The Guide to Community Preventive Services
THE COMMUNITY GUIDE
What Works to Promote Health

Preventing Dental Caries: Community Water Fluoridation (2000 Archived Review)

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Review Summary

Intervention Definition

Community water fluoridation involves adding fluoride (which prevents tooth decay) to community water sources, then adjusting and monitoring the amount of fluoride to ensure that it stays at the desired level.

Summary of Task Force Finding

The Community Preventive Services Task Force recommends community water fluoridation based on strong evidence of effectiveness in reducing tooth decay.

Results from the Systematic Reviews

Twenty-one studies qualified for review.

- Decay rates measured before and after water fluoridation: median decrease of 29.1% among children ages 4 to 17 years when compared with control groups (21 study arms).
- Decay rates measured after water fluoridation only: median decrease of 50.7% among children ages 4 to 17 years when compared with control groups (20 study arms).
- Fluoridation was found to help decrease tooth decay both in communities with varying decay rates and among children of varying socioeconomic status.

Nine studies qualified for review of the economic efficiency of community water fluoridation programs.

- Median cost per person per year for 75 water systems receiving fluoridated water: $2.70 among 19 systems serving < =5000 people to $0.40 among 35 systems serving >=20,000 people (7 studies).
- Community water fluoridation was cost saving (5 studies).
- In smaller communities (5000 to 20,000 residents), fluoridation was estimated to be cost-saving where decay incidence in the community exceeds 0.06 tooth surfaces per person annually.

These results were based on a systematic review of all available studies, conducted on behalf of the Task Force by a team of specialists in systematic review methods, and in research, practice and policy related to oral health.

Publications

Truman BI, Gooch BF, Sulemana I, et al. Reviews of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries [www.thecommunityguide.org/oral/oral-ajpm-ev-rev.pdf]. *Am J Prev Med* 2002;23(1S):21-54.

Task Force on Community Preventive Services. Recommendations on selected interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries [www.thecommunityguide.org/oral/oral-ajpm-recs.pdf]. *Am J Prev Med* 2002;23(1S):16-20.

Task Force on Community Preventive Services. Promoting oral health: interventions for preventing dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries: A Report on Recommendations of the Task Force on Community Preventive Services [www.cdc.gov/mmwr/preview/mmwrhtml/rr5021a1.htm]. *MMWR* 2001;50(RR21):1-13.

Task Force on Community Preventive Services. Oral health [www.thecommunityguide.org/oral/Oral-Health.pdf]. In: Zaza S, Briss PA, Harris KW, eds. *The Guide to Community Preventive Services: What Works to Promote Health?* Atlanta (GA): Oxford University Press;2005:304-28 (Out of Print).

Task Force Finding

Intervention Definition

Community water fluoridation (CWF) is the controlled addition of a fluoride compound to a public water supply to achieve an optimal fluoride concentration. Since 1962, the U.S. Public Health Service has recommended that community drinking waters contain 0.7 to 1.2 ppm of fluoride. In 1992, more than 144 million people in the United States (56% of the population and 62% of those receiving municipal water supplies) were being supplied with water containing enough fluoride to protect teeth from caries. In 2000, a total of 38 states and the District of Columbia provided access to fluoridated public water supplies to ≥50% of their populations. A national objective aims to ensure that at least 75% of the population will be served by community water systems providing optimal levels of fluoride by the year 2010.

Task Force Finding (October 2000)*

CWF is strongly recommended based on its effectiveness in reducing the occurrence of dental caries within communities. Other positive effects mentioned, but not systematically evaluated, include (1) reducing disparities in caries risk and experience across subgroups defined by socioeconomic status, race or ethnicity, and other predictors of caries risk; and (2) the "halo" or "diffusion" benefits to residents of nonfluoridated communities by means of exposure to processed food and beverages made from fluoridated water.

The safety of fluoride is well documented and has been reviewed comprehensively. Enamel fluorosis (visible discoloration of tooth enamel) is one of the potential adverse effects seen in children who ingest too much fluoride from any and all sources while tooth enamel is forming. Most cases of enamel fluorosis seen today are of the mildest form, which does not affect aesthetics or function. The most recent review of potential adverse effects of CWF showed no clear association between water fluoridation and incidence of mortality from bone cancers, thyroid cancer, or all cancers. Program costs of CWF are affordable. Median cost per person per year ranges from $2.70 among 19 public water systems serving ≤5000 people to $0.40 among 35 systems serving populations ≥20,000. Estimated cost-effectiveness ratios (i.e., net cost per tooth surface spared from decay) indicate that CWF is cost saving (i.e., saves money from a societal perspective and also reduces caries).

*From the following publication:

Task Force on Community Preventive Services. Recommendations on selected interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries [www.thecommunityguide.org/oral/oral-ajpm-recs.pdf]. *Am J Prev Med* 2002;23(1S):16-20.

