

December 15, 2005



Oral Health Status of Third Grade Children:

New York State Oral Health
Surveillance System

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Acknowledgement:

We would like to thank our partners, school superintendents, principals, teachers, nurses and parents for assisting us in completing this project.

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Introduction

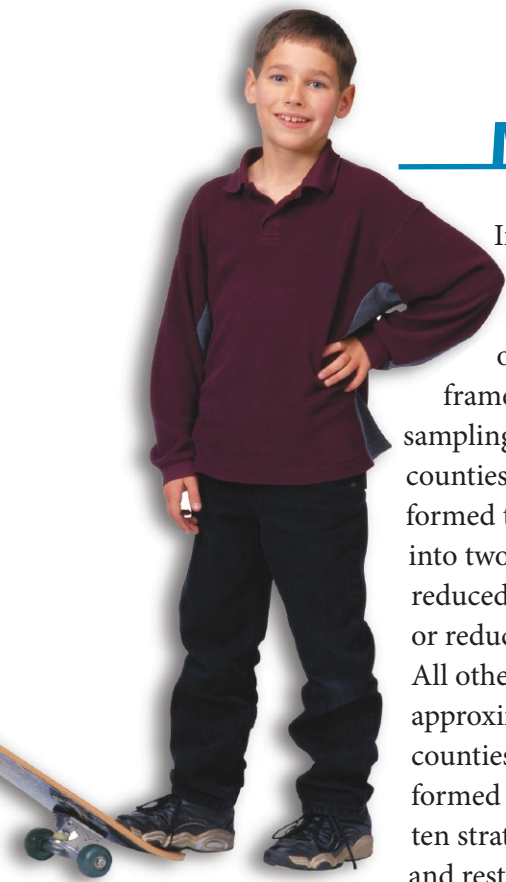


Dental caries, the most common chronic childhood disease, impacts children's functioning including eating, growth, speaking, and learning (1-3). Oral diseases in adults negatively impact their employability and systemic health (2;4-6). Although dental caries is preventable, almost 80% of children will have experienced tooth decay by the time they finish high school (7). For children, oral diseases can jeopardize their physical growth, self-esteem and capacity to socialize. In the US, children are estimated to lose over 51 million school hours annually because of dental problems and dental visits (5;7). *The Healthy People 2010 Progress Review*, designed to monitor the progress of the health status in the US cited multiple unmet goals, and substantiated the continued high prevalence of oral diseases in children (8). In a report titled *Oral Health in America*, the Surgeon General concluded that a "silent epidemic" of oral and dental diseases is affecting some population groups (1). The report noted profound disparities in oral health among children. A subsequent report titled *A National Call to Action to Promote Oral Health* emphasized the need for greater attention to improving oral health and dental care (9).

Data on oral diseases and treatment needs are not routinely available. The lack of data on disease levels and treatment needs has hampered the ability to assess problems, monitor progress, and identify solutions. In the past, most oral health data have been generated for research purposes, rather than for ongoing surveillance. Healthy People 2010 Oral Health Objective 21-16 calls for an oral and cranio-facial health surveillance system in each state (9;10). To address this need, the New York State Department of Health (DOH) entered into a cooperative agreement with the Centers for Disease Control and Prevention (CDC) to establish a surveillance system for monitoring oral health status, risk factors, workforce, and the use of dental services. To collect data on tooth decay or dental caries in children, DOH assisted local health units in conducting a survey of 3rd grade children. Partners included local health units, program contractors, schools of dental hygiene and dentistry and community-based organizations.

The survey of 3rd grade children is designed for fulfilling many of the requirements of the National Oral Health Surveillance System (NOHSS). The objectives of this survey were to determine the following indicators of oral health:

- Proportion of children with caries experience (history of tooth decay).
- Proportion of children with untreated tooth decay.
- Proportion of children with dental sealants.
- Proportion of children with a dental visit in the last year.
- Proportion of children who have ever received fluoride tablets on a regular basis.
- Proportion of children with dental insurance.



