

**A New View of Caries Prevention
for At-Risk Children:
ForsythKids Demonstration Program**

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Health Resources and Services Administration**

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Presentation Goals

- Share results of ForsythKids caries prevention program
- Determine if/how Forsyth might collaborate with HRSA and CHCs to expand ForsythKids caries prevention program nationally

*Forsyth Kids
Demonstration Program*



Results

- Cost per child per year: ~\$100
- Time/child/year: ~45 minutes
- Meets or exceeds 5-year goals of Healthy People 2010 in 1 year (2 visits).

Children 6-8 Comparison of Healthy People 2010 and ForsythKids

Objective 21	Description	HP 2010		ForsythKids	
		Baseline	Target	Start	End*
1b	Reduce proportion of children with caries	52%	42%	77%	67%
2b	Reduce proportion of children with untreated decay	29%	21%	55%	44%
8b	Increase proportion of children with molar sealants	23%	50%	27%	50%

* Average number of preventive visits: 1.95

Data suggests that absolute health change of ForsythKids

- * \approx Healthy People 2010 goals
- * Accomplished in 1 year

Background Problems

- Significant & widening gap in care access
Dentist-patient supply-demand demographics
- Healthcare costs to double by 2014
- Current dental models of care
Over used 19th century surgical care
Underused 21st century infection prevention

Background Forsyth

- Harvard affiliated oral health research institute
- Founded in 1910 to provide free dental care to Boston children
- Focus for last 50 years on infection and prevention
- Back to the future



Targeting Preventive Care Delivery

Age	Location	Care	Barriers
	Ob/Gyn	Comprehensive prevention (Caries, periodontal)	Limited access
1-3	PCP	F varnish	Limited access
3-6	Head Start	F varnish, GI Temporary	Limited access
6-12	Elementary School	Comprehensive prevention	Transitional dentition / Most difficult intervention
12-14	Middle School	Comprehensive prevention	Late intervention

Protocol Concepts

- Evidence-based prevention
- Comprehensive caries prevention
- Expand access (take care to children in school)
- Focus on locations with at-risk children
- Maintain quality (DDS exam, RDH care 2X/year)



Method:

Evidence-Based Comprehensive Caries Prevention (Infection Control or Elimination)



**Tooth cleaning +
Toothbrush + F
Toothpaste**

**F Ionomer Sealant +
F Ionomer Temporary Filling**



Fluoride Varnish



Fluoride Varnish*:

A high tech solution to control of dental caries

- Silicone polymer
- 22,600 ppm fluoride
- Marketed for tooth desensitization
- Low level of systemic delivery
- May be applied in a moist environment

