





**W 4.5 S838c 2006**  
**Sterba, Jennifer A.**  
**Child nutrition and hygiene**  
**practices related to dental**

**UNTHSC - FW**



**M03GM4**

LEWIS LIBRARY  
UNT Health Science Center  
3500 Camp Bowie Blvd.  
Ft. Worth, Texas 76107-2699





Sterba R.D.H., B.S., Jennifer A. Child Nutrition and Hygiene Practices Related to Dental Caries in Pre-School Children. Master of Public Health (Community Health), August 2006, 50 pp., bibliography, 22 titles.

Dental caries is a significant public health issue among low income children. Head Start is a child developmental program that provides education and health services for low income families. One hundred and thirty seven children, age's three to six, and their parents/guardians enrolled in four sites at Head Start Greater Dallas, Inc. participated in this study. Fifty-three percent of all children had evidence of early childhood caries. In this study, parents/guardians reported adequate nutrition and hygiene practices of their child's oral health, but children still show a high incidence of caries. Therefore, preventive educational services provided by a dental professional would be beneficial to the Head Start families to improve children's oral health.

CHILD NUTRITION AND HYGIENE PRACTICES

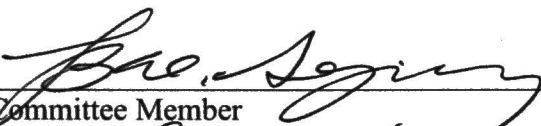
RELATED TO DENTAL CARIES IN

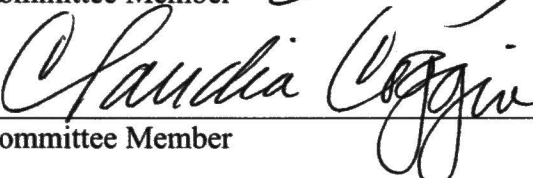
PRESCHOOL CHILDREN

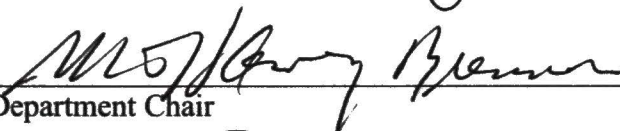
Jennifer A. Sterba, R.D.H., B.S.


APPROVED:

  
Major Professor

  
Committee Member

  
Committee Member

  
Department Chair

  
Dean, School of Public Health

**CHILD NUTRITION AND HYGIENE PRACTICES  
RELATED TO DENTAL CARIES IN  
PRESCHOOL CHILDREN**

**THESIS**

**Presented to the School of Public Health**

**University of North Texas  
Health Science Center at Fort Worth**

**in Partial Fulfillment of the Requirements**

**for the Degree of**

**Master of Public Health**

**By**

**Jennifer A. Sterba, R.D.H., B.S.**

**Fort Worth, Texas**

**August 2006**



## TABLE OF CONTENTS

### Chapter

I. INTRODUCTION .....	1
Research Problem	
Statement of Purpose	
Research Questions	
Delimitations	
Limitations	
Assumptions	
Definition of the Terms	
Importance of the Study	
II. LITERATURE REVIEW.....	7
III. METHODOLOGY .....	12
Population and Sample	
Protection of Human Participants	
Data Collection Procedures	
Instrumentation	
Data Analysis	
Summary	
IV. RESULTS.....	17
V. CONCLUSIONS AND RECOMMENDATIONS.....	27
Summary	
Conclusion	
Discussion	
Recommendations	
APPENDIX.....	35
BIBLIOGRAPHY .....	43

## CHAPTER I

### INTRODUCTION

Dental decay is one of the most common chronic infectious diseases among U.S. children (Center of Disease Control [CDC], 2005). Children with dental caries experience pain and suffering which can cause delays in learning and development. Data reported from the National Health and Nutrition Examination Survey (NHANES) (1999-2002) found 41% of children aged 2-11 had tooth decay in their primary teeth (CDC, 2005). Early childhood caries (ECC) is defined as the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. (American Academy of Pediatric Dentistry [AAPD], 2005). This condition is often associated with poor oral hygiene, use of baby bottles with beverages at night, and frequent use of sugar drinks and snacks.

#### *Research Problem*

Early childhood caries is a significant public health issue among low socioeconomic infants and toddlers in the United States today (Bray, Branson, & Williams, 2003). Poor children suffer twice as much dental caries compared to their more affluent peers, and their disease is more likely to stay untreated (Health and Human Services [HHS], 2000). Lower socioeconomic populations are at greater risk for dental decay because of lack of access to dental care, no dental insurance, low education of

parents, and frequent exposure to simple sugars. One out of four children in the United States is born into poverty, and children living below the poverty line (annual income of \$17,000 for a family of four) have more severe and untreated decay (HHS, 2000). One of the Healthy People 2010 objectives is to increase the number of low-income children who receive at least some amount of preventive dental care during a given year (HHS, 2000). More awareness about the factors that influence dental care among low income children may help develop and assess programs to improve their oral health and to meet the Healthy People 2010 objectives.

Head Start of Greater Dallas (HSGD) has 37 centers located throughout Dallas County and serves more than 4000 children (HSGD, 2006). They receive funding for their program from the United States Department of Health and Human Services and local community organizations (HSGD, 2006). The HSGD program targets low income families and provides educational, social, medical, dental, and mental health services, as well as two-thirds of their daily nutrition (HSGD, 2006). These are child focused programs and have the overall goal of increasing the school readiness of young children in low-income families (Head Start Bureau [HSB], 2004). Head start services extend to eligible infants and children aged 0 thru 5 years of age and pregnant women and their families when family income is below 185% of the federal poverty level (HSB, 2004). During much of the 1990's, Head Start staff and parents reported that the number one health issue affecting Head Start programs nationwide was access to oral health care services (Head Start Bulletin, 2001). One of the biggest challenges is finding dentists and oral health programs to provide oral health care to low income populations that is



affordable. Head Start collaborates with federal, state, and local officials to improve oral health services to children. Although Head Start children, who disproportionately come from low-income families, are not representative of all preschool children, they often are of interest to public policymakers because they are a particularly vulnerable group (Siegal, Yeager & Davis, 2004). Head Start of Greater Dallas offers dental screenings by community providers and referrals for those children who do not have a dental home. This gives parents an opportunity to learn about their child's oral health, to prevent oral diseases, and to seek dental care for treatment.

#### *Statement of Purpose*

The purpose of the research project is two fold: 1. to assess and evaluate the prevalence of cavities of children enrolled in the HSGD program in selected centers through observational screenings; 2. to assess the relationship of child nutrition/hygiene practices and dental caries in this population of children. The observed status and practices may lead to propose policies for improving the oral health of low-income children.

#### *Research Questions*

- What percentage of HSGD (East Dallas, Oak Cliff, A.M. Brooks, and Lake West) children participating in the study has early childhood caries?
- What is the percentage of decayed teeth in HSGD (East Dallas, Oak Cliff, A.M. Brooks, and Lake West) children by ethnicity?
- Are parent and child nutrition/hygiene practices related to dental problems?

