Public Health Impact of Community Water Fluoridation

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U.S. Department of Health and Human Services
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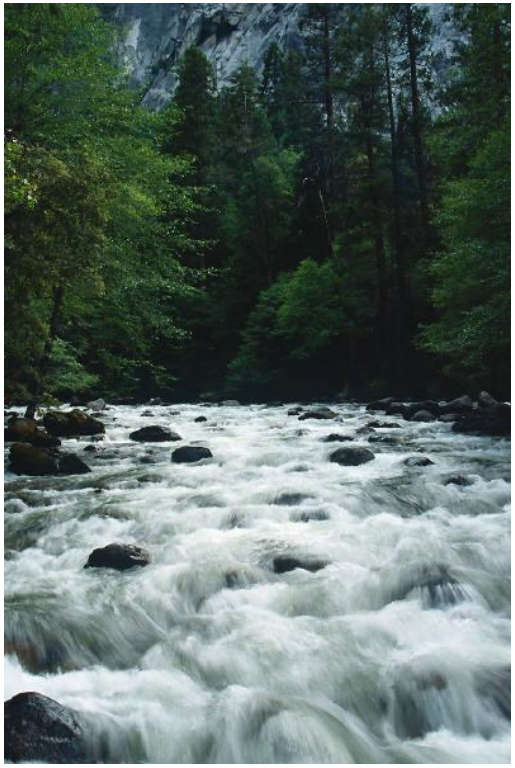
Significance of Dental Caries

- **Dental caries (tooth decay) is a highly prevalent chronic disease**
  - One in four children from low-income families had untreated tooth decay (NHANES, 2009–2010)
  - Untreated decay can cause pain, school absences, difficulty concentrating, and poor appearance
    - Decreased quality of life
- **One measure of tooth decay is the number of decayed, missing, or filled teeth (DMFT)**
  - Used in population surveillance and studies
- **Key benefit of community water fluoridation (CWF) is the reduction in DMFT**

Dye, Li, Thornton-Evans. NCHS Data Brief No 104. August 2012
NHANES: National Health and Nutrition Examination Survey

Fluoride is a Naturally Occurring Mineral

- **All water contains some naturally occurring fluoride, but usually at levels too low to prevent tooth decay**

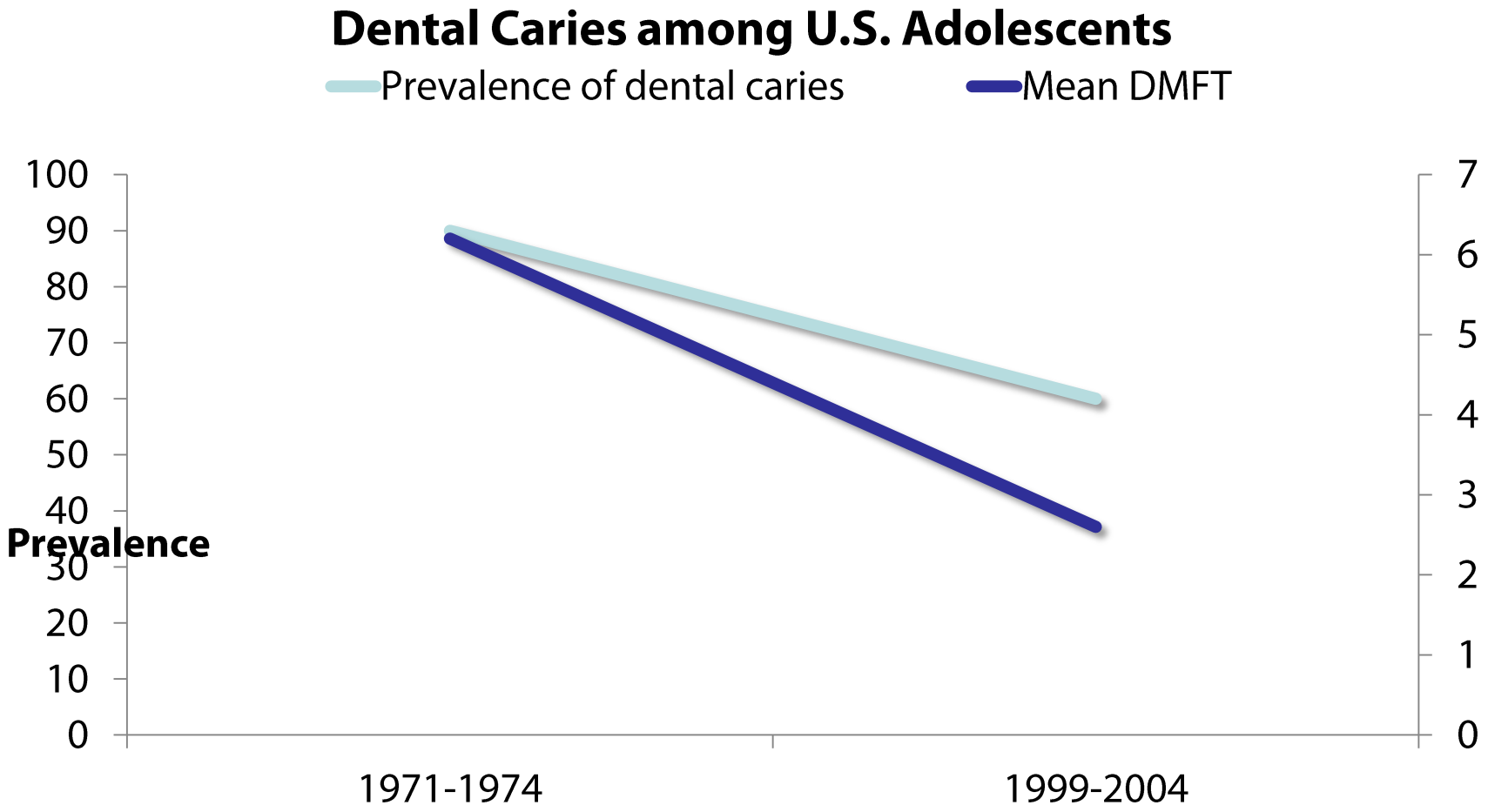


Community Water Fluoridation (CWF)

- CWF is the controlled adjustment of fluoride in a community water supply to an optimal concentration for reduction of tooth decay
- Optimal concentration of fluoride is approximately 1mg/L (equivalent to 1 ppm)
- Fluoride inhibits demineralization and enhances remineralization of dental enamel

mg/L: milligram per Liter
ppm: parts per million

Changes in Prevalence and Severity of Tooth Decay, 1971–1974 to 1999–2004



CDC. MMWR.1999;48:933-40
DMFT: decayed, missing, or filled teeth

Effectiveness

- Systematic review found that community water fluoridation was effective among adults (20–60 years) (9 studies) (N=7853)
- Meta-analysis of 5 cross-sectional studies published after 1979 and conducted among adults with lifetime residency in F and NF communities (N=2530)
  - Tooth decay reduced overall by 27% (95% CI 19–34%)