Methods

In order to accomplish these objectives, a representative sample of schools was selected from each county in New York State. The New York State Education Department Profiles of Schools and New York City Board of Education enrollment records were used for constructing the sampling frame. The sampling scheme was based on the concept of stratified random sampling of clusters. Samples were selected separately for New York City and upstate counties. In upstate New York, county and socioeconomic status of the school formed two levels of stratification. Schools with 3rd grade children were categorized into two socioeconomic strata (SES) based on the percent of children in the free or reduced school lunch program. A school with >39.15 percent of children in the free or reduced school lunch program (median) was considered as a low SES school. All other schools were considered as higher SES schools. A sample of 331 schools, approximately 3 each from the two SES strata, was selected from fifty-seven upstate counties. In New York City, public and nonpublic schools from five boroughs formed ten strata. A proportionate sample of 60 schools was obtained from these ten strata. A total of 13,147 children from 59 and 301 schools from New York City and rest of the state respectively, were included in the final analysis. However, only

10,895 children agreed to participate in the clinical examination. The overall response rate for the dental screening was 37.7%. This represents a target population of approximately 250,000 children.

After obtaining permission from the selected schools, parents of 3rd grade children were contacted to obtain consent for participation in dental screenings. Consent forms, along with questionnaires, were distributed in the classrooms or mailed to parents. Parents were encouraged to complete the questionnaire and return the signed consent form even if they did not want the child to participate in the screening. A trained dental hygienist or a dentist conducted the screening in the school using a mirror, explorer and light source, with the patient seated in a comfortable chair. Only those children with written permission were screened. These screenings were in accordance with the guide *Basic Screening Surveys: An Approach to Monitoring Community Health* (11).

Preliminary analysis was conducted using SAS software (12). Estimates of proportions, and the respective standard errors were obtained by methods appropriate for cluster sampling using SUDAAN software (13). These methods take into account the unequal sizes of the clusters and the differential response rates from each cluster. The weights necessary for such calculations were derived from the school enrollment records, and these weights took into account their probability of selection.

To determine the oral health status in different socioeconomic groups, estimates were obtained for lower and higher income groups separately. Participation in the free or reduced school lunch program was used to determine the child's income status. To assess the impact of the school-based dental sealant program, the prevalence of dental sealants was compared between children who attended schools with and without school-based interventions. The reported use of fluoride tablets on a regular basis was estimated to assess the appropriate use of fluoride supplements.