### *Delimitations*

Delimitations of the study include:

- Only children in 4 out of 26 Head Start Centers in the Dallas area, located at East Dallas, Oak Cliff, A.M. Brooks, and Lake West, were included in the study.
- Assessed results of dental screening, not a full dental exam.

### *Limitations*

Limitations of the study include:

- Caries are likely to be underestimated because radiographs were not used.
- The questionnaire is brief and only focused on certain issues.
- All data from questionnaire was self reported and not validated.
- Monolingual Spanish parents did not participate in the study because Spanish surveys and consent forms were not distributed.
- The consent forms and surveys were not sent home with the parents. The parents were asked to sign the form as they picked up or dropped off their child from the center. This could have been a reason for the low response rate (34%).

### *Assumptions*

The assumptions of the program are:

- Parents of children participating in the study will answer every question on the survey given to them with the informed consent.
- Every student that has a consent form signed for the screening will attend school on the day of the program.

### *Definition of Terms*

- Dental caries – disease of the mineralized structures of the teeth characterized by demineralization of the hard components and dissolution of the organic matrix. (Wilkins, 1999); a plaque disease caused by the complex interaction of food, especially starches and sugars, with bacteria that form dental plaque; any lesion caused by demineralization of a tooth (Anderson, Anderson, & Glanze, 1998).
- Cariogenic – tending to produce caries (Anderson, Anderson, & Glanze, 1998).
- Demineralization – a decrease in the amount of minerals or inorganic salts in tissues, as occurs in certain diseases (Anderson, Anderson, & Glanze, 1998).
- Remineralization – restoration of mineral elements; enhanced by presence of fluoride; remineralized lesions are more resistant to initiation of dental caries than is normal tooth structure (Wilkins, 1999).
- Substrate – a chemical substance acted on and changed by an enzyme in any chemical reaction (Anderson, Anderson, & Glanze, 1998).
- Primary dentition – the teeth in proximal arrangement in the maxilla and mandible that appear in the mouth first (Anderson, Anderson, & Glanze, 1998); the first teeth; normally will be shed and replaced by permanent teeth (Wilkins, 1999).
- Early childhood caries (ECC) – the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger (American Academy of Pediatric Dentistry, 2005).



### *Importance of the Study*

The importance of the study is to determine the prevalence of dental caries in HSGD children that participated in the study characterized by each ethnic group, and the nutritional and hygiene practices of the children participating in the screening. The study can contribute to the development of additional oral health promotion and prevention programs at HSGD. Studies similar to this one may support the development of education and prevention strategies for parents/guardians.

## CHAPTER II

### LITERATURE REVIEW

Dental caries is a major public health problem especially among preschool children. Early childhood caries affects the primary dentition and is a common oral health risk that is more prevalent among poor children. There are many factors that are associated with early childhood caries such as diet, socioeconomic status, poor oral hygiene, the amount of cariogenic bacteria present, and a susceptible host – the tooth. Oral health is often overlooked as an important aspect of a child's overall health and well-being. Untreated cavities may cause pain, dysfunction, absence from school, underweight, and poor appearance—problems that can greatly reduce a child's capacity to succeed in life (CDC, 2006).

Dental caries is an infectious disease requiring the presence of a host (tooth), bacteria, and substrate (fermentable carbohydrate) (Marshall, 2005). The events leading up to caries development occurs in three stages: 1) colonization of mutans streptococci 2) microbial shift of plaque bacteria from nonpathogenic to pathogenic and 3) demineralization of enamel (Harris & Garcia-Godoy, 1999). Mutans streptococci are the primary bacteria that cause dental caries. Dental plaque is a complex biofilm – a community of coordinated bacteria and fermentable carbohydrates of dietary origin which are the substrates for cariogenic bacteria and include sugars and refined starches

that are associated with dental caries (Marshall, 2005). Fermentation of carbohydrates by oral bacteria occurs within the biofilm and the acid produced can demineralize or dissolve the tooth at the site of the biofilm. Bacterial plaque and sugar metabolize and excrete an acid that demineralizes the tooth structure. The development of a carious lesion reflects an imbalance with time spent in demineralization greater than time spent in remineralization (Marshall, 2005).

Nutrition plays a significant role in development of dental caries in children. Early Child Caries (ECC) is a form of dental caries characterized by an infectious challenge and associated with specific dietary practices (Moble, 2005). Once teeth erupt and plaque accumulates, the ingestion of sugar-containing fluids during bedtime or naptime places the child at considerable risk for dental caries since salivary flow decreases during sleep and the fluid pools around the teeth, creating a highly acidic environment (Harris & Garcia-Godoy, 1999). In addition, cariogenic foods, such as sugar and starches can cause a drop in the pH and increase the chance of the teeth to demineralize. When the pH drops in the oral cavity, it becomes acidic. Most dietary factors found to be significantly related to childhood caries are related to either the amount, frequency, or timing of sugar consumption (Harris, Nicoll, Adair, & Pine, 2004), therefore control of the amount of sugar and starches is an important component in caries prevention. Dietary habits associated with increased caries include frequent consumption of sugared beverages; prolonged use of the bottle, sippy cup, or breastfeeding; falling asleep or sleeping with a bottle, or breast and nighttime feedings (Marshall, 2005). Intakes of sugar containing soda-pops, beverages made from powder, and, to a lesser



extent, 100% juices were associated with increased caries risk in a study by Marshall et al. (2005). Oral health nutrition is an area of childhood nutrition that focuses on the choice of foods and the frequency in which they are consumed. According to Mobley et al. (2005), parents do not always have accurate information about the oral health care of their children, especially the use of bottles at night time and nap time, therefore, parental education about introducing a variety of foods to support health, growth and development, while establishing good dietary habits to minimize caries risk for a lifetime, becomes an essential parental/caregiver task (Mobley et al., 2005).

Dental hygiene practices should be introduced by using a soft toothbrush once the teeth erupt. When the child is around 2 years old, parents can introduce a small amount of fluoride toothpaste and assist them in brushing their teeth. Toddlers, preschoolers, and very young children need parental assistance in tooth brushing and use of toothpaste until approximately 6 to 7 years of age, at which time they have the coordination to be efficient (Mobley et al, 2005.). Dental healthcare providers can provide education and instruction during pregnancy and encourage the first dental visit for the child by age one. A better understanding of the knowledge, beliefs and practices of caregivers should contribute to formulation of more effective preventive strategies to benefit infants and children (Chan, Tsai, & King, 2002).

