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"The Influence of Dentist Supply on the Relationship Between Fluoridation and Restorative Care Among Children"

WORKSHOP PAPER

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THE INFLUENCE OF DENTIST SUPPLY ON THE RELATIONSHIP BETWEEN FLUORIDATION AND RESTORATIVE CARE AMONG CHILDREN

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Interpretations of the data are the authors' own and do not necessarily represent the official opinion of the National Institute of Dental Research, Blue Cross of Washington and Alaska, or the State Employees Insurance Board of Washington State.

Written parental consent was obtained for all children subjects participating in this study after procedures and possible risks were explained fully.

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Tables presenting regression coefficients of our models are available from the senior author.

ABSTRACT

Because fluoridation effectively reduces dental caries among children, it may also reduce their demand for dental care. We tested this proposition among 985 children insureds aged 9 to 14 in Washington State (U.S.A.) using dental claims from 1982 to 1985. In our sample almost two-thirds of the children with continuous fluoridation exposure lived in markets with the smallest number of persons per dentist. Relative to other children, these children received more diagnostic and preventive services and had the highest probability of receiving restorative care. Among children who received restorations, children in this group had the fewest restorations. While the last result reflects expected reductions in caries due to fluoridation, the others may reflect providers' response to less tooth decay and increased competition for patients.

Running Head: Fluoridation and Restorative Care

Key Words: Fluoridation, dental economics, supplier-induced demand, dental manpower, restorative dentistry, preventive dentistry, pedodontics, dental demand, dental utilization

INTRODUCTION

Decayed teeth are among the most common childhood health problems. In fact, few preventable illnesses affect so many children. In response, many communities add fluoride to public water supplies, which reduces dental caries by 50-70 percent.[1] About 50 percent of U.S. children receive such benefits.[1]

Relatively little is known about fluoridation's effect on the demand for dental care among children.[1] Previous clinical studies of fluoridation's effect on caries report fewer restorations and extractions among children in fluoridated areas than children in nonfluoridated areas. However, the external validity of these findings is questionnable because the frequency of dental visits was controlled by investigators. More recent econometric studies of dental demand among children have produced inconclusive results because exposure to fluoridated water was not measured accurately.

In principle, as caries declines under fluoridation, so should the demand for restorations and extractions. Nonetheless, other factors may undermine this expected relationship. Providers can influence the relationship through their prescriptions of therapy.[2] As dentists become more numerous and compete for patients, they may prescribe more dental services to maintain their economic advantages.[3] Dentists might also alter their treatment planning decisions as tooth decay declines under fluoridation. Both are more probable in insured populations where economic barriers to receiving dental care are reduced.

Dental caries has declined about 37 percent in U.S. children since the early 1970s.[4] Although fluoridation is thought to be a major cause of the decline, caries reductions as high as 60 percent in *nonfluoridated* communities have also been observed.[5,6] Possible reasons for the decline in nonfluoridated areas include the following: the expansion of preventive dental services (primarily topical fluoride applications); widespread use of fluoride toothpastes and -- to a lesser extent -- fluoride tablets, drops and mouthrinses; improved oral hygiene practices and dietary habits; increased use of non-cariogenic sweeteners; use of antibiotics; development of immunity to the micro-organisms involved; and the consumption, in nonfluoridated areas, of foods and drinks prepared in fluoridated areas.[7,8] The caries decline in fluoridated and nonfluoridated areas could reduce or offset the expected, negative relationship between fluoridation and the demand for dental care.

Dental demand is determined by several factors, such as the patient's age, education, family income, and the price of the service.[9] Even though fluoridation effectively reduces dental needs among children, these other factors may reduce its influence on dental demand.

In summary, although a negative relationship between fluoridation and the demand for restorations and extractions is predicted, other factors may intervene to reduce, nullify or reverse the expected relationship.

