

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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The Economics of Fluoridation

A compilation of excerpts from a number of articles and reports which show the value of fluoridation in saving teeth, dollars, and dental manpower is enclosed.

We shall be interested in adding to this compilation from time to time and will welcome any additional studies or reports from you which contain specific information on savings in dollars and dental manpower.

Division of Dental Health
Preventive Practices Branch
9000 Rockville Pike
Bethesda, Maryland 20014

Enclosure

FLUORIDATION SAVES TEETH, DOLLARS, AND DENTAL MANPOWER

Twenty-five years of experience have conclusively demonstrated that adjusted fluoridation of public water supplies prevents up to two-thirds of tooth decay in children. Where fluoridation has been in effect, dentists have more time to provide more care for more people, and the cost-per-patient of dental health care programs for children is dramatically reduced. The following information provides examples of the effectiveness of fluoridation in saving teeth, saving dollars, and saving dental manpower.

Cross, Charles O. (President, Southwest Administrators, Los Angeles, California): "The economics of fluoridation," Journal of the Southern California Dental Association 36:499-500, December 1968. (Excerpts from the article by a labor leader closely associated with the dental care programs of the Teamsters Union)

Our experience in the dental care field commenced in 1962. Presently, we have five different dental programs in effect. Our experience on these programs has varied due to the composition of each covered group. However, without any doubt, the overall cost of care has increased considerably since 1962 Three of the dental programs I administer are underwritten by the California Dental Service. They have supplied us with some statistics relevant to children from birth to age nineteen. Their study covers twelve of the major population centers in the State of California and includes two areas whose water supply is presently fluoridated. These are: San Francisco and Solano. The survey breaks down claims into three groups: those under \$15; those between \$15 and \$50; and those exceeding \$50. To cite two very pertinent examples, Los Angeles and San Francisco: In Los Angeles the number of claims under \$15 was 15.3%; in San Francisco, 28.2%. In Los Angeles the number of claims between \$15 and \$50 is 44.1%; in San Francisco, 64.8%. Of paramount significance is the percentage of claims which exceeded \$50. In Los Angeles this figure is 40.6%; in San Francisco, 7%. I am inclined to doubt that these figures reflect anything as coincidental as a change in climate. They are specific and cannot be ignored.

Fluoridation will bring about not only general improvement in overall dental health, but very definite dollar savings I must say that in my view the economics of fluoridation make it essential that all those interested in dental care, and particularly unions and corporations, place themselves in the vanguard of any effort to fluoridate. . .

Ast, David B., et al: "Time and cost factors to provide regular, periodic dental care for children in a fluoridated and nonfluoridated area: final report," Journal of the American Dental Association 80:770-776, April 1970. (Summary)

Dental health studies continue to provide unequivocal confirmation that drinking optimally fluoridated water during childhood markedly reduces the hazards of both initial tooth decay and the progression of decay. Among 387 five and six year old children examined in Newburgh, New York (fluoridated), 41% were completely decay-free, whereas among 379 similarly aged children in Kingston (nonfluoridated), only 17% were completely free of decay. These children subsequently received complete initial dental care and annual incremental care for six years. At initial examination and each succeeding year, children in the nonfluoridated area required more compound fillings and more extractions than did their counterparts in the fluoridated area. Costs in the nonfluoridated area were more than twice as high, and chair time per patient was about one and one-half times that needed in the fluoridated area. The benefits from both fluoridated water and regular periodic dental care starting early in life make it quite clear that this kind of program is essential (1) to reduce the hazard of tooth loss and the potential results, (2) for economic reasons, and (3) to conserve the limited professional manpower time available so that more patients needing attention can get it.

Frank, John E., Law, Frank E., Spitz, Grace S., and Galagan, Donald J.: "School dental care in a community with controlled fluoridation," Public Health Reports 79:113-124, February 1964. (Dental Abstracts, May 1964) (Excerpts)

In a city with controlled fluoridation and a system of regular dental care for the school population, the number of dentist man-hours per child is about one-third the number required in a city without fluoridation. In the city with fluoridation the dentist can treat many more children than in cities without fluoridation.