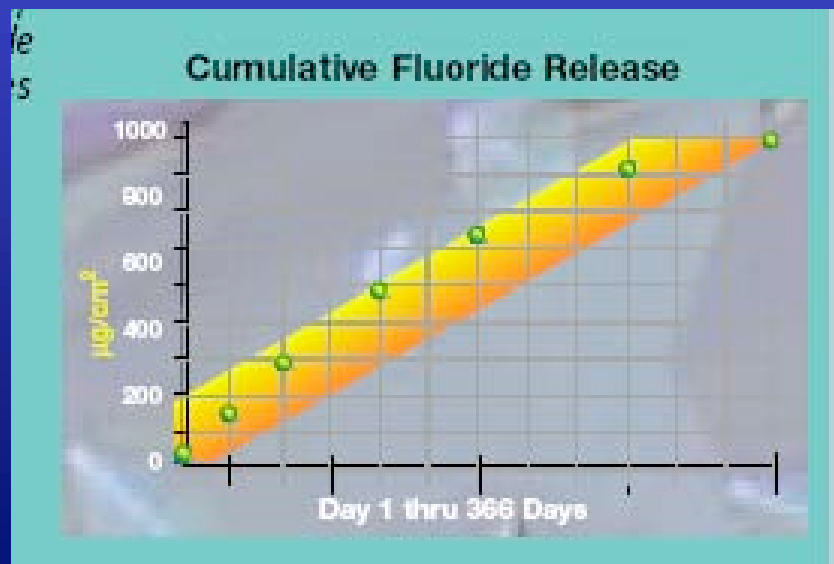


*DuraFlor, Colgate- formerly DuraPhat

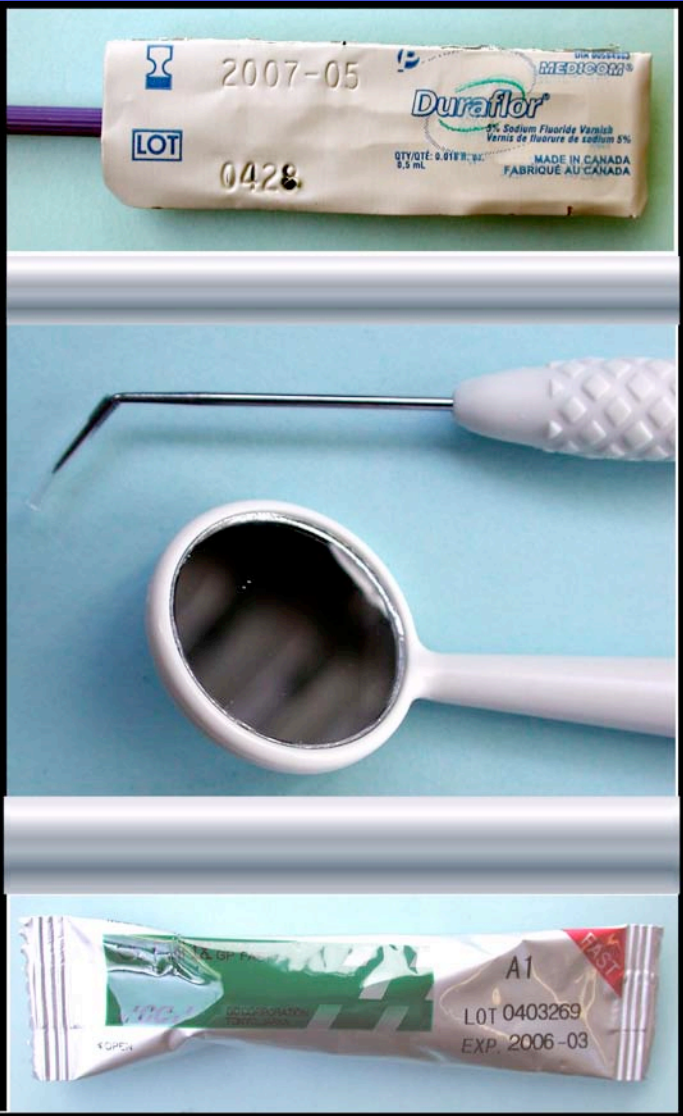
F-Containing Glass Ionomer Sealant and Filling

A High Tech solution to prevent caries

- Adhesive
- Relatively unaffected by moisture
- No drilling, no anesthesia
- Tooth-colored
- Fluoride releasing
- Fluoride recharge ability: long term sustained release
- Remineralizes tooth
- Sealant and filling material
- Permits conservative tooth preparation used in ART techniques



Supplies



FORSYTH KIDS OUTREACH

Permanent Tooth#	Deciduous Tooth#	Not Present	Abscess	CARIES					FILLED					SEALANTS PRRs			Sealed	Temp
				O	L	B	M	D	O	L	B	M	D	O	L	B		
1	●	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2	●	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
3	●	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
4	<input type="radio"/>	41(A) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
5	<input type="radio"/>	42(B) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
6	<input type="radio"/>	43(C) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
7	<input type="radio"/>	44(D) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
8	<input type="radio"/>	45(E) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
9	<input type="radio"/>	46(F) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
10	<input type="radio"/>	47(G) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
11	<input type="radio"/>	48(H) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
12	<input type="radio"/>	49(I) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
13	<input type="radio"/>	50(J) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
14	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
15	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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17	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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19	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
20	<input type="radio"/>	51(K) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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22	<input type="radio"/>	53(M) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
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28	<input type="radio"/>	59(S) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
29	<input type="radio"/>	60(T) <input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
30	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
31	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
32	●		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

1. Has own dentist?
 Yes No Unk

2. Fall Spring

3. Date of Exam
 / /
m m / d d / y y

4. Date of Treatment
 / /
m m / d d / y y

5. Treatment?
 Fluoride + Prophylaxis
 Prophylaxis Only
 None

6. Pathology (All that apply)
 None Mucosa
 Face Lips
 Floor Palate
 Gingiva Tongue

Subject ID#

School ID#

Grade

Date of Birth / /
m m / d d / y y

New Participant? Yes No Gender Male Female

Ethnicity: Hispanic? Yes No Not Reported Race American Indian Black White Not Reported
 Asian Pacific Islander Other _____



Research Subjects

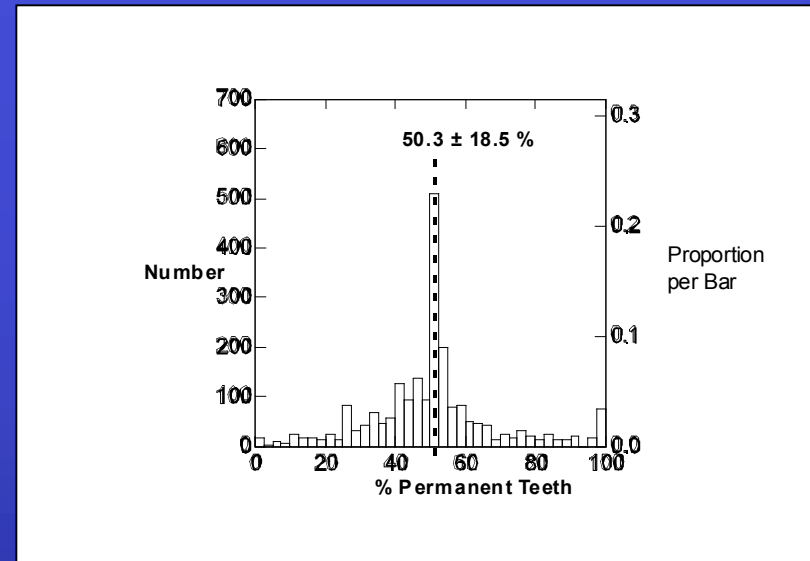
- 6 Massachusetts Elementary Schools:

Boston (2)	Lynn (2)	Hyannis (2)
F	F	NF
Urban	Suburban	Rural

- > 80% participate in free/reduced lunch program
- Grades 1, 2 and 3
- Children seen: 1,196
- Number of patient visits: 2,247

Participant characteristics

- Number of children seen: 1,196
- Qualify for free or reduced lunch program: 86.4%
- Grades 1, 2 and 3
- Number of patient visits: 2,247
- 6 Schools in Massachusetts