Griffin, et al. J Dent Res 2007;86:410-5
F: fluoridated
NF: non-fluoridated

Effectiveness

- **Community Preventive Services Task Force (2013):**
  - Found strong evidence that community water fluoridation (CWF) was effective in reducing tooth decay
  - Increase in percent caries free (mean difference)

    Median: 14.6%; range -5.0% to 64% (11 studies)

    Median: 25.1%; range 19.8% to 31.6% (1 study)
  - Decrease in number of DMFT (mean difference)

    Median 2.25 teeth; range 0.5 to 4.4 (10 studies)

- **Task Force recommended CWF to prevent or control caries in communities**

McDonagh MS, et al. Br Med J 2000;321:855-9
Gray MM, Davies-Slowik J. Br Dent J 2001;190:30-2
www.thecommunityguide.org/oral/fluoridation.html
DFMT: Decayed, missing, or filled teeth (primary or permanent)
CWF: community water fluoridation

Cost-Effectiveness

- **A systematic review by the Community Preventive Services Task Force (2001) found that CWF was cost-saving in all 5 included studies**
- **Medicaid costs for treatment of tooth decay were significantly lower among children in fluoridated vs. non-fluoridated communities in**
  - Louisiana parishes: preschoolers (1995–96); $67 (2010 U.S. dollars)
  - New York counties: children and adolescents (2006); $24

Truman BI, et al. AJPM 2002;23:21-54
CDC. MMWR. 1999;48:753-7
Kumar J, et al. Pub Heal Rep 2010;125:647-54
CWF: community water fluoridation

Safety

- **Review by Community Preventive Services Task Force (2013) found**
  - Clear, dose response relationship between fluoride concentrations in drinking water and dental fluorosis
  - No evidence that CWF results in severe dental fluorosis
  - No association observed between CWF and
    - Bone fractures or skeletal fluorosis
      - Lifetime exposure to fluoride at higher drinking water concentrations (e.g. 4.0 mg/L) has been associated with bone fractures and skeletal fluorosis
    - Unwanted health effects other than dental fluorosis

www.thecommunityguide.org/oral/fluoridation.html
CWF: community water fluoridation

Safety

- **Review by National Research Council (2006)**
  - Focused on naturally-occurring fluoride concentrations in drinking water of 2–4 mg/L
    - Notably higher than recommendations for CWF (~1 mg/L)
  - Found substantial evidence only for increased risk of severe dental fluorosis
  - Noted that prevalence of severe dental fluorosis was near zero with fluoride concentrations in drinking water of <2.0 mg/L
  - Concluded that lifetime exposure to fluoride at drinking water concentrations of 4.0 mg/L is likely to increase bone fractures compared to exposures at 1.0 mg/L

www.nap.edu/catalog.php?record_id=11571
CWF: community water fluoridation
mg/L: milligram per Liter