Socioeconomic status and ethnicity plays an important role in the prevalence of dental caries in children. Children living in poverty suffer from dental caries and experience pain and discomfort. They also lack access to appropriate dental care. (National Health and Nutrition Examination Survey, 1999-2002) found that children aged

2--11 years, 41% had caries experience in their primary teeth. Mexican-American children had higher caries experience (54.9%), compared with black (43.3%) or non-Hispanic white children (37.9%); children from families with incomes  $\geq 200\%$  of the FPL had lower caries experience (30.7%) compared with lower income groups (45.2% for those with family incomes  $\geq 100\%$  but  $< 200\%$  of the FPL and 55.3% for those with family incomes  $< 100\%$  of the FPL). The high prevalence of ECC emphasizes the importance of targeting children in a very early stage of their life if we want to improve the oral health status of the population (Willems, Vanobbergen, Martens, & Maeseneer, 2005). The percentage of 2 to 5 year old children with untreated decayed teeth with any caries experience and percentage of once-decayed teeth that remain untreated all are inversely related to family income (Siegal et al., 2004). Children from low-income families experience oral disease in part because of lack of insurance and transportation. Families facing economic hardship, such as difficulties paying bills or buying food, appear to have greater difficulty meeting their children's dental needs (Kenney, McFeeters, & Yee, 2005). Improving the dental health of these low-income children is likely to depend on increasing their access to insurance that includes dental benefits (Kenney et al., 2005). In addition, families enrolled in programs, such as Women, Infants, and Children (WIC) and Medicaid, often experience problems finding a dentist close to their home. Neighborhood deprivation and ethnicity are shown to be adequate criteria to identify groups at risk in the overall population (Willems et al., 2005). Therefore, oral health promotion should focus not only on social class but also on certain minority groups (Willems et al., 2005). Kenney et al (2005) found more gaps in receipt of dental

care among children who were not US citizens even after controlling for insurance coverage and other socioeconomic factors; fewer than half of non-citizen children in low-income families had received any preventive dental care in the preceding year. Many of these families face barriers to dental care because of language barriers and cultural beliefs. Cultural differences can create barriers to optimal oral health care.

Early childhood caries is a common oral disease that is associated with poor diet and poor oral hygiene. It is most prevalent among low-income preschool children because they lack access to dental care, no dental insurance, low education of parents, and frequent exposure to simple sugars. Parents need a better understanding of the risk factors for early childhood caries to prevent their child from experiencing pain and discomfort.

## CHAPTER III

### METHODOLOGY

The data analyzed in this study was collected during dental screenings and through surveys. Texas Dental Hygienists' Association (TDHA) carried out an assessment of the prevalence of dental caries in children age's three to six who are enrolled in the HSGD program at Lake West, East Dallas, A.M. Brooks, and Oak Cliff. The nutritional and hygiene practices related to dental caries were assessed during April, 2006 in a sample of 137 children whose parents agreed to participate via dental screening and survey.

#### *Population and Sample*

Children enrolled in the Head Start of Greater Dallas program participated in the dental screening program (male and female, all races/ethnicity, and ages 3-6 years old were included in the study). A list was stratified by ethnic concentration to reflect the nature of the HSGD program. The first list was developed from African American concentrated centers and the second list was from Hispanic concentrated centers. One center from each list was selected at random until the total number of subjects was over 200 from each list. A total of 401 children, ages three to six years, enrolled in HSGD and their parent or guardian were eligible to participate in the study.



Selected HSGD centers included East Dallas (85 students), A.M. Brooks (112 students), Lake West (124 students), and Oak Cliff (80 students).

### *Protection of Human Participants*

The study was approved by the Institutional Review Board (IRB) at University of North Texas Health Science Center on March 28, 2006 to protect the welfare and rights of the study participants. An approval was made in the English and Spanish version of the parent survey. A parental permission and informed consent for the survey was also approved.

### *Data Collection Procedures*

The Texas Dental Hygienists' Association (TDHA) was a collaboration partner in this study. TDHA collected the dental screening data and the investigator collected data on the child's nutrition, preventive practices, and oral hygiene using a survey with the permission from Head Start Greater Dallas, Inc. The examiners used the Association of State and Territorial Dental Directors' Basic Screening Survey (BSS) model form and followed the model's training recommendations. The examiners used the Basic Screening Survey (BSS) which is a standardized survey designed to collect information on the observed oral health of participants and self-reported or observed information on age, gender, race and ethnicity (Association of State and Territorial Dental Directors, 2003). All children with parental consent were screened by 1 of 3 screeners: two dentists or the one dental hygienist. The data scribe was also a dental hygienist from TDHA, but she did not conduct any screenings. All universal precautions were taken including appropriate infection control practices. The screenings were conducted on site at the

selected Head Start centers using a flashlight and tongue blade. The examiners recorded gender, race/ethnicity, age, and data on the prevalence of early childhood caries, untreated cavities, caries experience (treated and untreated decay), and treatment urgency. The data scribe recorded the data on a paper form.

The investigator developed a 9-question survey instrument that was distributed to the parents of the children participating in the dental screening program. The survey was a self-reported instrument (with no subject identifiers) designed to be completed in approximately 5 minutes. The parent or guardian was asked to respond to nutrition and oral hygiene questions about their child. The parents or guardians of eligible participants were hand delivered the informed consent and survey by Head Start staff beginning two weeks before the screening day. Parents filled out informed consent forms and surveys at the HSGD center that were selected for the study. Head Start delivered and collected the informed consent and surveys on TDHA and the investigator's behalf. On the day of the screening, Head Start staff gave the signed informed consent and completed survey to TDHA to match the survey with the BSS form. The scribe recorded the ID number on the BSS form to the survey. The age, gender, and race/ethnicity of each child was assessed and recorded per screener observation. When all dental screenings were complete, the Head Start staff gave copies of all completed surveys to the investigator. The investigator also received the completed BSS form from TDHA. The investigator then matched the parent survey with the screening data by pairing the ID numbers together.

### *Instrumentation*

Two surveys were used in the study. The first was the Basic Screening Survey (BSS) which is used to monitor community oral health status and recognize the need for dental intervention. A dental screening is not a thorough clinical examination and does not involve making a clinical diagnosis resulting in a treatment plan (Association of State and Territorial Dental Directors [ASTDD], 2003). A screening is used to identify gross dental or oral lesions (ASTDD, 2003). The BSS uses a scoring system for the screening variables. The variables screened for include early childhood caries, untreated cavities, caries experience, and treatment urgency. A score of “1” indicates the condition is present and a score of “0” means it is not. The last variable, need for treatment urgency, has three codes. A score of “0” means no problem, “1” means early dental care, and “2” means urgent care. As described above, the second survey was a nine item questionnaire completed by the child’s parent or guardian. These questions assessed the oral hygiene and nutritional practices of the child at home. Other questions included feeding practices, dental visits, use of fluoride, and access to dental care. See Appendix B and D.

### *Data Analysis*

The screening data and survey data was analyzed using Statistical Package for Social Sciences (SPSS) using descriptive statistics and contingency table analysis. Chi square statistic was used to explore association of dental caries and nutrition/hygiene practices.

## *Summary*

The research study used dental screening results and parent surveys to assess the prevalence of dental cavities and the relationship of child nutrition/hygiene practices and dental cavities. The dental screenings were carried out by TDHA and occurred at four selected Head Start centers in Dallas Texas. The parent survey was also distributed as part of the study. Once data was collected, it was analyzed using SPSS software using descriptive statistics, contingency table analysis, and chi square statistics.