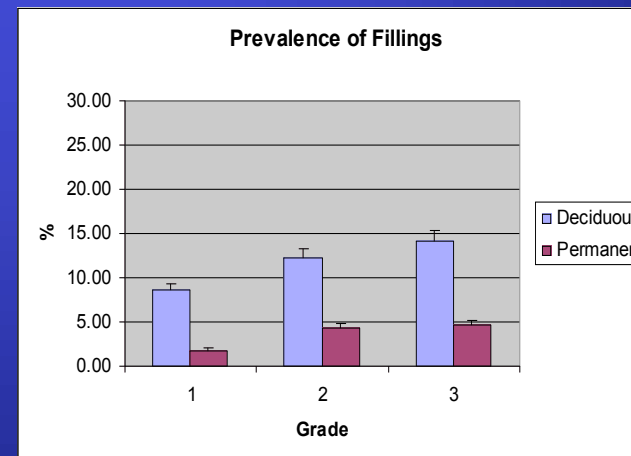
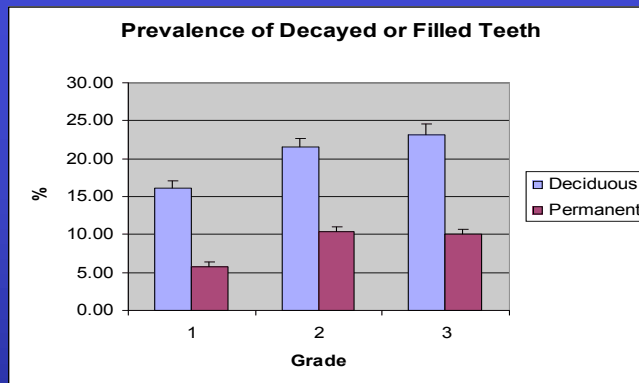
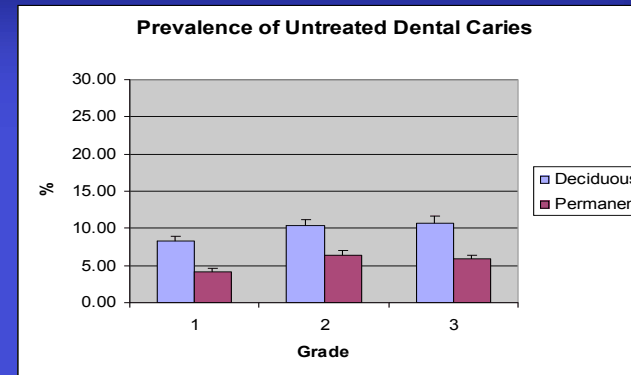


	Grade 1	Grade 2	Grade 3
Age (years):	7.07	8.16	9.18
Permanent Teeth:	8 (35%)	12 (50%)	14 (61%)
Deciduous Teeth:	15 (65%)	12 (50%)	9 (39%)

Baseline Prevalence (% of teeth)

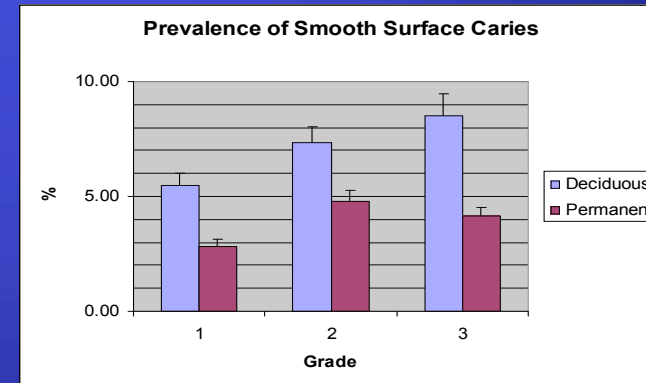
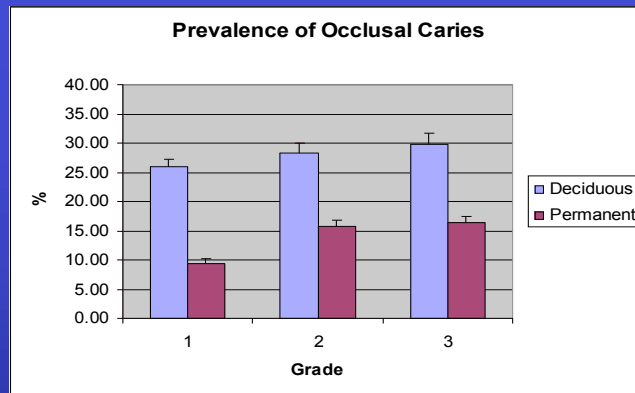
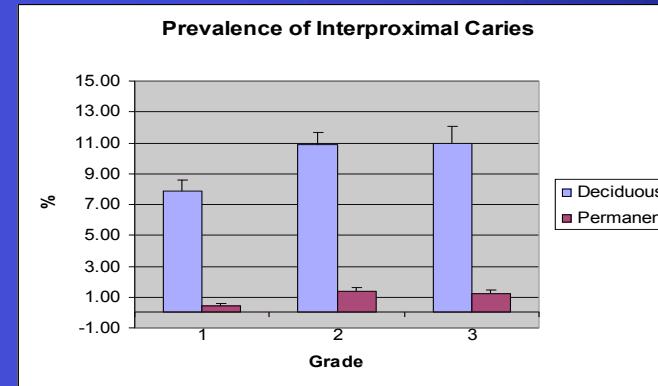
	Grade 1	Grade 2	Grade 3
df Prevalence	16.2	21.5	23.1
DF Prevalence	5.8	10.3	10.0
d Occlusal	26	28	30
D Occlusal	9	16	16
d interproximal	8	11	11
D interproximal	0.4	1.4	1.2
d smooth surface	6	7	9
D smooth surface	3	5	4

