Finding #3 – Costs and Benefits, Including the Distribution of Costs and Benefits

Cost-Effectiveness of Community Water Fluoridation

Economic analyses conducted before the mid-1980s found that the value of dental decay averted by community water fluoridation exceeded the cost to fluoridate community water supplies by as much as 8:1 (Davies, 1973; Nelson & Swint, 1976; Niessen & Douglass, 1984; White, Antczak-Bouckoms, & Weinstein, 1989). However, since the 1970s, a number of factors have given rise to questions about the possible reduced effectiveness and cost-effectiveness of community water fluoridation (Lewis & Banting, 1994). First, as noted in Finding #1, the widespread use of discretionary fluorides and the increased levels of fluoride in processed foods and beverages has led to smaller differences in the mean exposure to topical and systemic fluorides between fluoridated and nonfluoridated communities. Second, there has been a related decrease in the overall level of caries in the U.S. and many other developed countries, whether water supplies are fluoridated or not (Committee to Coordinate Environmental Health and Related Programs, USPHS [USPHS], 1991, p. 31). Finally, there has been an increase in the prevalence of dental fluorosis in both fluoridated and nonfluoridated communities (see Finding #2). The general reduction in caries and increase in dental fluorosis raises the question of whether it is still clinically and economically justified to replace existing fluoridation equipment and continue to fluoridate water supplies in Fort Collins.

Literature Review

The Fluoride Technical Study Group (FTSG) conducted a *Medline*, Internet, and secondary reference search for economic analyses of community water fluoridation published since the dramatic drop in caries prevalence that was documented by national survey data up through the mid-1980s. Criteria for inclusion of articles for review were:

1. the study included an assessment of community water fluoridation,
2. there was a comparison between cost and consequences, and
3. the study was published in English in a peer-reviewed journal between 1989 and 2002.

We defined an ideal economic analysis by the following criteria: the analysis took a societal perspective; it was based on a synthesis of U.S. incidence and effectiveness data from the 1980s or later from several sources; it included costing, which allowed for estimation of resources used; it used a long enough time horizon to capture all the effects of fluoridation; it specified a discount rate[1]; and it included multi-way sensitivity analyses[2] to assess uncertainties.

The FTSG identified two U.S.-based cost-effectiveness analyses of community water fluoridation published between 1989 and 2001 (Appendix 3, Table 1). Several cost-effectiveness analyses from other industrialized countries were also identified: two 1990 studies using data from the UK, a 1993 unpublished report from the UK and a report from New Zealand published in 2001 (Appendix 3, Table 2). The two U.S. studies, the report from NZ and a UK study estimated the cost of community water fluoridation per averted single surface restoration; two UK studies used tooth-level caries data. Two additional foreign studies that addressed the effectiveness of community water fluoridation in light of the general reduction in caries prevalence in Ireland and Scotland are included in Appendix 3, Table 2.

[1] A measure of people's preference for money and health now rather than in the future.

[2] "A method to determine the robustness of an assessment by examining the extent to which results are affected by changes in methods, values of variables, or assumptions" (Last, 1995).

In general, all cost-effectiveness analyses reviewed were based on evidence that community water fluoridation is effective in preventing or reducing cavities and that there are no treatment costs attributable to any adverse health effects associated with the practice. The analyses assumed that caries would increase if community water fluoridation were ceased.

Analyses that accounted for estimated treatment savings found that for all but the smallest communities, community water fluoridation remained cost-saving under a wide range of reasonable assumptions regarding baseline caries risk and the effectiveness of community water fluoridation (Birch 1990; Griffin, Jones, & Tomar 2001; Wright, Bates, Cutress, & Lee, 2001). The study which best met criteria for validity both in terms of study quality and applicability to our local situation was the 2001 report by Griffin et al. of the Centers for Disease Control and Prevention (CDC). They estimated per capita cost savings each year from community water fluoridation in larger communities from $3.52 to $33.71 in 1995 U.S. dollars, depending on baseline caries risk and estimated effectiveness of water fluoridation (Griffin, Jones & Tomar, 2001).

Estimation of Local Cost-Effectiveness Ratio

The cost per unit health benefit produced from water fluoridation can vary by at least a factor of four according to the underlying level of caries risk in the community, and by a factor of ten depending on the size of the community served by the distribution system (Birch, 1990). Therefore, local estimates of these parameters are important. Since there are no local data on baseline caries incidence, the FTSG asked researchers at the CDC to provide the group with regional estimates from the most recent national survey of oral health (the National Institute of Dental Research [NIDR] National Survey of the Oral Health of U.S. School Children, 1986-87), adjusted by estimates of the reduction in caries incidence that might have occurred since then.

The total costs of community water fluoridation are the direct and indirect costs of fluoridating our water minus the estimated treatment savings secondary to the fluoridation program (White et al., 1989). The total direct cost of fluoridating the Fort Collins community water supply has remained fairly constant at less than a dollar per capita per year since current facilities were constructed in 1993 (Kevin Gertig, City of Fort Collins Water Department). The annual operating cost (materials, operating costs and maintenance), estimated to be $57,500 in 2001, has averaged $0.52 per capita and has ranged from $0.41-$0.65 per capita (adjusted to 2000 dollars) since 1995. These costs are similar to published cost estimates from other large facilities (Ringelberg, Allen, & Brown, 1992). Given the estimated capital cost of $500,000 for proposed new equipment with a total useful life of at least 15-20 years, the total annuitized per capita cost is $0.21-$0.28. Assuming stable annual chemical, operating and maintenance costs per capita, a mean population of 120,000 over the next 15 years and a useful life of 15 years, the total cost of continuing fluoridation will be $0.96 per capita per year through 2023. Applying a discount rate of 4% and estimating opportunity cost of the capital investment at 4% compounding interest, the average present value of per capita costs is $0.76 in 2000 dollars.

Drs. Griffin et al. using our projections of local fluoridation costs, calculated mean decay increments from the most recent national survey of school children in Region V (Texas, Oklahoma, New Mexico, and Colorado) and calculated cost-benefit estimates according to the analysis of Griffin et al. 2001. Adjusting for inflation and the 2000 population age distribution of Fort Collins, the estimated net costs per capita per year if community water fluoridation were discontinued were estimated to be $4.25[3]. To account for uncertainties regarding the estimates of local caries rates from regional survey data collected over a decade ago, Griffin conducted a sensitivity analysis using least and most favorable estimates of caries increment and fluoridation effectiveness. Applying these estimates, averted cost savings could be as little as $3.22 per person per year and as high as $10.31 per person per year if Fort Collins suspends water fluoridation. (See Appendix 3, Table 1 for complete report.)

[3] Adjusted to the 2000 CPI-dental for U.S. cities.

Griffin writes:

> "Community water fluoridation actually saves Fort Collins money. Fort Collins has approximately 100,968 residents who benefit from community water fluoridation.[4] Using data on caries increment from Region V of the National Survey of the Oral Health of U.S. School Children [2] and cost data specific to Ft. Collins, the annual cost savings per person from community water fluoridation equals $4.25 (year 2000 US$). Thus after netting out the amortized capital costs as well as annual operating expenses, the annual cost savings to the Fort Collins community attributable to community water fluoridation would be approximately $429,000 (2000 US$). Because we did not have caries data specific to Ft. Collins we allowed caries increment to vary between the 1986-1987 estimates for the U.S. adjusted for the secular decline in caries (best-case scenario) and the 1986-1987 Region V estimates adjusted for the secular decline in caries (worst-case scenario). Our findings suggest that the annual cost savings to the Ft. Collins community could vary from $325,000 to $1,041,000" (Griffin, personal communication, July 3, 2002).

Approximately half of these costs would be personal out of pocket costs (Centers for Disease Control and Prevention [CDC], 2001b, p. 21). Of the remainder, a portion would be subsidized through local, state and federal taxes funneled through Medicaid, Child Health Plan Plus, and the Health District dental program.

Some local data exist to evaluate the impact of community water fluoridation on costs of publicly subsidized dental care. The Colorado Department of Public Health and Environment (CDPHE) Oral Health recently asked state Medicaid to compare the mean annual cost of all professional dental services for Medicaid eligible children in Larimer County (the large majority of eligibles live in fluoridated Loveland and Fort Collins) with those in nonfluoridated Logan County in 2001 (personal communication, Brunson, June 25, 2002). The goal was to replicate a study from Louisiana published in the Center for Disease Control's (CDC) *Morbidity and Mortality Weekly Report* (Water fluoridation and costs of Medicaid treatment for dental decay - Louisiana, 1995-6. CDC, 1999).

The sample was all Medicaid enrolled children in 2001. They found that 1) only 24% of all children eligible for Medicaid at any time during the year received any dental services during the year in either county, and 2) that the average annual cost of dental services per child receiving any dental care was 20% higher in nonfluoridated Logan County ($396 per child) than in mostly fluoridated Larimer County ($329 per child). The weakness in this assessment is that all services were included (not just caries treatment) and all children were included, not just those with lifetime residence. Both of these factors would tend to attenuate the apparent effect of increased caries incidence and treatment. The difference in cost on a per child basis was $67, a cost that is borne by taxpayers.

The assumptions of the Griffin et al. model are as follows:

- Cost savings applies to permanent teeth only.
- All decay is eventually treated.
- Benefits of community water fluoridation are topical and post-eruptive (i.e., start at age six for permanent teeth).
- Benefit is constant, non-cumulative and accrues only to community residents.
- Costs and benefits are discounted at 4%.
- The discounted cost of treating decay in the future is no less than the cost of treating it when it appears.

[4] According to the 2000 Census Fort Collins had 100,968 residents, aged 6 to 64 years. According to Griffin [1] water fluoridation has been shown to be effective in reducing tooth decay in the permanent dentition of individuals, aged 6 to 64 years.

- Simple amalgam fillings will always be used and require replacement with single surface fillings every 12 years until age 65. Potentially costlier treatments (composite fillings, root canals, crowns, bridges) and related treatments (i.e., for periodontal disease related to fillings) are not included.
- Dental fees are the same as the cost of resources to provide the services ($54 for single surface amalgam filling).
- Productivity costs averted were limited to one hour at average hourly wage ($18) for filling a cavity.
- Costs due to adverse effects of community water fluoridation are negligible.
- Fluoride from sources other than toothpaste and community water fluoridation are controlled for.
- The population of 6-64 year olds will remain fixed at 2000 levels.
- Suspending water fluoridation increases caries rates by the percentage equal to the relative difference in mean caries rates between fluoridated and nonfluoridated communities (adjusted for estimated decline in caries since then) according to the 1986-87 NIDR National Survey of the Oral Health of U.S. School Children.

Most of these assumptions would tend to under-estimate the potential costs of suspending fluoridation. For instance, fluoridation is believed to reduce caries in primary (baby) as well as permanent teeth, (and has been found to be effective in reducing root caries, an increasing problem for seniors (CDC, 2001b, p. 11). Weakening of tooth structure from accumulated treated caries, a problem that often leads to more expensive restorations or extractions and loss of function, is not accounted for in this analysis. Because of the "halo effect," fluoridation of Fort Collins water may also benefit those outside the community who ingest foods and beverages processed with city water. Griffin, Gooch, Lockwood and Tomar (2001) have shown that those living in nonfluoridated communities in regions where water fluoridation is widespread experience substantial caries reductions. Finally, the non-monetized benefits of an averted decayed surface—i.e., the pain and dysfunction that accompanies active untreated decay—might make fluoridation worthwhile even if there were no net savings to the program.

Uncertainties Regarding Cost-Effectiveness of Water Fluoridation

Several assumptions used in published cost-effectiveness analyses could, if incorrect, lead to over-estimations of cost-savings. First, costs of potential adverse effects of water fluoridation are assumed to be negligible. The only adverse health effect (presently known) for which there is greater than very low risk is enamel fluorosis. None of the cost-effectiveness analyses reviewed estimated costs of enamel fluorosis. While fluorosis is thought to be caused primarily by the early use or over use of fluoridated toothpaste and the inappropriate use of fluoride supplements, absolute levels of enamel fluorosis, mostly of the very mild-to-mild form, are still higher in communities with fluoridated water. Using McDonagh et al. (2000) estimate of the prevalence of fluorosis of aesthetic concern (12.5%) and Lewis and Banting's (1994) estimate of attributable fraction (39%) (see Finding #2), nearly 5% (12.5% X 39%) of lifetime residents in a fluoridated community will have enamel fluorosis attributable to water fluoridation that may be of aesthetic concern. Some people (generally those with moderate to severe mottling involving the anterior teeth) choose to modify this condition with elective treatment. The definitive treatment for moderate enamel fluorosis of aesthetic concern and severe fluorosis is application of a porcelain veneer or porcelain to metal crown (median charge $662 and $875 per tooth, respectively). Because the treatment is elective, and the "need" subjective, it would be difficult to estimate the number of people who would choose such treatment nor are estimates available of the number who currently receive it. Furthermore, it is uncertain whether or not levels of fluorosis of aesthetic concern decrease when a community stops fluoridating. Even if these treatment costs could be estimated, they do not include intangibles such as reduced self-esteem. Based on these concerns, the FTSG concluded that not considering the costs of enamel fluorosis might lead to over-estimation of the cost-savings of water fluoridation.

As noted in Finding #2, the FTSG did not find conclusive evidence of any other adverse effects of optimally fluoridated water, but identified some gaps in knowledge (see Finding#2). If increased risk of

bone fractures, cancers or other adverse health effects were in fact real, they would have a substantial impact on the cost effectiveness of water fluoridation.

Also, if baseline caries risk in Fort Collins is substantially lower than the conservative estimates used in this analysis (see Appendix 3), and if the diffusion effect of foods and beverages shipped in from fluoridated areas sufficiently buffers the loss of drinking water fluoride, the net expense of suspending fluoridation will be lower (at least from the perspective of the Fort Collins community).

Cost savings were calculated based on the use of hydrofluorosilicic acid (HFS), which is commonly used in community water fluoridation. However, questions have been raised by some members of the public about the safety of using this material, and they have requested that sodium fluoride be used instead. If the calculation were performed incorporating the higher cost of using sodium fluoride, the cost savings would be less.

Finally, using results of the Griffin analysis to estimate the net cost of suspending water fluoridation in the City of Fort Collins also presumes that changes in the behavior of dentists or consumers of dental products will not result and that caries levels will increase. In fact, as discussed in Finding #1, behaviors may change and caries levels may not increase. Some studies have found indications of increased use of preventive dentistry and use of alternative sources of fluoride in fluoridation-ended communities (Maupome, Clark, Levy, & Berkowitz, 2001; Kunzel, Fischer, Lorenz, & Bruhmann, 2000; Kunzel & Fischer, 1997). To the extent that these less cost-effective approaches are being substituted for a more cost-effective approach, caries rates may increase less than the analysis predicts, but net costs are likely to be higher.

Distributional Effects of Community Water Fluoridation

Because the Fort Collins Water Utility is operated as an enterprise fund, all costs—both operating and capital costs—are borne by customers of the Water Utility in proportion to the amount of domestic water used. The benefits are distributed to all those who live and drink water in the community, as well as those who ingest foods and beverages produced with community water. Fluoride modalities may be most effective and therefore cost-effective for persons at highest risk for caries. The risk factors for caries include (CDC, 2001b, p. 5):

- lower socio-economic status,
- lower levels of parent education,
- those without access to or who do not seek dental care, and
- individual factors.*

Numerous studies in the U.S. and elsewhere have found that the distribution of caries in a community is skewed, with caries experienced much higher among children and adults in lower socioeconomic strata (SES) than those in higher SES groups (CDC, 2001b, p. 5; CDC, 2001a, p. 2)

> "Eighty percent of dental caries identified in permanent teeth of children aged 5-17 years in the United States occur in 25% of children (4,6,7). Lower-income, Mexican American and African-American children and adults have more untreated decayed teeth than their higher-income or non-Hispanic white counterparts (4,5,8,9). Among low-income children, approximately one third have untreated caries in primary teeth that could be associated with pain, difficulty in eating, and underweight (9)" (CDC, 2001a).

(4, 5, 6, 7, 8, 9) References within a quote are available in the source document.

* Active caries, history of caries in siblings or care-givers, gingival recession, high levels of cariogenic bacteria, impaired ability to maintain oral hygiene, malformed enamel or dentin, decreased salivary flow, radiation treatment, low salivary buffering capacity, space maintainers/oral appliances or dental prostheses and consumption of refined sugars.

The reasons for this discrepancy are probably multifactorial. Many factors can contribute to high rates of caries in low-income populations:

> "Low indices of socioeconomic status (SES) have been associated with elevations in caries, although the extent to which this indicator may simply reflect previous correlates is unknown. Low SES is also associated with reduced access to care, reduced oral health aspirations, low self-efficacy, and health behaviors that may enhance caries risk" (National Institute of Health, Office of the Director, Consensus Statement [NIH], 2001, p. 12).

