Oral Health Guide: Community Water Fluoridation

Second Edition

COMMUNITY HEALTH

NALBOH
National Association of Local Boards of Health

Oral Health Guide:
Community Water Fluoridation
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Acknowledgements

This project was made possible by NALBOH staff and members of the Chronic Disease and Tobacco Use Prevention and Control Subcommittee, Education and Training Committee, and Board of Directors.

Special thanks to:

- The Division of Oral Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, for providing expertise, technical oversight, and financial support.
- The 2012 Chronic Disease and Tobacco Use Prevention and Control Subcommittee for contributing and reviewing this guide: Jim Stecker (Chair), J. Fred Agel, Kerry Cork, Quanq "Q" Dang, Sarah Derwin, Kristene Diggins, Marc Hiller, Steve Scanlin, Ed Schneider, Roger Wiese, and Leon Vinci.
- Kathleen Cuddy, Richard DiPentima, James Kennedy, and Alan Sousie for providing board of health examples for this guide.

This publication was supported by Cooperative Agreement Number 5U38HM000512-04 from the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

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Introduction

Oral health is essential to general health and well-being. In 2000, the first-ever U.S. Surgeon General's report on oral health reported a "silent epidemic" of dental and oral diseases that burdened some population groups (U.S. Department of Health and Human Services [HHS], 2000). The report and its subsequent *National Call to Action to Promote Oral Health* (HHS, 2003) called for a national effort to improve oral health among all Americans. In 2011, the Institute of Medicine (IOM) published a report, *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*, that discussed efforts of a committee of experts convened by the IOM and National Research Council to assess the current oral health care system, develop a vision to improve oral health care for vulnerable and underserved populations, and recommend strategies to achieve the vision. Findings from these reports and new information linking oral health to overall health are bringing oral health to the attention of policy makers and the public.

Tooth decay (dental caries) is a common, chronic disease that causes pain and disability across all age groups. If left untreated, tooth decay may lead to pain and infection and eventually tooth loss. As volunteer leaders in public health, boards of health make necessary policy and regulatory changes to introduce or institutionalize oral health programs and services into local public health agency practices. Board of health (BOH) members serve as advocates and liaisons with neighbors, peers, stakeholders, and other partners. Thus, it is the BOH's responsibility to continually assure and improve the oral health of the community.

The National Association of Local Boards of Health (NALBOH) has created this guide to provide BOHs with best practices and resources for promoting oral health. This guide provides recommendations for boards to promote and achieve maximum protection against tooth decay while using resources efficiently. NALBOH recognizes that communities vary in the scope and types of oral health programs they offer. Assessing this information and adapting ideas and strategies may be necessary to meet a community's specific needs.

This document specifically addresses prevention of tooth decay through community water fluoridation. NALBOH's goal is to inform BOHs about this effective public health intervention. Community water fluoridation and school dental sealant programs were found to be the two preventive interventions with the strongest support in the systematic reviews completed by the Community Preventive Services Task Force (Truman, Gooch, Sulemana, Gift, Horowitz, Evans, et al., 2002).

In 2012, Americans are projected to spend an estimated $109.6 billion on dental services (Centers for Medicare & Medicaid Services [CMS], 2010). *Healthy People 2020*, the nation's framework for prevention that sets health goals to achieve by the year 2020, calls for 79.6% of the U.S. population served by community water systems to have access to optimally fluoridated water—that is, water with fluoride levels found to be effective in preventing tooth decay (HHS, 2011). In 2010, the percentage of the U.S. population receiving optimally fluoridated water was 73.9% (Centers for Disease Control and Prevention [CDC], 2012).

Tooth Decay Prevalence and Disparities

The prevalence and severity of tooth decay in the United States has decreased significantly during the past three decades. However, the burden and cost of oral disease is still too high and could be lowered by using proven community prevention measures. The decrease in tooth decay has been uneven across the general population; prevalence of tooth decay and untreated tooth decay is more severe in certain groups and populations. For example, Mexican American children aged 6–11 years have the highest levels of tooth decay (31%) in permanent teeth, compared with non-Hispanic White (19%) or Black (19%) children (Dye, Tan, Smith, Lewis, Barker,

Thornton-Evan, et al., 2007). Similar disparities exist among adolescents aged 12–19 years. From 1999–2004, the prevalence of tooth decay in the permanent teeth of adolescents ranged from 54% among non-Hispanic Blacks to 65% among Mexican Americans (Dye et al., 2007). Some racial/ethnic groups have even higher levels of tooth decay. For example, in a 2008 study conducted in Alaska, 87% of Alaska Native 4–5 year olds and 91% of Alaska Native 12–15 year olds had dental caries (CDC, 2011a), compared to 20% of U.S. 2–5 year olds and 51% of U.S. 12–15 year olds (Dye et al., 2007).

In addition to disparities existing among racial and ethnic groups, children living below the poverty level also have an increased prevalence of tooth decay. Nearly twice as many children aged 6–11 years from families with incomes less than 100% of the Federal Poverty Level (FPL) have tooth decay in their permanent teeth (28%), compared with children from families with incomes greater than 200% of the FPL (16%) (Dye et al., 2007). A significant difference in the prevalence of dental caries (66% and 54%, respectively) also exists between 12–19 year olds living at less than 100% of the FPL and those living at greater than 200% of the FPL (Dye et al., 2007).