METHODS

Population

Fluoridation effects on dental demand were examined in a retrospectively constructed panel of 985 children over a three-year period, May 1982 to April 1985. The children were 9 to 14 years in 1984. All children were dependents of Washington state employees covered continuously by Blue Cross of Washington and Alaska dental insurance since 1977. Under the plan most diagnostic and preventive services were free; employees paid 40% of the charge for restorative services and simple extractions; and orthodontics was covered at 50% ($750 individual maximum). Sealants were not covered prior to 1985.

The population was chosen for several reasons. A variety of social classes were represented in such diverse occupations as professors, gardeners and secretaries. The employees lived in all types of communities, rural, suburban and urban. Approximately 32% of state employees worked in the Seattle metropolitan area, which had artificially fluoridated water, and about 28% worked either in the state capital, Olympia, or in the Tacoma metropolitan area, which had nonfluoridated water supplies. The balance was divided evenly across other fluoridated and nonfluoridated communities in the state. The continuous coverage requirement likely reduced any backlog of unmet treatment needs and eliminated attrition and transitory surges in demand caused by recent enrollment into the dental plan. In the 9-14 age range children are highly susceptible to caries, with second molars erupting at about 12 years.[10]

Data Collection

Blue Cross enrollment files were used to identify the universe of state employees with one or more children dependents, aged 10-14 in 1984, with continuous dental coverage since 1977. About 2251 employees were identified. Parents were mailed a consent form authorizing the release of dental claims and a questionnaire requesting information about the residence history of each child, brushing frequency, and other fluoride sources and determinants of dental demand. About 39% of the parents returned questionnaires and consent forms after one follow-up mailing (the number of follow-ups was limited by Blue Cross). The response rate was typical for mail surveys requiring written parental consent and having one follow-up.[11-13]

In telephone interviews with a random sample of nonrespondents, "refused to participate" was the primary reason for nonresponse. However, a minority did not respond because they lived in nonfluoridated areas, suggesting that children in these areas were underrepresented in the sample. No subjects mentioned little use of dental services as a reason for not responding. To check for possible bias, family and children characteristics in our Blue Cross sample were compared with those in a representative sample of children, aged 10 to 14, covered by Pennsylvania Blue Shield dental insurance in 1980.[14]

Each child's years of fluoridated water exposure (YFE) was calculated from the residence histories, weighted by the water's fluoride content. For example, if a 10-year old consumed 1.0 ppm F-water continuously since birth, YFE at age 10 would be 10 x 1.0 = 10.0. A 10 year old exposed to 0.2 ppm F for five years and 1.0 ppm F for five years would have a YFE of (5 x 0.2) + (5 x 1.0) = 6.0. Because no children lived continuously in communities with 0.0 ppm F water supply, all children had greater-than-zero YFE values. The distribution and validity of the YFE measure is examined elsewhere.[15]

Using May 1982 to April 1985 Blue Cross dental claims, dependent variables were the annual and pooled (all years combined) expenditures and number of services in each of the following categories: diagnostic, preventive, and restorative. All expenditure variables were adjusted to 1984 dollars. Orthodontia was not considered because fluoridation was presumed to have little effect on those services. Because 61% of simple extractions occurred among children receiving orthodontia (and, hence, were likely not caries-related), simple extractions were not included as a dependent variable.

Analysis

The function for estimating fluoridation effects on dental demand included the treatment variable, YFE, and five groups of control variables: fluoride, predisposing, enabling, need and provider. The fluoride group contained the following variables: brushing frequency (a measure of fluoride from toothpaste); years in school mouthrinse programs; years received fluoride tablets/drops; and the expected number of topical fluoride applications. The last variable was imputed to avoid endogeneity problems associated with including a dependent measure on the right-side of the model.

Based on Andersen's behavioral model of health service use,[9] the child's sex and race, family size, plus the parent's age, sex, education, marital status, and belief of how often the child should visit the dentist were included as variables that may predispose dental demand among children.