All "Tier One" references that addressed the issue of the impact of community water fluoridation on different socioeconomic groups observed that lower SES groups would be more likely to benefit from community water fluoridation, thereby reducing the disparity in oral health and increasing equity (CDC, 2001b, p. 11; USPHS, p. 28; NHS Centre for Reviews and Dissemination, University of York, 2000, p. 33; Spencer, Slade, & Davies 1996; Locker, 1999, p. 4).

However, the recent systematic review conducted by the University of York for the British National Health Service found the quality and quantity of evidence addressing this issue to be lacking. As reviewed by Medical Research Council of Great Britain:

> "The York Review concluded that there appears to be evidence that water fluoridation reduces the inequalities of dental health across the social classes in five and twelve year olds using the dmft/DMFT measure. This effect was not seen in the proportion of caries free children among five-year olds; the data on caries prevalence in children of other ages also did not demonstrate an effect. The review suggested caution in interpreting these results because of the small quality of studies, differences between the studies, and their low quality rating" (Medical Research Council, 2002, p. 21).

Effectiveness and Cost-Effectiveness of Other Fluoride Modalities Relative to Community Water Fluoridation

Laboratory research suggests that maintenance of constant low levels of fluoride in the oral cavity is most effective at reducing caries (World Health Organization [WHO] 1994, p. 1). The WHO Expert Committee on Oral Health Status and Fluoride Use concluded that the goal of a community-based caries prevention program should be to "…implement the most appropriate means of maintaining a constant low level of fluoride in as many mouths as possible" (WHO, 1994 p. 1). One of the key advantages cited by public health authorities for water fluoridation, when compared to other possible strategies for delivering fluoride to the oral cavity, is that it does not require behavioral changes from its recipients, and that those most likely to benefit from it will do so (CDC, 2001b, p. 11). Both the WHO committee and the CDC's Fluoride Recommendations Work Group found that, provided a community had a piped water supply, community water fluoridation is the most effective method of reaching the whole population.

There are, however, a wide variety of other methods to deliver fluoride to the oral cavity. To the extent that they supply frequent low-level exposures of fluoride to the mouth, they will yield similar caries reductions (see Appendix 3, Table 3). However they differ in their applicability to community-based interventions, in the degree to which they depend on individual behavior changes, in how logistically difficult it is to target them to needy members of the community and in their cost (see Appendix 3, Table 3).

School-based water fluoridation systems and classroom mouth rinse programs are amenable to a community-based approach and have been shown to be effective, but the former are logistically difficult and neither of these approaches benefits adults. Costs of school water fluoridation range from $1 to $14 per student/year (CDC, 2001b, p. 23). The expense of mouth rinse programs comes not from the materials but from the weekly or monthly supervision that is required. Risks of fluorosis in school-based programs

would be expected to be low since children 6 years and older are generally past the age of fluorosis susceptibility (CDC, 2001b, pp. 12 & 16). In several European countries, fluoridated salt (analogous to iodized salt) is widely available as a caries reducing agent (WHO, 1994, pp. 20-21). Because it is not available in the U.S., it is not a feasible option in our community.

Fluoride toothpaste has been shown in high quality studies to be safe, effective and inexpensive in older children and adults at reducing caries, but has been found to be an important cause of enamel fluorosis in young children due to inadvertent swallowing. According to the CDC, "Children who begin using fluoride toothpaste at age <2 years are at higher risk for enamel fluorosis than children who begin later or who do not use fluoride toothpaste at all" (CDC, 2001b, p. 14).

Dietary fluoride supplements (tablets, lozenges, liquids) have been used for caries prevention since the 1940s, but the evidence for their effectiveness is mixed (CDC, 2001b, p. 16; WHO, 1994, p. 23). Supplements are designed to be used in settings of fluoride-deficient drinking water, but studies have found their use in fluoridated communities to be common—7% to 35% in studies reviewed by the Fluoride Recommendations Work Group (CDC, 2001b, p. 16). There is good evidence for the association between use of supplements and the development of enamel fluorosis (see Finding #2). Fluoride supplements are inexpensive but they require a prescription and the dosage schedule is complex, particularly for parents with children of different ages (WHO, 1994, p. 24).