Disparities in oral health are also seen among adults. In a new report, among higher socioeconomic status adults aged 20–64 years, 17% had untreated tooth decay, compared to 42% of lower income adults (Dye, Xianfen, & Beltrán-Aguilar, 2012). In contrast to the prevalence of untreated tooth decay in children and adolescents, more non-Hispanic Black adults aged 20–64 have untreated tooth decay—40% vs. 35% Mexican American and 19% non-Hispanic White (Dye et al., 2012). The reasons for these disparities are not well understood, but several studies cite barriers to oral health care access (social, cultural, economic, structural, and geographic) as the cause. One specific example of a barrier to oral health care access and utilization is dental coverage (Brickhouse, Rozier, & Slade, 2008; Fisher, 2009; Fisher & Mascarenhas, 2007; Sohn, Ismail, & Lepkowski, 2007). Other examples include poor understanding of the importance of oral health care (low oral health literacy) and options for access (Jones, Lee, & Rozier, 2007; Kutner, Greenberg, Jin, & Paulsen, 2006) and geographic distribution of oral health professionals to the general population (Health Resources and Services Administration, 2011; IOM, 2009; Skillman, Doescher, Mouradian, & Brunson, 2010). Additionally, compared to urban populations, rural populations have lower dental care utilization, higher rates of dental caries, lower rates of insurance, higher rates of poverty, less water fluoridation, fewer dentists per population, and greater distances to travel to access care (Skillman et al., 2010). Because of the prevalence of tooth decay among children, adolescents, and adults as well as the barriers that exist for access to oral health care, it is crucial to provide community-based public health interventions and programs that will reach vulnerable populations. One such intervention that has been proven effective is community water fluoridation (CDC, 1999).

What Is Flouride and Where Is It Found?

Fluoride is the ionic form of the element fluorine (CDC, 2001a). Small amounts of fluoride are present in all soils, plants, air, and water; it is a naturally occurring element in groundwater (U.S. Environmental Protection Agency [EPA], 2011). However, some sources of groundwater with large concentrations of fluoride may be a community's public drinking water system (Towne & Freark, 2001). Other sources of exposure to fluoride occur through toothpaste and other dental products and dietary supplements, foods, and beverages prepared with fluoridated water, as well as the air, soil ingestion among children, pharmaceuticals, smoking, milk, and infant formula (EPA, 2011).

Fluoride helps to prevent tooth decay by protecting the teeth both systemically and topically (CDC, 2001a). During tooth development, fluoride that is consumed in water, beverages, and foods is incorporated into the tooth structures. Once teeth erupt into the mouth, topical fluoride that comes into contact with the teeth becomes incorporated into the dental surface enamel and further strengthens the teeth (CDC, 2001a; Featherstone, 1999).

Fluoride products include fluoride toothpaste, fluoride mouth rinse, and professionally applied fluoride products such as varnishes and gels. In addition, dietary supplements are available for children who have been evaluated by their dentist as being at high risk for tooth decay and whose home water supplies contain low amounts of fluoride. Although successful, these methods not only require a conscious decision to use them but also may be more expensive than the public health approach of fluoridating public water supplies because they require the services of an oral health professional.

Over the past six decades, the widespread availability of fluorides, including community water fluoridation, has resulted in a steady decline in the prevalence of tooth decay in children and adults in the United States (CDC, 2001a). From the early 1970s through the present, there has been a substantial decrease in the prevalence and severity of tooth decay in the permanent teeth of children, adolescents, and adults. For example, among adolescents aged 12–17 years, the average number of teeth affected by tooth decay has decreased from 6.2 to 2.6 (Kelly, 1975; Dye et al., 2007).

Because of the decrease in tooth decay, people are retaining more of their teeth. Whereas in the 1950s fewer than 50% of older adults retained their teeth, now more than 72% of the nation's 37 million adults aged 65 and older are keeping their teeth into old age (Dye et al., 2007).

As a result, it is even more important to provide the benefits of community water fluoridation throughout the lifespan.

What Is Community Water Fluoridation and How Does Fluoridation Prevent Tooth Decay?

Community water fluoridation is the controlled addition of a fluoride compound to a public water supply to bring its fluoride concentration up to a level that will best prevent dental caries (tooth decay or cavities) while limiting the potential for dental fluorosis (Burt & Eklund, 2005). Community water fluoridation prevents tooth decay by introducing a low level of fluoride into the mouth through consuming fluoridated water or foods and beverages prepared with fluoridated water throughout the day. Tooth decay is caused by certain bacteria in the mouth. When a person eats sugar and other refined carbohydrates, these bacteria produce acid that removes minerals from the surface of the tooth. Fluoride works by stopping or even reversing the tooth decay process. Fluoride helps to remineralize tooth surfaces, keeps tooth enamel strong and solid, and prevents cavities from continuing to form.

Water fluoridation is the most effective way of delivering the benefits of fluoride to all members of a community, regardless of age, education, or income level (CDC, 1999). A systematic review conducted by the Community Preventive Services Task Force found that water fluoridation prevented between 30–50% of tooth decay in children (Truman et al., 2002). Even under modern conditions where people have many more sources of fluoride, a recent review found that community water fluoridation prevents about 25% of tooth decay in adolescents and adults age 20 years and older (Griffin, Regnier, Griffin, & Huntley, 2007). Information regarding the safety of community water fluoridation is provided in Appendix A.

Since 1945, the U.S. Public Health Service (USPHS) and CDC have monitored the number of individuals who receive fluoridated water. CDC currently monitors the percentage of the population receiving optimally fluoridated drinking water through its Water Fluoridation Reporting System (CDC, 2011b). According to CDC, in 2010 approximately 204 million persons in the United States—or 73.9% of the U.S. population who receive their drinking water from community water systems—received optimally fluoridated water from 1 of the 18,427 community water systems. Of these 204 million individuals, 95% received water from community systems that

added fluoride, while the remaining 5% received water from systems that had naturally occurring fluoride at or above the recommended level (CDC, 2012).

Which Agency Regulates Fluoride in Drinking Water?