Enabling variables were the out-of-pocket market price of the dependent variable and complement and substitute services,[16] family income, appointment delay, whether multiple dental plans existed in the household, and time cost, or access, variables. The last included the child's travel time to the dentist, travel costs, appointment delay, waiting time in the dental office, and whether someone usually accompanied the child to the dentist.

The perceived oral health status of the child (reported by the parent) was excluded because it was endogenous to dental demand; we used the child's age as a proxy measure of oral health status and to control for variation in tooth eruption.

To control for provider effects on dental demand, the population-to-dentist ratio (defined as the number of persons per dentist in the child's market) and whether the dentist operated a patient recall system were also included. The population-to-dentist ratio captures "demand creation" effects in the model, where a decrease in the population-dentist ratio creates increased dentist incentives to "induce" extra demand.[17] Finally, the model also contained an adjustment factor for breaks in coverage during the period that occurred in 4 percent of the households. The function was estimated with 906 children having no missing data.

This specification varied slightly for the restorative equations. Under certain conditions, sealants are a potential substitute for restorative care. The number of sealants a child received during a period was not included because of incomplete claims prior to 1985. Instead, we included the average price of sealants in the child's market to control for potential substitution effects.

Scatter plots revealed that a nonlinear, parabolic relationship exists between YFE and the restorative service measures. The natural logarithm of YFE was used instead.[18,19]

In Washington State, fluoridation is inversely related to population-dentist ratios. Approximately 61% of the study's children with continuous exposure to fluoridated water (greater than or equal to .7 ppm F across all years) resided in markets with the lowest number of patients per dentist (1196); only 10% of all other children lived in these markets. In contrast, the average population-dentist ratio was 1726 for children with little fluoridation exposure (less than .7 ppm F across years). An interaction term (YFE-POPDENT) was included in the models to determine whether the relationship between dental demand and YFE is independent of the population-dentist ratio. In linear models YFE effects on demand are equal to $B_1 + B_2$ POPDENT. In log models, YFE effects on restorative demand are defined as shown below. Thus, by equation 2, the relative contribution of fluoridation and the population-dentist ratio to the total YFE effect may be readily determined.

$$\text{(1)} \quad \text{YFE effect} = B_1 LN(YFE) + B_2 LN(YFE*POPDENT)$$

$$= B_1 LN(YFE) + B_2 LN(YFE) + B_2 LN(POPDENT)$$

$$\text{(2)} \quad = (B_1 + B_2) LN(YFE) + B_2 LN(POPDENT)$$

Tobit regression was used to estimate the annual and pooled functions because a large percentage of cases had zero values across dependent variables.[20,21] Each coefficient estimates an independent variable's effect on *total* demand, which consists of the following two dimensions: the probability of receiving a particular service, and the number of services (or expenditures) among children receiving the service. Standard formulas exist for estimating the fraction of the total effect due to each dimension and for calculating their expected values.[20-22] To make the results of the restorative log models more interpretable, the formulas were used to calculate expected restorative demand (the probability of having one or more restorations, the number of restorations among children receiving the service, and the expected number of restorations among all children) at different fluoridation exposures and population-dentist ratios, evaluating other variables in the model at their means. We also calculated the proportion of the total response due to the probability dimension of restorative demand.

Finally, because the sampling unit is the family but children are the cases, the effect of intraclass correlation on the results was also examined.[16]

RESULTS

The age distribution of the children is presented in Table 1. About 38% of the children lived in fluoridated areas continuously since birth, 46% in nonfluoridated areas, and 16% in both areas. On average, about 76% of the children visited the dentist in each year, while 87% of the children visited the dentist at least once over the three-year period. Table 2 presents the percentage of children receiving dental services in each category in the two periods.

Table 3 compares the characteristics of Blue Cross and Pennsylvania Blue Shield (PBS) children. The two samples are similar for most variables except social class, as measured by parent education and family income. As a consequence, annual utilization rates are higher among Blue Cross children than PBS children.