Baseline Prevalence (DF) for each grade by tooth/patient



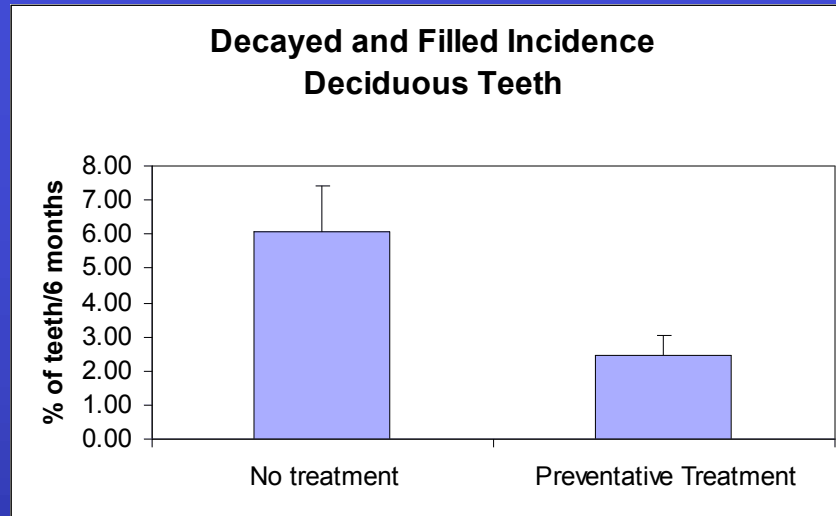
20% in primary teeth, 10% in permanent teeth.

Baseline Prevalence (DF) for each grade by surface/patient



Occlusal: 25% in primary teeth, 10% in permanent teeth.
Interproximal: 10% in primary teeth, 1% in permanent teeth.
Smooth Surface: 8% in primary teeth, 4% in permanent teeth.

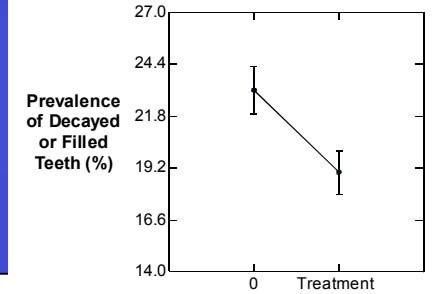
Preventative Effect of 1 treatment: Deciduous Teeth (DF)



TREAT	Prev. V1	S.E.M.	Prev. V2	S.E.M.	Incidence	S.E.M.	N
0	20.45	1.42	26.55	1.66	6.10	1.31	199
Prev	17.80	0.99	20.23	1.14	2.43	0.61	436

Conclusion: There was a 60% reduction in new deciduous dental caries (incidence) following 1 treatment cycle

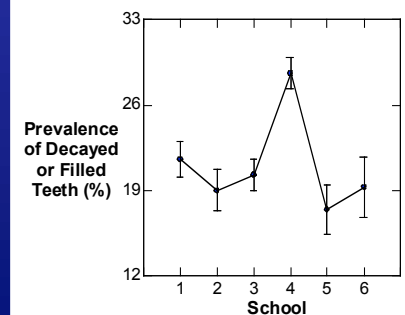
Decayed + Filled (DF): Deciduous Teeth 1 Treatment Visit (6months later)



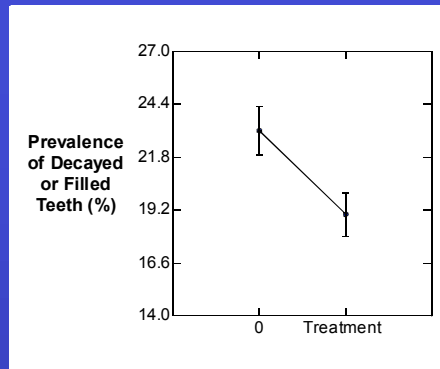
Analysis of Covariance - Deciduous Teeth

Source	Sum-of-Squares	df	Mean-Square	F-ratio	P
Treatment	1649.67	1	1649.67	8.17	0.004
School	10204.59	5	2040.92	10.10	0
Grade	162.81	2	81.41	0.40	0.67
Gender	2.01	1	2.01	0.01	0.92
Free Lunch	223.32	1	223.32	1.11	0.29
Baseline	214235	1	214235	1060.38	<0.00001
Error	125868	623	202.04		

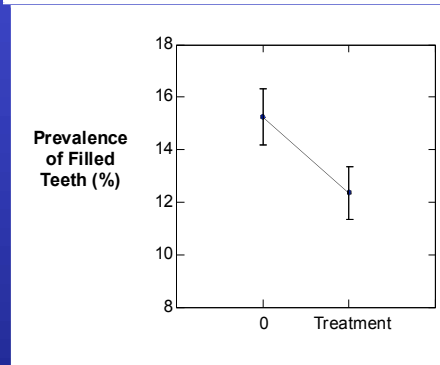
The reduction in deciduous dental caries following 1 treatment was highly significant. Baseline caries and school were significant covariates.