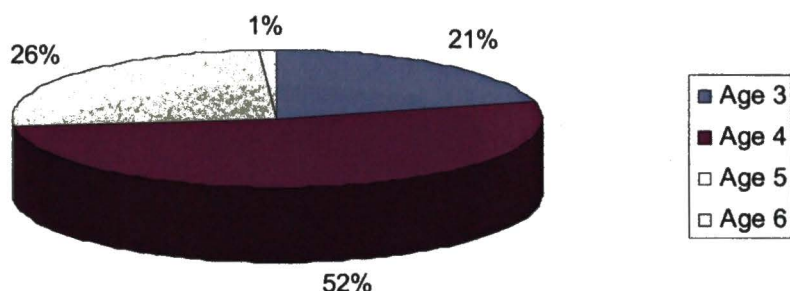
## CHAPTER IV

### RESULTS

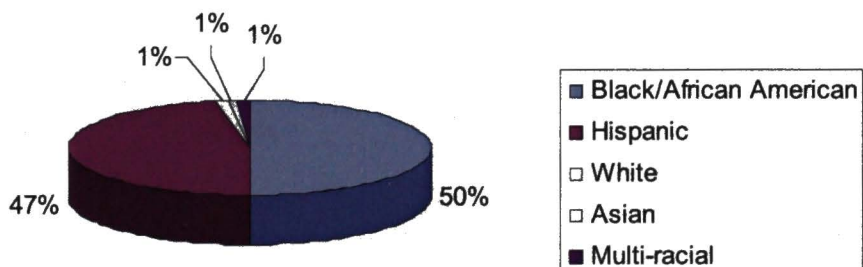
Of the 401 eligible children enrolled at four selected Head Start centers, only 137 participated, yielding an overall participation rate of 34%. One child returned the questionnaire/consent form but was not screened because the child was uncooperative on the screening day. Out of 137 children, 107 returned the parent nutrition/oral hygiene questionnaire which yielded a 78% survey participation rate. The participants of the study were 53% girls and 47% boys and the distribution of ages of the total population of children screened at HSGD is displayed in Figure 1. Figure 2 shows the race/ethnicity profile of the Head Start children screened which resembles the HSGD population. Of the total amount of students enrolled in the HSGD program in Dallas County, 43 percent of the students was African-American; 51 percent are Hispanic; 4 percent are Asian; 2 percent are Caucasian and less than 1 percent classify themselves as other (Head Start of Greater Dallas, 2006). The sample of the study mirrors the distribution of the overall HSGD population.



**Figure 1: Age of Children Screened at Head Start of Greater Dallas: April, 2006**

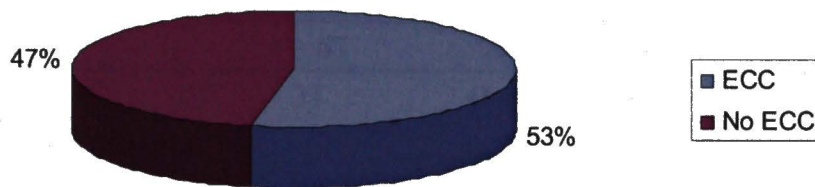


**Figure 2: Race/Ethnicity of Children Screened at Head Start of Greater Dallas: April, 2006**



Early childhood caries, as defined by the American Academy of Pediatric Dentistry, was diagnosed in 53% of the Head Start children screened (Figure 3). Figure 4 show that 17% of the children had at least 1 untreated decayed tooth. Sixteen percent of the children with untreated decay needed early dental care and 1% needed urgent dental care (Figure 5).

**Figure 3: Prevalence of Early Childhood Caries among Children Screened at Head Start of Greater Dallas: April, 2006**



**Figure 5: Prevalence of Treatment Urgency among Children Screened at Head Start of Greater Dallas: April, 2006**

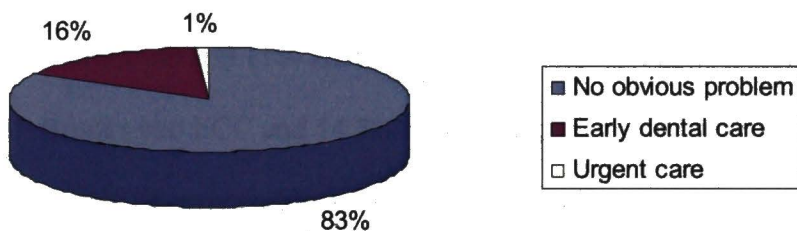


Table 1 shows 131 participants, among those 46.3% of African American children and 64.1% of Hispanic children had evidence of ECC. Due the small numbers of White, Asian, and Multi-racial children (n=6), they were not presented on Table 1. Dental care needs were similar in African American and Hispanic group.

Table 1:

Prevalence of Early Childhood Caries, Treatment Urgency, and Untreated Caries among Children Screened at Head Start Greater Dallas by Ethnicity

	Black/African American		Hispanic	
	n = 67	%	n = 64	%
Early childhood caries	31	46.3	41	64.1
Treatment urgency				
No problem	55	82.1	52	81.3
Early dental care	11	16.4	11	17.2
Urgent care	1	1.5	1	1.5
Untreated caries	12	17.9	11	17.2

The 4 Head Start centers chosen for the dental screening program included: A.M. Brooks, East Dallas, Lake West, and Oak Cliff (Table 2). A.M. Brooks (n = 28) participants were 89% Hispanic and 11% African American. Sixty-eight percent of the participants at A.M. Brooks had ECC and 14.3% had untreated decayed teeth. A.M. Brooks had the highest rate of early childhood caries. East Dallas (n = 39) participants were 64% Hispanic, 26% African American, 3% White, 3% Asian, and 5% Multi-racial. Slightly above 46% of the children at East Dallas had ECC and 17.9% had untreated decayed teeth. Lake West (n = 29) participants were 69% African American, 28% Hispanic, and 3% Asian. Slightly above 41% of the children at Lake West had ECC and only 3.4% had untreated decayed teeth. Oak Cliff (n = 41) participants were 83% African American, 15% Hispanic, and 2% White. Slightly above 58% of the children at Oak Cliff had ECC and 26.8% had untreated decayed teeth. Oak Cliff had the highest rate of untreated caries.

Table 2:

Prevalence of Early Childhood Caries, Untreated Cavities in Children Screened at Four Head Start Greater Dallas Centers

	A.M. Brooks		East Dallas		Lake West		Oak Cliff	
	n = 28	%	n = 39	%	n = 29	%	n = 41	%
Early childhood caries	19	68.0	18	46.2	12	41.4	24	58.5
Untreated caries	4	14.3	7	17.9	1	3.4	11	26.8

The association between child nutrition/hygiene practices and dental cavities of the study participants were reported in tables 3 and 4. Among the children with ECC, 15.1% of the parents/guardians put their child to bed with milk, juice, and water. Slightly below 4% of parents/guardians put their child to bed with kool aid and 1.9% with sodas. Similar practices were found in children with no ECC (Table 3). Sixty-six percent of parents/guardians put their child to bed with nothing. Among children with ECC, 46.2 % of parents reported their children drink tap water and 71.2% bottled water.

All parents/guardians (100%) reported that their child gets his/her teeth brushed at home regardless of ECC status. Slightly above 94% of parents/guardians reported their children do use fluoride toothpaste. The children with ECC reportedly brush once a day (19.6%), twice or more a day (78.4%) or don't brush at all (2%). When asked who brushes the child's teeth at home, 10.4% of the parents reported they brush their child's teeth, 22.9% of the children brush their own teeth, and 66.7% of both children and

parents/guardians brush with ECC. The frequency of children eating foods and consuming drinks that contain sugar was 81.1% for 1-3 times a day and 18.9% for 4-6 or more times a day for children with ECC. Parents/guardians of children (with ECC and with no ECC) reported taking their child to a dentist 2 times a year (66.7%) and 1 year and as needed 33.3%.