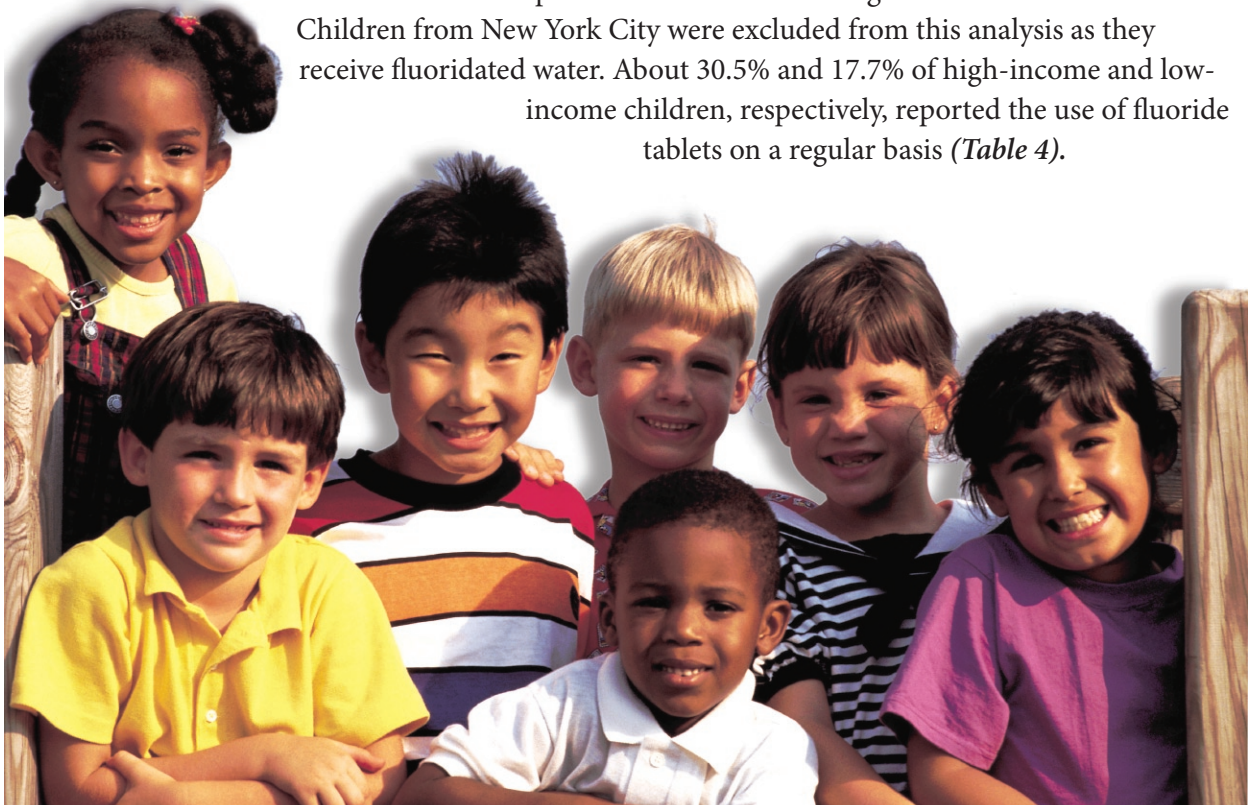
Findings

Caries experience reflects past disease and could be represented by a missing tooth due to caries or presence of a cavity or a filling. The estimated percent of children who have experienced caries was 54.1 (*Table 1*). The estimated percent of children with untreated caries was 33.1. The Healthy People 2010 target for caries experience and untreated caries for 6-8 year old is 42 and 20%, respectively. Consistently, both caries experience (59.6% vs. 48.0%) and untreated caries (40.8% vs. 23.1%) were more prevalent in the low-income group (*Table 1*).

The estimated percent of children with a dental sealant on a permanent molar, an indicator of access to preventive services was 27.0, compared with the Maternal and Child Health Block Grant performance measure of at least 50% (*Table 2*). Again, a lower proportion of low-income children had dental sealants compared to that of high-income children (17.8% vs. 41.1%). The percent of children with a dental sealant was higher in those schools with a dental sealant program (*Figure 1*). Furthermore, these school children had met the Maternal and Child Health Services Block Grant performance measure with respect to dental sealants (Target is 50%).

Approximately 80.1% reported having dental insurance coverage (*Table 3*). The percent of children with a dental visit was 73.4 (*Table 3*). While there was no noticeable difference in the insurance coverage between high and low income groups, a lower proportion of low income children had visited a dentist in the last one-year (60.9% vs. 86.9%).

Fluoride tablets are prescribed to children living in non-fluoridated areas. Children from New York City were excluded from this analysis as they receive fluoridated water. About 30.5% and 17.7% of high-income and low-income children, respectively, reported the use of fluoride tablets on a regular basis (*Table 4*).



Tables

Table 1.

Weighted estimates of dental caries experience and untreated caries (percent and standard error) in 3rd grade children. *New York State 2002-2004.*

	Caries Experience		Untreated Caries	
	Number	Percent (SE)	Number	Percent (SE)
All Children	10895	54.1 (1.3)	10,888	33.1 (1.8)
High income	4664	48.0 (1.4)	4663	23.1 (1.4)
Low income	4284	59.6 (1.6)	4283	40.8 (1.2)
Unknown Income	1947	51.4 (3.6)	1942	31.8 (3.2)

Table 2.