Supporting Materials

Analytic Framework

See Figure 1 on page 24 of Truman BI, Gooch BF, Sulemana I, et al. Reviews of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries [www.thecommunityguide.org/oral/oral-ajpm-ev-rev.pdf]. *Am J Prev Med* 2002;23(1S):21-54.

Evidence Gaps

What are Evidence Gaps?

Each Community Preventive Services Task Force (Task Force) review identifies critical evidence gaps—areas where information is lacking. Evidence gaps can exist whether or not a recommendation is made. In cases when the Task Force finds insufficient evidence to determine whether an intervention strategy works, evidence gaps encourage researchers and program evaluators to conduct more effectiveness studies. When the Task Force recommends an intervention, evidence gaps highlight missing information that would help users determine if the intervention could meet their particular needs. For example, evidence may be needed to determine where the intervention will work, with which populations, how much it will cost to implement, whether it will provide adequate return on investment, or how users should structure or deliver the intervention to ensure effectiveness. Finally, evidence may be missing for outcomes different from those on which the Task Force recommendation is based.

Identified Evidence Gaps

Community water fluoridation (CWF)

Most of the evidence indicates that CWF is safe and effective in reducing dental caries in communities. However, important research questions with practical applications remain unanswered, including:

- What is the effectiveness of laws, policies, and incentives to encourage communities to start or continue water fluoridation?
- What is the effectiveness of CWF in reducing socioeconomic or racial and ethnic disparities in caries burden?
- What is the effectiveness of CWF among adults (aged >18 years)?
- What, if any, are the effects of the increasing use of bottled water and in-home water filtration systems (which may not be fluoridated or may remove fluoride, respectively) on the benefits gained through CWF?
- How effective is CWF in preventing root-surface caries?

School-based or school-linked pit and fissure sealant delivery programs

The evidence is clear and convincing that sealants delivered through schools and school-affiliated clinics are safe and effective in preventing dental caries among children. Important research questions yet to be answered include:

- What is the effect of sealant delivery programs among adults aged >18 years (e.g., military recruits)?
- How do state dental practice laws and regulations affect use of sealants in school-based programs?
- How do school district oral health policies and curricula affect use of sealants?
- What is the effectiveness of sealants in primary teeth?

Statewide or community-wide sealant promotion programs

The available evidence of the effectiveness of statewide or community-wide sealant promotion programs was insufficient to support a recommendation by the Task Force. Therefore, research in the following areas is a high priority:

- What is the effect of public education on awareness, community mobilization (through coalitions), and resource allocation for sealant promotion?
- What is the effect of professional education, combined with provider reminders and other system-oriented strategies, on knowledge, skills, and appropriate use of sealants?
- What is the effect of insurance coverage and managed care plans on access to and use of sealants?
- How cost effective are models of sealant delivery other than school based?

Ecologic Approaches Using Multiple Interventions with Many Targets of Change

Research on ecologic approaches in various settings might involve multiple interventions with many targets of change and desirable health. Estimates of effectiveness might focus on increase in knowledge, behavioral intentions, and behaviors in the short term and the desirable health outcomes mentioned above in the long term. Questions such as the following need to be answered:

- What is the effect on several oral health outcomes of community-wide interventions that combine environmental change, legislative action, policy change, and social support within families to encourage behavior change?
- What is the effect on several oral health outcomes of community development coalitions, partnerships, mass media advocacy, and social marketing?
- What is the effect on several oral health outcomes of multicomponent interventions in selected settings?

Summary Evidence Table

See Appendix B on pages 47-52 of Truman BI, Gooch BF, Sulemana I, et al. Reviews of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries [www.thecommunityguide.org/oral/oral-ajpm-ev-rev.pdf]. *Am J Prev Med* 2002;23(1S):21-54.

Included Studies

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Hawew RM, Ellwood RP, Hawley GM, Worthington HV, Blinkhorn AS. Dental caries in children from two Libyan cities with different levels of fluoride in their drinking water. *Community Dent Health* 1996;13:175–7.

Kalsbeek H, Kwant GW, Groeneveld A, Dirks OB, van Eck AA, Theuns HM. Caries experience of 15-year-old children in The Netherlands after discontinuation of water fluoridation. *Caries Res* 1993;27:201–5.

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Slade GD, Spencer AJ, Davies MJ, Stewart JF. Influence of exposure to fluoridated water on socioeconomic inequalities in children's caries experience. *Community Dent Oral Epidemiol* 1996;24:89–100.

Tsutsui A, Yagi M, Horowitz AM. The prevalence of dental caries and fluorosis in Japanese communities with up to 1.4 ppm of naturally occurring fluoride. *J Public Health Dent* 2000;60:147–53.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. Task Force evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

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