Table 3:

## Characteristics of Child Nutrition/Hygiene Practices and Early Childhood Caries

Nutrition/hygiene practices	Early Childhood Caries		No Early Childhood Caries	
	n = 53	%	n = 54	%
Put child to bed with the following				
Milk <sup>b</sup>	8	15.1	8	15.4
Juice <sup>b</sup>	8	15.1	5	9.6
Sodas <sup>b</sup>	1	1.9	1	1.9
Kool aid <sup>b</sup>	2	3.8	2	3.8
Water <sup>b</sup>	8	15.1	10	19.2
Nothing <sup>b</sup>	35	66.0	35	67.3
Use fluoride toothpaste	50	94.3	50	94.3
Drink tap water	24	46.2	19	35.8
Drink bottled water	37	71.2	36	67.9
Teeth brushed at home	52	100.0	53	100.0
Times per day				
Once	10	19.6	13	25.0
Twice or more	40	78.4	35	67.3
Does not brush	1	2.0	4	7.7
Brushes teeth at home				
Parent/guardian	5	10.4	7	13.7
Child	11	22.9	17	33.3
Both	32	66.7	27	52.9
Times a day the child eat foods and consume drinks that contain sugar				
1-3 x a day	43	81.1	48	92.3
4-6 x a day	10	18.9	4	7.7
Frequency of dental visits				
2 x a year	32	66.7	34	66.7
1 x a year and as needed	16	33.3	17	33.3

<sup>b</sup> Not mutually exclusive

\* Some question were not answered on the survey responses

There was a statistically significant association ( $p=.012$ ) association between untreated cavities and children who are put to bed with juice (Table 5). Also, children with untreated cavities, 61.9% of children are put to bed with nothing, 23.8% with water, 9.5% with milk, and 4.8% with soda. One hundred percent of children with untreated cavities use fluoride toothpaste. Parents of children with untreated cavities reported 47.6% of their children drink tap water and 71.4% bottled water.

All parents/guardians (100%) reported that their child gets his/her teeth brushed at home. Slightly less than 29% of children with untreated cavities brushed once a day and 71.4% brushed twice or more a day. When asked who brushes the child's teeth at home, 68.4% of both children and parents/guardians brush, 21.1% of the children brush their own teeth, and 10.5% of the parents reported brushing their child's teeth with untreated cavities. Slightly more than 76% of children with untreated cavities eat foods and consumed drinks that contained sugar 1-3 times a day and 23.8% for 4-6 or more times a day.

Table 4:

## Characteristics of Child Nutrition/Hygiene Practices and Untreated Cavities

Nutrition/hygiene practices	Untreated Cavities		No Untreated Cavities	
	n = 21	%	n = 86	%
Put child to bed with the following				
Milk <sup>b</sup>	2	9.5	14	16.7
Juice <sup>b</sup>	6	28.6 <sup>c</sup>	7	8.3
Sodas <sup>b</sup>	1	4.8	1	1.2
Kool aid <sup>b</sup>	0	0.0	4	4.8
Water <sup>b</sup>	5	23.8	13	15.5
Nothing <sup>b</sup>	13	61.9	57	67.9
Use fluoride toothpaste	21	100.0	79	92.9
Drink tap water	10	47.6	33	39.3
Drink bottled water	15	71.4	58	69.0
Teeth brushed at home	21	100.0	84	100.0
Times per day				
Once	6	28.6	17	20.7
Twice or more	15	71.4	60	73.2
Does not brush	0	0.0	5	6.1
Brushes teeth at home				
Parent/guardian	2	10.5	10	12.5
Child	4	21.1	24	30.0
Both	13	68.4	46	57.5
Times a day the child eat foods and consume drinks that contain sugar				
1-3 x a day	16	76.2	75	89.3
4-6 x a day	5	23.8	9	10.7
Frequency of dental visits				
2 x a year	8	47.1	58	70.7
1 x a year and as needed	9	52.9	24	29.3

<sup>b</sup> Not mutually exclusive<sup>c</sup> Statistically significant  $P < 0.05$ 

\* Some questions were not answered on the survey responses

There were only 17 responses to the questions on access and use of services. Six percent of parents said it was not important to take their child to the dentist. Seventy-one percent (n=33) do not take their child to the dentist because they have no insurance, 24% (n=33) have lack of money, and 6% (n=33) have no transportation. When asked the reasons why they don't take their child to the dentist twice a year, one respondent reported that the dentist did not tell them to come back and another respondent stated that the parent forgot or they had no time. One parent made a comment that they only take their child to the dentist once a year because their child has "no cavities".

Only the practice of putting the child to bed with juice showed a statistically significant relationship with dental decay ( $P = .012$ ). The majority of children has experienced early childhood caries and has been to the dentist for treatment. A few parents reported putting their child to bed with drinks that contain sugar. Also, some parents reported that their child eats foods and consumes drinks that contain sugar 4-6 or more times a day. Head Start should deliver frequent messages to parents about oral health, the importance of seeing a dentist, and nutrition/oral hygiene practices at home.

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

Dental caries is the primary oral disease found in children, and has significant psychosocial and systemic health implications (Marshall, 2005). Lower socioeconomic populations are at greater risk for dental decay because of lack of access to dental care, no dental insurance, and low education of parents. Children with dental caries experience pain and suffering which can cause delays in learning and development. Dental caries is a preventable oral disease and is reduced in populations at greater risk through education and community dental services.

#### *Summary*

The purpose of this research study was to assess and evaluate the prevalence of cavities of children in the four sites of the HSGD program in Dallas, Texas. An additional purpose of the study was to assess the relationship of child nutrition/hygiene practices and dental caries. One hundred seven parent surveys were returned with the consent forms. The survey assessed their child's nutrition/oral hygiene practices at home. The Texas Dental Hygienists' Association (TDHA) collected the dental screening data and the investigator collected child nutrition/hygiene practices data from a survey with the permission from Head Start of Greater Dallas, Inc. The Basic Screening Survey Model (BSS) was used to assess early childhood caries, caries experience, untreated



caries, and treatment urgency. The children were screened by a dentist or hygienist. A data scribe recorded all data on the BSS paper form. The ID # from the screening form was then matched to the parent survey which was used for data analysis purposes.

### *Conclusion*

The research questions of the study included:

- What percentage of HSGD (East Dallas, Oak Cliff, A.M. Brooks, and Lake West) children participating in the study has early childhood caries?
- What is the percentage of decayed teeth in HSGD (East Dallas, Oak Cliff, A.M. Brooks, and Lake West) children by ethnicity?
- Are parent and child nutrition/hygiene practices related to dental problems?

Using HSGD children as a sample and taking into consideration the study limitations, it can be concluded that:

- The prevalence of early childhood caries at four sites of the Head Start Greater Dallas children is 53%.
- The prevalence of untreated caries in Black/African American (18%) and Hispanic (17%) children were similar in Head Start of Greater Dallas by ethnicity.
- Dental cavities are positively associated with a child drinking juice when they are put to bed at night.