Weighted estimates of prevalence of dental sealants (percent and standard error) in 3rd grade children by income status, *New York State 2002-2004.*

	Dental Sealant Prevalence	
	Number	Percent (SE)
All Children	10534	27.0 (2.9)
High income	4468	41.1 (2.4)
Low income	4124	17.8 (2.1)
Unknown Income	1942	24.4 (3.8)

Table 3.

Weighted estimates of 3rd grade children with dental insurance coverage and dental visits in the past year (percent and standard error) by income status. *New York State 2002-2004.*

	Dental insurance		Dental visit within 1 year	
	Number	Percent (SE)	Number	Percent (SE)
All Children	11835	80.1 (2.0)	11661	73.4 (2.4)
High income	6037	76.2 (3.1)	6036	86.9 (1.6)
Low income	4548	84.1 (1.2)	4523	60.9 (0.9)
Unknown Income	1250	78.9 (1.5)	1102	71.5 (2.8)

Table 4.

Weighted estimates of regular use of fluoride tablets (percent and standard error) in 3rd grade children by income status (excluding New York City). *New York State 2002-2004.*

	Dental insurance	
	Number	Percent (SE)
All Children	9905	26.9 (1.8)
High income	5808	30.5 (2.5)
Low income	3325	17.7 (1.8)
Unknown Income	772	36.1 (3.0)



Discussion

The findings show that the disparities in oral health and unmet needs observed in national and other state surveys are also apparent in New York State (1;10;14-16). Nationally, approximately 52% of 6- to 8-year-old children have dental caries (2). In this survey, compared to children in the high-income group, low-income children had more caries experience and untreated caries, fewer dental visits, fewer sealants and lower utilization of fluoride tablets. This occurred in spite of the fact that approximately 84% of the low-income children reportedly had dental insurance coverage. While the proportion of children with untreated caries appears sizeable, it should not be construed that every child with untreated caries will require treatment, as dentists do not recommend treatment for asymptomatic primary teeth in this age group.

Fluoride either in water, supplements or in various dental products has been the cornerstone of caries preventive efforts over the past 60 years. Because most children are exposed to fluoride in one form or other, most childhood caries in permanent teeth occur on tooth surfaces with pits and fissures (17). Therefore, the use of dental sealants as a protective coating on these pits and fissures has been the focus for further improving oral health in school aged children (2;7;8;18;19;19-22). Although numerous reports have shown dental sealants to be an effective method of reducing dental caries, its use continues to be low (2). Nationally, the percentage of children with a dental sealant has risen from 7.6% among 5-17 year old children in 1986-87 to 26.1% of