Enamel Fluorosis: Clinical Presentation

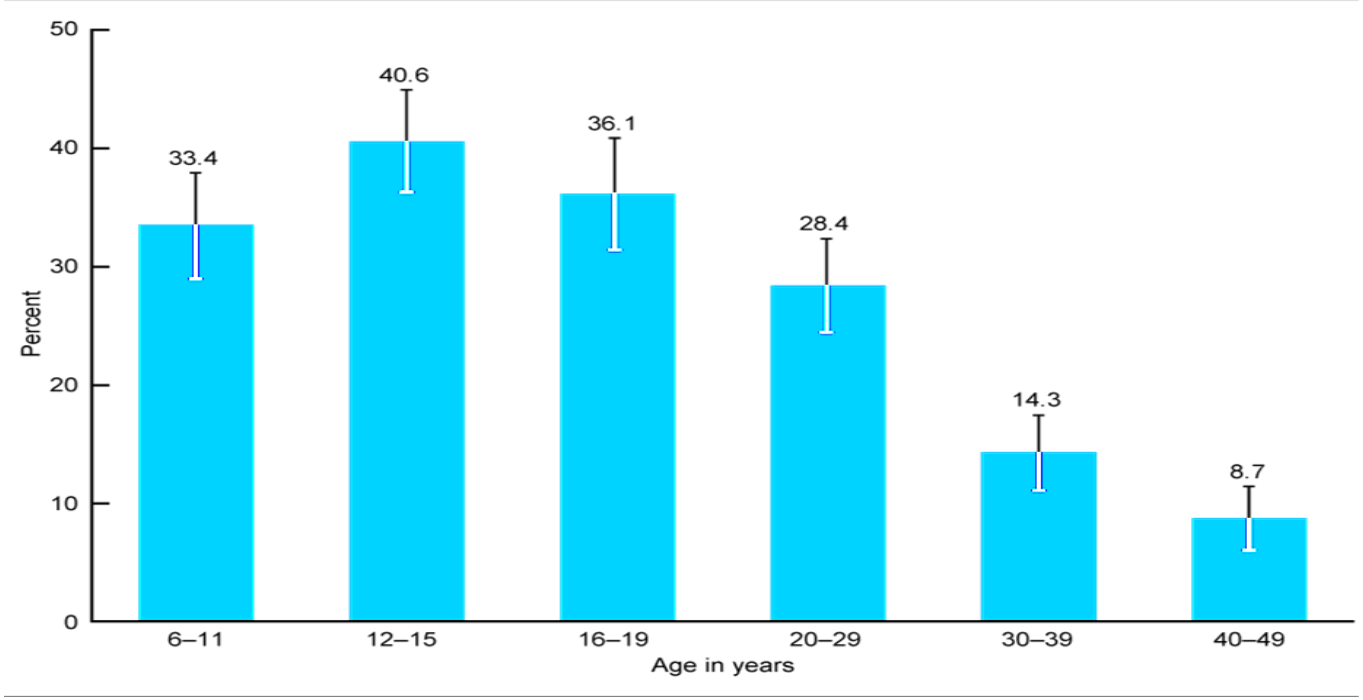
Unaffected to Questionable

Very Mild to Mild

Moderate and Severe

www.cdc.gov/fluoridation/faqs/dental _fluorosis/index.htm#a2

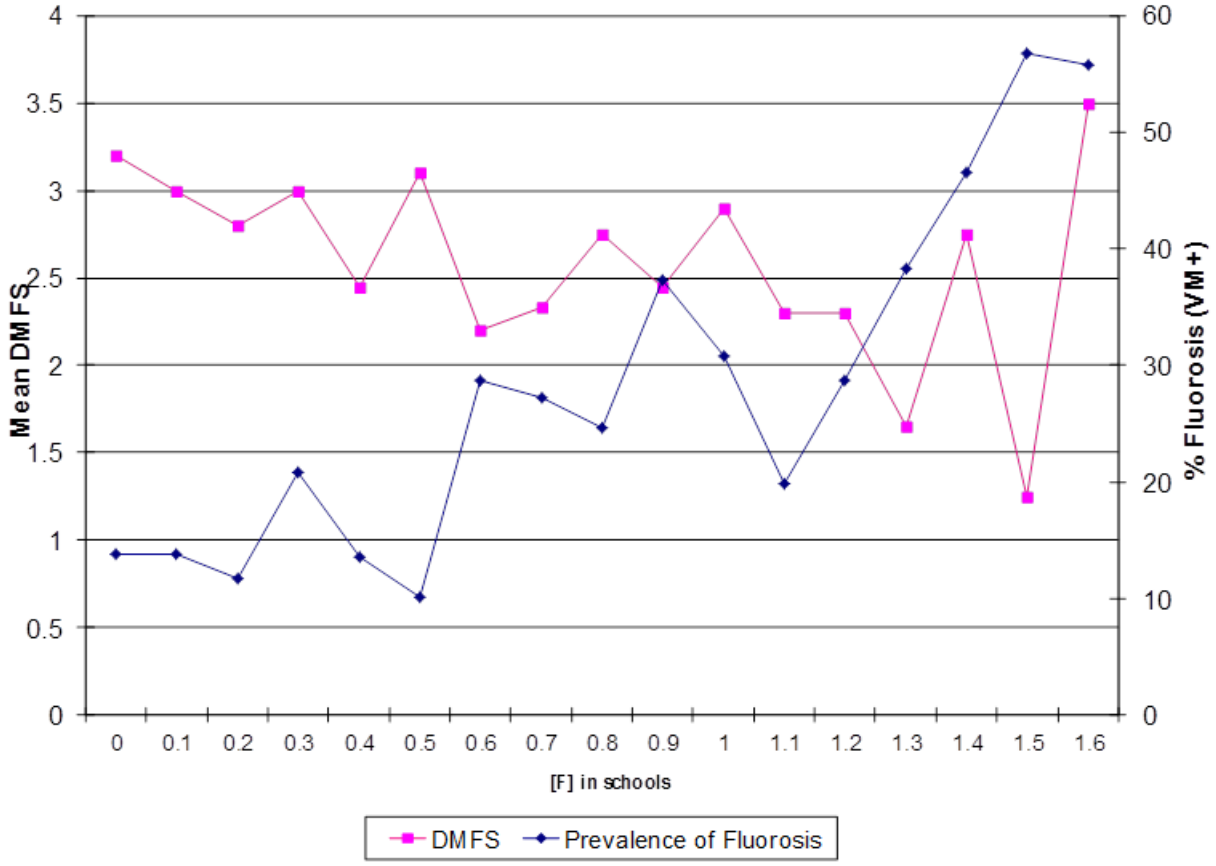
Prevalence in Enamel Fluorosis, Ages 6–49, 1999–2004



92% very mild to mild

CDC, National Health and Nutrition Examination Survey, 1999-2004
www.cdc.gov/fluoridation/faqs/dental _fluorosis/index.htm#a2

Dental Caries and Dental Fluorosis at Varying Water Fluoride Concentrations



Key finding:
decline in caries as fluoride content increased to 0.7 mg/L

Heller K, et al. J Pub Heal Dent 1997;57:136-43
mg/L: milligram per Liter

Community Water Fluoridation Recommendations

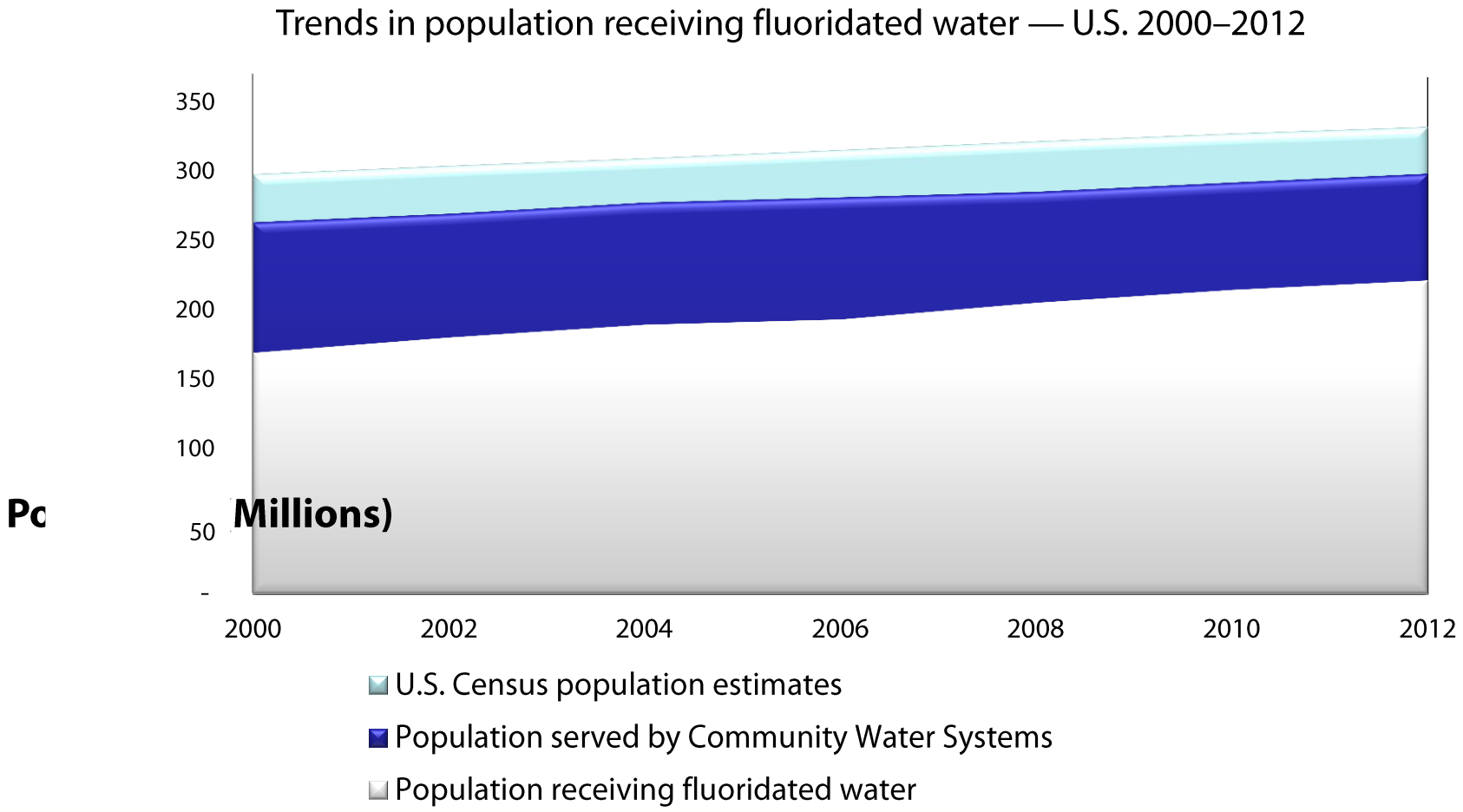
- **Recommendations established by the U.S. Public Health Service (1962): 0.7–1.2 mg/L water**
- **Proposed HHS recommendation (2011): 0.7 mg/L water**
- **Current Status**
  - Public comments addressed based on relevant science
  - External peer review completed
  - HHS final review pending
- **Release of recommendation expected early in 2014**

mg/L: milligrams per Liter

Main Reasons for Proposed Change In Fluoridation Recommendations

- **Drinking water is now one of several sources of ingested fluoride**
  - Fluoride toothpaste
  - Fluoride supplements
  - Commercial foods and beverages
- **Increase in prevalence of dental fluorosis**
- **Likelihood that caries prevention can be maintained while reducing risk of fluorosis**
- **Lack of important differences in water intake by outdoor temperature**