In the annual models significant fluoridation effects were detected rarely across years. Time series analysis of the annual data also revealed no significant effects. Therefore, only the pooled results are reported here. All equations are statistically significant($p<.01$).

INSERT TABLES 1-3 ABOUT HERE

Number of Services

Diagnostic and Preventive Services. Controlling for other factors, fluoridation had a positive effect on the number of diagnostic services, .29 ($p< .05$, 2-tailed test), indicating that on average, an eleven-year old child (the average age in the sample) consuming optimally fluoridated water for 11 years would receive 3.2 more diagnostic services in the 3-year period than a child with no consumption of fluoridated water.

Controlling for other factors, the effect of fluoridation on preventive services was smaller, .10 ($p< .05$; 2-tailed test), indicating a difference of 1.1 preventive services between eleven-year old children with 11 versus zero years of exposure to optimally fluoridated water. No significant interaction effect between fluoridation exposure and the population-dentist ratio was detected in either service category.

Restorative Services. Years of fluoridation exposure (YFE) and YFE-POPDENT were significant ($p< .01$ and .02, respectively). Inserting coefficients from the model into equation (2), the total fluoridation effect on the demand for restorative services was, (18.13-17.38)LN(YFE)+(-17.38)LN(POPDENT). The small magnitude of the YFE component (.75) indicates that most of the total effect was due to the population-dentist ratio in the market where the child lived.

Table 4 presents expected restorative demand for eleven year-old children with little (1 year) and continuous (11 years) exposure to optimally fluoridated water in three market population-dentist ratios: 1196 (minimum ratio); 2871 (maximum ratio); and 1672 (average ratio). Exposure to fluoridated water was positively related to the probability of receiving one or more restorative services. Other things equal, children with continuous exposure to fluoridation in markets with the smallest population-dentist ratio had the highest probability (.67) of receiving restorative services. Children with little exposure to fluoridation in areas with a small supply of dentists had the lowest probability, .23. The amount of increase in the probability of having at least one restoration was similar across all three market ratios (the increases ranged from .12 to .14), reflecting the dominance of POPDENT in the total YFE effect equation.

Conversely, fluoridation exposure was negatively related to the number of restorations among children receiving at least one restoration. Children with continuous fluoridation exposure in markets with the smallest population-dentist ratio had the lowest number of restorations, 3.1. Children with little exposure in markets with few dentists had the most, 5.9. Among children receiving the service, fluoridation reduced restorations by 17 to 18 percent across the three markets.

In short, the probability of receiving at least some restorative care *increases* with an increase in YFE and a decrease in POPDENT; but, if a child receives any restorative care, the amount of care received *decreases* with an increase in YFE and a decrease in POPDENT. Thus, the two dimensions offset each other, producing similar averages across fluoridation exposures (see Table 4). However, because the probability dimension accounts for 65 percent of the total effect, a positive relationship exists between fluoridation and the expected number of restorations among all children.

On average, children in markets with fewer dentists receive fewer restorations, regardless of their exposure to fluoridated water.

Insert Table 4 about Here

Expenditures

Diagnostic and preventive services. Fluoridation had a small, positive effect on expenditures for both services. For each year of fluoridation exposure, diagnostic and preventive expenditures increased $1.47 and $2.27, respectively, over the three year period ($p < .02$; two-tailed test).

Restorative services. Years of fluoridation exposure and YFE-POPDENT had significant effects ($p < .01$) on restorative expenditures. Expected probabilities of having any restorative expenditures for various YFE and POPDENT values were virtually identical to those in Table 4. Among children receiving restorations, a similar, negative relationship between fluoridation exposure and restorative expenditures was obtained (Table 5). Children with the highest predicted restorative expenditures ($274) had little fluoridation and lived in areas with a small supply of dentists, while those with the lowest expenditures ($111) had continuous fluoridation and lived in markets with the largest supply of dentists.