Under the Safe Water Drinking Act, the U.S. Environmental Protection Agency (EPA) is required to determine the level of contaminants (i.e., biological, chemical, physical, and radiological substances) in drinking water below which no adverse health effects are likely to occur (S. 1316, 1996). The enforceable standard is the Maximum Contaminant Level (MCL)—the highest level of a substance that is allowed in public water supplies. The current MCL for fluoride is 4 milligrams per liter (mg/L). This standard was set to protect against health effects that could occur from exposure to too much fluoride. The EPA also has a Maximum Contaminant Level Goal (MCLG), which is not enforceable and is based on possible health risks and exposure over a lifetime. The current MCLG for fluoride also is 4 mg/L. This level was determined to be sufficient to protect against increased risk of crippling skeletal fluorosis, a very rare condition characterized by pain and tenderness of the major joints. In addition, the EPA has a secondary standard for fluoride in public drinking water of 2 mg/L to reduce the chance of dental fluorosis in its moderate and severe forms. A secondary standard is a non-enforceable guideline. Although water systems are not required to comply with secondary standards, for fluoride the EPA does require that water systems notify customers if the fluoride concentrations exceed the secondary standard. In areas where community water systems contain more than 2 mg/L fluoride, but less than 4 mg/L fluoride, the EPA requires that each household be notified annually of the desirability of using an alternative water source for children younger than 9 years. Parents of children with developing teeth are strongly encouraged to use an alternative source of water if their water system contains 2 mg/L fluoride or greater.

The EPA is required to review its standards at regular intervals. It is currently reviewing whether it will revise the drinking water standards for fluoride.

What Are the Current Public Health Recommendations for Fluoridation?

Since 1962, the U.S. Public Health Service's recommendation for fluoride concentration in drinking water to prevent tooth decay has been a range of 0.7–1.2 mg/L or parts per million (ppm). In January 2011, the U.S. Department of Health and Human Services (HHS) proposed changing the optimal fluoride level in drinking water for preventing tooth decay to a single national target of 0.7 mg/L, the lowest end of the current optimal range (Federal Register Notice, 2011).

There are several reasons for this change, including that Americans have access to more sources of fluoride than they did when water fluoridation was first introduced in the United States. The increase in additional sources of fluoride has been accompanied by an overall increase in dental fluorosis. Dental fluorosis in the United States appears mostly in the very mild or mild form—as barely visible lacy white markings or spots on the enamel. The severe form of dental fluorosis, with staining and pitting of the tooth surface, is rare in the United States.

Following the announcement of the proposed change to the government recommendation for community water fluoridation, the public was invited to submit comments. HHS is continuing to review these comments and expects to provide a final recommendation during 2012.

What Is Dental Fluorosis?

Dental fluorosis is a change in the appearance of tooth enamel caused by taking in more fluoride than is needed during childhood when teeth are developing under the gums (Aoba & Fejerskov, 2002).

Several studies have been conducted in the United States since 1942 to measure the prevalence and severity of dental fluorosis (Dean, 1942; Driscoll et al., 1983, 1986; Driscoll, Horowitz, & Kingman, 1988; Eklund, Burt, Ismail, & Calderone, 1987; Galagan & Lamson, 1953; Hong, Levy, Warren, Broffitt, & Cavanaugh, 2006; Horowitz, Driscoll, Meyes, Heifetz, & Kingman, 1984; Jackson, Kelly, Katz, Brizendine, & Stookey, 1999; Jackson, Kelly, Katz, Hull, & Stookey, 1995; Richards, Westmoreland, Tashiro, McKay, & Morrison, 1967; Selwitz, Nowjack-Raymer, Kingman, & Driscoll, 1995, 1998; Szpunar & Burt, 1988).

The most recent national study on dental fluorosis used data from the National Health and Nutrition Examination Survey (NHANES) in 1999–2004 and the 1986–1987 National Survey of Oral Health in U.S. School Children. The data showed that in 1999–2004 fewer than 25% of persons aged 6–49 has some form of dental fluorosis. Among this population, 16% had very mild fluorosis, 5% had mild fluorosis, about 2% had moderate fluorosis, and less than 1% had severe fluorosis. The prevalence of dental fluorosis was higher in adolescents aged 12–15 than in adults and the prevalence of dental fluorosis among adolescents had increased since the 1980s (Beltrán-Aguilar, Barker, & Dye, 2010).

CDC provides steps parents can take to reduce the chance of their children's teeth having dental fluorosis. These steps include the following:

- Knowing the fluoride concentration of their community's drinking water.
- For children aged 2-6 years, applying no more than a pea-sized amount of fluoride toothpaste to the brush and supervising their toothbrushing, encouraging the child to spit out the toothpaste rather than swallow it.
- For children younger than age 2, parents should not use fluoride toothpaste unless advised to do so by their doctor or dentist.
- Parents can use fluoridated water for preparing infant formula. However, if a baby is exclusively consuming infant formula reconstituted with fluoridated tap water, there may be an increased chance for mild dental fluorosis. Additional information can be found in a CDC factsheet on infant formula at http://www.cdc.gov/fluoridation/safety/infant_formula.htm.

Is Community Water Fluoridation Cost Effective?

Water fluoridation is the least expensive way to deliver the benefits of fluoride to all residents of a community (HHS, 2000). The cost per person of fluoridation varies by the size of the community's population. The average cost for a community to fluoridate its water is estimated to range from about $1 a year per person in a large community (population greater than 20,000) to about $5 a year per person in a smaller community (populations less than 5,000) (Griffin, Jones, & Tomar, 2001). Thus, the cost of community water fluoridation over a person's lifetime is less than the cost of one dental filling.