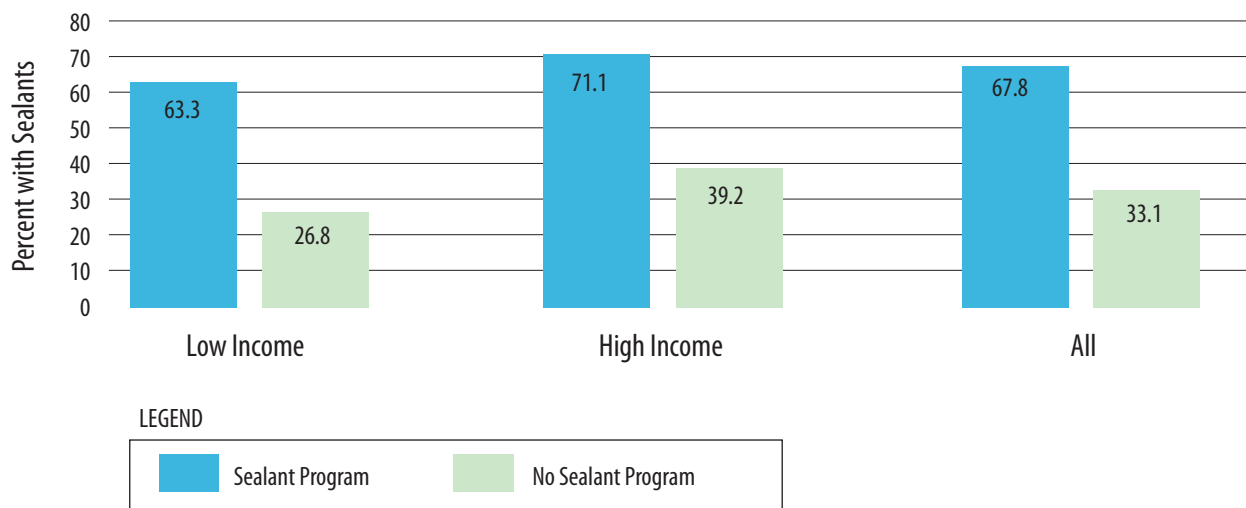
8-10 and 22.2% of 14-16 year old children in the NHANES III (2). A survey of 2nd grade children in upstate New York in 1997-99 showed that the prevalence of sealants in poor and non-poor children was 21.1% (95% Confidence Interval \pm 3.7) and 28.3% (95% Confidence Interval \pm 4.1), respectively (23). While the current data may not be directly comparable, the prevalence of sealants appears to be higher now at 26.8 to 39.2% among 3rd grade children in schools without a dental sealant program in upstate New York (*Figure 1*). However, the prevalence of dental sealants was lower in many schools. For example, in 53 (90%) out of the 59 schools surveyed in New York City, the prevalence of sealants was less than the state average of 27%. It appears that many children at high risk for caries are not receiving sealants. Reasons for the lower utilization of dental sealants require further exploration. Previous studies have shown that the reasons for low level of sealant usage include lack of public knowledge, concerns stemming from early problems with sealant materials and procedures for application, reimbursement issues in both public and private sectors, and concerns about covering undetectable caries lesions (2;7;8;19-21).

To promote the use of sealants, the New York State Department of Health has provided grant support to many communities to implement school-based and school-linked dental programs, and organize community-wide educational efforts. While school-based programs provide sealants on site, school-linked programs identify school children in need of sealants and refer them to private offices or

facilities for sealant placement. These programs identify schools with a high proportion of high-risk and underserved children, mobilize support and deliver or facilitate the delivery of sealants. The Department has also sponsored many training sessions and workshops for dental professionals (24). In addition, the reimbursement fee under the Medicaid program has been increased to \$43 per tooth, which falls at the 89th percentile when compared to the claims submitted by dentists to other payers for the same procedure (25).

Figure 1.

Percent of 3rd grade children with a dental sealant (excluding New York City) by school-based sealant program and income status. *New York State 2002-2004.*



Note: New York City schools were excluded from the analysis, as there were no school-based dental sealant programs in the New York City sample.

Approximately 67.8% of the children in those schools with a dental sealant program in upstate New York had dental sealants compared to that of 33.1% in schools without a program. These data suggest that school-based dental programs have the potential to accomplish the Maternal and Child Health Block Grant performance measure. This finding is consistent with a study conducted in Ohio (26). Among third grade students surveyed in Ohio, 34.2% had at least one dental sealant on a permanent molar tooth. At schools with dental sealant programs, 56.7% of third grade students had a sealant, compared with 28.2% of students at schools without sealant programs.

An annual visit to a dentist provides an opportunity for obtaining preventive services, early detection of dental diseases and prompt intervention. This self-reported data indicated that approximately 73.4% of 3rd grade children visited a dentist within the past one year. This is consistent with the NHANES III data that showed a similar percentage of US children 5-14 year old visited a dentist annually (2). However, the estimates of dental care usage vary among national surveys (27).



According to the Medical Care Expenditure Panel Survey, only 51.1% of 6-17 year old children had incurred an expense related to dental services (28). While the self reported dental visit rate may be an over-estimate, the disparity observed between low and high income groups should still be valid.

It is reassuring to note that fluoride tablets are being prescribed mostly in upstate New York where fluoridation of water reaches approximately 46% of the population. These data support the view that low-income children are less likely to benefit from fluoride prescriptions as evidenced by the disparity in the reported use of fluoride tablets whereas the benefits of water fluoridation accrue to all residents.