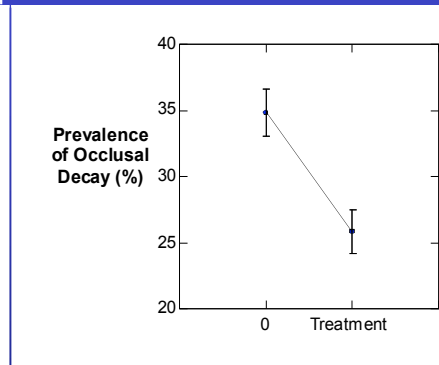
Effect of Prevention on Deciduous Teeth 1 Treatment Visit (6months later)



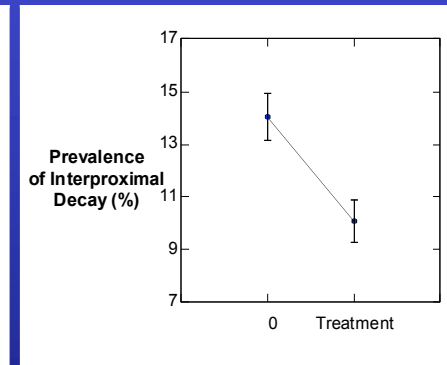
($p=0.004$)



($p=0.03$)



($p=0.00003$)

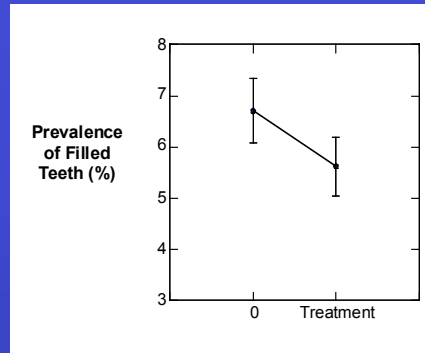


($p=0.0003$)

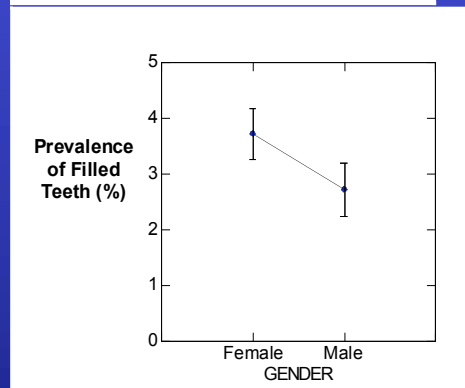
Conclusions:

Highly significant reduction in deciduous dental caries
Were observed after a single preventative treatment.

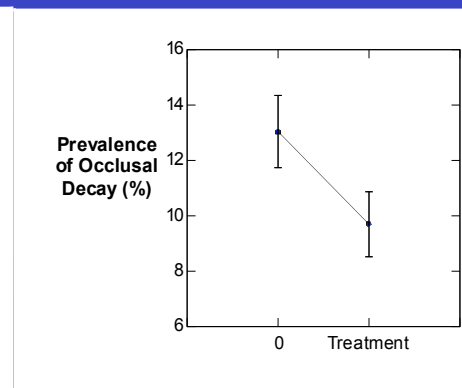
Effect of Prevention on Permanent Teeth 1 Treatment Visit (6months later)



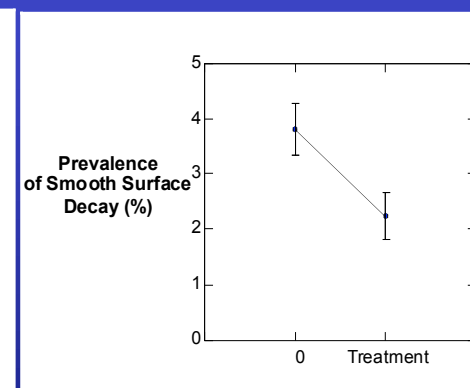
(NS, $p=0.16$)



(NS, $p=0.43$)



($p<0.04$)

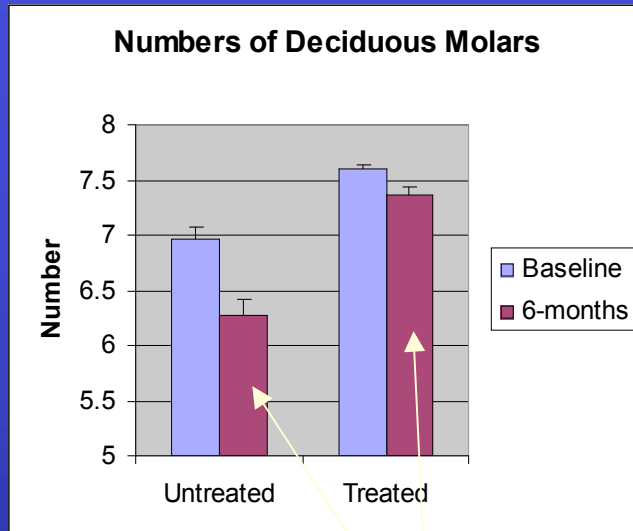


($p<0.005$)

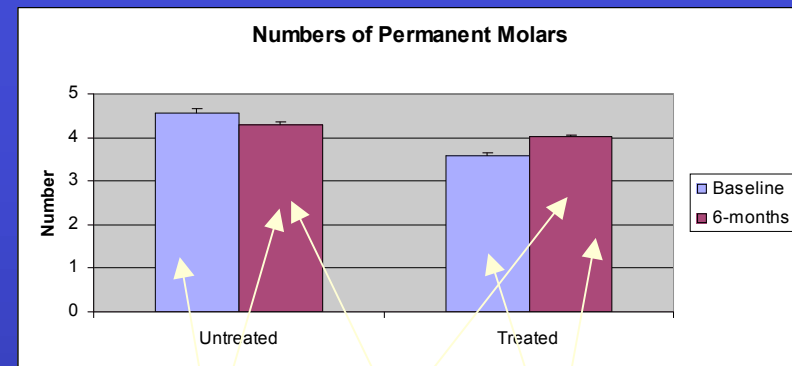
Conclusions:

Significant reductions in permanent tooth dental caries were also observed after a single preventative treatment.