Gainesville, Fla., began controlling the fluoride level of its drinking water at 0.8 ppm in 1949. This study began in January, 1954, and ended in 1959, and was designed to provide complete dental care (except orthodontics) for the approximately 5,000 children in grades one through six. Each school was visited four times during the study

The increasing effectiveness of fluoridation during the course of the study is illustrated by the increase in proportion of eight-year-old white children whose permanent teeth were caries-free: 22 per cent in the first series, 27 per cent in the second, 36 per cent in the third and 43 per cent in the fourth. In this interval the DMF rate decreased 42 per cent

Treatment time per child averaged 45 minutes in the first two series and 30 minutes in the final two series. In the first series a dentist

was able to care for 1,270 children in 12 months. By the third series more than 2,000 children per year were treated by each dentist, an increase of nearly 60 per cent.

Treatment needs were reduced from an average of more than two filled teeth per child in the first treatment series to 0.7 filled tooth per child in the final series.

Treatment time in Gainesville was less than had been observed in the earlier school dental care studies in Richmond, Ind., and Woonsocket, R.I. In Richmond and Woonsocket /then nonfluoridated/ about three dental hours were required per child in the first treatment series, four times that in Gainesville.

Healy, Thomas F.: "Study of the effects of fluoride on teeth of children in Cleveland public schools," Cleveland Public Schools, Cleveland, Ohio, November 1963. (Excerpts)

This is the report on the dental examinations of some 80,000 kindergarten children over a period of eight years in the Cleveland Public Schools. Naturally, it has to do with the primary teeth. Fortunately for our study, we have the detailed yearly dental examination of each school in our system, beginning in 1930. We selected the 1955-56 school year as our pre-fluoride base line examination. We could have selected any other year, but this was the year before the fluorides were added to the water. They were added in July, 1956.

We used three criteria as means of comparison. First, the number (in percentage) of children entering the kindergarten with Physiologically Perfect (P.P.) sets of teeth The second criteria of comparison is the DEF - decayed plus extracted plus filled. By coincidence, DEF is the abbreviation for defects and that is exactly what DEF means - teeth that have defects, as contrasted to physiologically perfect teeth. The third criteria of comparison is tooth loss. This is based on the number of teeth that had been extracted before the child entered kindergarten.

	<u>Physiologically Perfect</u>	<u>DEF</u>	<u>Tooth Loss</u>
1955-56	27.9%	3.4	.29
1962-63	59.3%	1.3	.07
Improvement	112.0%	61.7%	75.8%
	(Twice as many)	(Reduced 2/3)	(Reduced 3/4)

Bronstein, Edward: "A survey of caries experience among the pre-school children of Philadelphia," Journal of Public Health Dentistry 29:24-26, Winter 1969. (Excerpts)

Epidemiological studies of dental caries experience among preschool children are scarce in the literature. Since these data are needed in planning and budgeting programs of dental care for preschoolers in such programs as "Get Set" and "Head Start," the Division of Dental Health of the Philadelphia Department of Health decided to collect current data on def (decayed, extracted, filled) for preschool children in the City Among the three-year-olds, about 85 percent were free of carious lesions. The percentage with no caries experience dropped for four- and five-year-olds, but the total still was 72 percent. The implication, then, is that less than one-third of these children would need any operative treatment. /Only/ one child out of the 682 three- and four-year-olds examined had a tooth indicated for extraction. It was an anterior tooth injured in an accident. The number of teeth indicated for extraction in the total population of patients is about one percent. In a similar study in 1957, this rate was 23 percent A decrease of over 70 percent in caries experience of three-year-olds, 60 percent in four-year-olds, and 50 percent in five-year-olds . . . occurred in the 10 years Philadelphia has benefited from fluoridated drinking water since 1954, hence, most of these children have gained the optimum benefits from fluoridation. Some of these children, however, were born in nonfluoridated areas and subsequently moved to Philadelphia The survey has demonstrated once again that fluoridation has a considerable effect on the primary dentition . . . the volume of expected lesions could be expected to be from two to three times as great in a pre-school population not benefiting from fluoridation as one benefiting from fluoridated drinking water.