Insert Table 5 about Here

Among all children, expected restorative expenditures ranged between $62 and $82 for the three population-dentist ratios; they were lowest for children with little fluoridation exposure in markets with a small supply of dentists. However, although fluoridation exposure was positively related to average restorative expenditures for children in markets with above average population-dentist ratios, a negative relationship was obtained for children in markets with 1196 persons per dentists. In this market eleven year-old children with one year of fluoridation exposure had $82 of restorative expenditures, while those with continuous exposure had $75. In short, fluoridation had a relatively small influence on average restorative expenditures because of the opposite, off-setting effects obtained across the two dimensions of restorative demand.

DISCUSSION

The major finding of this study is that fluoridation effects on the demand for restorative services among insured children cannot be considered independent of the supply of dentists in the marketplace. In our sample almost two-thirds of the children with continuous fluoridation exposure lived in markets with the smallest number of persons per dentist. Relative to other children, these children received more diagnostic and preventive services and had the highest probability of receiving restorative care. Among children who received restorations, children in this group had the fewest restorations. While the last result reflects expected reductions in caries due to fluoridation, the others may reflect providers' response to less tooth decay and increased competition for patients.

In the past, restorative dentistry was the financial mainstay of private practice. As caries and practice income from restorative services declined, dentists in fluoridated areas adjusted by substituting diagnostic and preventive services for corrective treatment.[23-25] However, the change in service mix has a lower level of economic return for the practitioner.[25,26] The positive relationship between fluoridation exposure and the probability of receiving restorative care suggests that dentists in fluoridated areas with a relatively high concentration of providers may induce restorative demand to maintain financially viable practices.

This interpretation is reinforced by the positive relationship between fluoridation and preventive care. While prophylaxes have little effect on dental caries, the combination of fluoridated water and topical fluoride applications provide greater caries-protective benefits than fluoridation alone.[27] Thus, the positive relationship between fluoridation and preventive services implies better oral health among children with continuous fluoridation exposure, yet these children have the highest probabilities of receiving restorative services.

Several factors may encourage this pattern of demand for restorative services. Similar to "professional uncertainty" in medicine,[28] dentistry lacks standard clinical criteria for deciding whether restorative treatment is necessary. Practitioner agreement on restorative treatment planning rarely exceeds 50 percent.[29,30] As a consequence, at the margin in deciding whether a child has caries or not, dentists in fluoridated areas with small patient supplies may be predisposed toward diagnosing more lesions as requiring treatment than dentists in markets with fewer providers.

The practices of dental insurers may also be reinforcing this behavior. Most insurers lack claims review programs for low-cost restorative services that children normally require. However, given the lack of reviewer agreement in determining whether restorative care is necessary,[30] this approach might not be an effective means of detecting and reducing unnecessary restorative services. More importantly, under fee-for-service reimbursement programs, which are the standard in dentistry, insurers automatically reimburse the dentist for amalgam restorations. Higher copayments for children's restorative services in fluoridated areas or other forms of reimbursement, such as capitation, might reduce dentists' economic incentives to restore questionable carious lesions. In addition, many insurers do not cover sealants as a preventive service, and only a minority of dentists regularly offer this service.[31] Adding sealants as a covered benefit might encourage dentists to substitute sealants for operative treatment. More importantly, the preventive use of sealants, in combination with fluoridation and regular topical fluoride applications, can reduce caries in children populations.[32]

Fluoridation's positive effect on the probability of receiving restorations may also be caused by the decline in caries occurring in nonfluoridated areas, which could make them more similar than different from fluoridated communities. However, Driscoll, et al., report that a 38% difference in caries rates still remains, suggesting the decline is not a factor in the study's results.[33] A more important influence might be the level of measurement. Previous studies usually report caries rates at the community level, and substantial differences are usually detected between fluoridated and nonfluoridated communities. However, within either community substantial variation in caries usually exists across children.[19] Given the decline in caries in nonfluoridated areas and within-community variation of caries rates, similar patterns of restorative demand among children with varying fluoridation exposure might emerge. However, the level of measurement alone cannot account for the opposite relationships between fluoridation and the different dimensions of demand for restorative services.