Effect on number of preventative treatment on permanent and deciduous teeth



$P = 0.03$



$P < 0.001$ NS $P < 0.001$

Conclusion: A single preventative treatment increased the number of teeth six months later.

Summary of Significant Effects of a Single Preventative Treatment Cycle*

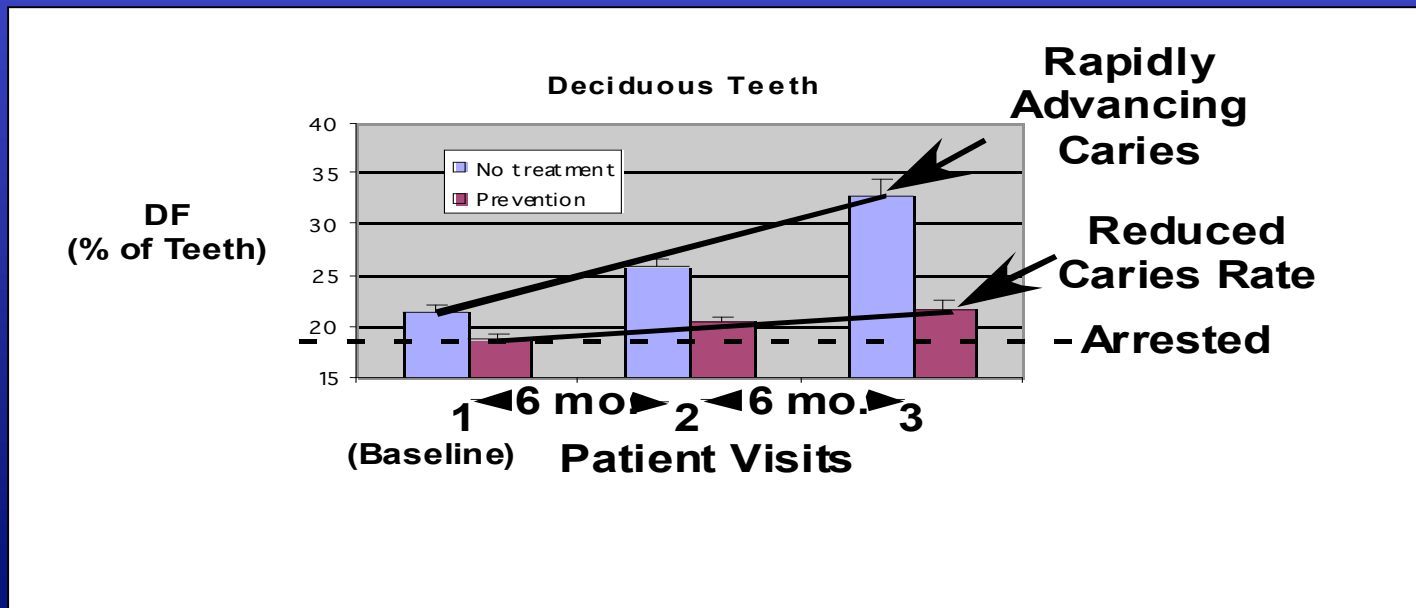
Measure	% Reduction (p)	
	Deciduous	Permanent
Decayed + Filled	4.13%(0.004)	1.1% (NS, 0.16)
Decayed	1.42% (NS, 0.19)	0.65% (NS, 0.28)
Filled	2.8% (0.03)	(NS, 0.43)
Occlusal Caries	9.0% (0.00003)	3.3% (0.04)
Interproximal Caries	3.9% (0.003)	(NS, .42)
Smooth Surface Caries	2.3% (0.04)	1.6% (0.005)
Number of teeth	0.43 teeth (0.03)	(NS, 0.23)

Conclusion: Significant reductions associated with preventative treatments were observed in both deciduous and permanent teeth.