Soricelli, David A.: "Fluoridation - the Philadelphia story," Archives of Environmental Health 8:752, May 1964. (Excerpts)

The act was simple, the cost and maintenance are insignificant and the results so tremendously rewarding in the overt improvement in oral health, not to mention the inestimable potential savings of millions of dollars each year on dental bills as a result of decreased needs, that it is difficult to conceive that there still exists any community which has not yet taken advantage of this procedure The actual and potential savings realized from fluoridation are impressive. In Philadelphia last year, it is estimated that fluoridation reduced the number of decayed permanent teeth by about 360,000 representing a potential financial saving in dental care of about \$2,000,000 to residents for 1960 alone. This amount will increase to near maximum figure by 1972 so that the financial as well as the health aspects are worthy of note.

Young, Wesley O.: "Fluorides and dental caries in Idaho: IV. Cost of providing care for children in fluoride and fluoride-deficient areas," Newsletter, Idaho State Dental Association, January 1957. (Excerpts)

Generally, complete treatment for the primary teeth would have cost about twice as much in Coeur d'Alene /nonfluoridated/ as in Nampa /naturally fluoridated/ . . . The contrast is . . . striking for the eight-year-olds in the two cities. At this age, the cost of providing complete care for the primary teeth in Coeur d'Alene would have been more than \$30.00, of which only \$13.00 represented care that had been received. Complete treatment of the primary teeth in Nampa would have come to less than \$13.00 -- \$5.27 worth of treatment that had been received and an additional \$7.12 worth of care that was needed.

The same cost differential existed in the cost of providing care for the permanent teeth . . . At age 13, the average Coeur d'Alene child had received \$41.33 worth of care but needed \$24.21 more. The average cost of providing care for the 13-year-olds in Nampa was only \$10.47, and all except \$3.19 of this total represented treatment already received.

This analysis of treatment costs in two Idaho cities re-emphasizes the tremendous impact of fluorides on dental decay experience. In addition to the benefits of improved oral health, however, fluoridation programs more than repay their cost by reducing the amount of money the community must expend on dental care.

Schreiber, M.F.: "Sheboygan led fluoridation 'war' on tooth decay," Fluoridation News (Wisconsin Department of Health) 3:5-6, April 1966 (article first published in Sheboygan Press, February 25, 1966). (Excerpts)

Throughout the past two decades, clinical tests have provided uncontestable evidence that tooth decay among residents born here after water was fluoridated has been reduced by more than 60 per cent. The State Board of Health reported that before fluoridation here, average dental care costs were \$172.32 per child from birth through age 14. Now the average cost has been lowered to \$46.39, representing a saving of \$124.93 -- a return of \$55.77 for each \$1 invested in the fluoridation program. In the 20 years of water fluoridation in Sheboygan, combined costs for the fluoride compound and equipment maintenance has amounted to \$140,527,000 or \$7,026.53 annually . . . The vast savings in dollars, plus incalculable savings in human misery . . . has cost the individual an average of 14 3/4 cents per year.

Hann, H.J. (Study Director): "The dental benefits of water fluoridation; 1968 Prince George report," Prince George and District Dental Society and the Northern Interior Health Unit, Prince George, British Columbia, October 1968. (Summary)

In Prince George, British Columbia, the 1968 findings of the Dental Caries Study showed a continuing reduction in dental decay experience in children twelve years after the introduction of water fluoridation in that community. The over-all reduction in decayed, missing, and filled (DMF) teeth in children of all ages through 14 during the first 12 years of fluoridation was 61.1 percent. In the six-to-eight-year age group, the percentage of decay-free deciduous teeth increased from 48.1 percent in 1956 to 71.5 percent in 1968. In 1956, the average child in this group had 2.5 decayed, missing, and filled (DMF) teeth; in 1968, only 0.8, or less than one. An impressive improvement was demonstrated in the 12- to 14-year age group. In 1956, the permanent tooth loss for each 100 children was 102.0; in 1968, the loss figure was found to be only 13.9, a decrease of 86 percent. The economic value of fluoridation is therefore considerable.

