliminary data, and concluded that we did not need to hold any more focus groups, as we had reached an acceptable level of data saturation (94).

While we outline our unique focus group structure as the study's strength, it is important to note that it comes with distinctive weaknesses as well. While focus groups allow for interaction among participants, which may provide a more natural interaction than individual interviews, these specifically gathered focus groups are not 'natural' settings (94). Because of the structured nature of our focus group, which included a presentation outlining dental public health policy options, the discussion was structured in the sense of deliberately canvassing views,

controlling turn-taking, or asking for elaboration from participants. This facilitation shapes to an extent the accounts participants give, and what they consider to be relevant to the researcher's needs (94).

#### **4.4 Conclusions**

This study sought to explore parental views on population-wide dental public health interventions in Calgary, Canada, in the context of cessation. From this research question, three themes were developed: 1. Expert/Lay Relations, 2. Ways of Knowing, and 3. Values in Public Health. Participants in our study had sophisticated, thoughtful views on dental public health interventions; and they were able to hold contradictory views and identify advantages and disadvantages of various policy options. Our findings support calls for public engagement in public health policy (60, 105), in a way that is genuine but does not privilege those views over those of experts. Lastly, we found participants preferred universal dental care to other dental public health policy options presented, which provides some insight into the attributes of population-level interventions (e.g., universal but preserve individual liberties) that are acceptable to, and align with values of, some members of the public in the Calgary context.

We used two conceptual frameworks, public health ethics and public engagement with science to answer our research question. One important concept in public health ethics is that of individual choice versus community responsibility. In this study, we found that although participants did value individual freedoms, they did not favour the least intrusive policy option presented, fluoridated salt or milk (option 4). That is, although individual choice was important, participants also wanted a population-wide policy option that included some degree of collectivity, viewing collective interventions as more effective and also more acceptable. Therefore, this research adds nuance to the public health ethics framework, demonstrating that



participants' opinions around public health interventions are complex and may not necessarily correspond directly to degree of intrusion (with participants preferring the least intrusive option). Rather, working as a collective, and therefore forfeiting some individual liberties, might be preferable to some members of the public in certain instances.

With regards to public engagement with science, we acknowledge that although engaging members of the public is important and increasingly expected for public health, doing so is complex. From the perspective of value pluralism, engaged policy-making will require greater understanding the meaning of the public itself, as well as the meaning of expertise, which are increasingly nuanced as we move away from the foundational assumptions that shape the current decision-making model. Our findings support the view that genuine public engagement can lead to more transparency around which values guide dental public health policy decision-making.

As a future research objective, we recommend building on these findings to develop and operationalize a framework for developing and choosing dental public health policy. This framework could be a tool for decision-makers to integrate the public into decision making, to use public engagement as a way to challenge the foundational assumptions and framing strategies that underpin public policies (105).

## References

1. Centers for Disease Control and Prevention. Water fluoridation: a manual for engineers and technicians. Washington, DC: US Department of Health and Human Services. 1991.
2. Canadian Dental Association. CDA position on early childhood caries. Ottawa, Canada: Canadian Dental Association 2010.
3. Cho HJ, Jin BH, Park DY, Jung SH, Lee HS, Paik DI, et al. Systemic effect of water fluoridation on dental caries prevalence. *Community dentistry and oral epidemiology*. 2014;42(4):341-8.
4. Groeneveld A, Van Eck AA, Backer Dirks O. Fluoride in caries prevention: is the effect pre- or post-eruptive? *Journal of Dental Research*. 1990;69 Spec No:751-5; discussion 820-3.
5. Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, Macey R, et al. Water fluoridation for the prevention of dental caries. *Cochrane Database of Systematic Reviews*. 2015(6).
6. McDonagh MS, Whiting PF, Wilson PM, Sutton AJ, Chestnutt I, Cooper J, et al. Systematic review of water fluoridation. *Bmj*. 2000;321(7265):855-9.
7. O'Neill B KT, McLaren L. Politics, science, and termination: a case study of water fluoridation policy in Calgary in 2011. . Unpublished manuscript.
8. Einsiedel E, Premji S, Geransar R, Orton NC, Thavaratnam T, Bennett LK. Diversity in public views toward stem cell sources and policies. *Stem Cell Reviews and Reports*. 2009;5(2):102-7.
9. Kagihara LE, Niederhauser VP, Stark M. Assessment, management, and prevention of early childhood caries. *J Am Acad Nurse Pract*. 2009;21(1):1-10.
10. Naidoo S, Myburgh N. Nutrition, oral health and the young child. *Maternal & child nutrition*. 2007;3(4):312-21.
11. Rowan-Legg A, Committee CP. Oral health care for children—a call for action. *Paediatrics & child health*. 2013;18(1):37.
12. McLaren L, McIntyre L. Drinking water fluoridation in Canada: Review and synthesis of published literature. Report commissioned by the Public Health Agency of Canada. 2011.
13. McLaren L, Singhal S. Does cessation of community water fluoridation lead to an increase in tooth decay? A systematic review of published studies. *J Epidemiol Community Health*. 2016;70(9):934-40.
14. Mehta A. Biomarkers of fluoride exposure in human body. *Indian Journal of Dentistry*. 2013;4(4):207-10.
15. Featherstone JD. Prevention and reversal of dental caries: role of low level fluoride. *Community Dentistry & Oral Epidemiology*. 1999;27(1):31-40.

16. Wolfe J, Ishaque S, Aung YN. The State of Dental Health in Alberta: A Brief Report. Edmonton, AB: University of Alberta, School of Public Health. 2013.
17. Holt K, Barzel R. Oral Health and Learning: When Children's Health Suffers, So Does Their Ability to Learn (3rd ed.). Washington, DC: National Maternal and Child Oral Health Resource Center.; 2013.
18. ElKarmi R, Shore E, O'Connell A. Knowledge and behaviour of parents in relation to the oral and dental health of children aged 4-6 years. *Eur Arch Paediatr Dent.* 2015;16(2):199-204.
19. Prabhu A, Rao AP, Reddy V, Ahamed SS, Muhammad S, Thayumanavan S. Parental knowledge of pre-school child oral health. *Journal of community health.* 2013;38(5):880-4.
20. Naidu R, Davis L. Parents' views on factors influencing the dental health of Trinidadian pre-school children. *Community Dent Health.* 2008;25(1):44-9.
21. Ashkanani F, Al-Sane M. Knowledge, attitudes and practices of caregivers in relation to oral health of preschool children. *Medical Principles and Practice.* 2012;22(2):167-72.
22. Cooney P. Report on the findings of the oral health component of the Canadian Health Measures Survey 2007–2009. Ottawa: Health Canada. 2010:1A111.
23. Divaris K, Lee JY, Baker AD, Gizlice Z, Rozier RG, DeWalt DA, et al. Influence of caregivers and children's entry into the dental care system. *Pediatrics.* 2014;133(5):e1268-e76.
24. Burt BA. Fluoridation and social equity. *Journal of public health dentistry.* 2002;62(4):195-200.
25. Health Canada. Fluoride in Drinking Water 2017 [Available from: <https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/fluorides-human-health.html>].
26. Griffin SO, Jones K, Tomar SL. An economic evaluation of community water fluoridation. *Journal of public health dentistry.* 2001;61(2):78-86.
27. American Dental Association. Fluoridation Facts. [http://www.ada.org/public/topics/fluoride/facts/fluoridation\\_facts.pdf](http://www.ada.org/public/topics/fluoride/facts/fluoridation_facts.pdf). 2005.
28. Dean HT, Arnold FA, Jr., Jay P, Knutson JW. Studies on mass control of dental caries through fluoridation of the public water supply. *Public Health Rep.* 1950;65(43):1403-8.
29. Canadian Dental Association. CDA position on use of fluorides in caries prevention. Ottawa, ON: CDA. 2012.
30. Quiñonez CR, Locker D. Public opinions on community water fluoridation. *Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique.* 2009:96-100.

31. Rabb-Waytowich D. Water fluoridation in Canada: past and present. Available from: [www.cda-adc.ca/jcda](http://www.cda-adc.ca/jcda). 2009;75(6):451-4.
32. Martin B, Groth E. Scientific knowledge in controversy: The social dynamics of the fluoridation debate. Albany: State University of New York Press: SUNY Press; 1991.
33. Inglehart R. Culture shift in advanced industrial society. Princeton: Princeton university press; 1990. p. 484 p.
34. Rudman B, Furth I. Effectiveness of Population-Based Interventions to Promote Oral Health: Understanding Public Judgment on Science-Intensive Issues: San Diego Dialogues on Community Water Fluoridation. 2007.
35. Susser M, Susser E. Choosing a future for epidemiology: I. Eras and paradigms. *Am J Public Health*. 1996;86(5):668-73.
36. Terris M. The complex tasks of the second epidemiologic revolution: the Joseph W. Mountin lecture. *Journal of Public Health Policy*. 1983;4(1):8-24.
37. Potvin L, McQueen DV. Modernity, public health, and health promotion. *Health and Modernity: Springer*; 2007. p. 12-20.
38. Fassin D. L'espace politique de la santé: essai de généalogie: Presses universitaires de France; 1996.
39. Porter D. Health, civilization and the state: a history of public health from ancient to modern times: Routledge; 2005.
40. Breslow L. From disease prevention to health promotion. *Jama*. 1999;281(11):1030-3.
41. Lalonde M. A New Perspective on the Health of Canadians: A Working Document= Nouvelle Perspective De La Sante Des Canadiens. 1974.
42. World Health Organization, editor Ottawa charter for health promotion. First International Health Promotion Conference, Ottawa, Canada, 1986; 1986.
43. Potvin L, Gendron S, Bilodeau A, Chabot P. Integrating social theory into public health practice. *Am J Public Health*. 2005;95(4):591-5.
44. McQueen DV. Strengthening the evidence base for health promotion. *Health promotion international*. 2001;16(3):261-8.
45. Acheson D. Report of the Committee of Inquiry into the future development of the Public Health functions and Community Medicine. Report of the Committee of Inquiry into the future development of the Public Health functions and Community Medicine. 1988.
46. Kickbusch I, Nutbeam D. Health promotion glossary. Geneva: World Health Organization. 1998;14.
47. MacDonald M, Keeling M, Bellefleur O. Introduction to Public Health Ethics: Background2014.
48. Beauchamp TL, Childress JF. Principles of biomedical ethics: Oxford University Press, USA; 2001.

