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**Costs and Savings Associated
with
Community Water Fluoridation
in the
United States**

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Study Goal



In 2001 CDC published a seminal study on costs and savings associated with community water fluoridation programs (CWFP) in the U.S.

Study Goal: Update these findings using updated

1. Caries increment

2. Community water fluoridation cost estimates

3. Treatment cost estimates

and that considered methods and limitations of recent studies

Table 1. Population fluoridation status for persons with access to community water systems and estimated fluoridation costs in 2013.

Water system size: Number of persons served	Distribution of persons by water system fluoridation size			Estimated fluoridation cost, average per person
	Fluoridated communities	Unfluoridated communities	All communities	
	Percent	Percent	Percent	
Group 1 - 1,000-4,999	5.7%	15.9%	8.4%	\$11.52
Group 2 - 5,000-19,999	13.0%	20.6%	15.1%	\$3.16
Group 3 - 20,000-99,999	26.2%	32.3%	27.9%	\$0.89
Group 4 - 100,000+	55.1%	31.2%	48.6%	\$0.43
All communities > 1,000	100.0%	100.0%	100.0%	
Number of persons (millions)	211.0	78.2	289.2	
Percent of persons (row)	73.0%	27.0%	100.0%	

In 2014, 74.4% of the U.S. population on community water systems had access to fluoridated water.

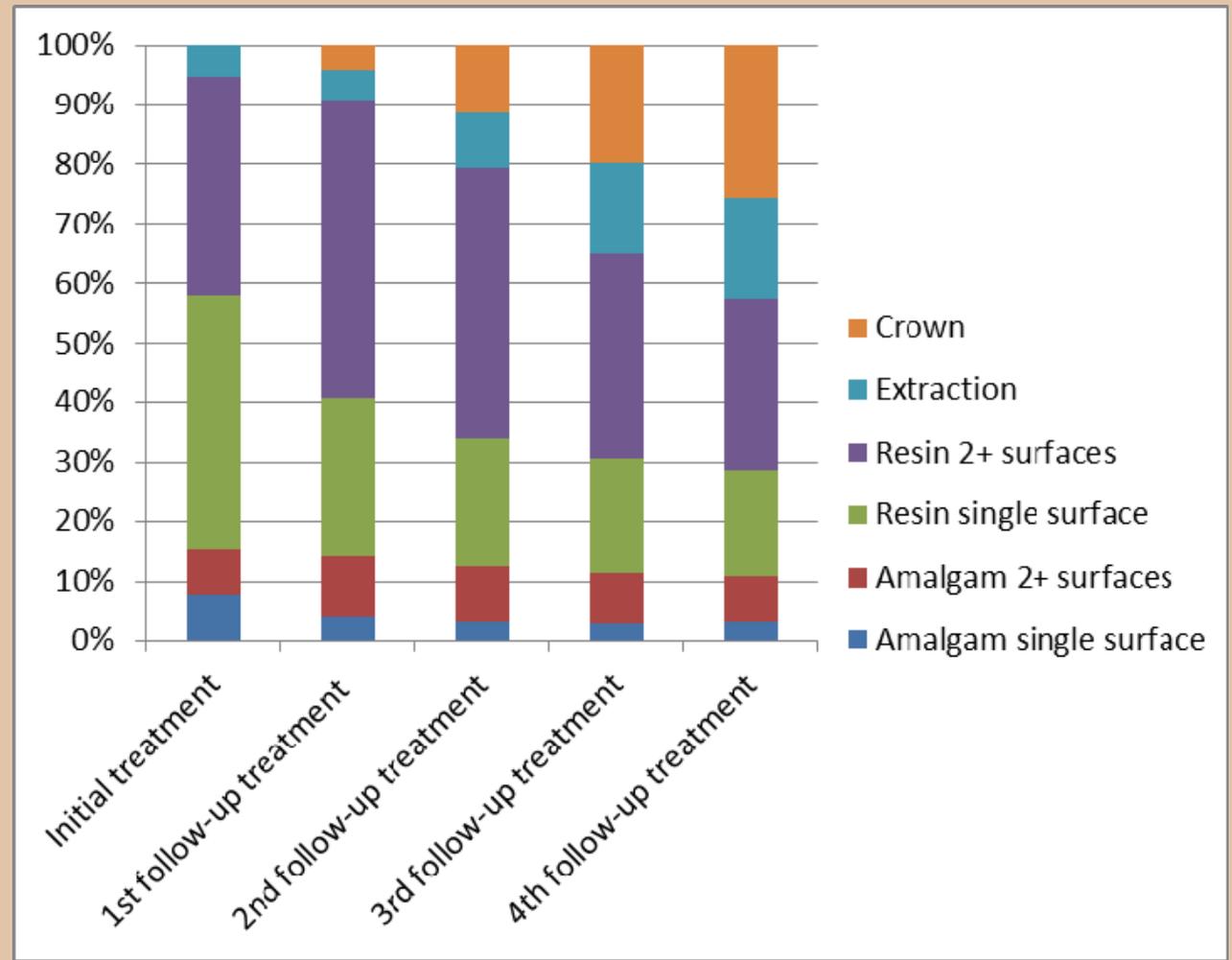
Table 2. Estimated 2013 caries increments for primary and permanent teeth from 3 waves of the National Health and Nutrition Examination Survey