A peer-reviewed CDC study found that, in communities with more than 20,000 residents, every $1 that is invested in community water fluoridation yields about $38 in savings each year from fewer cavities treated (Griffin et al., 2001). A second study conducted in Colorado estimated that in 2003 existing community water fluoridation programs serving 2.5 million persons were associated with $203 million savings in annual dental treatment costs ($82.9 per person). The study further concluded that Colorado would save an additional $63.5 million ($82.60 per person) annually if community water fluoridation programs were implemented in jurisdictions without the program (O'Connell, Brunson, Anselmo, & Sullivan, 2005).

Four analyses of dental claims data published since 2000 found that fluoridation substantially reduced dental treatment costs among children and youth (Barsley, Sutherland, & McFarland, 1999; Kumar, Olubunmi, & Melnik, 2010; Maupomé, Gullion, Peters, & Little, 2007; Texas Department of Health, 2000). Three of the analyses found that fluoridation was associated with lower Medicaid dental treatment costs. Annual per person Medicaid treatment cost savings ranged from $27.60 to $66.80. In the fourth study (Maupomé et al., 2007), which was conducted in a Health Maintenance Organization (HMO) population, the difference in annual per person treatment costs between children living in fluoridated and non-fluoridated communities was $16.44.

Why Do Some People Oppose Community Water Fluoridation?

Fluoridation is considered beneficial by the public and scientific communities (American Dental Association [ADD], 1995). One of the most recent surveys of people's attitudes regarding water fluoridation was conducted in Arkansas. In a telephone survey of 500 registered voters, more than half (54%) favored legislation to mandate water fluoridation in communities larger than 5,000 residents (SalterMitchell, 2010).

Despite this support, there has been opposition in some communities that seek to adopt or maintain community water fluoridation. Some individuals may view fluoridation of public water supplies as limiting their freedom of choice, or of having harmful effects on their health or on the environment. Others may misinterpret or misrepresent the science behind the subject of fluoridation (ADA, 2005). In addition, some have voiced concerns about technical engineering issues and believe the costs of fluoridating small water systems are too high.

Websites of fluoridation opponents often contain outdated and misinterpreted studies and statements. These websites frequently contain information from studies that have flaws in their research methods, such as not taking into account other factors that could influence the study's results or that were conducted in communities in other countries with high levels of natural fluoride. Unfortunately, their efforts do not direct people to sources of reliable, science-based information sources such as the American Dental Association or other recognized health and scientific organizations and government agencies, including the U.S. Centers for Disease Control and Prevention, the National Institutes of Health, the Institute of Medicine, and the World Health Organization. NALBOH encourages BOH members to keep this in mind when reviewing opposition arguments.

A recent strategy by anti-fluoridation groups is to provide templates of form letters on their websites that individuals can use to email public officials, newspaper publishers, water departments, and others, falsely warning policy makers of their "liability" should they support or endorse water fluoridation (ADA, 2005). These sites also may urge leaders to remain "neutral" and allow fluoridation decisions to be put to a public vote (ADA, 2005), while opponents of fluoridation use this time to "educate" the public with information designed to turn public opinion against fluoridation.

NALBOH and professional organizations such as the American Dental Association (ADA), American Academy of Pediatrics (AAP), the Pew Children's Dental Campaign, American Public Health Association (APHA), and the Association of State and Territorial Dental Directors (ASTDD) urge community leaders and policy makers to educate themselves on this issue. Appendix C provides a comprehensive listing of resources that provide more information about water fluoridation to assist you in addressing commonly raised concerns.

Board of Health Opportunities and Best Practices

Boards of health have a unique opportunity to protect the oral health of their communities and support community water fluoridation. The following section includes some responsibilities of boards of health, depending upon their legal authority.

Oral health should be part of a community needs assessment process. Following are some best practices for boards of health to protect the community from tooth decay. (Adapted from *Best Practice Approaches for State and Community Oral Health Programs—Use of Fluoride: Community Water Fluoridation*, Association of State and Territorial Dental Directors, 2003.)

Education

Educate yourself, other board of health members, and community leaders.

- Know the best practice approaches for oral health. The Association of State and Territorial Dental Directors developed *Best Practice Approaches for State and Community Oral Health Programs—Use of Fluoride: Community Water Fluoridation*. Available at http://www.astdd.org/bestpractices/BPAFluoridation.pdf
- Learn the fluoridation status of your jurisdiction and provide support. This information is available from your local water supplier, state health department, or from CDC's My Water's Fluoride website (http://apps.nccd.cdc.gov/MWF/Index.asp). In addition, CDC's Oral Health Maps application allows you to view county fluoridation status within a state.
- Educate fellow board members by providing sessions and training at local, state, and regional meetings.
- Know where to go for reliable, science-based information about water fluoridation (e.g., the U.S. Centers for Disease Control and Prevention, the Community Preventive Services Task Force (*The Community Guide*), the American Dental Association, etc.).

Support Policy

Recommend, implement, and enforce laws, regulations, and resolutions to continue or implement community water fluoridation. The *ADA Fluoridation Ordinance – Suggested Provisions* is provided as a resource for BOH to use as a model ordinance in Appendix B.

Assure that your jurisdiction is in compliance with current engineering and administrative recommendations for water fluoridation. CDC provides *Engineering and Administration Recommendations for Water Fluoridation* (1995) (www.cdc.gov/fluoridation/engineering.htm). This resource has specific recommendations for water fluoridation including recommendations related to administration, monitoring and surveillance, technical requirements, and safety procedures for community public water systems. This document will be updated in 2012 in conjunction with the release of a new U.S. Department of Health and Human Services national recommendation for community water fluoridation.

Collaboration

Collaborate with water quality and other partners to organize and mobilize community resources (both public and private). This includes participating in health-related coalitions that support water fluoridation as a means of improving oral health.