This pattern of results generally holds for dental expenditures as well. Data analyses excluding children with no use of dental services during the three-year period produced similar results. Tests for intraclass correlation did not alter the findings. No significant differences existed between the number of restorations that children with and without orthodontia received. Furthermore, measuring fluoridation in different ways (such as years of fluoridation exposure during infancy, preschool and other ages) produced similar effects. Because significant effects were not detected using annual data, researchers should consider whether data for longer periods are needed for hypothesis testing in future studies of dental demand.

We also rejected the hypothesis that the number of restorations was determined mainly by the number of oral examinations a child received. The correlation between the two variables, though positive (.23), was relatively small. Further, with 87 percent of the children visiting the dentist at least once during the 3-year period, most children received at least one exam.

As stated earlier, children with continuous fluoridation exposure received more diagnostic and preventive services than children with little exposure. Separate analyses (not reported earlier) indicate that about 60% of the increase in diagnostic services was for oral examinations, the balance for radiographs. The greater number of examinations implies that the chances of detecting caries were greater for children with continuous fluoridation exposure than others. However, recall that the correlation between the number of examinations and the number of restorations is fairly low, so this difference may not be critical. Further, it is troublesome that children with continuous fluoridation exposure received more diagnostic and preventive services than other children but still developed caries. This pattern suggests that the preventive services were not effective, or that some surfaces were being filled unnecessarily rather then sealed, or both.[34] In addition, from a public health point of view, more of these services should have been provided to children with the least exposure to fluoridated water, who are at most risk to developing caries.

In summary, the relationship between fluoridation exposure and restorative demand is influenced by the supply of dentists in the market. While the evidence suggests that dentists induce demand in response to less decay under fluoridation and increased competition for patients, other interpretations remain possible. Conceivably, children with continuous fluoridation exposure could have had fewer restorations than children with little exposure at the start of the study. Alternatively, children with continuous fluoridation exposure in areas with a large dentist supply may have had a greater percentage of their restorative needs met.* Further studies that combine dental claims with baseline oral health data are needed to confirm or refute these competing interpretations of the data.

Our estimates of fluoridation effects on dental demand may be generalizable to children insureds in other states for several reasons. First, case mix is controlled by including major determinants of dental demand and oral health in our models. Second, although social class differences exist between Blue Cross children and PBS children, social class is not a major determinant of diagnostic, preventive and restorative demand among children with dental insurance.[16] Third, our results reflect underlying covariation between dentist supply and fluoridated public water supplies across communities in Washington State. Given that large, urban communities are more likely to have fluoridated water and a greater supply of dentists than smaller communities,[35] this covariation may be common in other

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*This pattern was detected by Graves, *et al.*, in the National Preventive Dentistry Demonstration Program.[34] At baseline, when children were 10 years old, 58% of the children in nonfluoridated sites had their restorative treatment needs met, while in fluoridated sites it was 71%. At the end of the four-year study, similar differences (71% and 86%, respectively) were also obtained. Their evidence also suggested unnecessary treatment: "...some of the fissured grooves and pits in occlusal or buccolingual surfaces may have been restored unnecessarily, or could have been sealed rather than filled. Although the benefit is less than for smooth surfaces, fluoridation has a protective effect on fissured surfaces. Therefore, it is particularly disturbing that a higher percentage of all fissured first molar surfaces was converted from sound to filled annually at fluoridated sites than nonfluoridated sites" (pages 27-28).

states. In short, our results may be representative of U.S. children insureds (in the relevant age range) with a history of dental benefits.* Replicate studies in different settings are encouraged to confirm or qualify our results. A similar study among children without private or public dental benefits would complement these findings.**

These findings suggest that the number of restorative services children receive can be reduced by reducing the supply of dentists in the market. Because dental school enrollments have declined 23% since 1978,[37] dentist supply may decline naturally during the remainder of this century. However, regardless of trends in dental education, policies aimed at reducing dentist supply are not a satisfactory solution because they ignore the influence of professional uncertainty.