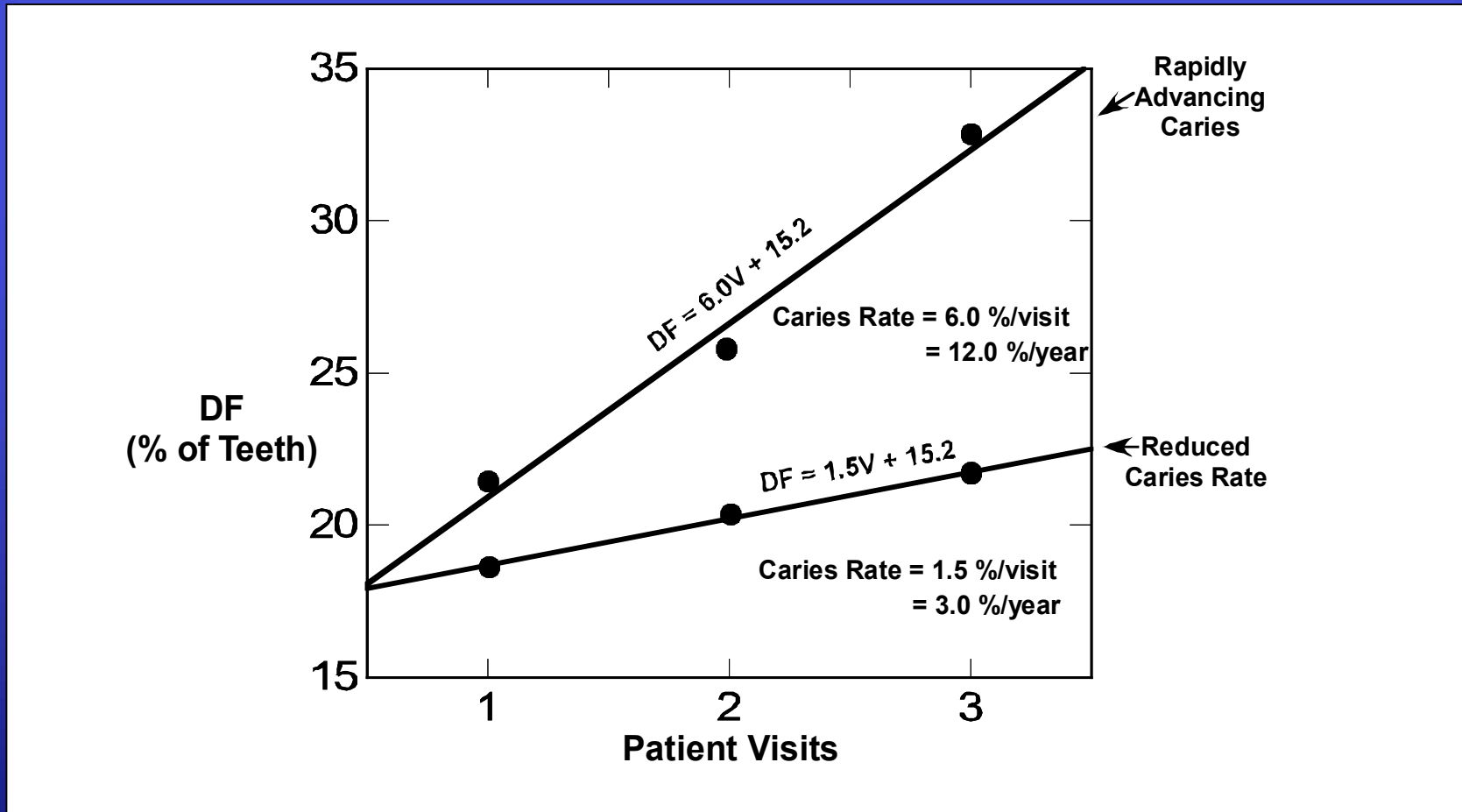
*difference in least-squares means

Effects of Multiple Prevention Cycles

- Principle: The measure of caries is an increase in the DF increment over time.
 - Unchecked, DF continues to increase
 - If there is no change in DF over time, the caries process is arrested.

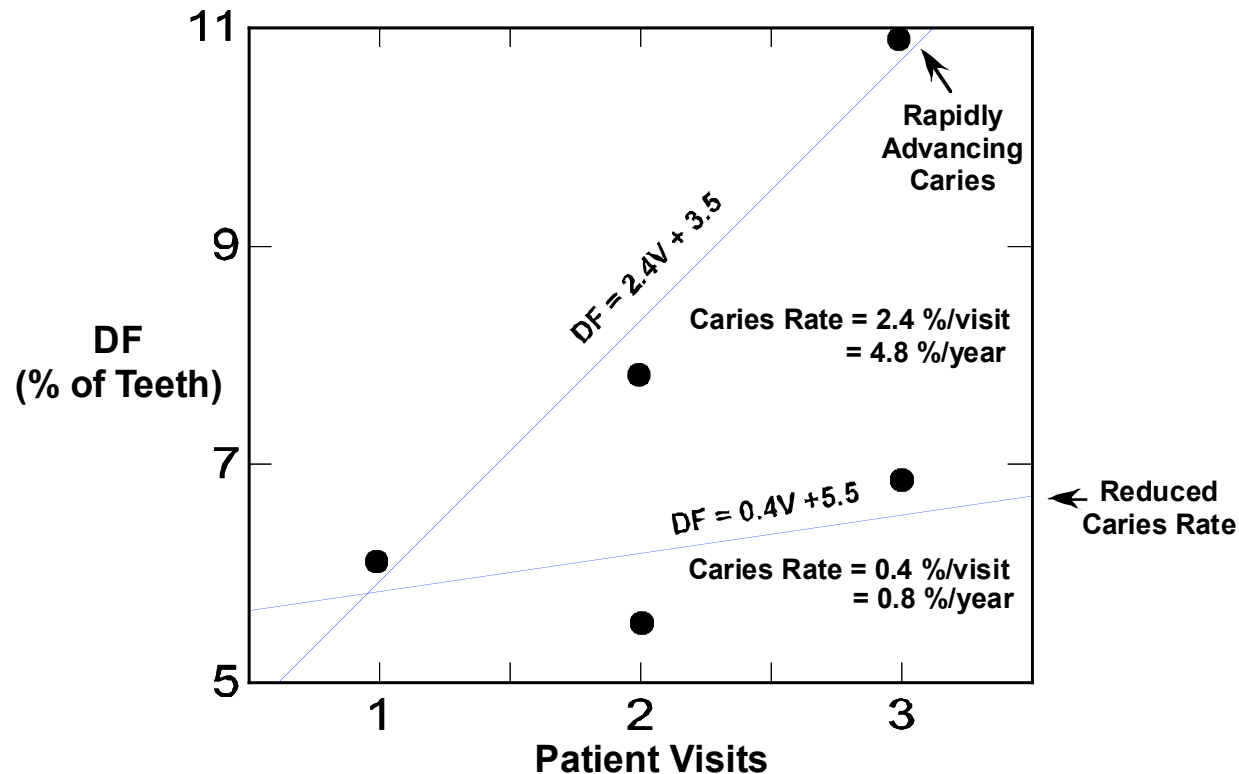


Analysis of Multiple Treatment Effects in Deciduous Teeth



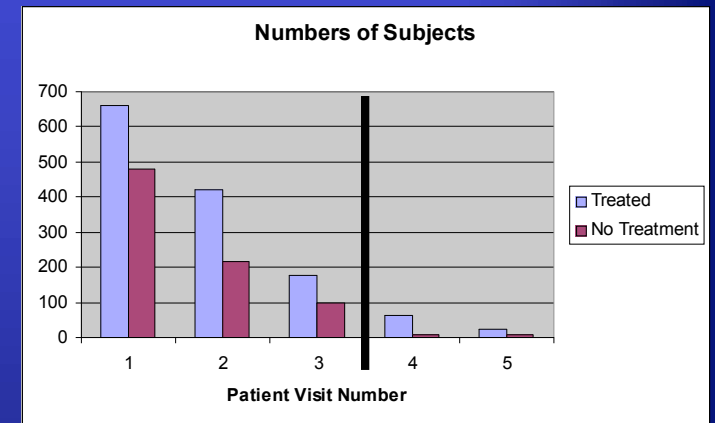
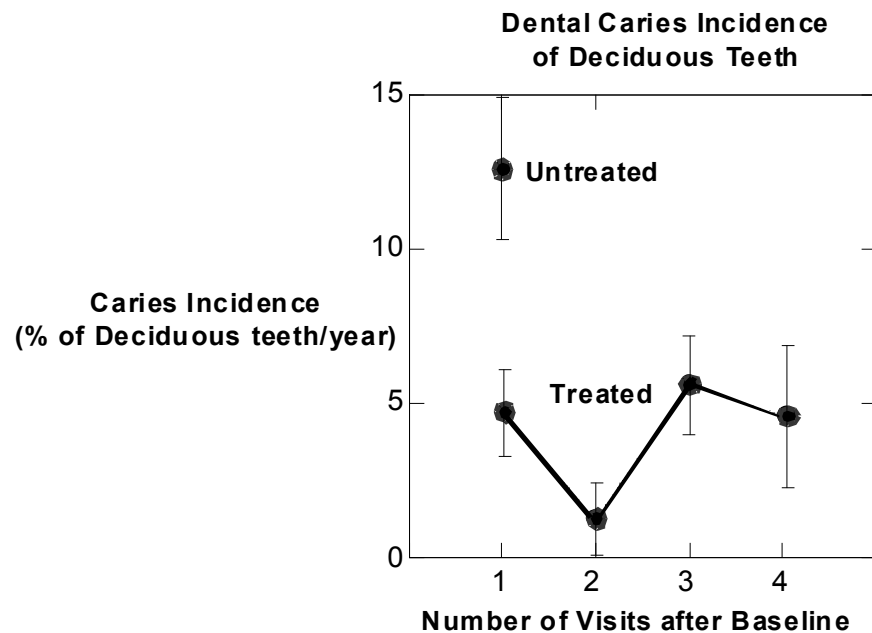
Conclusion: The preventative procedure reduced the caries rate in deciduous teeth by 75%

Analysis of Multiple Treatment Effects in Permanent Teeth



Conclusion: The preventative procedure reduced the caries rate in permanent teeth by 83% (NS) but the caries rate in permanent teeth was 40% less than that of deciduous teeth.

Effect of multiple Applications on Deciduous Teeth



Conclusion: Two treatments reduced caries incidence to a level that was indistinguishable from zero.

Approximate Time and Cost/Visit*

	Time (min)	Cost
Setup³	10	\$8.33
Rx Supplies		\$7.00
Exam Supplies		\$3.00
Exam^{1,3}	5	\$8.33
Treatment^{2,3}	15	\$12.50
Cleanup³	10	\$8.33
	40	\$47.50

***Based on:**

- 1) \$100/hr Dentist (\$1.67/min)**
- 2) \$50/hr Hygienist (\$0.83/min)**
- 3) \$18/hr Assistant (0.30/min)**

Business Case for Prevention

	Mass Health Allowed Reimbursement
Examination	\$52
Prophy	\$90
Fluoride	\$48
Sealants	\$144
	\$334
Cost	\$100
Net	\$234

Conclusion: Medicaid reimbursement can cover costs of prevention

Summary

The results suggest that school-based comprehensive preventive care delivery can:

- **Increase access to care: 80% participants were poor**
- **Improve oral health: ~75% caries reduction**
- **Sustainable on Medicaid fees: Net \$200/child/year**
- **Produce results that are better than goals for 5-year Healthy People 2010.**
- **Time/child/year: ~45 minutes.**

**This work was supported in part by
Delta Dental Plan of Massachusetts**

Our Goals in Participating in this Meeting

- Share results of ForsythKids caries prevention program
- Determine if/how Forsyth might collaborate with HRSA and CHCs to expand ForsythKids caries prevention program nationally

*“If we want more evidence-based practice,
We need more practice-based evidence”*

Thank you