Financial Resources

Support financial resources to increase or maintain community water fluoridation. For example, some communities may need to upgrade their water system's fluoridation equipment.

Board of Health Example – City of Manchester, New Hampshire: The Board of Health in a Supportive Role

Submitted by:
Richard DiPentima
Public Health Director (retired January 2006)
Manchester Health Department

Fluoridation had been maintained in Manchester, New Hampshire, without interruption since December 19, 2000. However, in 2002, the New Hampshire Superior Court and Supreme Court agreed that a 1999 referendum to fluoridate water in Manchester was faulty since it did not address the issue of residents living in towns outside of Manchester that purchase water from the town. The Supreme Court upheld a ruling that the residents of towns purchasing water from Manchester should have voted in the referendum, but the town of Derry was excluded because it purchased water on a wholesale basis. The city was given until June 2005 to hold another referendum or have the legislature change the existing law governing fluoridation.

In 2004, the Manchester Health Department requested legislation be filed to correct the situation. Legislation was passed that required any town with 100 or more connections to the Manchester water system to conduct a vote on fluoridation. Manchester was also required to put the fluoridation referendum on the ballot again during the 2004 primary election. This law was signed by the governor in June 2004.

The Healthy Manchester Leadership Council (HMLC)* began to prepare for the referendum. The board of health supported its staff's involvement in the HMLC fluoridation initiative. Public hearings were held in all the affected towns. Dr. Paul Connett, a professor of Chemistry at St. Lawrence University, and Dr. William Hirzy, senior vice president of Local Chapter 280 of the National Treasury Employees Union, spoke against fluoridation, while former U.S. Surgeon General Dr. C. Everett Koop spoke in support of fluoridation. Subsequently, all the towns, including Manchester, passed the referendum. An important aspect of the law was that the vote was an aggregate, so if one town did not vote in favor of fluoridation, it could not veto the results so long as the majority of the total vote was in favor of fluoridation.

After the vote, those against fluoridation filed a lawsuit charging that the legislation and second vote were illegal because the community of Auburn had been excluded. The complainants wanted the language of the referendum changed from "allows fluorides to be added to the water" to "adds arsenic, lead, fluoride and other containments to the water." They suggested that Derry have a vote. The Superior Court ruled that Auburn should have a referendum, that Derry should not, and that the language was appropriate. In the end, Auburn voted in the September 2006 primary to approve fluoridation.

Individual members of the board of health assisted in the campaign by obtaining signatures for the referendum and gaining votes for the referendum. This was a true community initiative, with the Manchester Health Department conducting most of the "behind the scenes" work with assistance from HMLC members. The board of health was very supportive of the fluoridation initiative and gave the public health director authority to support this activity, staff to work on the initiative, and proactively informed the mayor and aldermen of their support for water fluoridation.

* Healthy Manchester Leadership Council (HMLC) consisted of the following:
Catholic Charities, Child and Family Services, Child Health Services, Dartmouth-Hitchcock Clinic, Elliot Hospital Catholic Medical Center, Greater Manchester Mental Health, Manchester Community Health Center, Manchester Health Department, Manchester Office of Youth Services, Manchester Police Department, Salvation Army, United Way of Greater Manchester, and the YWCA.

Board of Health Example – City of Burlington, Vermont: The Board of Health Takes the Lead

Submitted by:
Alan Sousie, BSN
Chair, Burlington Board of Health

Burlington, the largest city in Vermont, had fluoridated its water for more than 50 years when the board of health (BOH) began an open, public investigation of the issue. On March 9, 2005, the board received information from Michael Connett, Project Director of the Fluoride Action Network, a group that is opposed to water fluoridation. It also received information in support of fluoridation from Dr. Donald Swartz, then Director of Oral Health Improvement at the Vermont Department of Health. Dr. Steve Arthur, who followed Dr. Swartz as Vermont's state dental director, contributed to subsequent discussions and testimonies. Attendees at the March 2005 meeting included about 40 members of the public and city councilors.

The BOH subsequently decided to conduct a public debate on fluoridation. It also decided to hold a second hearing when all testimony would be accepted by the BOH without discussion. On June 15, an informational debate was held before an audience of approximately 100 citizens. The follow-up opinion hearing was conducted on June 23, in the presence of about 85 citizens.

Following these public forums, during a public meeting on June 29, the BOH chose by a vote of 3 to 2 to recommend continuation of community water fluoridation in Burlington. Some board members had concerns about the potential for public harm and advocated removing fluoride from the city's public water supplies. The dispute resulted from individual differences of opinion on the validity of benefit-to-harm ratios determined by research and studies. However, they did agree that the effects of fluoride for infants between birth and 6 months of age posed a "public health risk." It was decided that the BOH would develop and distribute public education materials about the use of tap water when it is used to mix with infant formula.

In August 2005, the BOH sent an Interim Report to the City Council. The report stated that "the Board of Health has limited statutory responsibility for the prevention, removal, or destruction of public health hazards and the mitigation of public health risks." In 2005, the board's most important project was the evaluation of Burlington's need to continue fluoridation of its public water supply. They spent many hours studying and discussing this subject, and endeavored to "address concerns of citizens, legislators, city officials, and the public health community."

In September 2005, acting on the Interim Report, the City Council voted to lower the level used to fluoridate Burlington's water from 1.2 milligrams per liter (mg/L) to 1.0 mg/L.* On March 7, 2006, 71.4% of Burlington voters confirmed their support for continuation of fluoridation. In view of these decisions, the Burlington BOH continues to evaluate both the amount and type of fluoride being added to the city's water. As new research is reported and public health recommendations made, the BOH expects to update its policies accordingly. In the end, the board of health unanimously agreed that progress toward improvement has been made by the community.