### *Discussion*

Dental caries remains an important public health concern, especially among low income children. Even though the use of fluorides has significantly reduced caries in children, dental caries remains high in certain groups, particularly low-income children

(Bray, Branson, & Williams, 2003). Early childhood caries has been defined by the American Association of Pediatric Dentists (AAPD) as the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary teeth in a child 6 years of age or younger. The condition has also been referred to baby bottle tooth decay which is decayed teeth but most often the upper front teeth. Efforts to reduce caries in young children are complicated by a lack of agreement regarding the case definition and diagnostic criteria for ECC (Bray, Branson, & Williams, 2003). Case definitions for ECC vary with respect to location of the lesions and number of teeth involved (Ismail & Woosung, 1999). There are different case definitions of ECC so this may have caused different outcomes of our study when compared to other studies. While conducting the research the dentist and hygienist doing the dental screening had to agree on the definition for ECC for this study.

The first objective of the research study was to determine the prevalence of ECC in the HSGD program. Due the socioeconomic status of the children at Head Start, a high prevalence of ECC was expected. Fifty-three percent of children at HSGD had experienced ECC. Centers for Disease Control and Prevention (2006) reported that tooth decay affects more than one fourth of United States children aged 2-5. The National Health and Nutrition Examination Survey (1999-2002) reported the prevalence of dental caries in primary teeth in children aged 2-5 was 27.91% (CDC, 2005). The occurrence of ECC is higher among racial and ethnic minority groups in the United States (Bray, Branson, & Williams, 2003). The higher ECC rate in this group gives the opportunity for policy makers to develop strategies and implement oral health services to this group.

Even though the children in the study sample are getting their teeth restored, there remains a primary need of preventing the disease process by educating the parents on preventive dental services and nutrition/oral hygiene practices at home. This can reduce the cost of treating decayed teeth and also prevent the child from having a bad experience at such a young age.

The second objective of the study was to determine the prevalence of decayed teeth in HSGD children by ethnicity. Due to the small number of White, Asian, and multi-racial children, they were excluded from the analysis and discussion. The prevalence of untreated caries among Black/African American was 18% and Hispanic 17%. The National Health and Nutrition Examination Survey (1999-2002) reported the prevalence of untreated tooth decay in primary teeth in children aged 2-5 was 19.5% (CDC, 2005). In addition, the percent of untreated tooth decay for children aged 2-5 was 27.24% for African American and 31.55% for Hispanic (CDC, 2005). There was not a large difference in the numbers by race/ethnicity, but it does show the early dental care is needed in this population.

The third objective of the study was to determine if there is a relationship between child nutrition/hygiene practices and dental cavities. There was one statistically significant relationship among dental cavities and children being put to bed with juice. A small percentage of children with ECC and untreated cavities were put to bed with milk, sodas, kool aid, and water. Intakes of sugar containing soda-pops, beverages made from powder, and to a lesser extent, 100% juices were associated with increased caries risk (Marshall, 2005). Sweetened beverages like juices, colas, and fruit drinks throughout the

day can displace other important nutrient-rich foods and increase risk for ECC (Mobley, 2005).

The majority of the parents reported their child uses fluoride toothpaste. Fluoride has a topical effect on increased tooth surface mineralization, inhibits bacterial activity, and strengthens resistance to decay (Mobley, 2005). On the other hand, when asked about drinking water, 71% of children with untreated cavities and ECC drink bottled water. Tap and bottled waters processed by distillation or reverse osmosis do not contain fluoride (Marshall, 2005).

One hundred percent of parents reported their child has their teeth brushed everyday. Apparently the parents/guardians do value their child's teeth because they make an effort to brush them everyday. Twenty-three percent of children with ECC and 21% of children with untreated cavities brush their teeth without help from their parents. Toddlers, preschoolers, and very young children need parental assistance in tooth brushing and use of toothpaste until approximately 6 to 7 years of age, at which time they have the coordination to be efficient (Mobley, 2005). Children tend to have poor tooth brushing habits and can lead to poor oral health and increased dental decay. Proper tooth brushing techniques and the time of brushing (before and after meals) can help reduce dental cavities.

Frequent exposure to foods containing fermentable carbohydrates is thought to increase risk of caries (Marshall, 2005). Nineteen percent of children with ECC and 24% of children with untreated cavities eat foods and consume drinks that contain sugar 4-6 times a day. Extensively refined carbohydrates, concentrated sugars, and baked starches



with sugar are thought to be more cariogenic than minimally processed or fresh foods (Marshall, 2005). It is important for parents to understand the frequency of exposure and length of time consuming foods and beverages with sugar can increase caries risk.

Sixty-seven percent of children with ECC and untreated cavities see a dentist twice a year. This high number of dental visits could be because Head Start requires their students to have a dental check up. Thirty-three percent that take their child to the dentist 1 time a year or as needed and 71% stated they don't take their child because they do not have dental insurance. This is an ongoing problem for this group because they often do not have access to dental services because of lack of insurance, money, or transportation, etc. Some children at Head Start are enrolled in dental programs and have access. The greatest access-to-dental-care problem that Head Start children face is that Medicaid pays for the dental care of two thirds to three fourths of all children enrolled in Head Start (Siegal, Marx, & Cole, 2005). Another access to dental care problem is the lack of early intervention by a dental professional who specialized in preventive oral disease. It is important for Head Start to develop strategies and collaboration with dental communities and professionals to provide oral health services to low-income children.

Based on the visual screenings only, ECC and untreated cavities rates are most likely underestimated in this study. The low response rate could have been due to inadequate time to give out the surveys. The surveys and consent forms were given to Head Start three weeks before the screening date. It was originally discussed with Head Start that the surveys and consent forms would be sent home with the parents to sign and return. Instead, the survey and consent forms were given to parents as they picked up and



dropped off their child at the center. The Spanish surveys and consent forms were not given to the parents. Some of the parents may not have understood English so they did not fill out the form.

### *Recommendations*

The following recommendations are made based on the results of the study:

- Methodology - more time should be allotted for consent forms and surveys to be returned. It would be beneficial for the dental professionals/investigators to go to each center and have a meeting with the parents to explain the dental screening process. Some parents may be hesitant to have their child participate because they do not understand the purpose of a dental screening. At that time, the investigator could explain the purpose of the survey and how it can possibly lead to future dental health programs for Head Start.
- The practice of children using bottles filled with cariogenic fluid should be discouraged at bed or nap time.
- Sugared beverages, if served, should be provided with meals and snacks and water should be provided between meals.
- There should be ongoing education for parents at the Head Start center about their child's oral health. Children at Head Start are constantly moving, changing schools, or not returning for various reasons. So it is important to try and reach the parents with multiple education programs, even if some parents get repeated information.

Within this study, the parents/guardians nutrition and hygiene practices of their child's oral health were accurate, except putting their child to bed with cariogenic (juice) drinks. Children still showed a high incidence of caries. The guidance of a dental professional may be beneficial to the Head Start community for continuing education on their child's oral health.