Professionally applied fluoride compounds include gels, foams, and varnishes. They have an effectiveness similar to that of community water fluoridation and the risk for fluorosis is reported to be low (CDC, 2001b, pp. 17-18). They require professional application at six-month intervals and therefore are the least cost-effective method of delivery. Pit and fissure sealants have also been shown to be effective as long as the sealants are maintained (see Appendix 3, Table 4) (NIH, 2001, p. 15). Sealants and fluoride modalities are complementary approaches to caries prevention, since topical fluoride is less effective at preventing caries on the pit and fissure surfaces than on the smooth surfaces of teeth.

There is very little data on the relative cost-effectiveness of these other methods of caries prevention. Recently, the Fluoride Recommendations Work Group compared what is known of the effectiveness and cost-effectiveness of the various methods of fluoride delivery (CDC, 2001b, pp. 21-24). The results are summarized in the second column of Table 3 in Appendix 3. The costs of the fluoride material alone are higher for toothpaste, mouth rinse, supplements and professionally applied compounds than the entire per capita cost of community water fluoridation. To those material costs one must add the costs of promoting the health behavior. Kay and Locker (1998) conducted a systematic review of the effectiveness of health promotion programs aimed at oral health. They reported that there are no established cost-effective methods for reliably bringing about the personal use of fluoride. Oral health promotion delivered at the dentist's office was most effective, but was most expensive. According to this review, school-based brushing programs and mass media programs have not been shown to be effective (Kay & Locker, 1998). School-based sealant delivery programs, were found to be effective and were "strongly recommended" by the Task Force on Community Preventive Services (CDC, 2001a, p. 9). Under some circumstances, these programs may be cost-saving (Zabos et al., 2002).

Considering the effectiveness and costs of the various modalities discussed above, the CDC expert panel recommended community water fluoridation in all areas of the U.S. and fluoride toothpaste, used as directed, for all persons. Other fluoride modalities were recommended only for certain high-risk individuals and only after consultation with their dentist or health care provider (CDC, 2001b, pp. 26-27). To meet the public health challenge presented by dental caries, the U.S. Department of Health and Human Services outlined the goals for community water fluoridation as part of the Healthy People 2000 and 2010. These national health goals include objectives to increase national baseline fluoridation level to 75% of the U.S. population served by community water systems from the 1989 and 1992 levels of 61 and 62% (CDC, 2002 p.144.) The Centers for Disease Control and Prevention states, "Fluoridation of the

public water supply is the most equitable, cost-effective, and cost-saving method of delivering fluoride to the community" (CDC, 2002, p. 144).

Other effective caries modalities are in current use in other countries to prevent caries. Examples include fluoridated salt (France, Germany, Switzerland, and others), fluoridated milk, and use of xylitol-containing chewing gum (Hayes, 2001). Fluoridated salt and milk are not available in the U.S. Xylitol-containing gum is available in the U.S. and regular use has been shown in one study in Finland to be similar in cost and effectiveness to school-based sealant programs in that country (Alanene, Holsti, & Pienihakkinen, 2000). However, cost-effectiveness data are not available for the U.S., thus its application as a public health strategy is unclear.

FINDINGS: Costs and Benefits

The research indicates that the public health goal of a reduction in the incidence of caries is better achieved through community water fluoridation than through individual approaches. It requires minimal behavioral changes compared to alternative delivery methods. It is effective in reaching people in all socioeconomic strata.

The FTSG finds that, even in the current situation of widespread use of fluoride toothpaste and lower baseline caries risk, it is likely that community water fluoridation remains effective and cost saving at preventing dental caries. Based on best available evidence, suspending fluoridation of water in Fort Collins would yield a net increase in costs of preventing and treating caries approximately $4.25 per person per year (range $3.22 - $10.31.) The burden of caries is disproportionately borne by those with lower socio-economic status. There is some evidence that water fluoridation reduces this inequality in oral health.

Not considering the costs of enamel fluorosis or other potential adverse health effects may have led to an over-estimation of the cost-savings of water fluoridation in Fort Collins. The magnitude of the costs of adverse effects is likely to fall well below the estimated net savings.

In summary, this cost analysis assumes that there is a significant benefit from community water fluoridation in preventing caries and potential adverse health effects are not significant. The analysis also assumes that the city will continue using current fluoride additives (hydrofluorosilicic acid). Using this set of assumptions, there appears to be a net cost benefit to community water fluoridation. If any of these assumptions are not valid the cost-benefit picture could change significantly.

The FTSG did not review any study or measure that will achieve the same levels of prevention as water fluoridation for the same resources.

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