"Trenton Fluoridation Program," Journal of the New Jersey State Dental Society 41:5, January 1970. (Dental Abstracts, p. 406-7, July 1970.) (Excerpts)

"The long fight, through public hearings and two referendums, before Trenton introduced fluoride into its communal water supply, was well worth the effort," the city's mayor, Carmen Armentì, commented as he reviewed the latest statistics on caries among Trenton's young people. "The experts told us fluoridation would have drastic long-range effects on dental health in this community, but no one was prepared for the exceptional results after only five years of fluoridation."

A comparison of results of studies of children in 1963 and 1969 shows dramatic results: 170% improvement in the number of children without any caries, 230% improvement in the number of fillings per child, and 216% improvement in the number of extractions per child.

"How can any community refuse to allow its young people the benefits of fluoridation after comparing these recent data?" asked Mayor Armentì. "Anyone who cares for children must be concerned."

In 1963 the Mercer County Dental Society examined the teeth of children in three public and two parochial schools in various parts of Trenton. The results were appalling, especially in depressed areas where almost 100% of the children examined were in dire need of dental attention. In 1965, after a difficult campaign, the water supply of Trenton was fluoridated. In the summer of 1965, 3.5 fillings per child were inserted; one of every three children required extractions, and 32% required no dental work. In 1969, the fifth year of fluoridation, 56.3% of the children needed no dental attention, and 1.5 fillings per child were inserted. The number of extractions was lowered to one in every 6.5 children.

"Milwaukee: Results of Twelve Years of Fluoridation," Fluoridation News, Wisconsin Division of Health, 6, Fall 1969. (Excerpts)

Comparing the decay incidence found in 1965 examinations of school children with baseline statistics reported in 1950, three years before fluoridation started, the rate of decayed, missing, and filled teeth declined 53 percent in the permanent teeth of fourteen year olds to 67 percent in the permanent teeth of six year olds. In all age groups the final reduction in dental decay experience in the permanent dentition was well over half. The deciduous or "baby" teeth of the five, six, and seven year olds showed a comparable decay experience decline of from 35 to 40 percent from 1950 to 1965.

Perhaps even more remarkable was the increase in the percentage of children with no decay at all present reported in the study. There were, for example, eight times as many thirteen year old children free of dental decay in 1965 as in 1950.

The cost for the great improvement in dental health was remarkably low. The total twelve-year cost including equipment and fluoride was \$476,521.00 or an average of five cents per person per year.

EXAMPLES OF LOWER DENTAL CARE COSTS PER CHILD IN TAX-SUPPORTED PROGRAMS
(HEAD START, ETC.) IN FLUORIDATED AREAS

FLUORIDATED

NONFLUORIDATED

ARIZONA

\$41.61 (Tucson, part)

\$62.97 (Tucson)

CALIFORNIA

\$26.35 (San Francisco)

\$70.01 (Berkeley)

\$27.77 (Vallejo)

\$66.76 (San Mateo)

MISSOURI

\$26.60 (St. Louis)

\$41.55 (Kansas City)

\$63.37 (Springfield)

EXAMPLES OF LOWER DENTAL CARE COSTS PER CHILD IN TAX-SUPPORTED PROGRAMS
(HEAD START, ETC.) IN FLUORIDATED AREAS (cont.)

FLUORIDATED

NONFLUORIDATED

OHIO

\$27.62 (Portsmouth City)	\$75.29 (Mad River Township)
\$24.32 (Portsmouth Minford School)	\$86.88 (Scioto County Northwest School)
\$22.09 (Lake County)	\$78.84 (Perry County) (New Lexington)
\$21.45 (Northwestern Ohio, five communities)	\$60.50 (Hocking County) (Logan)

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Brewster, L. L.: "Tucson Headstart dental care project," American Journal of Public Health 58:881-891, May 1968.

California Dental Service Corporation: "The relationship of fluoridation and Operation Head Start expenditures," California Dental Service Newsletter, San Francisco, California, June 1967.

Hagan, J.H. (President, MDSC): "Annual report to the membership of the Missouri Dental Service Corporation, 1970," Missouri Dental Service Corporation, Crystal City, Missouri.

Ohio Dental Association (Council on Legislation): "Tax savings from fluoridation in Ohio Head Start and other anti-poverty dental programs," Ohio Dental Association, 40 S. Third Street, Columbus, Ohio, April 1969. (Original distribution by Ohio Citizens' Committee for Fluoridation)

EXAMPLES OF ESTIMATED SAVINGS IN COSTS OF CHILDREN'S DENTAL CARE
RESULTING FROM FLUORIDATION

MICHIGAN

In Battle Creek, Kalamazoo, and Jackson, fluoridated since 1951, children showed a 52 to 76 percent reduction in decayed and missing teeth. As a result, the parents of children ten to twelve years old in these three communities saved more than \$118,000 through the reduced costs of dental care. Fluoridation represents a significant net profit to each family who lives there.

Source: Michigan Department of Public Health, 1971.

MASSACHUSETTS

More than 1,000 7-to-13 year old children from nonfluoridated communities in eastern Massachusetts received dental care for three years at a Boston clinic. The cost of the care that these children received was calculated and compared with the cost of caring for children of like ages in some fluoridated communities. The comparison indicated that, had these communities been fluoridated, care costs would have been \$13.00 less per child per year.

Source: Forsyth Dental Center, Boston, 1971

ONTARIO, CANADA

A series of dental health surveys among five-year-old children in North York, a Toronto suburb, revealed the important effect of fluoridation on the costs of care of primary teeth. Calculated costs for 5-year-olds born 20 months before fluoridation began totaled about \$63 per child, while for 5-year-olds born after fluoridation began, the total cost was only about \$34 per child, a difference of 46 percent. These costs included examination and X-rays, which were done whether or not treatment was needed.

Source: University of Ontario, 1971.

NEW YORK

The Bureau of Dental Health made some comparisons between the estimated cost of dental care in a fluoridated and a nonfluoridated community, assuming populations of 100,000 each, with about 35,000 people under 21. About a fourth of these young people would be eligible for dental care under Medicaid in New York State. Without fluoridation, treatment costs would total about \$137,000; in the fluoridated community, the cost would be less than half, about \$63,000. Even with the annual cost of fluoridation added, the local community Medicaid fund savings would be \$16,000 a year. Another \$48,000 in State and Federal Medicaid funds would be saved. The total saving to families paying their own children's dental bills would be far greater.

Source: New York State Health Department, 1968.

OHIO

The improvement in children's dental health and parents' savings in dental bills after ten years of fluoridation in Toledo were documented recently. Savings of at least \$29.00 per child per year for second and third grade children were attributed to fluoridation. In 1955, children in these grades averaged nearly seven teeth decayed, missing, or filled, compared with slightly more than three among their 1965 counterparts. The total savings in dental costs for these children was estimated to be \$481,000.

Source: Toledo Health Department, Toledo, Ohio, 1968.

Denby, G. C., and Hollis, J.J.: "The effects of fluoridation on a dental public health programme," New Zealand Dental Journal 62:32-36, January 1966. (Summary)

In 1965, dental officers of the New Zealand Department of Health made a survey of the effectiveness of ten years of fluoridation in Hastings. The survey showed that:

(1) The cost of dental treatment, i.e. for fillings and extractions per "Completion" in Hastings children has been reduced from 8.57 dollars to 4.27 dollars. Total treatment costs have been reduced from 11.45 dollars to 7.48 dollars. The latter figure includes a charge for examination and X-rays, this charge being a standard one that is independent of the treatment needs of the individual.

(2) The number of fillings required in the deciduous teeth of Hastings children has been reduced from 5 to 3 per completion; and the number of fillings required in 12-year-olds (who were selected as an example) has been reduced from 5 to 1.2 fillings per completion.

(3) The usual number of children whom Hastings nurses were able to treat prior to fluoridation was about 475 per nurse. This number has been increased to about 700 children per nurse and in the case of experienced operators 800 to 900 children are being handled.

The reduction in the need for School Dental Nurses has a twofold benefit for New Zealand in that there is a saving in the cost of the programme, and a saving in labor in a country with a labor shortage Further, the dental practitioners have more time to devote to the population over 16.

Salzmann, J. A.: "Effects of fluoride on prevalence of malocclusion," Journal of the American College of Dentists 35:82-91, January 1968. (Dental Abstracts, p. 406-7, July 1968) (Excerpts)

Hill, Blayney, and Wolf in 1959 reported 20% less malocclusion among 6- to 8-year-old children, and 17% less among 12- to 14-year-old children, drinking fluoridated water, compared with pre-fluoridation findings in Evanston. In 14-year-old children who had been drinking fluoridated water all their lives, they found a much higher rate of normal occlusion and considerably lower rate of malocclusion than in children on nonfluoridated water.

After about ten years of fluoride experience in Newburgh, N.Y., Ast and co-workers (1962) found that the use of fluoridated water by children during their dental development period reduced the loss of permanent first molars to the vanishing point

The Kingston children (with nonfluoridated water) showed consistently higher percentages of malocclusion than did the Newburgh children. The percentage of children with normal occlusion was almost twice as high in Newburgh compared to those in Kingston. A follow-up study

by Ast and others (1965) concluded that "The benefits which accrue from public water fluoridation programs may be measured not only in terms of significant protection against dental caries but also with respect to a reduced hazard of malocclusion, especially severe malocclusion which may be regarded as physically handicapping."

Mitchell, George E.: "The false economy of dental neglect," Chapter III in "Economic benefits from public health services: objectives, methods, and examples of measurement," U.S. Public Health Service Publication No. 1178, Superintendent of Documents, Washington, D.C., April 1964. (Excerpts)

. . . . dental neglect is a major, costly health problem It is quite evident that only a fraction of the Nation's dental ills can be treated adequately. Unless available preventive measures are applied, expenditures will continue to go upward and the problem will increase in magnitude and severity each year It is not easy to come up with a specific dollars and cents evaluation of the gain to the nation's economy from dental public health activities - or to state it conversely, the loss in the economy due to dental neglect The public spends over 2.4 billion dollars per year - about \$12 per person - to maintain a standard of dental health of which no one can really be proud. I estimate that to treat the existing backlog of dental needs would cost the nation 15 billion dollars in the first year alone, or nearly \$80 for each person in the United States Fluoridation of community water supplies is one health measure which has proved effective in preventing 60 to 70 percent of new tooth decay We can estimate fairly accurately the dollars and cents value of fluoridation on the basis of potential costs of treating cavities which could be prevented by this measure. On this basis, the delay in adopting fluoridation was estimated in 1960 to be costing more than \$452 million a year. If all communities throughout the Nation adopted water fluoridation, the dollar saving in dental treatment made unnecessary by the measure would be about \$700 million annually. This figure is the potential return on an annual national investment in fluoridation of only about \$12 million - amounting to a return of \$58 for each dollar invested.

Division of Dental Health
Preventive Practices Branch
9000 Rockville Pike
Bethesda, Maryland 20014

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PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
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ATLANTA, GEORGIA 30333