While there has been progress for children in the high-income group toward accomplishing many of the Healthy People 2010 objectives, the need to control disease appears to be more acute in the low-income groups. The presence of untreated decay and absence of sealants on permanent teeth reflect missed opportunities for primary prevention, as many children are not utilizing dental services in a timely manner.

The Centers for Disease Control and Prevention recommends population-based approaches such as water fluoridation and school-based or school-linked dental sealant programs to control dental caries (21;29). Initiation of effective personal preventive measures (e.g., tooth brushing with fluoride toothpastes and flossing) as soon as teeth erupt is also recommended (30-32). Further, tailored dental visits provide an opportunity to assess dietary and oral hygiene practices, place sealants on permanent teeth and implement prompt treatment (30-32).

These data support the current efforts of the New York State Department of Health to promote targeted interventions in elementary school children in underserved areas. However, interventions must also occur earlier to accomplish the Healthy People 2010 Objectives with respect to caries experience and untreated caries in primary teeth. Several investigators have found that tooth decay is an infectious, transmissible, disease caused primarily by *Streptococcus mutans* bacteria acquired by infants and toddlers from their mothers (33-35). In its early stages, the effects of dental caries are largely reversible through remineralization of tooth enamel. According to the Guide to Children's Dental Care in Medicaid, primary prevention must begin in the first to second year of life (30). The American Academy of Pediatrics recommends that pediatricians and pediatric health care professionals develop the knowledge base to perform oral health risk assessments on all patients beginning at six months of age (30). The evidence for the transmission of the bacteria from mothers to children also suggests the need to improve the oral health of expectant and new mothers and reduce the transmission of bacteria (32;36). While interventions directed toward individuals are likely to be successful, several reports have highlighted the need to integrate oral health into general health and build partnerships to promote oral health (1;9;20;37).

Limitations

There are several limitations in this survey. First, these screenings were conducted without the help of radiographs. Therefore, the findings may differ from those observed by clinicians. Second, the study was not designed to examine the severity of the disease. Third, the possibility of bias from selective participation should be considered in applying the results to all children. Fourth, questions on residence, race, and insurance coverage were included only in New York City. Finally, a smaller number of schools and children in some subgroups may have resulted in unstable rates and invalid standard errors. This particularly applies to high-income children in New York City.

Indicators

- **Caries experience (history of tooth decay):** Reflects the presence of a cavity or a filling, or a history of extraction of a permanent tooth. It indicates that opportunities for primary prevention may have been missed.
- **Untreated caries:** Reflects the presence of a cavity. It indicates that treatment has not been obtained in a timely manner.
- **Dental sealants:** A reflection of use of preventive services. Sealants are plastic coatings applied to decay-susceptible tooth surfaces (the pits and fissures).
- **Dental visits in last one year:** Reflects the visit to a dentist or dental clinic at least once in the past year.
- **Use of fluoride tablets:** Reflects the use of fluoride tablets or drops on a regular basis. Fluoride tablets or drops are prescribed to those children living in non-fluoridated areas.
- **Dental insurance:** Self reported coverage that pays for visits to a dentist or a dental clinic. Includes Medicaid and Child Health Plus coverage.
- **Standard error (SE):** A statistic indicating how greatly the estimate obtained from the sample is likely to differ from the population. This is used for calculating Confidence Intervals for the rates. The general formula for the 95% confidence intervals is as follows: $95\text{ CI} = \pm 1.96 * SE$.

A confidence interval is analogous to the margins of error that are provided for news polls. In the simplest term, Caries experience of 54.1% with a standard error of ± 1.3 means that there is a 95% chance that the prevalence in the population is between 51.5% and 56.7%. Conversely, there is a 5% chance that the prevalence is lower than 51.5% or higher than 56.7%.

- **School lunch participation:** Based on the self-reported history, children were categorized as participating in the free or reduced lunch program or not. This reflects the economic status of the family. Those who reported participating in the free or reduced lunch program are categorized as low income children.

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