**APPENDIX A**

**ENGLISH INFORMED CONSENT AND PARENT PERMISSION FORM**

**PARENTAL PERMISSION AND INFORMED CONSENT TO  
PARTICIPATE IN RESEARCH STUDY**

**Dear Parent:**

Hello, my name is Jennifer Sterba and I am a graduate student at University of North Texas Health Science Center. I am doing a research study relating childhood cavities to nutrition and oral hygiene practices. The purpose of this research study is to find out if there is a relationship between your child's nutrition and hygiene practices at home and dental cavities. I will match up the information on cavities (dental screening) with the answers to the survey.

You will be asked to complete an 8-question survey about dental care at home, nutrition and dental visits. The survey should take approximately 5 minutes. You do not need to answer any question that you are uncomfortable with.

The answers to the survey and screening results will be used for research purposes only. Your response to participate in the survey is voluntary. Your participation (or nonparticipation), or any answers that you give, will in no way affect your child's dental screening. With your permission, the investigators will be using your child's private dental health information for this study. In case you change your mind, you may take back your permission to use the information by contacting the investigators.

Your survey answers will be kept confidential. There are no discomforts of the study and the only risk is your answers to the survey might be seen by someone other than the investigators. However, we will take all precautions necessary to protect your confidentiality as a research study participant. No personal information, such as name and address, will be collected on the survey.

You may not benefit from the study. Although, the information you provide for this research study may lead to the development of better dental health programs for Head Start.

If you have any questions about the survey, you may contact Jennifer Sterba (Investigator) at (817) 731-3787. If you have any questions about your rights in a research study, you may contact Dr. Jerry McGill, Chairman of the Institutional Review Board (IRB), University of North Texas Health Science Center at Fort Worth at (817) 735-5457. The IRB makes sure the research is done fairly and your information is protected.

---

I voluntarily agree to participate in this study. I have had the chance to ask the study investigators any questions I have regarding this study.

**I WILL RECEIVE A COPY OF THIS SIGNED INFORMED CONSENT AGREEMENT**

---

Signature of Study Participant

Date

---

Signature of Person Obtaining Informed Consent

Date

**APPENDIX B**  
**ENGLISH PARENT SURVEY**



## PARENT SURVEY

1. How long has your child been enrolled in Head Start of Greater Dallas?

\_\_\_\_ Year(s) \_\_\_\_ Month(s) (e.g. 2 years 3 months)

2. Does your child get his/her teeth brushed at home?

☐ No☐ Yes

→ How many times a day?

☐ Once a day ☐ Twice or more a day ☐ Does not brush every day

Who brushes the child's teeth?

☐ Parent/guardian☐ Child☐ Both☐ Other (Specify) \_\_\_\_\_

3. Do you put your child to bed with any of the following?

☐ None ☐ Milk ☐ Juice ☐ Sodas ☐ Kool Aid ☐ Water☐ Other (Specify) \_\_\_\_\_

4. How many times a day does your child eat foods and consume drinks that contain sugar?
- 
- (e.g. desserts, candy, sodas, flavored milk, kool aid, etc)

☐ Once a day☐ 2 times a day☐ 3 times a day☐ 4 times a day☐ 5 times a day☐ 6 times or more a day

5. Does your child use fluoride toothpaste? (e.g. Crest, Colgate, Oral B)

☐ No☐ Yes

6. Did you breast feed your child?

☐ No☐ Yes → How long: \_\_\_\_ Year(s) \_\_\_\_ Month(s) (e.g. 1 year 1 month)

7. What is your child's primary source of drinking water?

☐ Tap water☐ Bottled water

8. Has your child been seen by a dentist?

☐ No☐ Yes → How often: ☐ Twice a year☐ Once a year☐ As needed

↓ If not seen by a dentist twice a year,

What is the main reason you don't take your child to a dentist  
twice a year for check up?☐ Not important☐ No insurance☐ No transportation☐ Lack of money☐ Can't get off work☐ Other (Specify) \_\_\_\_\_

**APPENDIX C**

**SPANISH INFORMED CONSENT AND PARENT PERMISSION FORM**

## PERMISO DE LOS PADRES PARA PARTICIPACION EN UNA ENCUESTA DE INVESTIGACION

Estimado Padre/Madre,

Mi nombre es Jennifer Sterba y soy una estudiante de maestria en la Universidad de North Texas Health Science Center. Estoy llevando a cabo un estudio para investigar como la alimentacion y practicas de higiene oral afectan las caries durante la niñez. El proposito de este estudio es identificar la relacion entre la alimentacion del niño/a y las practicas de higiene oral en el hogar y la formacion de caries. Los resultados finales de esta encuesta seran comparadas con los resultados de los chequeos dentales.

Se le pide que participe en una encuesta de ocho (8) preguntas que para determinar el cuidado dental del niño/a en el hogar, su alimentacion y las visitas anuales al dentista. La encuesta toma mas o menos 5 minutos. Si alguna pregunta que se le hace incomoda de contestar no tiene que responda.

Todos los resultados de la encuesta y el chequeo dental de su niño/a seran solamente para el uso de la investigacion. Su participacion es voluntaria. Su decisión de participar o no participar no afectara el examen dental de su niño/a. Con su autorizacion, la investigadora usaran los resultados de chequeo dental de su hijo/a para esta investigacion. En caso que Ud. Decida que su niño/a deje de participar, Ud. Puede retirar su permiso para usar la informacion adquirida durante la encuesta contactando a la investigadora directamente.

Las respuestas de esta encuesta son confidenciales. No se espera que su niño/a tenga molestias al participar en el estudio, el unico riesgo podria ser que de sus repuestas pueden ser vista por alguien mas que los investigadores. Tomaremos todas las precauciones necesarias para mantener su privacidad mientras participe en este estudio. Ninguna informacion personal, tal como el nombre y direccion sera incluida en esta encuesta.

Esta encuesta no le beneficiara a Ud. Directamente, pero la informacion obtenida sera utilizada para mejorar los programas de salud dental de Head Start.

Si Ud. Tiene alguna pregunta sobre esta encuesta, puede contactar Jennifer Sterba (investigadora) al (817) 731-3787. si Ud.. Tiene alguna pregunta sobre sus derechos de esta encuesta puede contactar al Dr. Jerry McGill, Presidente del Institutional Review Board (IRB), Universidad de North Texas Health Science Center at Fort Worth al (817) 735-5457. El IRB se asegurara que la encuesta y su informacion sea protegida.

Yo voluntariamente estoy de acuerdo que mi niño/a participe en esta encuesta. Yo he tenido la oportunidad de hacer cualquier pregunta al investigador/a sobre dicha encuesta.

**YO RECIBIRE UNA COPIA DE ESTE ACUERDO/PERMISO FIRMADO**

---

Firma del Padre/Madre del Participante

Fecha

---

Firma de la persona tomando la informacion

Fecha

**APPENDIX D**

**SPANISH PARENT SURVEY**

## ENCUESTA A LOS PADRES

1. Por cuanto tiempo ha estado su hijo/a inscrito en el programa Head Start of Greater Dallas?

\_\_\_\_ Año(s) \_\_\_\_\_ Mes(es) ( ejemplo: 2 años 3 meses)

2. Su hijo/a se cepilla los dientes en el hogar?

☐ NO

☐ SI →

Cuantas veces al día?

☐ una vez al día ☐ 2 veces o mas al día

☐ no se cepilla  
todos los días

Quien le cepilla los dientes a su hijo/a?

☐ Padre/Madre

☐ Su propio hijo/a

☐ Ambos

☐ Otro (especifique por favor) \_\_\_\_\_

3. A la hora de dormir, Ud. le da algún tipo de líquido a su hijo/a?

☐ Nada

☐ Leche

☐ Jugos

☐ Gaseosas

☐ Kool Aid

☐ Agua

☐ Otro (especifique por favor) \_\_\_\_\_

4. Cuantas veces al día su hijo/a consume comidas o bebidas que contienen azúcar?  
(Ej.: postres, golosinas, sodas, leche con sabor, kool aid, etc.)

☐ una vez al día

☐ 2 veces al día

☐ 3 veces al día

☐ 4 veces al día

☐ 5 veces al día

☐ 6 veces o mas al día

5. Su hijo/a usa pasta dental con fluor? (ejemplo: Crest, Colgate, Oral B)

☐ no

☐ si

6. Ud. Le dio pecho a su hijo/a?

☐ NO

☐ SI → Cuanto tiempo: \_\_\_\_\_ Año(s) \_\_\_\_\_ Mes(es) (ejemplo: un año un mes)

7. Que tipo de agua bebe su hijo/a?

☐ agua de la llave

☐ agua embotellada

8. Ha visto su hijo/a un dentista?

☐ no

☐ si → Cada cuanto tiempo: ☐ 2 veces al año

☐ una vez al año

☐ cuando necesita

Si su hijo/a no ha visto un dentista 2 veces  
al año.

Cual es la razón principal porque Ud. no lleva su hijo/a a un dentista  
dos veces al año para su cheque dental?

☐ no cree que es importante

☐ no tiene seguro

☐ no tiene transporte

☐ falta de dinero

☐ no puede dejar de ir a su trabajo

☐ otro (especifique por favor) \_\_\_\_\_



## REFERENCES

- American Academy of Pediatric Dentistry (2005). Definition of early childhood caries (ECC). Retrieved April 21, 2006 from [www.aad.org/media/policies\\_Guidelines/D\\_ECC.pdf](http://www.aad.org/media/policies_Guidelines/D_ECC.pdf).
- Anderson, K.N., Anderson, L.E., & Glanze, W.D. (1998). Mosby's medical, nursing, and allied health dictionary, fifth ed. St. Louis, Missouri: Mosby
- Association of State and Territorial Dental Directors (2003). Basic screening surveys: An approach to monitoring community oral health. Retrieved January 19, 2006 from [www.astdd.org/docs/BSS\\_Manual\\_9-25-03.pdf](http://www.astdd.org/docs/BSS_Manual_9-25-03.pdf).
- Bray, K.K., Branson, B.G., & Williams, K. (2003). Early childhood caries in an urban health department: An exploratory study. *The Journal of Dental Hygiene*, 77(IV), 225-232.
- Brocato, R. (2001). Head start and partner's forum on oral health. *Head Start Bulletin*, 21, 1-44.
- Centers of Disease Control and Prevention. (2005). Children's oral health. Retrieved January 15, 2006, from [www.cdc.gov/oralhealth/topics/child.htm](http://www.cdc.gov/oralhealth/topics/child.htm).
- Centers of Disease Control and Prevention. (2005). Fact sheet: Surveillance for dental caries, dental sealants, tooth retention, edentulism, and enamel fluorosis – United States, 1988-1994 and 1999-2002. Retrieved January 15, 2006 from [www.cdc.gov/oralhealth/factsheets/nhanes\\_findings.htm](http://www.cdc.gov/oralhealth/factsheets/nhanes_findings.htm).

- Centers of Disease Control and Prevention. (2005). MMWR: Surveillance for dental caries, dental sealants, tooth retention, edentulism, and enamel fluorosis – United States, 1988-1994 and 1999-2002. Retrieved July 16, 2006 from [www.cdc.gov/mmwr/preview/mmwrhtml/ss5403a1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5403a1.htm).
- Centers of Disease Control and Prevention. (2006). Oral health: Preventing cavities, gum disease, and tooth loss. Retrieved January 15, 2006, from [www.cdc.gov/nccdphp/publications/aag/oh.htm](http://www.cdc.gov/nccdphp/publications/aag/oh.htm).
- Chan, S.C.L., Tsai, J.S.J. & King, N.M. (2002). Feeding and oral hygiene habits of preschool children in Hong Kong and their caregivers' dental knowledge and attitudes. *International Journal of Paediatric Dentistry*, 12, 322-331.
- Harris, N.O. & Garcia-Godoy, F. (1999). Primary preventive dentistry, fifth ed. Stamford, Connecticut: Apple & Lange.
- Harris, R., Nicoll, A.D., Adair, P.M., Pine, C.M. (2004). Risk factors for dental caries in young children: A systematic review of literature. *Community Dental Health*, 21, 71-85.
- Head Start of Greater Dallas (2006). About Head Start. Retrieved January 25, 2006, from [www.hsgd.org/about.htm](http://www.hsgd.org/about.htm).
- Head Start of Greater Dallas (2006). Frequently asked questions. Retrieved June 17, 2006 from [www.hsgd.org/faq.htm](http://www.hsgd.org/faq.htm).
- Ismail A, Woosung, S. (1999). A systematic review of clinical diagnostic criteria of early childhood caries. *Journal of Public Health Dentistry*, 59, 171-191.

- Kenney, G.M., McFeeters, J.R., & Yee, J.Y. (2005). Preventive dental care and unmet needs among low income children. *American Journal of Public Health*, 95(8), 1360-1366.
- Marshall, T.A. (2005). Pediatric oral health and nutrition. *Topics in Clinical Nutrition*, 20(3), 189-199.
- Mobley, C.C. (2005). Nutrition needs and oral health in children. *Topics in Clinical Nutrition*, 20(3), 200-210.
- Siegal, M.D., Marx, M.L., & Cole, S.L. (2005). Parent or caregiver, staff, and dentist perspectives on access to dental care issues for head start children in Ohio. *American Journal of Public Health*, 95(8), 1352-1359.
- Siegal, M.D., Yeager, M.S., & Davis, A.M. (2004). Oral health status and access to dental care for Ohio head start children. *Pediatric Dentistry*, 26(6), 519-525.
- U.S. Department of Health and Human Services (2004). Administration for children and families. *Head Start Bureau*. Retrieved January 20, 2006 from [www2.acf.dhhs.gov/programs/hsb/index.htm](http://www2.acf.dhhs.gov/programs/hsb/index.htm).
- U.S. Department of Health and Human Services. (2000). Oral health in America: A report of the surgeon general- executive summary. Retrieved January 19, 2006, from [www.surgeongeneral.gov/library/oralhealth/](http://www.surgeongeneral.gov/library/oralhealth/).
- Wilkins, E.M. (1999). Clinical practice of the dental hygienist, eighth ed. Boston, Massachusetts: Lippincott Williams & Wilkins.

Willems, S., Vanobbergen, J., Martens, L. & Maeseneer, J.D. (2005). The independent impact of household and neighborhood-based social determinants on early childhood caries. *Family Community Health*, 28(2), 168-175.