People Reached by Community Water Fluoridation



CDC, Water Fluoridation Reporting System

Community Water Fluoridation: Progress at the Population Level

- **Since 2000, 48 million people in the United States have received fluoridated water for the first time**

- **More than 6 million people were added between 2010 and 2012**
  - Percentage coverage increased from 73.9 to 74.6

CDC, Water Fluoridation Reporting System

Healthy People 2020: Community Water Fluoridation

- **Objective: Increase the proportion of the U.S. population served by community water systems with optimally fluoridated water**
- **Target:** 79.6%
- **Baseline:** In 2010, 73.9% of the U.S. population was served by community water systems with optimally fluoridated water
- **Status:** As of 2010, 23 states have met the Healthy People 2020 target

CDC, Water Fluoridation Reporting System
www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=32

Fluoridation: Ongoing Public Health Initiatives

- **Science: update estimates of effectiveness of CWF in the current context of multiple fluoride exposures**
- **Policy: track policy changes on CWF through partners**
  - **www.fluidlaw.org:** funded by CDC, database maintained by academic partners
- **Communications: Educate the public, health care providers, and decision makers**

CWF: community water fluoridation

Communications Challenges and Approaches

Shelly Spöeth, BS
Health Communications Specialist
Hager Sharp, Inc.

HAGER SHARP
COMMUNICATIONS THAT MAKE A DIFFERENCE

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Expert Consensus: Professional Organizations Supporting CWF

Pew Children's Dental Campaign available at http://www.pewstates.org/projects/childrens-dental-policy-328060
CWF: community water fluoridation

Supported by Public Opinion

- **Public opinion polls have consistently showed that 70% or more U.S. adults supported fluoridation**
- **An analysis of 2009 HealthStyles Survey data showed more than 50% of respondents**
  - Agreed that water fluoridation was safe (55%)
  - Believed there was some benefit to their health (57%)
- **In Arkansas in 2010, a survey of 500 voters showed more than half (54%) favored legislation to mandate water fluoridation in communities larger than 5,000 residents**

American Dental Association, Fluoridation Facts 2005
www.ada.org/public/topics/fluoride/facts/fluoridation_facts.pdf
Unpublished data, Mork, N. Perceived safety and benefits of community water fluoridation: 2009 HealthStyles survey
Public attitudes on fluoridation in Arkansas, Phone survey 2011

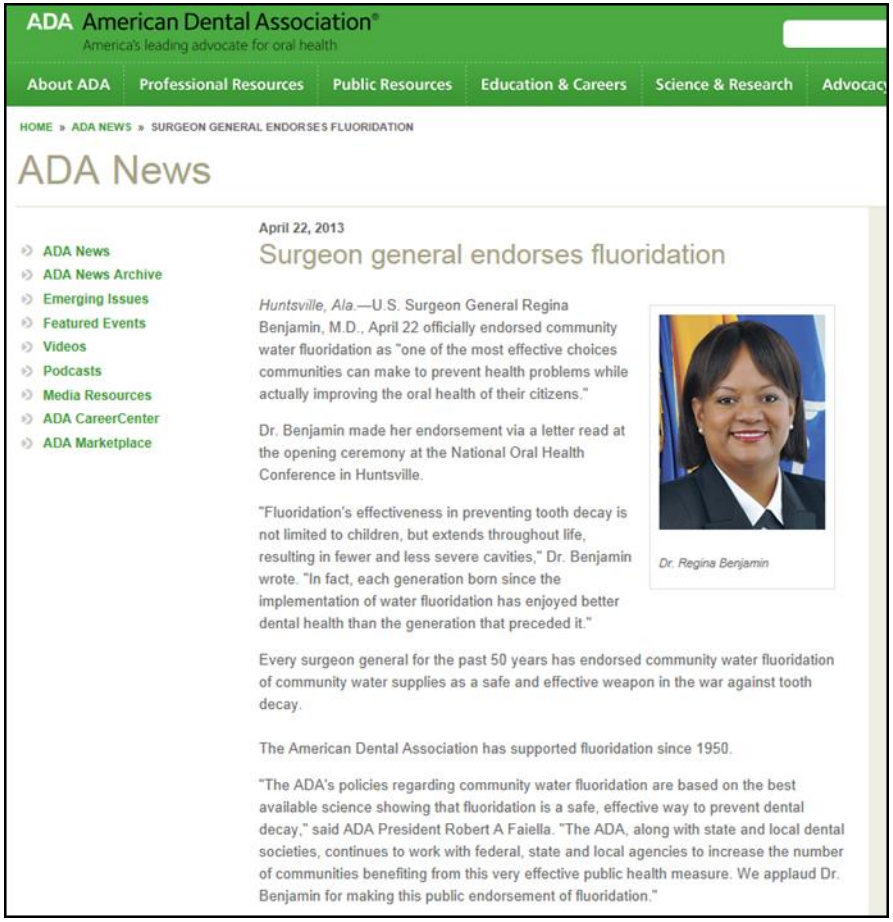
Policy Background

- **No federal requirement to fluoridate**
- **States and communities considering whether to fluoridate must weigh the risks and benefits**
  - These decisions often are made by elected officials or by a public vote
- **Role of CDC is to monitor the benefits and risks of community water fluoridation and promote its public health benefits**
- **CDC communications focus on the facts and summarize the latest scientific evidence**

A Polarizing Issue

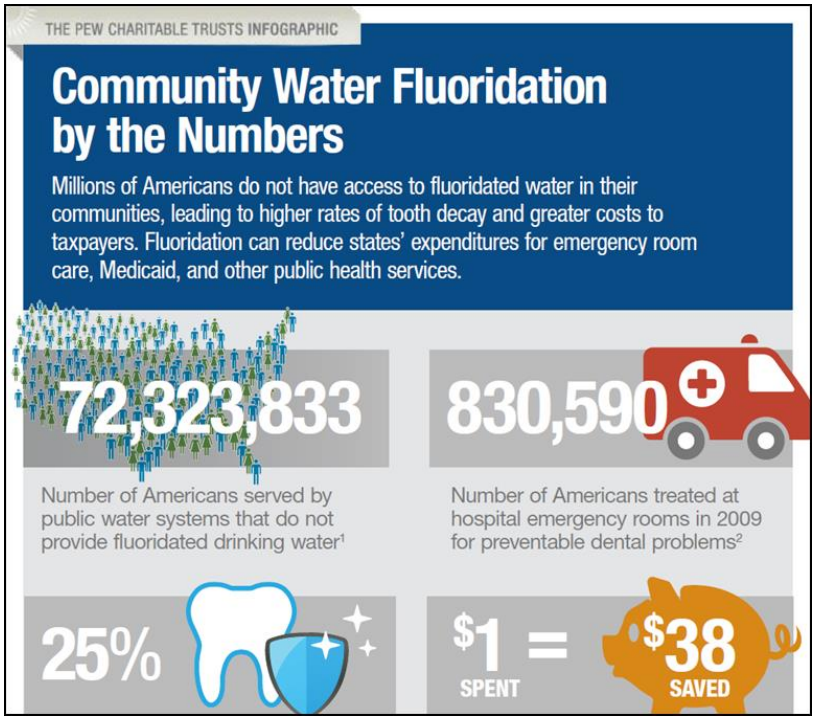
Photo courtesy of Mark Colman
Fluoride Action Network

Professional Association Partners



American Academy of Pediatrics
American Dental Association

Public Health Partners



The Pew Charitable Trusts
Pew Children's Dental Campaign

The Doubt Virus

The Doubt Virus

- Tends to "infect" some communities more than others
- Appears quite suddenly — sometimes without warning
- Can spread from person to person
- Prevention is the best approach

Bill Smith, PhD, EdD; The Pew Charitable Trusts; Hager Sharp, Inc.

