Costs and savings associated with community water fluoridation programs in Colorado

O'Connell J M, Brunson D, Anselmo T, Sullivan P W

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The objective was to assess the economic and clinical impact of community water fluoridation programmes (CWFP) for the prevention of dental decay, versus no fluoridation programme or naturally high fluoride levels. The authors concluded that the benefits of the implementation of CWFP led to substantial cost-savings from the perspective of society. The study methodology was well reported and described. The extensive use of valid sources and sensitivity analyses enhances the validity of the authors' conclusions.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to assess the economic and clinical impact of community water fluoridation programme (CWFP)s for the prevention of dental decay, compared with no fluoridation programme or naturally high fluoride levels. This study adapted a previous comprehensive economic evaluation of water fluoridation programmes.

Interventions
A CWFP consisted of the adjustment of fluoride levels in public drinking water systems for the prevention of dental decay. These levels range from 0.7 parts per million (ppm) to 1.2ppm.

Location/setting
USA/community.

Methods
Analytical approach:
This economic evaluation modified a previous study in order to assess the costs and benefits (in terms of future savings) of CWFPs versus no CWFP. A lifetime horizon appears to have been considered and the authors stated that a societal perspective was adopted.

Effectiveness data:
The data were derived from multiple selected sources. One of the key sources was the Water Fluoride Reporting System for 172 public water systems in Colorado which served populations of 1,000 or more in 2004. This source included 61 systems with CWFPs and 111 systems without a CWFP, with water fluoridation recommended in 52 of these. Some data were derived from the Colorado Department of Public Health and Environment. The clinical data on tooth decay without fluoridation were obtained from the previous economic evaluation, a meta-analysis, and other national studies. Similarly, the effectiveness of CWFPs, which was the key clinical parameter, was obtained from published US studies and US surveys.

Monetary benefit and utility valuations:
None.

Measure of benefit:
The benefit measure was the percentage reduction in tooth decay associated with CWFPs. However, this measure was not combined with costs. In effect, a cost-consequences analysis appears to have been performed.

Cost data:
The analysis included the costs associated with the implementation of the CWFP, the lifetime costs of treatment (supplying and maintaining an installation), and the lifetime cost-savings associated with the averted decay attributable to CWFP. These estimates also included patient and time costs. CWFP costs were derived from a published study that included both one-time fixed costs and annual operating costs for communities in Florida. A breakdown of cost items for these two macro-categories was provided. Most data on lifetime costs and resource use were derived from the previous economic evaluation. Other sources of data were reported. Future costs and savings were discounted at an annual rate of 3%. The price year was 2003 and the costs were in US dollars ($).

Analysis of uncertainty:
The issue of uncertainty was addressed by means of both a deterministic univariate and a probabilistic sensitivity analysis. In the former, all model inputs were varied by plus or minus 15% from their baseline value, while the latter approach was based on a second-order Monte Carlo simulation that allowed CWFP costs and effectiveness, decay increment, dental fees, and patient-time costs to vary simultaneously. Alternative scenarios were also considered.

Results
CWFPs reduced the decay increment by approximately 25%.

The implementation of a CWFP led to annual savings of $148.9 million (credible range, CR: $115.1 million, $187.2 million) in 2003 or an average of $60.78 per person (CR: $46.97, $76.41). Colorado could save an additional $46.6 million (CR: $36.0 million to $58.6 million) annually by introducing a CWFP in the 52 water systems without a CWFP for which fluoridation was recommended.

The univariate sensitivity analysis showed that a CWFP net savings were most sensitive to changes in the baseline estimates for the CWFP effectiveness. However, in all cases, the cost of the programmes was more than offset by the reduction in future costs associated with treatment of dental decay.

Authors’ conclusions
The authors concluded that the implementation of a CWFP led to substantial cost-savings from the perspective of society.

CRD commentary
Interventions:
The selection of the interventions under examination was appropriate as no CWFP represents a valid comparator in several settings.

Effectiveness/benefits:
The sources used to derive the clinical data were mainly national databases, which reflected the real-world experience of systems with or without water fluoridation. Thus, they represent valid sources of data. These data were used to calculate the net-savings of the programme. The summary benefit measure, which represents an intermediate endpoint of the programme, was not combined with costs. The authors noted that the estimation of treatment effectiveness was based on uncertain assumptions, thus a conservative approach was used.

Costs:
The authors stated that a societal viewpoint was adopted. Nevertheless, productivity losses associated with disease-related morbidity were not considered, although they may have been relevant. The cost categories were reported and described. Furthermore, the authors provided clear details of cost calculations. The sources of costs were stated. Other details of the analysis such as the price year and the use of discounting were reported.

Analysis and results:
Costs and benefits were not synthesised as only total costs were calculated. The sensitivity analysis addressed the key areas of uncertainty, which were extensively explored. The analysis was generally focused on the economic data. The authors noted some limitations of the analysis such as the fact that CWFPs used different types of fluoride compounds. The model assumptions were mainly derived from cross-sectional data, which may not be the best source of evidence.
Concluding remarks:
The study methodology was well reported and described. The extensive use of valid sources and sensitivity analyses enhances the validity of the authors’ conclusions.

Funding
Not stated.

Bibliographic details

PubMedID
16263039

Original Paper URL
http://www.cdc.gov/pcd/issues/2005/nov/05_0082.htm

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Colorado; Cost Savings /economics; Dental Caries /prevention & control /therapy; Dental Restoration, Permanent /economics; Fluoridation /economics; Health Care Costs; Humans; Models, Economic; Monte Carlo Method; Residence Characteristics

AccessionNumber
22006006544

Date bibliographic record published
02/10/2006

Date abstract record published
02/03/2009