49. Callahan D, Jennings B. Ethics and public health: forging a strong relationship. *Am J Public Health*. 2002;92(2):169-76.
50. Jennings B. Public health and civic republicanism: Toward an alternative framework for public health ethics. *Ethics, prevention and public health*. 2007:30-58.
51. Childress JF, Faden RR, Gaare RD, Gostin LO, Kahn J, Bonnie RJ, et al. Public health ethics: mapping the terrain. *The Journal of Law, Medicine & Ethics*. 2002;30(2):170-8.
52. Institute of Medicine . Committee on Assuring the Health of the Public in the 21st Century. *The Future of the Public's Health in the 21st Century*: National Academy Press; 2003.
53. Salamon LM, Sokolowski SW, List R. *Global civil society. Dimensions of the Nonprofit sector* Baltimore. 1999.
54. Himmelman AT. On coalitions and the transformation of power relations: Collaborative betterment and collaborative empowerment. *American journal of community psychology*. 2001;29(2):277-84.
55. Nuffield Council On Bioethics. *Public Health: ethical issues*. Nuffield Council, London, England. 2007.
56. World Health Organization. *The world health report 2000: health systems: improving performance*: World Health Organization; 2000.
57. Dworkin G. Paternalism. *The Stanford Encyclopedia of Philosophy* (Winter 2017 Edition), Edward N Zalta (ed)2017.
58. Callon M. The role of lay people in the production and dissemination of scientific knowledge. *Science, Technology and Society*. 1999;4(1):81-94.
59. Bucchi M, Trench B. *Handbook of public communication of science and technology*: Routledge; 2008.
60. Wynne B. Chapter 17: Public Understanding of Science. 1995 2018/06/24. In: *Handbook of Science and Technology Studies, Revised Edition* [Internet]. Thousand Oaks, California: SAGE Publications, Inc. Available from: <http://sk.sagepub.com/reference/handbook-of-science-and-technology-studies>.
61. Bohman J. Reflexive public deliberation: Democracy and the limits of pluralism. *Philosophy & Social Criticism*. 2003;29(1):85-105.
62. Blue G. Framing climate change for public deliberation: What role for interpretive social sciences and humanities? *Journal of Environmental Policy & Planning*. 2016;18(1):67-84.
63. Quiñonez C. Why was dental care excluded from Canadian Medicare. *Network for Canadian Oral Health Research Working Papers Series*. 2013;1(1).
64. Scott A, Maynard A, Elliott R. *Advances in health economics*: John Wiley & Sons; 2005.

65. Health Canada. Summary report on the findings of the oral health component of the Canadian Health Measures Survey, 2007-2009. Ottawa (ON): Health Canada; 2010. Report No.: 1100156623.
66. Quiñonez C, Sherret L, Grootendorst P, Shim M, Azarpazhooh A, Locker D. An environmental scan of publicly financed dental care in Canada. Community Dental Health Services Research Unit and Office of the Chief Dental Officer, Health Canada. 2005.
67. Public Health Agency of Canada. The state of community water fluoridation across Canada. 2017.
68. Statistics Canada. Census Dictionary.
69. McLaren L, McNeil DA, Potestio M, Patterson S, Thawer S, Faris P, et al. Equity in children's dental caries before and after cessation of community water fluoridation: differential impact by dental insurance status and geographic material deprivation. *Int J Equity Health*. 2016;15:24.
70. Carstairs C. Cities without cavities: democracy, risk, and public health. *Journal of Canadian studies*. 2010;44(2):146-70.
71. Health Canada. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document: Fluoride. S.l.: Health Canada; 2012.
72. Centers for Disease Control and Prevention. Populations receiving optimally fluoridated public drinking water--United States, 1992-2006. *MMWR Morbidity and mortality weekly report*. 2008;57(27):737.
73. Jones S, Burt BA, Petersen PE, Lennon MA. The effective use of fluorides in public health. *Bulletin of the World Health Organization*. 2005;83(9):670-6.
74. Marthaler T, Petersen P. Salt fluoridation—an alternative in automatic prevention of dental caries. *Int Dent J*. 2005;55(6):351-8.
75. Musto RJ. Fluoridation: why is it not more widely adopted? *CMAJ: Canadian Medical Association Journal*. 1987;137(8):705.
76. Kapoor T ONB, McLaren L. , editor Cessation of community water fluoridation in Calgary in 2011: a study of the decision-making process. Poster presentation at 2016 Canadian Association of Public Health Dentistry Conference, Sept 30-Oct 1 2016, Edmonton (Manuscript currently in preparation); 2016.
77. Magnieh A. Put fluoride back in Windsor's drinking water. *Windsor Star*. 2016.
78. van Harten M. ID. A Provincial Mandate for Community Water Fluoridation in Ontario? . *Ontario Dentist (Ontario Dental Association Journal)*. 2016.
79. Centers for Disease Control and Prevention. Community Water Fluoridation – 2014 Water Fluoridation Statistics. 2014.
80. Arora A, Manohar N, John JR. Factors Associated with Dental Caries in Primary Dentition in a Non-Fluoridated Rural Community of New South Wales,

- Australia. *International journal of environmental research and public health*. 2017;14(12):1444.
81. Ismail AI, Sohn W. The impact of universal access to dental care on disparities in caries experience in children. *The Journal of the American Dental Association*. 2001;132(3):295-303.
  82. Biggs A. Dental reform: an overview of universal dental schemes. 2012.
  83. Council NR. Improving access to oral health care for vulnerable and underserved populations: National Academies Press; 2012.
  84. Kim J, Choi Y, Park S, Kim JL, Lee TH, Cho KH, et al. Disparities in the experience and treatment of dental caries among children aged 9-18 years: the cross-sectional study of Korean National Health and Nutrition Examination Survey (2012-2013). *Int J Equity Health*. 2016;15:88.
  85. Kramer PF, Chaffee BW, Bertelli AE, Ferreira SH, Béria JU, Feldens CA. Gains in children's dental health differ by socioeconomic position: evidence of widening inequalities in southern Brazil. *Int J Paediatr Dent*. 2015;25(6):383-92.
  86. Broomhead T, Baker S, Jones K, Richardson A, Marshman Z. What are the most accurate predictors of caries in children aged 5 years in the UK? *Community Dent Health*. 2014;31(2):111-6.
  87. Do L, Spencer A, Slade G, Ha D, Roberts-Thomson K, Liu P. Trend of income-related inequality of child oral health in Australia. *Journal of dental research*. 2010;89(9):959-64.
  88. Estupiñán-Day S. Promoting Oral Health: The use of salt fluoridation to prevent dental caries: Pan American Health Org; 2005.
  89. Marthaler T. Increasing the public health effectiveness of fluoridated salt. *Schweizer Monatsschrift Fur Zahnmedizin*. 2005;115(9):785.
  90. Bánóczy J, Petersen PE, Rugg-Gunn A. Milk fluoridation for the prevention of dental caries: World Health Organization; 2009.
  91. Yeung CA, Chong LY, Glenny A-M. Fluoridated milk for preventing dental caries. *Cochrane Database of Systematic Reviews*. 2015(9).
  92. Rose G. Sick Individuals and Sick Populations. *International Journal of Epidemiology*. 1985;14(1):32-8.
  93. Denzin NK, Lincoln YS. *The Sage handbook of qualitative research*: Sage; 2011.
  94. Green J, Thorogood N. *Qualitative methods for health research*: Sage; 2013.
  95. Singh KA, Spencer AJ. Relative effects of pre- and post-eruption water fluoride on caries experience by surface type of permanent first molars. *Community Dentistry & Oral Epidemiology*. 2004;32(6):435-46.
  96. Béland Y. Canadian community health survey--methodological overview. *Health reports*. 2002;13(3):9.