The Doubt Virus: A Public Health Response

Surveillance – Monitor states and communities so we know where the "virus" is most likely to threaten fluoridation

Prevention – Educate the communities before the "virus" takes hold

Treatment – Move quickly to contain the "virus" by educating stakeholders and mobilizing them to help preserve fluoridation

Bill Smith, PhD, EdD; The Pew Charitable Trusts; Hager Sharp, Inc.

Assessment of the Communications Environment

Sample of Messaging: Pros and Cons

Messages in support of CWF	• Fluoride prevents tooth decay. • CWF is widely accepted in the U.S. with an estimated 204 million (74 percent) of those on community water systems drinking fluoridated water. • CWF has been used in the U.S. for nearly 70 years. • CDC says CWF is one of "10 great public health achievements of the 20th century." • Every $1 invested in CWF saves $38 in annual dental costs.
Messages against CWF	• The recommendation to change water fluoride levels suggests it is unsafe. • There are too many unknowns when it comes to CWF. • CWF has shown to have negative impacts on IQ in children, as well as cause bone fractures, bone pain, and tenderness (with citations to non-scientific studies). • Fluoride is a by-product of pesticide or a prescription drug. • CWF is a means of government intrusiveness, and it inhibits personal autonomy.

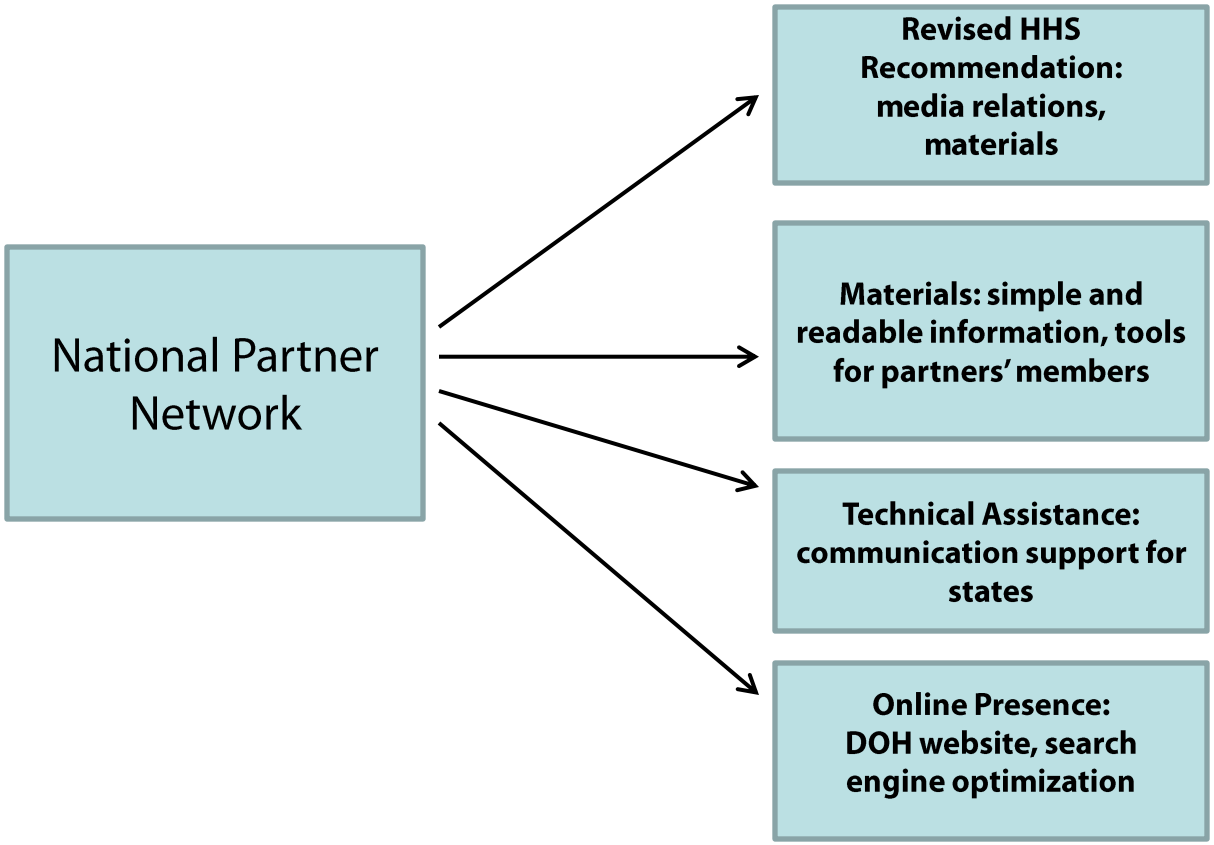
Unpublished data, Development and Implementation of a National Communications Plan to Support Community Water Fluoridation: Literature Review Results Final Report , Hager Sharp, Inc.
CWF: community water fluoridation

Findings from Environmental Assessment

- **Online information is "king"**
- **CWF is**
  - Not THE key priority for any one organization
  - Difficult to explain and understand
  - A contentious issue
  - Typically a local issue, with national roots
- **Local spokespeople and local media drive community decisions**
- **CWF lacks a single recognized national leader**

Hager Sharp, Inc.
CWF: community water fluoridation

Evidence-Informed Communications Approach



Hager Sharp, Inc.
DOH: department of health

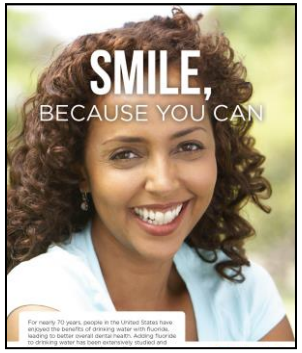
Developing Clear and Convincing Messages

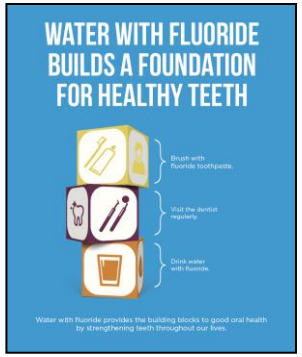
- Simple to understand
- Feature the benefits of CWF
- Use "kitchen table" or "back-fence" conversation
- Incorporate the long-standing history of water fluoridation