Finally, our results may foreshadow future trends in medical care. A number of medical studies reveal that demand inducement occurs in response to negative changes in physicians' economic environments, such as changes in reimbursement rates or increased competition for patients.[38-41] Our results suggest that similar responses may be obtained when preventive programs (such as fluoridation) systematically reduce disease levels in the community. The predicted oversupply of physicians and the growing emphasis on health promotion and disease prevention might combine to stimulate demand inducement in future years. However, because

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*About 38% of U.S. children had private dental coverage in 1981.[36] Because insureds are more likely to visit the dentist than noninsureds, our results may apply to the majority of children dental visits in the U.S.

**Because dental insurance reduces economic barriers, provider induced demand may be more prevalent in insured than noninsured populations. A similar study with children from both populations is needed to separate cost-sharing from provider and fluoridation effects. Given that coinsurance mainly influences the probability of any use of dental services,[36] the incentive effect of cost-sharing on demand inducement may be small. However, the potential for an incentive effect would still remain, given that cost-sharing effects on provider treatment patterns have not been estimated.

the evidence for the effectiveness of these programs is equivocal at best,[42] the preventive effect on demand inducement may prove to be small.

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Table 1
AGE DISTRIBUTION OF CHILDREN IN 1984

AGE	FREQUENCY	PERCENT
9	19	2
10	93	9
11	188	19
12	208	21
13	241	24
14	241	24

Table 2

ANNUAL AND POOLED PERCENT OF CHILDREN RECEIVING EACH CATEGORY OF DENTAL SERVICE

SERVICE CATEGORY	AVERAGE ANNUAL %	POOLED %
Diagnostic	79	85
Preventive	77	83
Restorative	27	48

Table 3
COMPARISON OF BLUE CROSS AND PENNSYLVANIA BLUE SHIELD CHILD AND FAMILY CHARACTERISTICS

Variable	Blue Cross Sample	Pennsylvania Blue Shield Sample
Percent children with fair/poor oral health (as perceived by parent)	8	10
Percent children with a usual source of care	98	98
Average travel time to dentist (minutes)	17	17
Average family size	4.2	4.6
Percent of respondents with a college degree	55	33
Average family income (inflation adjusted)	$28,191	$25,087
Annual probability of use (percent)	76	63

TABLE 4
EXPECTED DEMAND FOR RESTORATIVE SERVICES IN THREE MARKETS AMONG 11-YEAR OLD CHILDREN WITH LITTLE (1 YEAR) OR CONTINUOUS (11 YEARS) FLUORIDATION EXPOSURE

Market Dentist-Population Ratio	Probability of Having 1 or More Restorations		Number of Restorations Among Children Receiving 1 or More Restorations		Average Number of Restorations	
	1 year F	11-years F	1 year F	11-years F	1 year F	11-years F
1196 (minimum)	.54	.67	3.8	3.1	2.1	2.1
1672 (average)	.33	.47	5.1	4.2	1.7	2.0
2871 (maximum)	.23	.35	5.9	4.9	1.4	1.7

TABLE 5
EXPECTED RESTORATIVE EXPENDITURES (1984 DOLLARS) IN THREE MARKETS AMONG 11-YEAR OLD CHILDREN WITH LITTLE (1 YEAR) OR CONTINUOUS (11 YEARS) FLUORIDATION EXPOSURE

Market Dentist-Population Ratio	Restorative Expenditures Among Children Receiving 1 or More Restoration		Average Restorative Expenditures	
	1 year F	11-years F	1 year F	11-years F
1196 (minimum)	$153	$111	$82	$75
1672 (average)	$232	$181	$73	$81
2871 (maximum)	$274	$220	$62	$76