97. Morgan DL. Focus group interviewing. In JF Guvrium, JA Holstein (Eds), *Handbook of Interview Research: Context and Method* (pp. 141-159). Thousand Oaks CA: Sage Publications, 2002.
98. Leask J, Hawe P, Chapman S. Focus group composition: a comparison between natural and constructed groups. *Aust N Z J Public Health*. 2001;25(2):152-4.
99. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative research in psychology*. 2006;3(2):77-101.
100. Eakin JM, Mykhalovskiy E. Reframing the evaluation of qualitative health research: reflections on a review of appraisal guidelines in the health sciences. *Journal of evaluation in clinical practice*. 2003;9(2):187-94.
101. Noble H, Smith J. Issues of validity and reliability in qualitative research. *Evidence Based Nursing*. 2015;18(2):34-5.
102. Nicholls R. Research and Indigenous participation: critical reflexive methods. *International journal of social research methodology*. 2009;12(2):117-26.
103. Jennings B. Frameworks for ethics in public health. *Acta Bioethica*. 2003;9(2):165-76.
104. Milne A, Weijs CA, Haines-Saah RJ, McLaren L. Parents' online discussions about children's dental caries: A critical content analysis. *Can J Public Health*. 2017;108(3):265-72.
105. Blue G. Scientism: A problem at the heart of formal public engagement with climate change.



## Appendices:

### Appendix A. Consent Form



Department of Community Health Sciences

#### **CONSENT TO PARTICIPATE IN RESEARCH**

REB17-0800

#### **TITLE:**

Parent views on fluoridation and alternative policy choices

#### **INVESTIGATORS:**

The project investigators are Rebecca Lang, BSc and Lindsay McLaren PhD (Principal Investigator), This study has been approved by the Conjoint Health Research Ethics Board of the University of Calgary (REB17-0800). If you have any questions or comments please contact Dr. Lindsay McLaren, the Principal Investigator or Rebecca Lang (*contact information has been removed for the submission of this thesis*)

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what you will need to do if you decide to participate. If you would like more detail about something mentioned here, or information not included here, please ask. Please read this carefully to make sure you understand. If you would like a copy of this form, please ask.

#### **WHAT IS THE PURPOSE OF THE STUDY?**

The purpose of this study is to learn more about parents' thoughts and experiences with children's dental health in Calgary. We are also interested in parents' views on various policy choices to improve the dental health of children. We hope to better understand which policy choices might be good options for Calgary to explore in the future.

## **BACKGROUND**

Dental caries, or tooth decay, is the most common chronic childhood disease in several countries including Canada. Over half of Canadian children have tooth decay.

One way to prevent dental decay is community water fluoridation, which is the controlled adjustment of fluoride in public drinking water systems. However, community water fluoridation is a contentious issue, which has prompted other countries to consider other policy options.

In Calgary, the practice of fluoridation was stopped in 2011. In the wake of CWF cessation in Calgary, it is important to understand how members of the public view CWF as well as alternative policy options for preventing tooth decay, to make sure that future policies best suit the needs of the Calgary public.

### **WHAT WOULD I HAVE TO DO?**

You will be asked to share your views, opinions, and experiences of water fluoridation and other policy options, in a group discussion with approximately 5 other parents. The focus group session will be 2 hours in total, plus travel time. This session includes time to fill in questionnaires and a brief presentation by the researchers, giving you more information on community water fluoridation and the different policy choices.

The focus group will be audio recorded so that the researchers will have a record of the discussion to refer to in the future. Only members of the research team will hear the audio recordings. Once an anonymized transcript of the 2-hour discussion has been prepared, the audio recordings will be placed in safe storage for 5 years, as required by the University of Calgary.

### **WHAT ARE THE RISKS?**

Your participation in the focus groups is voluntary and confidential, however, you may know some of the other participants since all will be parents of young children in the Calgary area.

The nature of focus groups means we cannot guarantee complete confidentiality, however, we will ask all participants not to repeat anything they hear during the focus group discussion outside of the group.

One possible risk you may experience is embarrassment and/or social risk when sharing your views and opinions, or disagree with the views of other participants. Although this could happen in everyday life, it might be more likely when discussing issues such as community water fluoridation. You may also experience issues of power and authority related to expertise. This may raise the potential for emotional stress or trigger other experiences of power and authority for participants.

### **WILL I BENEFIT IF I TAKE PART?**

You may benefit from the learning that happens when peers share their parenting experiences if you agree to participate in this study. You will also be adding to dental public health research, since we plan to publish our findings in a scientific journal. In the future, policy workers might use this information when developing policies to prevent children's tooth decay.

### **DO I HAVE TO PARTICIPATE?**

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences. You are free not to answer any question you aren't comfortable answering.

The investigator may also withdraw you from this research if circumstances arise that warrant doing so.

We cannot remove your contributions to the focus group audio recordings.

### **WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?**

You will receive \$50 for costs related to time and travel to the focus group. Light refreshments will be served. Parking is free at all locations.

### **WILL MY RECORDS BE KEPT PRIVATE?**

During the discussion group, you will be asked to share your first name only. When the audio recording is transcribed all names and personal identifiers will be removed to maintain confidentiality.

The audio recording of the session will be kept on a password protected computer and an external hard drive in a locked cabinet. As required by the University of Calgary data retention policy, audio recordings will be kept for 5 years, and then they will be destroyed.

Our research team, and a hired transcriptionist (who are bound by a confidentiality agreement), will be the only ones to have access to the audio recordings collected in this study. Once the transcripts are produced the audio recordings will be deleted from the recorder. **Any findings released from the outcome of this study will not be directly linked to any of the project participants.**

Your signature on this consent means that you agree to the use of non-identifying verbatim quotes in future published materials and presentations.

SIGNATURES

Your signature on this form means that you understand the information about your participation in the research project and agree to participate. Your signature does not waive your legal rights or release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without consequence. If you have further questions concerning matters related to this research, please contact:

Dr. Lindsay McLaren

Or

Rebecca Lang

If you have any questions concerning your rights as a possible participant in this research, please contact the Chair, Conjoint Health Research Ethics Board, University of Calgary

---

Participant's Name

---

Signature and Date

---

Investigator/Delegate's Name

---

Signature and Date

---

Witness' Name

---

Signature and Date

The University of Calgary Conjoint Health Research Ethics Board has approved this research study.

## Appendix B: Demographic Questionnaire



UNIVERSITY OF  
CALGARY

Department of Community Health Sciences

### Exploring Parental Views on Community Water Fluoridation and Policy Alternatives in the Context of Fluoridation Cessation

#### PARTICIPANT INFORMATION REB17-0800

Please complete the following demographic information form. All responses will be kept confidential.

1. I am \_\_\_\_\_ (#) years of age.
2. I have lived in Calgary for \_\_\_\_\_ years.
3. I identify as:
  - a. Female
  - b. Male
  - c. Other
  - d. Prefer not to say
4. I am:
  - a. Single
  - b. Married
  - c. Divorced
  - d. Prefer not to say
5. I have \_\_\_\_\_ (#) children whose ages are \_\_\_\_\_  
\_\_\_\_\_
6. The home we live in is:
  - a. owned by one of the adults living in it
  - b. rented by our family
  - c. other (Please specify) \_\_\_\_\_
7. The level of education I have completed is:
  - a. some high school
  - b. high school
  - c. university graduate degree
  - d. university under-graduate degree
  - e. professional school

c. college

f. university graduate degree

g. Other (please specify) \_\_\_\_\_

8. I am employed outside the home in:

a. Temporary part-time work

b. Temporary full-time work

c. Permanent part-time work

d. Permanent full-time work

9. I was born in the following country: \_\_\_\_\_

## Appendix C: Pre-Focus Group Questionnaire



Department of Community Health Sciences  
Parent views on fluoridation and alternative policy choices  
PRE-FOCUS GROUP QUESTIONNAIRE  
REB17-0800

**Please indicate your answer by marking the appropriate box with an “x”**

1. To your knowledge, is your municipality fluoridated?

- Yes
- No
- Don't Know

**Some people oppose community water fluoridation for a variety of reasons. Please tell us the extent to which you agree or disagree with each of the following statements**

2. “Community water fluoridation is effective in preventing tooth decay in populations”

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Don't know

3. “Community water fluoridation may be harmful to people”

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Don't know

4. "Community water fluoridation infringes on individuals' freedom"

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Don't know

5. "Community water fluoridation should be implemented because it is equitable, and fair to everyone in the community"

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Don't know

**Please select how knowledgeable you feel about each of the following policy options for preventive dental health:**

6. Community water fluoridation

- I know a lot about this
- I have some knowledge about this
- I have little to no knowledge about this

7. No community water fluoridation, but universal dental care

- I know a lot about this
- I have some knowledge about this
- I have little to no knowledge about this

8. No community water fluoridation, but fluoride added to salt or milk

- I know a lot about this
- I have some knowledge about this



I have little to no knowledge about this

**Please indicate how supportive you feel, at this point in time, about the following policy options for preventive dental health:**

9. Community water fluoridation by municipality (for example, fluoridation as a decision made by city council in Calgary)

- Very supportive
- Somewhat supportive
- Neither supportive nor unsupportive
- Somewhat unsupportive
- Very unsupportive
- Don't know

10. Community water fluoridation by province (for example, fluoridation as a decision made by Alberta's provincial authorities)

- Very supportive
- Somewhat supportive
- Neither supportive nor unsupportive
- Somewhat unsupportive
- Very unsupportive
- Don't know

11. No community water fluoridation, but strong universal dental care

- Very supportive
- Somewhat supportive
- Neither supportive nor unsupportive
- Somewhat unsupportive
- Very unsupportive
- Don't know

12. No community water fluoridation, but fluoride added to salt or milk

- Very supportive

- Somewhat supportive
- Neither supportive nor unsupportive
- Somewhat unsupportive
- Very unsupportive
- Don't know

13. If you wanted information about community water fluoridation, where would you look for that information? Please list as many sources as needed.