Staples, SalterMitchell, People.com
CWF: community water fluoridation

Key Messages

- **Found to be effective with consumers, dentists, and pediatric health care providers:**
  - For nearly 70 years, people in the United States have benefitted from drinking water with fluoride leading to better overall dental health
    - Combined with photo of smiling person
  - Building blocks–water with fluoride builds a foundation for healthy teeth
    - Paired with visual of building blocks





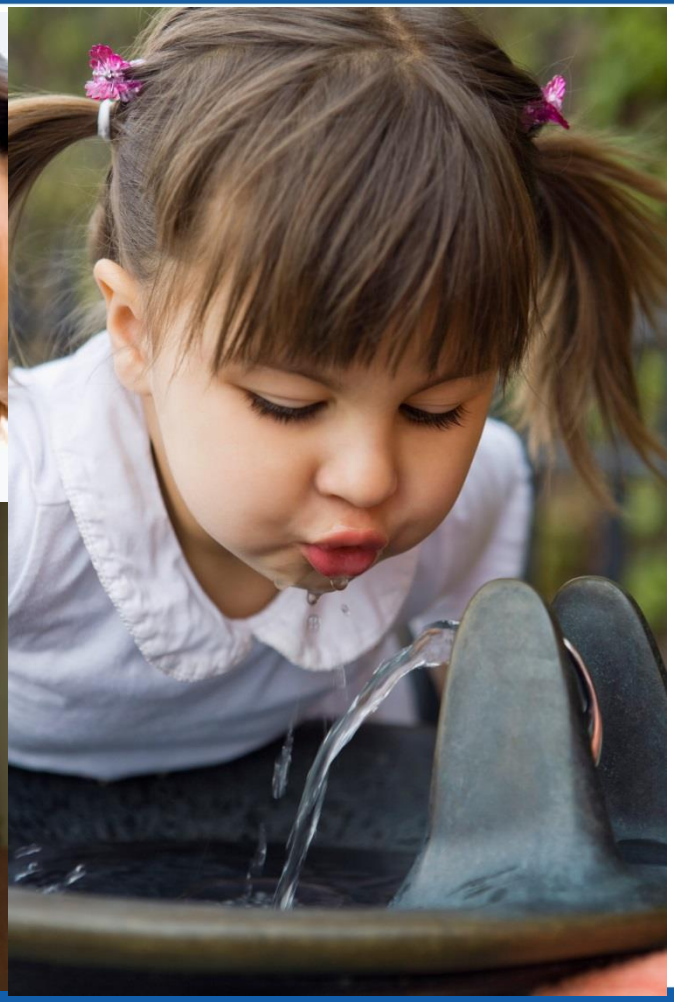
Additional Message Content: What People Want to Know About Fluoridation

- Use data and facts to show that water fluoridation is safe, effective, and beneficial
- Address the issue of "side effects"
- Explain that fluoride is a naturally-occurring mineral
- Address concerns about costs to consumers
- Clarify which organizations that have reviewed the science supporting fluoridation

Overall Communications Approach

So what can we do?

- **Get the facts right**
- **Acknowledge people's concerns**
- **Use metaphors and stories**
- **Personalize the story**



Innovative Approaches to Advance Community Water Fluoridation in New York State

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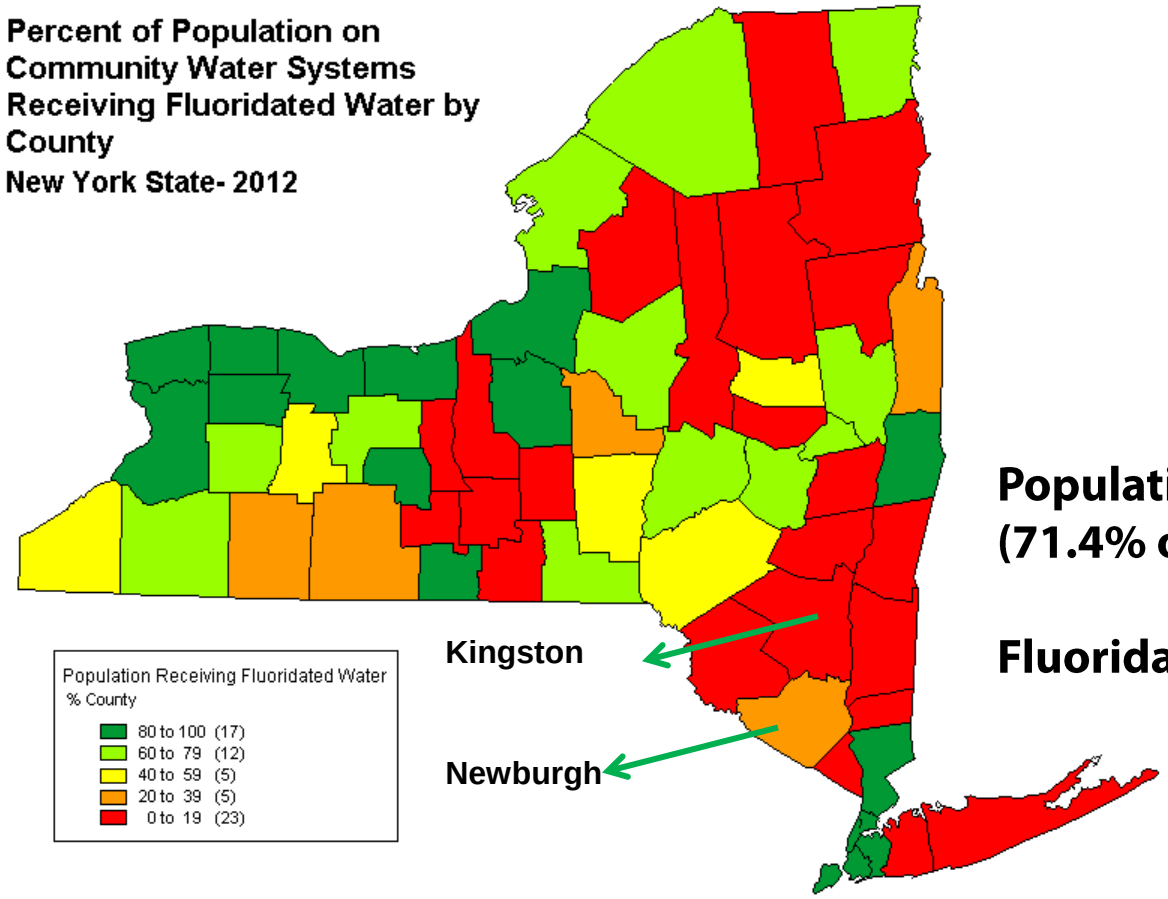
Director, Bureau of Dental Health
New York State Department of Health, Albany, NY

NEW YORK state department of HEALTH
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Fluoridation in New York State (NYS)



Population served: 12.9 million (71.4% of NYS residents)