Estimated caries increment: annual incidence decayed and filled teeth	
Primary teeth: decayed & filled teeth	
Age 1-8 years	0.465
Permanent teeth, coronal caries	
Age 1-5 years	0.159
Age 6-17 years	0.308
Age 18-34 years	0.204
Age 35-64 years	0.113
Age \geq 65 years	0.060
Permanent teeth, root caries	
Age \geq 35 years	0.025

Base model: Estimated community water fluoridation effectiveness at reducing caries: 25%

Figure 1. Estimated distributions of initial and follow-up treatments for permanent teeth in 2013.

Treatment distributions were derived from those of persons with private dental coverage in 2013.



Analysis



- A Markov model was used to estimate CWFP costs, savings, net savings, and return on investment for the 2013 US population with access to CWFPs that served 1,000 or more people.
- Probabilistic sensitivity analyses were conducted using Monte Carlo simulations. We report resulting means and 90 percent uncertainty intervals (UIs) based on the fifth- and ninety-fifth-percentile values.
- The robustness of results to selected model input parameters (for example CWFP effectiveness, fluoride level) was assessed by conducting simulations using alternative parameter estimates.
- We attempted to use conservative estimates when possible.

Community water fluoridation programs (CWFP): 2013 Key Findings



Base Model: Water systems with CWFP in 2013

- CWFP savings associated with dental caries averted:
\$32.19 per capita
- Estimates CWFP costs: \$324 million
- Estimated CWFP net savings: \$6.5 billion
- Estimated CWFP return on investment
(net savings/costs): 20.0 (uncertainty interval 15.5 – 26.2)

Base Model: Water systems without CWFP in 2013

- Estimated savings if implemented CWFP: \$2.5 billion

Study Limitations



Limitations include:

1. Water fluoridation costs were from a convenience sample.
2. We excluded costs associated with providing CWFP information to inform CWFP-related policy decisions.
3. Estimated caries increments were from cross sectional data.
4. We did not adjust estimated savings for adverse effects of water fluoridation (dental fluorosis) based on reviews of existing evidence. We assumed costs associated with nonsevere fluorosis would not have had a meaningful influence on the findings.
5. In 2015 the Public Health Service updated its recommendation that community water systems fluoridate to 0.7 mg/L. While we were able to estimate the influence of this change on fluoride chemical costs, because of the timing of this change we were not able to include other influences.

Concluding Remarks



1. Savings attributable to community water fluoridation programs far exceeded estimated program costs under varying assumptions. This held true for all four sizes of water systems.
2. The estimated CWFP return on investment averaged 20.0 across all sizes of water systems.
3. Costs to maintain or implement community water fluoridation programs vary. Instead of using this study's estimated return on investment, communities could inform their policy decisions by identifying their specific annual costs and comparing those costs to our annual estimated per capita savings (\$32.19) in averted treatment costs.

References and Funding



Study findings: Health Affairs, December 2016 (Volume 35, 12)

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