14. Have you been involved in activism regarding Community Water Fluoridation?

*By "activism", we mean speaking out in a public manner (verbally or in writing) in favour of or in opposition to fluoridation. Examples might include writing or speaking to one's elected representative (e.g., MLA or city councillor), writing a letter to the editor of newspaper, or commenting on an online forum.*

- Yes – several times or more
- Yes – once or twice
- No – never
- Don't know

## **Appendix D: Focus Group Discussion Guide**

Parent views on fluoridation and alternative policy choices (REB17-0800)

Department of Community Health Sciences

*Preamble.* The goal of this focus group is to generate discussion and share your views, opinions, and attitudes about policy choices for preventing tooth decay in children. We will discuss community water fluoridation, which was stopped in Calgary in 2011, and other preventive dental health policy options that Calgary could consider. Today's focus group session will last 90 minutes. Your \$50 reimbursement will be provided to you at the end of the focus group for the rest of the participants.

It is important to note that we are focusing on prevention, or in other words, ways to prevent tooth decay before it starts, instead of treating or curing it afterwards.

To do this, we will focus on four health policy options to prevent tooth decay, that exist in other places in the world. Though other options exist, we present these four options to get a better understanding of what parents like you, like and don't like about various policies. We also welcome any other ideas about prevention??? that you may have, and are very interested in hearing these ideas.

It is important to gather this kind of information from parents like you, because you have a say in public health programs like community water fluoridation. Also, all of you are

parents of young children in Calgary, so you have a unique perspective on this issue, as this issue affects you.

Information gathered during this focus group may contribute to recommendations for policy makers, such as Calgary city council or the Alberta ministry of health. We will also share this information with other dental health researchers and decision-makers, such as the Canadian Dental Association, through scientific presentations and journals. We really want to hear your thoughts on this subject and bring it to policy makers.

As you can see, there is a microphone to record our conversation, so while talking, please make sure to speak up. Also, please allow one person to speak at a time to make for a clearer recording.

To respect confidentiality, and as you read on the consent form, the written transcript of this focus group will have your names replaced with "Participant A" "B" etc....so there will be no way for anyone to connect your recorded comments with your name. Once we have usable transcripts, the recording will be stored on a password-protected computer belonging to the Principal Investigator (Dr. McLaren) for 5 years as per University of Calgary requirements. Also, neither the research associate, transcriptionist, nor I will talk about these focus group discussions with anyone other than the research team.

We suggest that each of you may also want to refrain from sharing the content of our discussion with others outside this group to respect each other's confidentiality.

It's important to hear from each of you. Each person's opinions and experiences are unique and important. With that goal in mind, we hope you feel comfortable to be honest even if your views are not in agreement with other views you hear during the discussion.

You have the option of withdrawing from this study at any time, and will still receive your \$50 reimbursement. If you do need to withdraw, please let me or Rebecca know, and we will help you do so quietly without disrupting the discussion. If you do decide to withdraw, any data collected up to the point of withdrawal will still be included in our study, as it would be difficult to remove it from the discussion.

Does anyone have any questions?

*Icebreaker.* To get things going why don't we go around the room and introduce ourselves. Please tell us a bit about where you grew up, and something unusual about yourself.

What words, thoughts or ideas come to mind when you think about Community Water Fluoridation?

*Probing:* Let's talk about what source you are using to get your knowledge of community water fluoridation. For example, some people may learn about water fluoridation on the internet, on the news, through word of mouth.

*Probing question:* Now let's talk about any risks or concerns you might have about fluoridation?

Secondary probing question if participant indicates that they do not like the mass medication aspect of fluoridation: do you feel the same way with chlorine in our water as with fluoride?

We're going to show a brief presentation on community water fluoridation. I will then introduce you to four policy options that involve community water fluoridation. These are all policies that have existed in other places, and therefore are possible options for Calgary to choose

*[Presentation]*

You have a sheet in front of you with the four policy options that Rebecca outlined in the presentation. I'll give you about 2-3 minutes to think about each option, and write some thoughts down beside each one. Then we will talk about them as a group. I would encourage you to kind of ignore me – I will answer technical questions and interject where needed to keep us on time and on topic, or to get more details about something. But we are really interested in hearing what you come up with as a group.

Moderator reminders:

Focus on prevention when conversation defaults to treatment too much. We want to let it happen naturally because it is an important finding that people default to treatment all the time. But when it takes too much time, I will pull us back to prevention.

The three considerations

*Post-Presentation Questions*

Looking at the notes you've jotted down, can you talk with each other about what you like and don't like about each of these policy options, starting with the first one and moving to the fourth one?

*Probing questions/comments*

Probe for details about trade-offs between personal choice and what is best for the community as a whole?

Probe about whose opinion matters when there is conflicting information such as when such an even split exists between the pro- and anti-fluoride sides.

Are there any major risks or benefits that you see for any options? Any major red flags that concern you?

*Closing questions.* Are there any policy options that have not been introduced in this discussion that you think should be considered?

Is there anything that hasn't been raised that you think is important in relation to this topic?

*Closing.* Thank you for your participation.

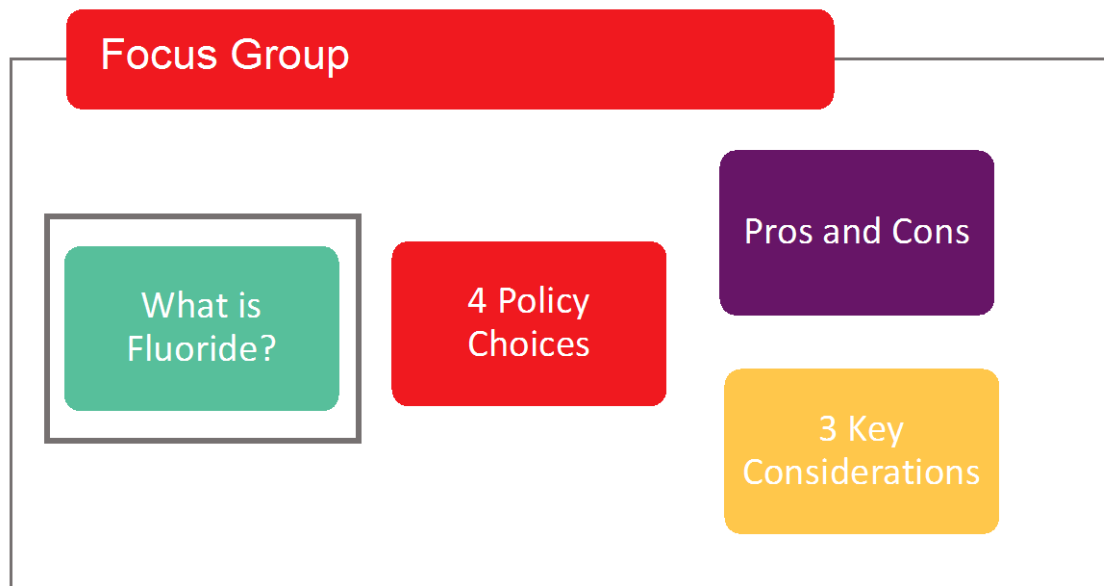
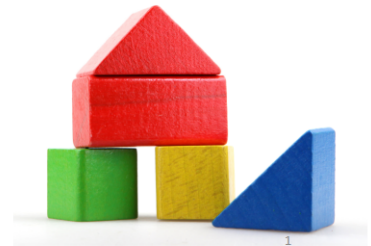
## Appendix E: Focus Group Presentation Slides

Department of Community Health Sciences

# Parent views on community water fluoridation and alternative policy choices

Focus Group Presentation

Rebecca Lang, BSc



2



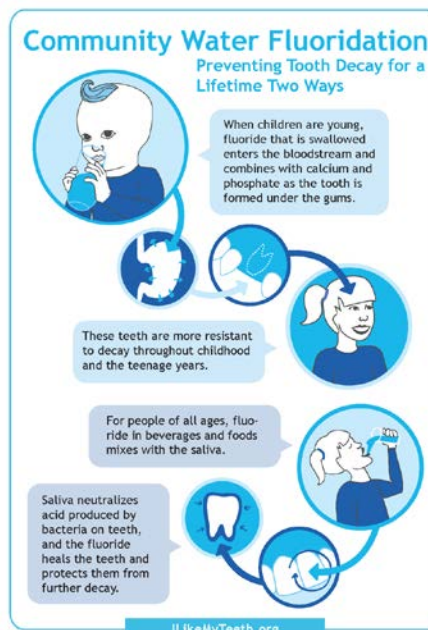
Community Water  
Fluoridation (CWF)  
adjusting the level of  
fluoride in a public water  
supply to reduce tooth  
decay

*CDC (2005) Water Fluoridation Training for Water  
Treatment Facility Operators*



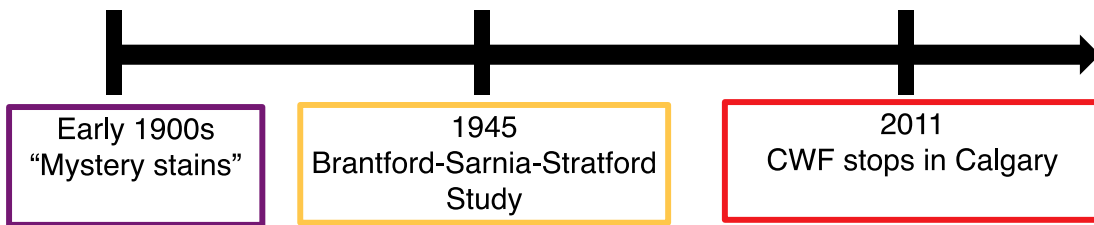
3

**BACKGROUND:  
HOW  
FLUORIDE  
WORKS**



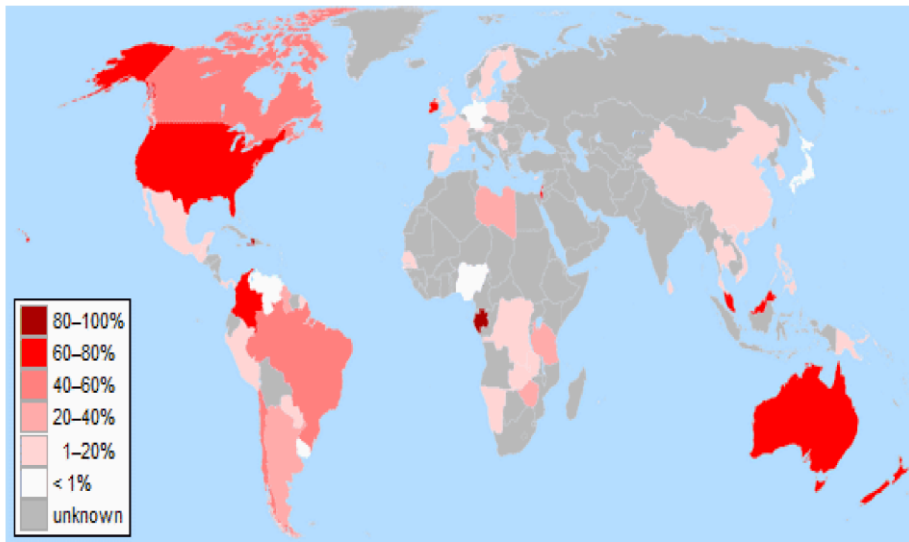
4

# BACKGROUND: HISTORY



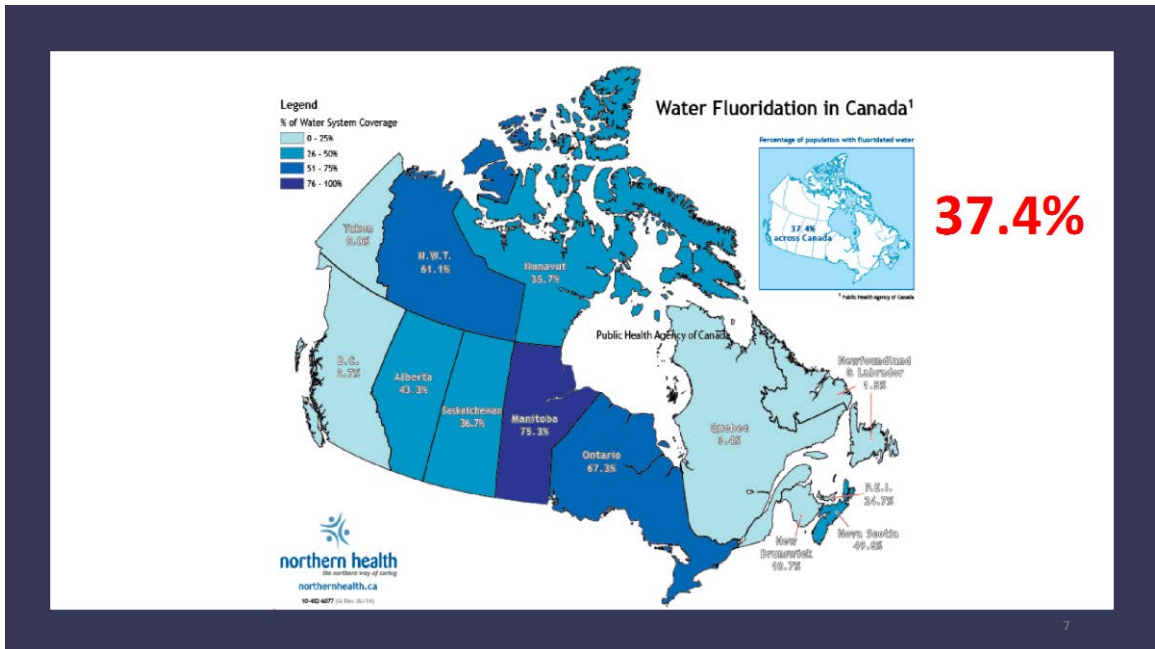
5

## Around the World



The British Fluoridation Society; The UK Public Health Association; The British Dental Association; The Faculty of Public Health, 2004  
"The extent of water fluoridation" in *One in a Million: The facts about water fluoridation 2nd ed.*, pp. 55–80

6

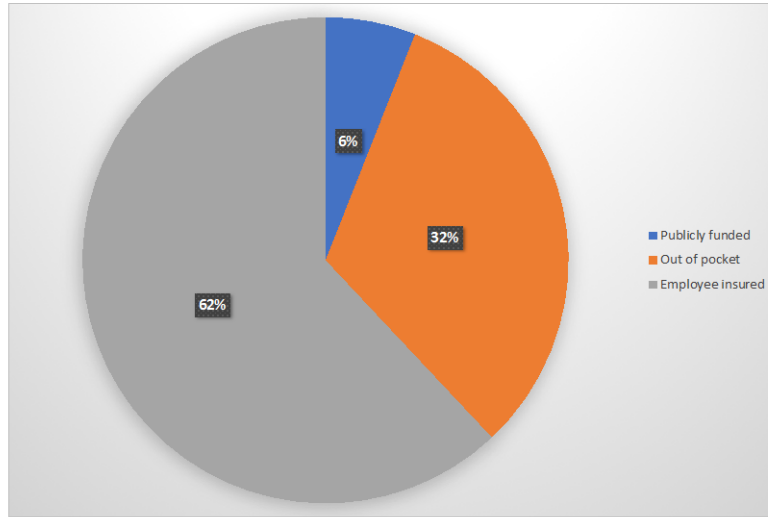


- Nearly **2.26 million school-days** are lost every year due to dental visits or dental sick-days.

## DENTAL CARE

Dental care is expensive so it is important to think about prevention including fluoridation and any other options

Alberta has the highest dental fees in Canada, making it especially unaffordable



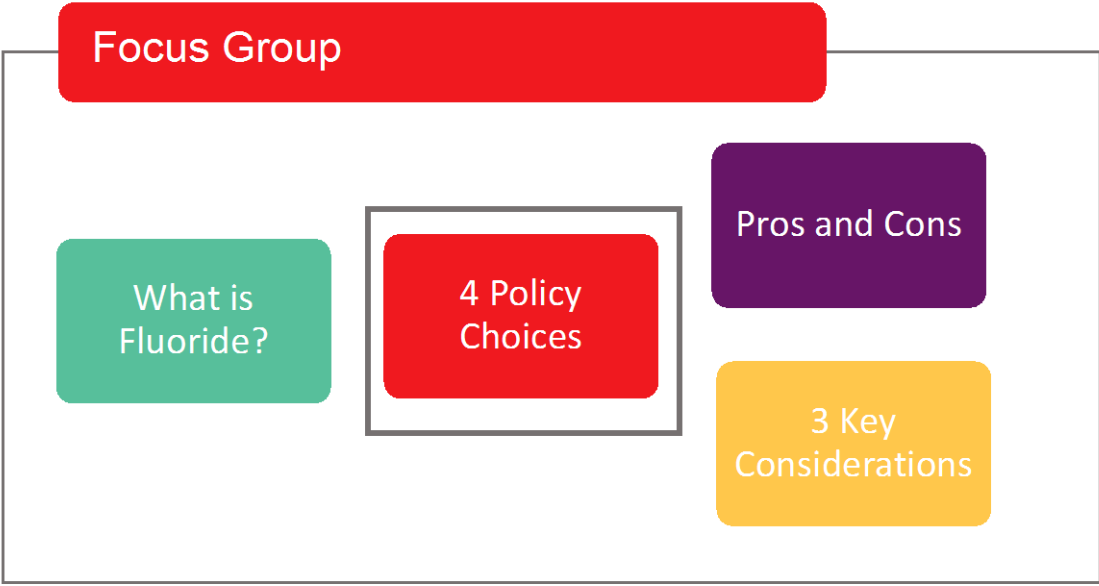
## PUBLIC HEALTH

Doctor-Patient Model

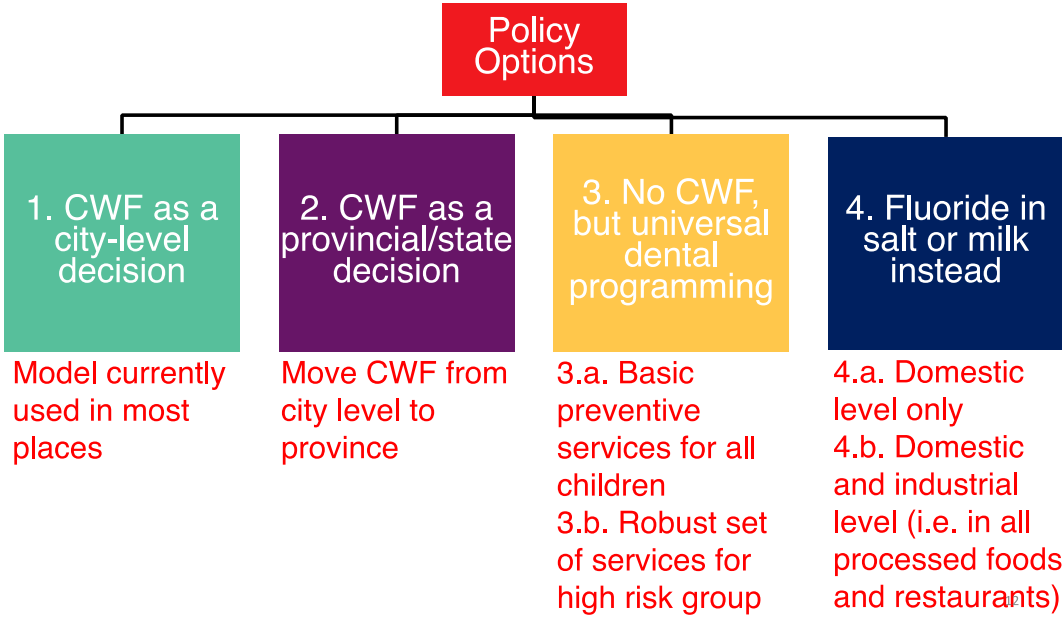
Public Health

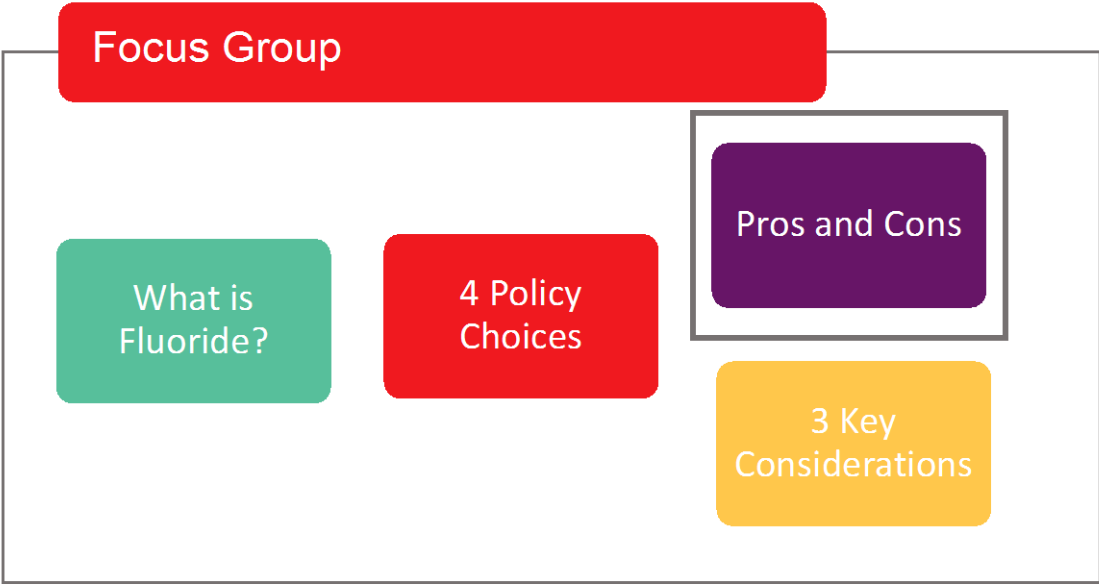
- *Meant to serve the interests of populations*
- *We need the views of parents*





11





13

PRO	CON
<p>yone receives it and therefore very effective</p>	

14

2. CWF as a provincial/state decision

Ontario has explored this option. Would mean that every urban and rural area in the province has CWF

A Provincial Mandate for Community Water Fluoridation in Ontario?



PRO	CON
<ol style="list-style-type: none"> <li>1. The government with the most resources to support the practice                             <ul style="list-style-type: none"> <li>• Many city councillors feel unequipped to make decision</li> </ul> </li> <li>2. Everyone receives it and therefore very effective</li> </ol>	<ol style="list-style-type: none"> <li>1. Moving even further away from any individual choice and</li> <li>2. Further away from local decision-making</li> </ol>

15

3. No CWF, but universal dental programming

st set of services to high risk



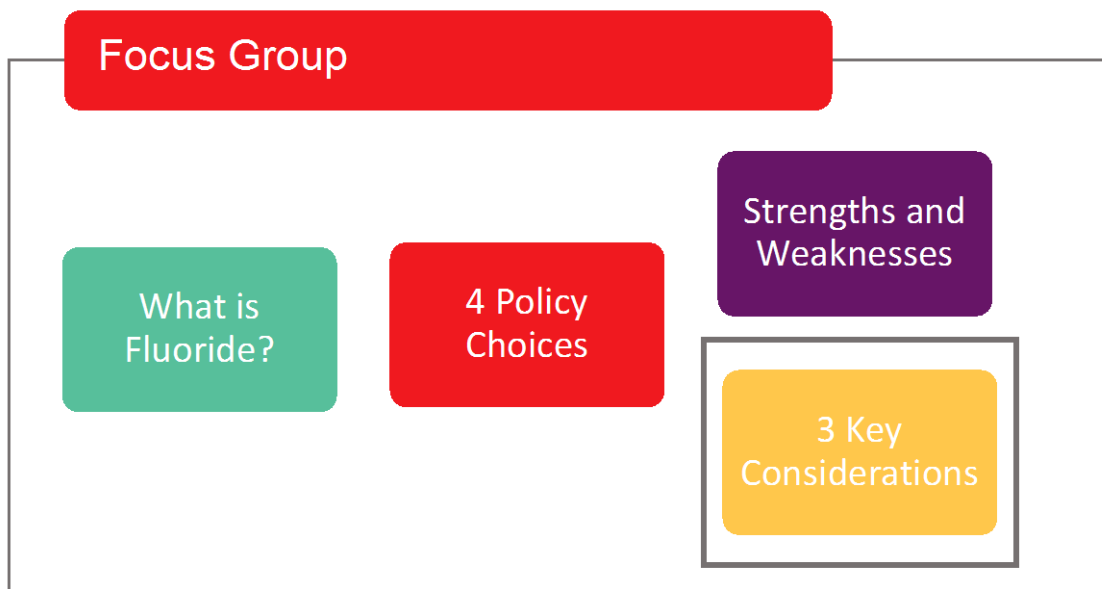
16

4. Fluoride in salt or milk instead



in age groups

17



18





## Appendix F: Post-Focus Group Questionnaire



Department of Community Health Sciences  
Parent views on fluoridation and alternative policy choices  
POST-FOCUS GROUP QUESTIONNAIRE  
REB17-0800

1. After this focus group session, what do you view as current benefits and risks of community water fluoridation?

2. Please rank the policy options discussed in today's focus group.  
*Where 1 = most liked, and 4 = least liked*

- Community water fluoridation as a municipal decision (Calgary)
- Community water fluoridation as a provincial decision (Ontario)
- Strong universal dental care instead of community water fluoridation (Cuba)
- Fluoride in salt or milk instead of community water fluoridation (Switzerland)

3. Regarding your Most Liked policy option: Why did you like this option most?  
*Please provide up to 3 reasons*

---

---

---

4. Regarding your Least Liked policy option: Why did you like this option least?  
*Please provide up to 3 reasons*

---

---

---

**Appendix G: Collection of quotes for each of the themes and sub-themes developed from the data.**

**Table 5. Collection of quotes for each of the themes and sub-themes developed from the data.**

Theme	Sub-Theme	Idea	Supporting Data	Interpretation
Expert/Lay Relations	Between	1. Who/what is considered an expert	"1D: I have a very highly educated friend, and she's sending things about H1N1 from a few years back, about people injecting robots into you. But she was a highly educated person, and I don't know where she found this article about how the government was injecting robots into you through this vaccination. So yeah you have to be careful about, I guess what I'm saying you have to be careful about the expertise that you're accessing as well."	Education may not dictate level of expertise
			"1C: I feel there is more knowledge and background when you're doing a research from a provincial (Alberta Health Services) standpoint	A provincial-level dental public health intervention would mean more knowledge and background, compared

			versus a city council type of thing. So I would prefer provincial/state delivery of fluoridation (See Option 2)."	to a municipal-level decision.
			"1B: Well I'm surprised that [city councillors] didn't ask the professionals (about removing fluoridation). They must have done that. Trusting the politician to do the right thing."	City councillors may not be considered experts on dental public health interventions, and should be consulting "professionals"
			"1D: I trust that the doctor went to school, 8 to 12 years. I trust their education, and so my sources are to go to the family physician, or go to my friends with expertise."	Doctors can be seen as experts because of their education, demonstrating that education may act as a proxy for education
			"1A: I know people with Master's degrees, who are in science, who are very strong anti-vaccine, anti-vaccers right? So, [expertise] is individual, right? It's not necessarily tied to education, on some level."	Education may not dictate level of expertise

			<p>"1A: I would say I don't necessarily listen to my own doctor because you know, I know people who went to medical school, some people who barely got through, right? I've had doctors tell me things. I'm like, no, I don't need that knee surgery, but I know you're gonna do it for me because you know, you'll get your insurance reimbursed. So I don't necessarily listen to whatever my doctor has to say."</p>	<p>Expertise can be corrupt. Research is not unbiased.</p>
			<p>"1A: Just because you know plenty of PhDs or physicians, just because they have a lot of years of education, it doesn't mean I need to trust their judgment if it doesn't match up with what I think is best for me and our family. "</p>	<p>Education may not dictate level of expertise, and should not decide whether or not a professional can be trusted</p>

			<p>"1D: Alberta Health Services is just going to have more resources to inform the public, versus an individual city councillor that might not have the background. For example, with Alberta Health Service's flu shot campaign, it's not mandatory, but they have the education of evidence-based practices. They can present policies to the public in a knowledgeable matter, compared to a city council vote."</p>	<p>Compared to city councillors, the provincial level of government, which comprises Alberta Health Services, has more resources which allows their interventions, for example the flu shot campaign, to be effective and well received by the public.</p>
			<p>"2B: I don't know if [city councillors] are the right people or not (to implement fluoridation). What do they know? Who taught them? Are they just like me and just, ignorant of the whole fact, or have they done their homework and know lots?"</p>	<p>City councillors may not be considered experts on dental public health interventions</p>
			<p>"3A: I'm more a proponent of the provincial</p>	<p>Professionals are considered experts,</p>

			<p>decision (fluoridation implemented at the provincial level) as opposed to municipality (fluoridation implemented at the municipal level)</p> <p>because you can access more professionals in order for the group that's deciding to implement to have the greater resource and knowledge in order to go ahead and do it."</p>	<p>and these professionals come from a provincial level of government, rather than municipal</p>
			<p>"1A: I think your local officials are going to feel the pressure of, which way did [my constituents] vote? And maybe they've got a certain constituency, maybe they're in an area with a bunch of people who are against government intervention, they don't want to vaccinate their children and they don't want fluoride in the water. So taking [fluoridation] to a [provincial] level I think there's actually, it makes a lot of sense for</p>	<p>City councillors can be corrupted by special interests, whereas the provincial level is better equipped to weigh population-wide risks and benefits, without being affected by political expediency</p>



			something like this where I do think it's greater good."	
Expert/Lay Relations	Between	2. What is the role of the expert in the decision-making process?	<p>"4D: I'm tempted to trust, uh, what [experts] have distilled down as the science and say, you know what, it's pretty clear.... I can't read the scientific literature so I'll trust the news media, for better or worse.</p> <p>4A: The credible collective."</p>	"They" seems to refer to "experts", whose role is to summarize the science and using the news media, communicate the scientific literature to the public in a comprehensible way
			"2B: I think [city councillors] should use what they learned to educate the public and let the public decide or at least have a good say in [fluoridation]."	Experts should be communicating the scientific literature to the public and ensure that the public is involved in dental public health interventions
			"1D: You know, [Alberta Health Services] are the experts, they've done the research, and if their recommendation is to add it to the water, then that	Experts have the role of doing the research and providing a recommendation that should then be

			makes sense.”	followed. Dental public health policy should be coming from experts, who are found at the provincial level, not the municipal level.
			"3C: [Alberta Health Services] needs to do a better job using the sources of information people are using now and actually being open and accessible and transparent and providing the information and answering their questions. It won't change everybody's minds (about fluoridation), but all these fence-sitters might feel more comfortable about the choices being made at a policy level"	Experts should be communicating the scientific literature to the public, staying open and transparent about the information, rather than carrying out dental public health interventions without consulting the public
			"1B: But that explains why after so many years people are still debating [fluoridation]. If they had done a good job of telling people why they voted	When fluoridation was voted out at the municipal level, the lack of communication between city

			<p>it out, I guess there would be less people still against it now. That explains why we are still talking about it now after so many years."</p>	<p>councillors and the public may be one reason why there is still a large debate around fluoridation, suggesting that communication between policy makers and the public should be improved</p>
			<p>"2E: It's a bigger picture. In order for us to make the decisions for anything in our lives, we need information. Just like you were saying, you go to the doctor, you are sick, these are your options. Well, the doctor gives you all the information and these two options that you have. So you have the knowledge and the education in order for you to make these decisions."</p>	<p>Policy makers, just like doctors, should be presenting all of the options to the public (like a patient), and allow them to weigh the options that exist.</p>
			<p>"2C: Yeah I think the point I'm making is [city councillors] are not taking it seriously in a way, so the decision shouldn't be in their hands."</p>	<p>City councillors should not be the ones who make decisions around fluoridation because they do not take it</p>

				seriously enough.
Relationships	Within	1. Who is the public?	<p>"2D: Because when its free and accessible to everybody, maybe people don't appreciate that much to look after their oral health because its free at the end of the day. If I don't brush, if I mis-brush, tonight, tomorrow, then its free, I can go and have [universal dental care]"</p>	<p>Implementing a dental public health intervention such as universal dental care may lead to members of the public taking their oral health for granted, since they no longer need to pay for the dentist.</p>
			<p>"4A: I'm okay with universal dental care up to the age of 16 or 18, it just makes sense to me, because sometimes a kid doesn't always have a choice of what their parents do. So being able to give that child the opportunity to have full dental care that other kids have just based on, their well-being, just seems to make sense. After they turn 16 and choose to drink Coca-Cola three times a day for the next 10 years of their life and not</p>	<p>Children should be protected by universal dental care up to a certain age, because they do not always have a choice regarding their oral health habits. However, after the age of 16, everyone has the choice to have good or bad oral health habits, and they should pay for these choices.</p>

			brush their teeth, then they can pay for their own dentures when they hit 35. That's fine, I'm good with that [laughs]."	
			"2D: I think [fluoridation] is accessible to everyone. So, like even if the parent maybe is not educated, or they don't have the information, the kids can get the benefits."	Children benefit from fluoridation, regardless of the choices their parents make regarding oral health
			"4D: You have people that are completely uninformed or poorly informed about dental fluoridation. They draw party lines and say, its bad because my, you know, uncle's cousin's next door neighbor has a low IQ and it's because of fluoride. You'll get people who will literally vote along those lines and say, you know vaccinations cause autism."	Some members of the public are poorly informed while making decisions, and make conclusions on topics such as fluoridation and vaccinations based on their environment

			<p>"2F: That is what, I think, being a human being is about, is making sure we're all on the same level. Not the rich are up here and we're down here, or the people up here have that access to health care, but all of us do. Not whether you have money or you don't."</p>	<p>All individuals should be treated equally. Money should not dictate your access to health care.</p>
			<p>"4B: Universal dental programing, although it would be very expensive, I'm sure, it would help a lot of those that maybe aren't able to have proper dental care."</p>	<p>Universal dental care is a great way to ensure all children has access to the same services, but it is highly costly.</p>
			<p>"2F: My choice, if I go to the store and see fluoride salt or regular salt I'm going to get the regular salt, I don't know, I may or may not speak English, I may or may not understand what fluoride is."</p>	<p>A dental public health interventions such as fluoridation of salt or milk may not be effective because members of the public may not understand its benefit.</p>
Relationships	Within	2.	<p>"4A: Well with the city level decision, when the</p>	<p>Fluoridation should not be voted in by</p>

		Implications of these various publics for decision-making	last one came up, I was like, please don't let people vote for it. Because I just don't think, en masse, people make the right decisions."	the public, as people cannot always be trusted to make the right decisions.
			"4D: I'm not in favour of the plebiscite. You know when you give everyone an opportunity to vote, when they're poorly informed about things, that's how people like Donald Trump get elected president. Everyone's vote, gets counted for the same thing."	Fluoridation should not be voted in by the public, as people cannot always be trusted to make the right decisions.
			"4B: Well [universal care] I think is great for supporting everyone, especially those that aren't able to afford it. Absolutely. So that's what that means, for all children to have it, right? But, the	Universal dental care is a great way to ensure all children has access to the same services, but it is highly costly.