Fluoridating systems: 123

CDC, Water Fluoridation Reporting System

Recent Developments in NYS Affecting Fluoridation

- **In the last 5 years, several local water systems have reconsidered fluoridation due to**
  - Financial constraints
  - Availability of other fluoride sources
  - Increased cost of fluoridation
  - Need to upgrade or replace fluoridation equipment

NYS: New York State

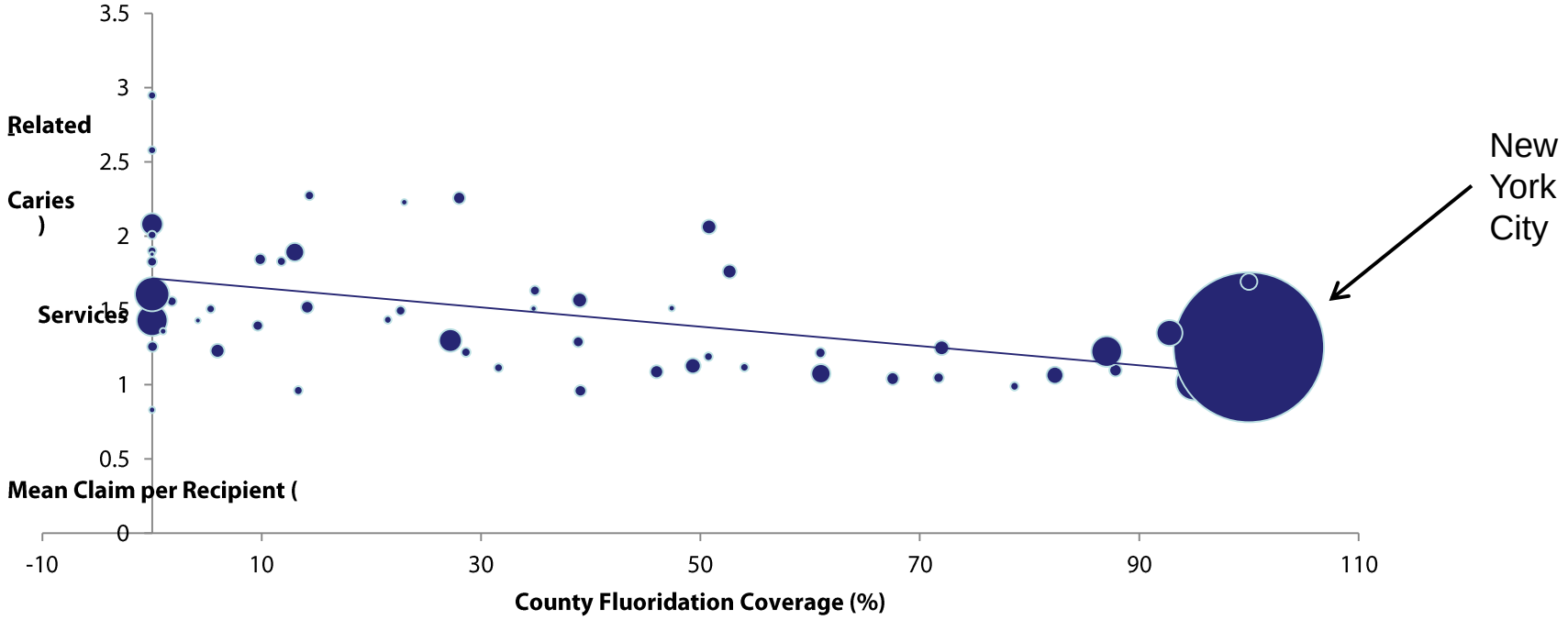
Elevating Fluoridation as a Priority in the NYS Health Agenda

- **Recommended strategies**
  - Build support–internal and external
  - Engage partners and stakeholders
  - Explore financing options
  - Develop resources
  - Provide training
- **Challenges**
  - Fluoridation expenditures typically borne by water systems, but savings occur in health care
  - Need for data showing local-level benefits

NYS: New York State

Geographic Variation in Medicaid Claims for Dental Procedures in NYS

Average child in a higher-fluoridation county incurred $23.65 less in Medicaid dental expenditures, compared with a child in a lower fluoridation county



Kumar JV, Adekugbe O, Melnik T. Public Health Reports 2010;125:647-54
NYS: New York State

Addressing Questions About Fluorosis: A Comprehensive Scientific Response

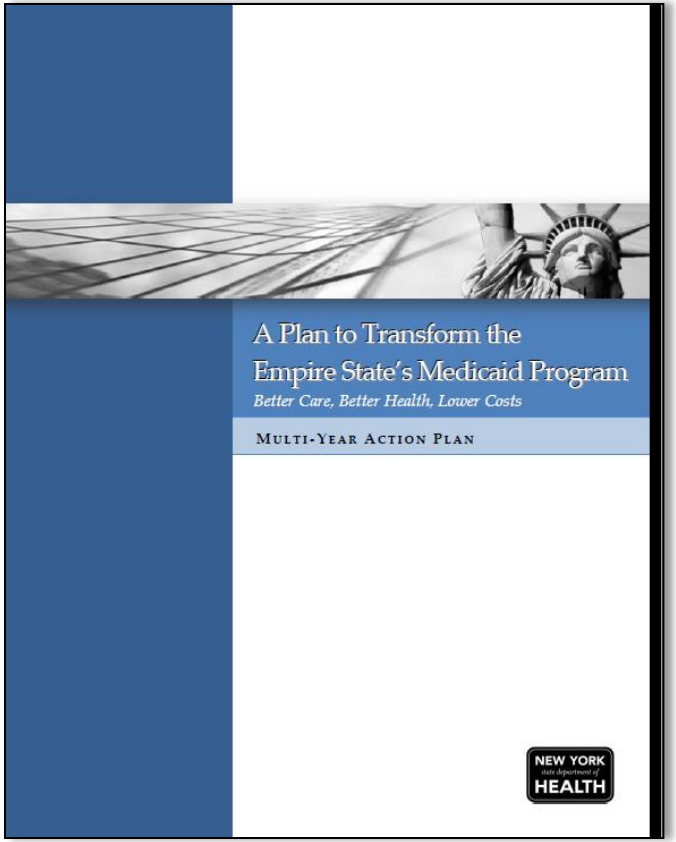
- **NYS has actively pursued answers to questions raised in communities**
  - 1988 – Is dietary fluoride intake in NYS children a concern?
  - 1999 – Does the prevalence of dental fluorosis increase after the implementation of fluoridation in NYS?
  - 2009 – Does dental fluorosis increase or decrease the risk for caries at the individual level?
- **Key finding: advanced fluorosis is extremely rare in fluoridated communities, even those that have been fluoridating for over 50 years**
- **The NYS Department of Health concurs with CDC that optimally fluoridated water has not been shown to cause adverse health effects**

Featherstone JDB, Shields CP. A Study of Fluoride Intake in New York State Residents. 1988. Final report to New York State Department of Health
Kumar JV, Swango PA. Community Dent Oral Epidemiol 1999; 27: 171–80
Hiroko I, Kumar JV. J Am Dent Assoc 2009;140;855-862
NYS: New York State