* At that time, the community was following U.S. Public Health guidance that the level of fluoride in drinking water for the prevention of tooth decay be within a range of 0.7–1.2 mg/L, based on the average community temperature.

Board of Health Example – Cayuga County, New York: The Board of Health Passes a Resolution

Submitted by:
Kathleen Cuddy, MPH
Former Deputy Director, Health Services
Cayuga County Health and Human Services

James X. Kennedy, MS, LCSW
Cayuga Community Health Network

Cayuga County does not currently provide fluoridated water to its citizens; it is one of only six counties in central New York that does not fluoridate its public water supplies. About 150 water systems in New York add fluoride to their water, and another 800 water systems receive fluoridated water by purchasing their water from systems that fluoridate. The debate on community water fluoridation began in Cayuga County more than 20 years ago and frequently resurfaces. In order to implement water fluoridation in Cayuga, the city of Auburn would be required to change the city charter.

In 2005, a community health assessment was completed and dental health was shown to be a major public health problem in the community. Cayuga County also had the highest percentage of children with cavities (72% of Cayuga County third grade schoolchildren had at least one cavity). In contrast, in Onondaga County where 93% of the population had access to fluoridated water, only 42% of third graders had cavities.

In 2005, the Cayuga Community Health Network (the Network), a rural health network led by James X. Kennedy, was instrumental in moving community water fluoridation to the forefront. The Network sponsored a forum on water fluoridation, held on January 24, featuring Julie Reuther, RDH, a dental hygienist who also was the fluoridation specialist in the Bureau of Dental Health, New York State Department of Health, and nationally known fluoridation expert Michael Easley, DDS, MPH. This forum provided the following information on the safety of fluoridated drinking water:

Fluoridation is safe, effective, efficient, economical, socially equitable, environmentally sound, and good public policy. Community water fluoridation is the perfect public health intervention because it does not discriminate against any group, large groups are protected continuously without any conscious effort on their part to participate, works without requiring individuals to gather in a central location, does not require the costly services of expensive health professionals to deliver its benefits, there are no daily dosage schedules to remember, and there are no foul tasting oral medications to endure or painful inoculations to experience. All the public has to do is go about their normal daily routine to be protected.

In 2006, the Cayuga County Board of Health (BOH) unanimously passed a resolution in support of fluoridating the county's public water system, stating that fluoridated water is a safe and effective way to prevent tooth decay. The resolution was heard by the city council, although it declined to vote on community water fluoridation at that time.

Along with many other strong advocates, the BOH was involved in the effort to pass community water fluoridation and will continue to work on this issue in the future. The Network continues to promote the use of fluoride as part of its Healthy Cayuga health promotion campaign (www.cayugahealthnetwork.org). In September 2006, the Network conducted a community survey during a community event where the overwhelming majority of respondents indicated their support for public water fluoridation.

Appendix A: Frequently Asked Questions

The following questions often are asked about the safety of community water fluoridation. For answers to additional questions, please visit the American Dental Association's website for Fluoridation Facts (www.ada.org) and the CDC's Fluoridation: Questions and Answers web page (http://www.cdc.gov/fluoridation/fact_sheets/cwf_qa.htm).

Is fluoride in the water supply at the levels recommended for the prevention of tooth decay safe?

Reviews by scientific and public health organizations provide compelling evidence that fluoridation of community water supplies is safe (CDC, 2001b).

The overall value and safety of community water fluoridation has been endorsed by the U.S. Centers for Disease Control and Prevention, U.S. Surgeons General, the Community Preventive Services Task Force (2001), and numerous public health and professional organizations, including the American Dental Association, the American Medical Association, the American Academy of Pediatrics, the American Public Health Association, the U.S. Department of Health and Human Services, the U.S. Public Health Service, and the World Health Organization (ADA, 2005; CDC, 2012).

Scientists continue to conduct studies on fluoride (ADA, 2005). Over the past 65 years, thousands of reports have been published in the scientific literature on all aspects of fluoridation. The collective dental, medical, and public health evidence concerning fluoridation has been reviewed and evaluated by committees of experts, academics, special councils of government, and most of the world's major national and international health organizations. Reviews of water fluoridation safety include a comprehensive review of the scientific literature by the U.S. Public Health Service in 1996 and the University of York in 2000 (Centres for Review and Dissemination, University of York, 2000). In 2007, the Australian government published *A Systematic Review of the Efficacy and Safety of Fluoridation*, which primarily addressed the caries-reducing benefits and associated health risks of providing fluoride systemically.

A report, *Fluoride in Drinking Water: A Scientific Review of EPA's Standards*, by the National Research Council (NRC) (2006), addresses safe maximum fluoride levels. The report discusses the safety of high levels of fluoride in water that occur naturally, and does not question the use of lower levels of fluoride to prevent tooth decay. The findings are consistent with CDC's current assessment that water is safe and healthy at the low levels used for water fluoridation.

Thus, the current scientific evidence indicates that the level of fluoride used for community water fluoridation is safe and effective in preventing tooth decay in humans.

With many other sources of fluoride available, is water fluoridation still needed?

Although other sources of fluoride are widely available, such as toothpaste and mouth rinse, fluoridation continues to provide an additional benefit—it reduces tooth decay by about 25% in children and adults.

What are some of the claims about harms to health made against water fluoridation?

From sources such as the World Wide Web, newsletters, and personal anecdotes, community water fluoridation is frequently blamed for causing harmful health effects such as low IQ, Alzheimer's disease, cancer, behavior problems, bone disease, thyroid disease, kidney disease, and even tooth decay. Such claims may raise doubts of some members of the public.

The U.S. Environmental Protection Agency, under the Safe Water Drinking Act, sets an enforceable standard—the Maximum Contaminant Level (MCL)—for the highest level of fluoride that is allowed in public water supplies. This standard—which currently is 4 mg/L of water—is set to protect against health effects that could occur from exposure to too much fluoride. The small amount of fluoride used for water fluoridation is not harmful to health; water systems currently fluoridate water at around 1 mg/L, or 1 part per million (current range is 0.7-1.2 mg/L).

Are the chemicals used for community water fluoridation safe?

All additives used at water treatment plants, including fluoride additives, must meet strict quality standards that assure the public's safety. These additives are subject to a stringent system of standards, testing, and certificates by the American Water Works Association (AWWA) and the National Sanitation Foundation/American National Standards Institute (NSF/ANSI). AWWA standards stipulate product quality testing requirements and verification. The NSF/ANSI standard addresses product purity and safety and ensures that a water treatment system will not exceed 10% of the amount allowed for a substance by the U.S. Environmental Protection Agency. More information about the manufacture and safety of fluoridation additives is available at http://www.cdc.gov/fluoridation/fact_sheets/engineering/wfadditives.htm.

Is community water fluoridation expensive for communities?

The cost of water fluoridation is typically less than 1% of the total cost of delivering drinking water to consumers. Updating a water system with the equipment needed to fluoridate drinking water generally costs as little as $10-$20 per consumer, with an average cost of $12 per consumer. The installation that is constructed will last 20 years or more. Annual costs for providing fluoridated drinking water depend on the size and complexity of the water system, and vary from less than $1 per person for larger communities (> 20,000 residents) to as much as $5 per person in smaller communities (< 5,000 residents). A CDC study (Griffin et al., 2001) shows that every $1 spent on water fluoridation by communities saves at least $38 annually in costs for treatment of tooth decay.

Appendix B: Model Fluoridation Ordinance

American Dental Association, reprinted with permission

Suggested Provisions

1. Findings of fact:

- Fluoridation of community water supplies is the single most effective public health measure to prevent tooth decay and to improve oral health for a lifetime.
- The Centers for Disease Control and Prevention has proclaimed community water fluoridation one of 10 great public health achievements of the 20th century.
- Fluoridation of community water supplies is supported by the American Dental Association, the U.S. Department of Health and Human Services, the U.S. Public Health Service (USPHS), the American Medical Association, and the World Health Organization.
- Studies over the past 65 years have repeatedly confirmed the safety of water fluoridation and its effectiveness in preventing dental decay.
- A United States national health objective for the year 2020 is to increase the portion of the population served by community water systems providing optimal levels of fluoride to at least 79.6%. According to the Centers for Disease Control and Prevention, approximately 73.9% of the population served by water systems received fluoridated water in 2010.
- Community water fluoridation is a public health measure that benefits individuals of all ages and socioeconomic groups, especially those without access to regular dental care.

2. Authorization, Direction and Responsibility

The city [insert title of appropriate person or entity, given the state and local regulatory scheme, e.g., director of health/board of health] (the "Responsible Party") is authorized and directed to fluoridate the city's water supply by [date] and is thereafter responsible for the fluoridation of that supply.

(Rationale: Identifies individual/entity to maintain authority over the fluoridation process.)

3. Funding

Funding shall be provided [describe funding mechanism]. [Modify as needed to reflect funding mechanism.]

(Rationale: Need money to get the job done.)

4. Introduction of Fluoride

Upon the direction of the Responsible Party, the [insert name of public works entity that will fluoridate] (the "Agency") shall take the steps necessary to fluoridate the city's water supply, and shall introduce a fluoride compound meeting American Water Works Association (AWWA) standards into the city water supply in such quantities as required to maintain throughout the distribution system a fluoride concentration at levels recommended by the USPHS, or otherwise required by the state health department.

(Rationale: Helps assure optimal fluoridation of the water. Allows the state to provide necessary guidance.)

5. Records

The Agency shall keep an accurate record of the type and amount of fluoride compound introduced and the quantities of water treated.

The Agency shall conduct and keep records of tests for fluoride compound in the treated and untreated waters in accordance with CDC engineering and administrative recommendations for water fluoridation, or otherwise required by the state health department.

The Agency shall make copies of the records required above to the Responsible Party every [set time frame for predetermined intervals, if desired] and/or as otherwise requested by the Responsible Party.

(Rationale: Provides tools to assist in accounting for the management of the process; provides method to monitor quality and accountability.)

NOTE: This document identifies select elements for possible inclusion in a local water fluoridation ordinance. Exactly what elements will be needed in a particular community, and how they will need to be worded, will depend upon existing state and local laws. The document is especially designed to provide helpful information to dentists and dental societies promoting fluoridation in their communities, but is not intended or offered as legal or other professional advice. Readers must consult their own legal counsel for such advice.

Appendix C: Oral Health Resources

American Association for Community Dental Programs (AACDP)

Supports the efforts of those with an interest in serving the oral health needs of vulnerable populations at the community level. Members include staff of city, county, and community-based health programs with an interest in oral health issues and access to care. AACDP publishes a newsletter and sponsors an annual meeting. Available at www.aacdp.com/index.html.

American Academy of Pediatric Dentistry (AAPD)

This organization representing 8,000 pediatric dentists provides a policy affirming water fluoridation as a safe and effective measure for reducing tooth decay. Available at http://www.aapd.org/media/Policies_Guidelines/P_FluorideUse.pdf.

American Dental Association (ADA)

The world's largest (156,000 members) and oldest national dental organization, the ADA is the professional association of dentists committed to the public's oral health, ethics, science, and professional advancement. Through its Council on Access, Prevention, and Interprofessional Relations, the ADA provides assistance to communities that are seeking to implement or maintain fluoridation. A key publication is *Fluoridation Facts*, which provides answers to frequently asked questions about community water fluoridation. Available at http://www.ada.org/sections/professionalResources/pdfs/fluoridation_facts.pdf.

Association of State and Territorial Dental Directors (ASTDD)

Provides leadership to advocate for a governmental oral health presence in each state and territory, to formulate and promote sound oral health policies, to increase awareness of oral health issues, and to assist in the development of initiatives for prevention and control of oral diseases. Provides a best practice report on *Use of Fluoride: Community Water Fluoridation*, as well as several community examples. Available at www.astdd.org.

Centers for Disease Control and Prevention (CDC) Division of Oral Health

The Centers for Disease Control and Prevention's Division of Oral Health (DOH) seeks to prevent and control oral diseases and conditions at the community level and reduce disparities among diverse population groups by building the knowledge, tools, and networks that promote healthy people and effective public health practices and programs. To accomplish this, DOH seeks to extend the use of proven practices to prevent oral diseases, strengthen the nation's oral health infrastructure, and enhance efforts to monitor oral diseases. DOH is well-known for monitoring the status of community water fluoridation and working to enhance the quality of fluoridation throughout the nation. Guidelines, factsheets, reports, surveillance information including state and county fluoridation statistics (http://www.cdc.gov/fluoridation/statistics.htm), and information on its water fluoridation training program are found here. Available at http://www.cdc.gov/fluoridation/index.htm.

CDC also provides My Water's Fluoride, a website that allows people to learn the fluoridation status of their water system. Available at http://apps.nccd.cdc.gov/MWF/Index.asp.

In addition, CDC publishes the *Engineering and Administrative Recommendations for Water Fluoridation*, which provides specific recommendations on the engineering aspects of water fluoridation, including administration, monitoring and surveillance, technical requirements, and safety procedures for community public water supply systems. Last published in 1995, a revision to this document will be published in 2012. Available at www.cdc.gov/fluoridation/engineering.htm.

Council of State Governments (CSG)

A multi-branch organization forecasting policy trends for the community of states, commonwealths, and territories on a national and regional basis. In 2006, CSG issued a policy resolution to encourage states to support or adopt community water fluoridation. The resolution is available at http://www.csg.org/knowledgecenter/docs/CommunityWaterFluoridation.pdf.

***The Guide to Community Preventive Services*, Oral Health Chapter**

The Community Preventive Services Task Force conducts systematic reviews of the effectiveness of selected population-based interventions addressing oral health focused on three strategic areas: preventing or controlling dental caries (tooth decay), preventing or controlling oral and pharyngeal cancers, and preventing or controlling sports-related craniofacial injuries. Based on its previous review (2001), the Task Force recommended community water fluoridation based on strong evidence of effectiveness in reducing tooth decay. Available at http://www.thecommunityguide.org/oral/fluoridation.html.

National Oral Health Surveillance System (NOHSS)

NOHSS is a collaborative effort between CDC's Division of Oral Health and the Association of State and Territorial Dental Directors (ASTDD). NOHSS is designed to monitor the burden of oral disease, use of the oral health care delivery system, and the status of community water fluoridation on both national, state, and county levels. Available at www.cdc.gov/nohss/ and http://apps.nccd.cdc.gov/gisdoh/.

Institute of Medicine (IOM) Report

The report, *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*, released in July 2011, discusses the current oral health care system, develops a vision to improve oral health care for vulnerable and underserved populations, and recommends strategies to achieve the vision. Topics discussed in this report include improving dental education and training, reducing financial and administrative barriers, expanding capacity, and creating optimal laws and regulations. Available at http://www.iom.edu/Reports/2011/Improving-Access-to-Oral-Health-Care-for-Vulnerable-and-Underserved-Populations.aspx.

Oral Health America

Develops, implements, and facilitates educational and service programs designed to raise awareness of oral health's importance to total health. This organization's President/CEO has a statement of support for community water fluoridation available at http://oralhealthamerica.org/enewsarticle/from-the-president-and-ceo-prevention-is-key/.

Pew Children's Dental Campaign

A special project of The Pew (Charitable Trusts) Center on the States, the Pew Children's Dental Campaign is working to ensure that more children receive dental care and benefit from policies proven to prevent tooth decay, including expanding access to optimally fluoridated water. The Campaign provides a website, www.ilikemyteeth.org, which seeks to provide up-to-date information on communities' efforts to fluoridate, as well as resources helpful to community campaigns. Available at www.ilikemyteeth.org.

Synopses of State and Territorial Dental Programs

The Synopses contain information useful in tracking progress toward *Healthy People 2020* oral health objectives in states, U.S.-associated jurisdictions, and the nation. The word "state" is used in a general way to indicate states, the District of Columbia, U.S. territories, and other U.S.-associated jurisdictions. Available at http://apps.nccd.cdc.gov/synopses/index.asp.

Surgeon General's Report: *Oral Health in America* (May 2000)

This report, the first ever on oral health by a U.S. Surgeon General, focuses on the relationship between oral health and general health throughout the lifespan. Oral problems discussed in this report include tooth decay, periodontal (gum) diseases, oral cancer, birth defects, oral infections (e.g., cold sores), chronic facial pain conditions, and quality of life. In this report, the U.S. Surgeon General calls for a national partnership to provide opportunities for individuals, communities, and the health professions to work together to maintain and improve the nation's oral health. Available at http://www.surgeongeneral.gov/library/reports/oralhealth/index.html.

Surgeon General's *National Call to Action to Promote Oral Health*

Released by the Office of the Surgeon General in 2003, this companion report to *Oral Health in Americ*a calls on policy makers, community leaders, private industry, health professionals, the media, and the public to improve the oral health status of the nation. Available at http://www.surgeongeneral.gov/library/calls/oralhealth/nationalcalltoaction.html.

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