			<p>other side, it's something that would cost a lot too. We would all end up paying, we'd all be paying for it. It's not a bad thing, everyone's pitching in and helping out, but at the same time, every dollar counts."</p>	
<b>Theme</b>		<b>Idea</b>	<b>Supporting Data</b>	<b>Interpretation</b>
Ways of Knowing	N/A	1. Science as a singular source of knowledge	<p>"4D: I think if the research was overwhelmingly in favour of [fluoridation] being beneficial, I think there's more merit to the argument, but when it's, when you talk to average Joe and Jane on the street and it's 50-50, it's not very clear-cut. And nor is the science as you mentioned, you can find science on both sides of it. Which is really</p>	<p>Uncertainty exists around the issue of fluoridation, making it difficult to argue that it should be implemented</p>



			disheartening, to be honest with you. It's hard to make a cogent argument when the science isn't on your side, firmly planted on your side."	
			"2A: People say oh my kids have [cavities], or I didn't get cavities until this age. But is there an actual study? What were the numbers when we only had 0.7? Was it effective, was it not? Is there any difference or is it just people that now know it's been removed, going like oh hold on a minute! What was it like at 0.7, and if that's not effective according to the WHO then what's the difference between 0.4 and 0.7? [Laughs] Like I'm just, don't know how this works."	Questioning fluoridation in detail - looking for more information on its effectiveness and safety
			"2B: Are there any studies that were done prior or post that actually show a decline in teeth, in children's teeth health? Pre and post. Without	Questioning fluoridation in detail - looking for more information on its effectiveness and safety

			that, it's hard to make a decision of whether or not I support it, or don't support it."	
			"4D: That's curious that it would be so, I mean such a split. There's gotta be some scientific literature about, whether or not its effective."	Surprise at the uncertainty that exists surrounding fluoridation.
			"2B: I think the whole topic is just a little, a little blurred for too many people, nobody knows if its good or bad"	Suggesting that fluoridation is a "grey" area - referring to the uncertainty around fluoridation.
			"2E: Not a lot of people know all the information. We're told that its good, but some people don't believe it's good, because we're not given all the information that we should be getting. All you're getting is its good for you because it prevents this and this and this, but why?"	Questioning fluoridation in detail - looking for more information on its effectiveness and safety

Ways of Knowing	N/A	2. The triangulation of multiple sources of information	<p>“1B: well, I always search for evidence-based research, and health research too. No matter how much you read in the paper, it’s like, what your mom says [laughs]. It’s evidence and also who is close to you. Regarding the dental professionals, you have your own personal connection, and you trust that more than what you see from dental association statements.”</p>	<p>While the scientific literature can be an important source of information, those around you is also a source of knowledge</p>
			<p>“3D: Dr. Google, it’s the misinformation age. You can find, like you said, you can find studies to support or detract from what you’re saying. You’re gonna find what you’re looking for.”</p>	<p>There are a lot of studies on fluoridation, potentially leading to misinformation.</p>
			<p>"1D: I'll also go to Google and try to refute it, right? And say, well I read about this somewhere, what do you have to say about that?"</p>	<p>The wealth of information that exists on fluoridation leads to people cross-referencing multiple sources to formulate an opinion.</p>

			"3D: That's key difference. You asked me about this generation. That's the difference about this generation from other generations. We have social media, we have the internet."	Social media and the internet as ways to easily access a wealth of information.
			"4A: Well I would have gotten [information about fluoridation]from the news, radio, uh, occasionally Dr. Google [laugh]"	Using multiple sources of information to gain information on fluoridation.
			"1C: I think that study (Calgary vs Edmonton study) has been used as a strong reason, I haven't read it myself, but I just think it's not as clear cut as vaccine."	The literature around vaccination is clearer cut than the literature around fluoridation.
			"3D: I also think, like I know you're missing the 0 to 5 age group with something like this, but I know how effective having the vaccine in the school system is. I know that they get other things into the school system like speech and all these	Using the vaccination method of delivery, through schools, as a suggestion for ways to deliver dental health to kids.

			other methods of care. I think once kids are in school, if they could have the fluoride treatments and a dental assessment done, would be beautiful.”	
			"3D: Yeah, it's a minority that don't vaccinate, but they're a very loud minority, right? They're a very loud opinionated minority. And that's just it, vaccinations are not mandatory, but we do still do our best to make them accessible. We break down barriers by outright taking the vaccines into the schools to vaccinate the children because we got higher vaccination rates than, you know, trying to get people into clinic, right?"	Comparing the vaccination issue to fluoridation, discussing the accessibility as an important factor
Ways of Knowing	N/A	3. Intersection of values	"3A: Some of the knowledge that people may hold doesn't actually hold weight to the evidence that's available. We all have cognitive biases, we	Our worldview leads to cognitive biases that will cause us to interpret the evidence in a way that fits with our

			believe and take in information that fits with our belief system. We work very hard to believe what we wanna believe, what fits with our natural worldview."	beliefs.
			"3A: It's really reinforcing to find that there's another person who agrees exactly with what you're thinking. Even though both of you may be thinking incorrect information."	There are a lot of studies on fluoridation, potentially leading to misinformation.
			"3A: It's easy to exist in this silo of information that fits your cognitive beliefs."	
<b>Theme</b>	<b>Sub-Theme</b>	<b>Idea</b>	<b>Supporting Data</b>	<b>Interpretation</b>
Values in Public Health	N/A	1. Individual choice vs community responsibility	"3D: I think whatever option is decided upon, given the century we're living in, that it does need to respect personal choice. Because that's a big thing for individuals. I unfortunately don't think	Personal choice is more important now than in the past, making fluoridation no longer a viable option.

			<p>the city-level decision community water fluoridation is going to be a viable option as it doesn't respect personal choice."</p>	
			<p>"1B: I don't want what happened in China to happen here. The salt is iodized, you didn't have a choice, same as the fluoride added in the water, you don't have choice. And now, people are saying, oh that's too much iodine. We want the choice to buy things like that. So, if fluoridated salt is available to buy, and labeled clearly, then that's good. You should have a choice."</p>	<p>Fluoridated salt gives individual's the choice, which is important. China iodized the salt without giving anyone a choice, and now there are complaints of people having too much iodine.</p>
			<p>"3A: And you'll always have people that say, well why should I put X amount of money in, I'm no longer a child, my teeth are out, or I already have dentures, so this is irrelevant to me and I don't want to pay for it. But they don't understand that</p>	<p>By supporting the greater good in a collective way, you help yourself.</p>

			the greater good would support you going forward too."	
			"3A: But, some kids are going to suffer because we made this choice to take it out, and we can see it with the tooth decay, I think half the children have tooth decay in Calgary right now. So the people are paying consequences for our choice not to have it at the community level, and its impacting people, like 2-whatever million sick days related to dental health care is a significant issue."	
Values in Public Health	N/A	2. Treatment vs Prevention	"4C: I would choose, I prefer to spend more money on next generations. Compared to the cancer. On the prevention for our next generation. Like you said, old people, they're going to die, spending the most amount of money just for	Prevention in the next generation is a better use of money than treatment for those at the end of their lives.



			prevent 4 to 6 more weeks, one month, you know.”	
			“1A: I think that [fluoridation] is an important preventative measure. Especially for children. That’s when, that’s when their teeth are being formed. And you need them for the rest of your life.”	
			“2F: It’s not the cleaning, though. Its already the decaying in play. It’s already the decay, its already the, you know, the hole in the tooth, the abscess growing in their gums. It’s already, like we’ve already surpassed preventative.”	Prevention treatment such as cleaning, are maybe not as valuable given the amount of poor dental health that currently exists
			"3D: It’s the whole upstream downstream thing. I really feel that [universal dental care], or any of these options, it’s worth thinking more upstream."	Prevention and upstream thinking is valuable
			"4D: I just don’t know that, that [prevention and	We cannot directly connect prevention

			<p>less oral health surgery] a linear relationship. I just don't know that it's that clear. Because there are so many other factors. I think what we're doing is isolating one factor and saying, you know, prevention, from a hygienist or public health nurse or whatever, would equal less surgery time, and less hospital resources."</p>	<p>to decreased amounts of oral health surgery.</p>
			<p>"3C: But I think [fluoridation] is a long-term investment in the people. The initial cost upfront would be substantial, but I think there are the very long-term benefits to it as well."</p>	<p>fluoridation is a long-term investment.</p>
			<p>"4C: Cutting some treatment, like in some kinds of a cancer, you can never fix them. We shouldn't waste time there. It's just extending your life. But, eventually you will die. When you do treatment, it only gets painful, and you get a longer the life,</p>	<p>Treatment for certain things, such as cancer, never lead to a complete cure. It can extend a life, but it will not cure.</p>

			but eventually you die."	
			"4C: Prevention can save you lots of money for the treatment, right?"	Prevention can save downstream costs for treatment
			"3A: If [dental care] is universally paid for by the province, then anybody that has insurance that currently covers their kid 16 and under, they're already basically paying for it whether their company is paying for it or not, that money just has to be re-funneled somewhere in a different direction."	Universal dental care is expensive, however, it would cut other costs currently payed for by individuals or companies.
Values in Public Health	N/A	3.Importance of dental health	"2A: Where cavities fall on the spectrum of overall health, it's, cavities are here, and then, plaque in a ten-year-old is up here."	In comparison to other childhood diseases, cavities is minor
			"2F: You don't really know the importance of how much your teeth can cause diabetes, can cause sepsis, all these things for your overall	Dental health is more important than some people think

			health, in your system. And there's kids that are severely sick because of a tooth ache, do you know what I mean?"	
			4D: Do you suspect, in comparing vaccination to fluoridation, do you suspect that it's because people might consider dental health as a cosmetic type thing, whereas vaccination is your health and well-being?	Fluoridation is used to treat dental health, which might be seen as cosmetic in comparison to the diseases that vaccination seeks to inhibit
			"4D: I think we're in a society where dentist equals getting your teeth whitened or getting braces, which are very cosmetic procedures. As opposed to thinking that it can affect your health, can affect your development, especially when you're a young child. There's so many components that, I don't think most people think about when they think about dental health."	Dental health is associated with cosmetic. We are in a society where people do not think of it as having larger effects on health