NYS Medicaid Redesign Team Recommendation for Water Fluoridation

- *"Medicaid reform must be about more than health care system redesign and payment reform. Medicaid reform – and broader reform of the entire New York health system – must also be about improving overall population health."*

Panel recommended new fiscal incentives to support community fluoridation



NYS: New York State
Available at nysac.org/Conferences/documents/Medicaid1115Waiver.pdf

NYS Prevention Agenda 2013–2017

- **Goal: Reduce the Prevalence of Dental Caries Among NYS Children**
  - Reduce prevalence of tooth decay among NYS children by 10%
  - Increase proportion of NYS children who have dental sealants by 10%
  - Increase proportion of NYS children who receive regular dental care by 10%
  - Increase percentage of NYS population receiving fluoridated water by 10%

www.health.ny.gov/prevention/prevention_agenda/2013-2017/
NYS: New York State

Key Partners for Promoting Prevention Agenda

- NYS Association of County Health Officials
- NYS Dental Foundation
- Schuyler Center for Analysis and Advocacy
- NYS Health Foundation
- Health Foundation for Western and Central New York
- NYS Oral Health Coalition

NYS: New York State

Support for State Fluoridation Efforts

CDC

- Surveillance and performance management
- Technical assistance
- Training of water system operators
- Resources for water systems

HRSA Workforce

- Training of professionals to be advocates
- Websites for information dissemination
- FluorideScience
- Ilikemyteeth.org

Federal MCH Block Grant

- Community support through Oral Health Center for Excellence
- Promotion of best practices
- Resources for local health departments
- Grants for equipment replacement

Partners

- Local infrastructure development to promote oral health
- Education of public and policymakers
- Community mobilization

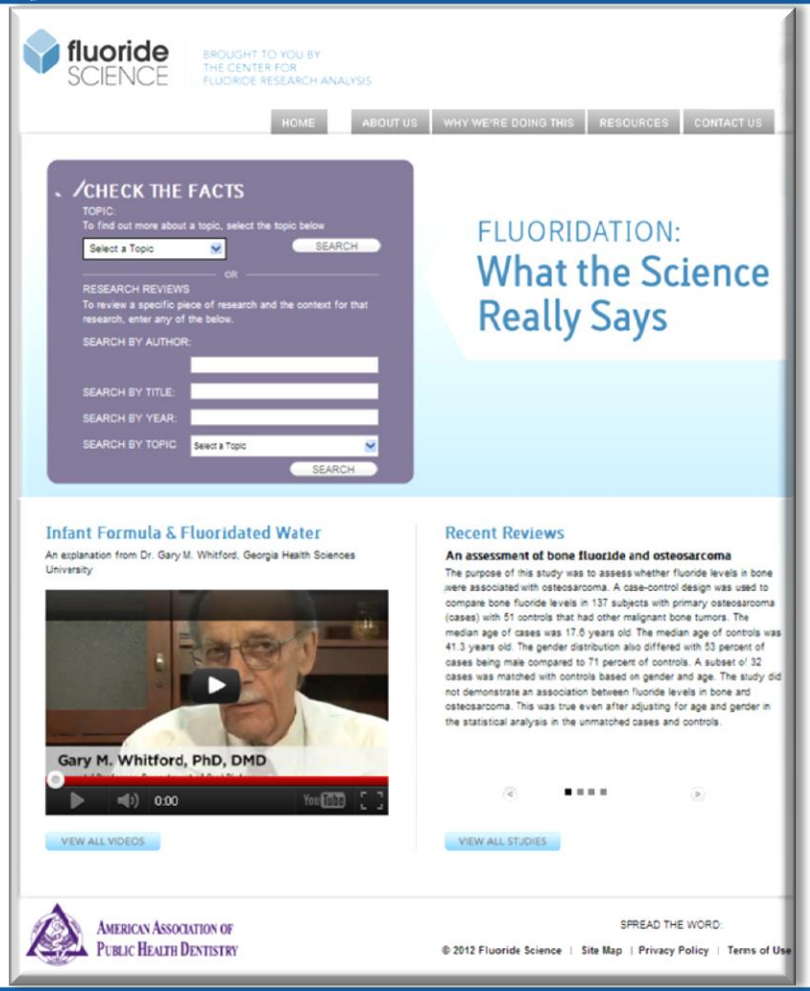
HRSA: Health Resources and Services Administration
MCH: Maternal and Child Health

Resources

- **New York State Department of Health**
  - Water Fluoridation Manual
  - Fact sheets, posters, presentation materials
- **Rural Water Association**
- **Technical Assistance Center in Rochester, NY**
  - Newyork.ILikeMyTeeth.org: statewide partnership
  - FluorideScience.org

Oral Health Technical Assistance Center
Rochester, NY

- **Fluoridescience.org**
  - Topic summaries
  - Critical appraisals of research and online content
  - Videos featuring fluoride researchers



Summary: Promoting CWF in NYS

- **In addition to traditional approaches such as surveillance of CWF, the state has also pursued**
  - Targeted research demonstrating local benefits
  - Collaborations with public health and non-public health partners, including developing and responding to online materials
  - High-level policy attention to fluoridation
- **Actions intended to help New York State make further progress towards achieving the Healthy People 2020 fluoridation objective**
  - HP 2020 target: 79.6% of population served by optimally fluoridated water system
  - NYS, 2012: 71.4% of population served

CDC, Water Fluoridation Reporting System
www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=32
CWF: community water fluoridation
NYS: New York State

Fluoridation: A Population Health Priority

Peter Briss, MD, MPH
Medical Director
National Center for Chronic Disease Prevention
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U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

Oral Health in Public Health

- **Oral health an essential part of general health**
- **Fluoridation recognized as one of the ten greatest public health achievements of the last hundred years**
- **Some groups including poor children, the elderly, and members of racial and ethnic minority groups are experiencing avoidable morbidity**
  - Dental caries one of most prevalent childhood chronic diseases
  - Preventable dental conditions (including caries) resulted in >800,000 ED visits in 2009

CDC. MMWR.1999;48:933-40
www.pewstates.org/uploadedFiles/PCS_Assets/2012/A%20Costly%20Dental%20Destination(1).pdf
CWF: community water fluoridation
ED: emergency department

Importance of Implementing Community-based Oral Health Interventions

- **Individual interventions insufficient**
  - Only 44.5% of all persons and 46% of Medicaid-enrolled children visit a dentist annually
- **Community interventions such as fluoridation needed to**
  - Promote better oral health of all persons
  - Reduce oral health disparities
- **Other strategies that target underserved populations include school-based dental sealant programs**
  - Dental sealants are thin plastic coatings that are applied to the back teeth to protect them from tooth decay
  - Sealants do not replace fluoride for cavity protection

Healthy People 2020 leading health indicators, available at: healthypeople.gov/2020/lhi/default.aspx

Refining and Evaluating Community-based Oral Health Interventions

- The PHS is revising its guidelines to assure that water fluoridation provides the best balance of benefits with potential harms
- Additional research and surveillance will address issues such as overall exposure to fluorides and prevalence of fluorosis

PHS: Public Health Service

Community Water Fluoridation: A Vital 21st Century Public Health Intervention

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention