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Water Fluoridation and Costs of Medicaid Treatment for Dental Decay -- Louisiana, 1995-1996

Treatment costs for dental decay in young children can be substantial, especially if extensive dental procedures and general anesthesia in a hospital operating room (OR) are needed. Because caries in the primary dentition disproportionately affect children from low-income households (1,2), the cost for care frequently is reimbursed by state Medicaid programs. To determine whether the average treatment cost for Medicaid-eligible children in Louisiana differed by community fluoridation status, the Louisiana Department of Health and Hospitals (LDHH) and CDC analyzed Medicaid dental reimbursements and Medicaid eligibility records from July 1995 through June 1996 for children aged 1-5 years. Findings suggest that Medicaid-eligible children in communities without fluoridated water were three times more likely than Medicaid-eligible children in communities with fluoridated water to receive dental treatment in a hospital OR, and the cost of dental treatment per eligible child was approximately twice as high.

The Louisiana Bureau of Health Financing provided data on Medicaid dental reimbursements and Medicaid eligibility from July 1995 through June 1996 for children aged 1-5 years and the number of dentists practicing in each parish (county) in 1995. Demographic data for each parish were obtained from the Bureau of the Census (3). The proportion of the population that received optimally fluoridated water in each parish was estimated based on CDC's 1992 fluoridation census (4) and a study by LDHH (LDHH, unpublished data, 1996). A parish was designated as optimally fluoridated (F) if 100% of its population received fluoridated water (optimal level: greater than or equal to 0.7 ppm) in both 1992 and 1996, and nonfluoridated (NF) if 0% received fluoridated water in both years. Of 64 parishes, five F parishes with 38,162 Medicaid-eligible preschoolers and 14 NF parishes with 16,444 Medicaid-eligible preschoolers were included in this analysis. All analyses were conducted at the parish level.

For each F and NF parish, the percentage of Medicaid-eligible children aged 1-5 years who, during the study period, received one or more of the following types of services was calculated: 1) caries-related services (e.g., fillings, crowns, and pulpotomies); 2) examinations or preventive care (topical fluoride or prophylaxis) but no caries-related services; 3) topical fluoride application (with or without caries-related care); and 4) dental care in a hospital OR. The mean value for each of these measures was calculated for F and NF parishes for each of the five ages.

Medicaid reimbursements for dental procedures likely to be associated with treatment for dental caries were totaled for each parish for each age group. If dental care was provided in a hospital, a payment of \$650 (based on estimates from the Louisiana Bureau of Health Financing) was added for OR use and general anesthesia. The average caries-related cost per Medicaid-eligible child in each parish was obtained by dividing parish Medicaid reimbursements by the number of Medicaid-eligible children in the parish in each age group.

For each age group, linear regression was used to examine the association between parish average caries-related cost per Medicaid-eligible child and fluoridation status of the parish. In addition to fluoridation status, per capita income, population, and dentists per 1000 residents were included in the model as dichotomous variables. Independent variables that added no explanatory power were eliminated through backward elimination to obtain the reduced model (5).

Children residing in F parishes were slightly more likely to have received only examinations or preventive services (Table 1). The proportions of children who received topical fluoride were similar, with younger children in F and older children in NF slightly more likely to have received the procedure. For all age groups, the percentage of Medicaid-eligible children who received one or more caries-related procedures was higher in NF parishes.

The difference in treatment costs per Medicaid-eligible child residing in F parishes compared with those residing in NF parishes ranged from \$14.68 for 1-year-olds to \$58.91 for 3-year-olds (Table 2); at all ages, costs were higher in NF than in F parishes. Louisiana Medicaid-eligible children were distributed uniformly by age; the mean difference in treatment costs per eligible preschooler was \$36.28 (95% confidence interval=\$9.69-\$62.87).

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Editorial Note:

In this analysis of Medicaid claims, more Medicaid-eligible children in NF parishes received caries-related dental treatment and OR-based care at greater cost than did Medicaid-eligible children in F parishes. In 1998, 1.3 million Louisianans received nonfluoridated water from public water systems that served approximately 10,000 customers (S. Hoffman, Office of Public Health Engineering Services, personal communication, 1999), and 3% of the state population were Medicaid-eligible children aged 1-5 years (3). These data suggest that at least 39,000 preschoolers in Louisiana could potentially benefit from water fluoridation; the expected annual reduction in their dental treatment costs is \$1.4 million.

The findings in this report are subject to at least four limitations. First, although the analysis showed an association between lower caries-related costs and residence in one of the five F parishes, the analysis did not measure the length or magnitude of the children's exposure to fluoride. Some children classified as residing in NF parishes once may have resided in F parishes and vice versa. It also did not verify that the water systems serving the five F parishes maintained fluoride concentration at the optimal level. However, misclassification of exposure status would be more likely to reduce the observed effect of fluoridation. Second, if access to dental care were better in NF than in F parishes, children with decay who resided in F parishes would be less likely to seek restorative care, resulting in an underestimate of treatment costs in F parishes and an overstatement of water fluoridation's benefits. The observed rates for preventive care in F and NF parishes suggest similar rather than differential access. Furthermore, this analysis controlled for differences in access to dental care. Third, the difference in treatment costs attributable to water fluoridation would be overstated if children in F parishes had more exposure to other sources of fluoride (e.g., toothpaste or topical application in a dental office). Although fluoride toothpaste use could not be determined, toothpastes containing fluoride accounted for greater than 94% of the market in 1984

(6). Different uses of topical applications was probably not a substantial factor because children in F and NF parishes received topical fluoride in the dental office at similar rates. Finally, lower treatment costs associated with water fluoridation should not be generalized to preschoolers from high- and middle-income families because of their lower prevalence of dental caries in primary teeth (1,2).

The lower treatment costs associated with residence in F parishes is a conservative estimate of benefits because the analysis did not consider benefits that accrue to populations other than Medicaid-eligible preschoolers. For this group, however, treatment cost savings associated with fluoridating the 39 NF water systems that serve populations of greater than or equal to 10,000 could be substantial.

In 1996, approximately 50% of Louisiana's population using public water supplies received fluoridated water, a percentage well below the 2000 objective of 75% (objective 13.9) (7). The 1996 assessment of community water fluoridation in Louisiana also found that of 73 water systems adjusting fluoride content in 1986, only 45 were still doing so in 1996 (8). This decline prompted passage of state legislation in 1997 that 1) established a water fluoridation program within LDHH; 2) encouraged fluoridation of public water systems serving at least 5000 households (because the average number of persons per U.S. household in 1996 was 2.66, this equals approximately 13,000 persons [3]); and 3) created a Fluoride Advisory Board to assist in locating public and private funding to cover the costs of initiating water fluoridation in these locations. In addition, LDHH is planning an early intervention program to ensure that infants and toddlers at high risk for early childhood caries are screened and referred for clinical preventive services (e.g., topical fluoride application), prompt treatment of incipient disease, and education of the parent or caregiver.

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Table 1

Note: To print large tables and graphs users may have to change their printer settings to landscape and use a small font size.

TABLE 1. Mean percentage of Medicaid-eligible children aged 1-5 years who received various dental procedures from July 1995 through June 1996 and the mean caries-related cost per eligible child, by age and fluoridation status in parish of residence -- Louisiana

Age (yrs)	Mean percentage of Medicaid-eligible children who received procedures										Mean caries-related cost per eligible child			
	Caries-related procedure		Examination or preventive procedure				Topical fluoride application		Hospitalized for treatment		F* (n=5)		NF+ (n=14)	
	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)	F* (n=5)	NF+ (n=14)
1	3.3 (1.2)	4.4 (2.4)	8.2 (7.1)	6.3 (6.2)	7.5 (5.3)	5.8 (5.3)	0.2 (0.3)	1.0 (0.9)	\$ 7.4 (\$ 5.0)	16.9 (\$13.1)				
2	11.0 (3.3)	15.9 (5.8)	17.8 (10.8)	16.3 (8.1)	19.2 (11.2)	17.5 (9.5)	1.2 (1.1)	4.0 (2.0)	\$35.3 (\$18.8)	\$ 75.5 (\$29.9)				
3	19.6 (4.0)	31.6 (10.9)	34.0 (7.9)	30.9 (9.2)	38.2 (15.1)	40.9 (13.2)	1.4 (1.1)	5.0 (2.6)	\$53.8 (\$19.0)	\$117.9 (\$42.1)				
4	27.3 (5.0)	34.5 (9.4)	33.2 (6.2)	32.3 (4.8)	44.6 (9.5)	48.6 (12.3)	0.9 (1.3)	3.4 (2.3)	\$52.1 (\$22.7)	\$ 92.3 (\$25.2)				
5	28.6 (5.4)	34.1 (10.2)	28.0 (6.2)	25.8 (4.5)	44.8 (6.4)	43.7 (11.6)	0.2 (0.2)	1.7 (1.1)	\$39.5 (\$10.0)	\$ 71.0 (\$30.6)				

* Fluoridated parishes. Total number of Medicaid-eligible children aged 1-5 years residing in F parishes was 38,162.
 + Nonfluoridated parishes. Total number of Medicaid-eligible children aged 1-5 years residing in NF parishes was 16,444.
 & Standard deviation.

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Table 2

Note: To print large tables and graphs users may have to change their printer settings to landscape and use a small font size.

TABLE 2. Results of multivariate regression* analysis: adjusted R² and estimated treatment cost savings associated with water fluoridation for Medicaid-eligible children aged 1-5 years residing in fluoridated and nonfluoridated parishes, by age - Louisiana, July 1995-June 1996

Age (yrs)	Adjusted R ²	Estimated treatment cost savings associated with water fluoridation	(95% CI&)
1	0.59	\$14.68	\$ 5.58-\$23.77
2	0.27	\$40.17	\$ 9.81-\$70.53
3	0.42	\$58.91	\$19.45-\$98.37
4	0.47	\$36.08	\$11.81-\$60.35
5	0.18	\$31.55	\$ 1.79-\$61.31
All age groups+		\$36.28	\$ 9.69-\$62.87

* Controlling for the parish variables of per capita income, population, and number of dentists per 1000 population.
 + Assumes children are distributed uniformly by age.
 & Confidence interval.

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This page last reviewed 5/2/01