

ORAL HEALTH DISPARITIES OF FOSTER CHILDREN

An Undergraduate Research Scholars Thesis

by

MALLORY MCCLURE, KINDAL SAUTER, AND CASSIE MALONE

Submitted to the LAUNCH: Undergraduate Research office at
Texas A&M University
in partial fulfillment of requirements for the designation as an

UNDERGRADUATE RESEARCH SCHOLAR

Approved by
Faculty Research Advisors:

Mikhail Umorin, Ph.D.
Leigh Ann Wyatt, BSDH, MA, MS

May 2023

Major:

Dental Hygiene, B.S.

Copyright © 2023. Mallory McClure, Kindal Sauter, and Cassie Malone.

RESEARCH COMPLIANCE CERTIFICATION

Research activities involving the use of human subjects, vertebrate animals, and/or biohazards must be reviewed and approved by the appropriate Texas A&M University regulatory research committee (i.e., IRB, IACUC, IBC) before the activity can commence. This requirement applies to activities conducted at Texas A&M and to activities conducted at non-Texas A&M facilities or institutions. In both cases, students are responsible for working with the relevant Texas A&M research compliance program to ensure and document that all Texas A&M compliance obligations are met before the study begins.

We, Mallory McClure, Kindal Sauter, and Cassie Malone, certify that all research compliance requirements related to this Undergraduate Research Scholars thesis have been addressed with our Faculty Research Advisors prior to the collection of any data used in this final thesis submission.

This project did not require approval from the Texas A&M University Research Compliance & Biosafety office.

TABLE OF CONTENTS

	Page
ABSTRACT.....	1
ACKNOWLEDGEMENTS.....	3
NOMENCLATURE.....	4
INTRODUCTION.....	5
1. WHAT IS FOSTER CARE?.....	7
2. HEALTH COMPLICATIONS OF POOR ORAL HEALTH CARE.....	9
3. ACCESS TO ORAL HEALTH CARE.....	12
4. IMPLEMENTATION OF PROGRAMS.....	14
5. INTERVENTIONS.....	19
CONCLUSION.....	23
REFERENCES.....	25

ABSTRACT

Oral Health Disparities of Foster Children

Mallory McClure, Kindal Sauter, and Cassie Malone
Caruth School of Dental Hygiene, School of Dentistry
Texas A&M University

Faculty Research Advisor: Mikhail Umorin, Ph. D.
Caruth School of Dental Hygiene, School of Dentistry
Texas A&M University

Research Faculty Advisor: Leigh Ann Wyatt, BSDH, MA, MS
Caruth School of Dental Hygiene, School of Dentistry
Texas A&M University

In 2017, the United States provided foster care for approximately 691,000 children. During years in foster care, these children face significant deficits in medical and dental care. Foster children are known for having poor overall health, due to three main factors, poverty, abuse, and neglect. Early childhood caries (ECC) is a major oral health problem primarily in lower socioeconomic populations. With the lack of care and the increased prevalence of dental problems, the foster population can be classified as children with special health care needs. Some of the reasons foster children do not receive dental care could be that there is a shortage of dentists that are willing to accept Medicaid, the lack of federal funding for dental care, and the lack of health record keeping. Interviewees in one study felt the continuity of dental care for children in foster care was compromised due to their frequent moves throughout homes and in and out of the foster system. Disruptions in placement occur frequently within the foster care

system, and are associated with a variety of maladaptive outcomes, and pose significant risks to foster children's immediate and long-term well-being. A 21 day and night brush intervention placed in one school, resulted in a 25% increase in the number of school children brushing their teeth twice a day. A further 8% improvement after 6-12 months and improvements in DMFT/dmft. Further future studies should be performed with hygienists or hygiene students in schools or with hygienist-led training with social workers and teachers, to see if the prevalence of oral health disparities in foster children will decrease even more.

ACKNOWLEDGEMENTS

Contributors

We would like to thank our faculty advisor, Dr. Mikhail Umorin, and Leigh Ann Wyatt, and our UGR group leader Annabelle Aymond for their guidance and support throughout the course of this research.

Thanks also go to my friends and colleagues and the department faculty and staff for making my time at Texas A&M School of Dentistry, Caruth School of Dental Hygiene a great experience.

Funding Sources

No funding was received for this research project.

NOMENCLATURE

ECC	Early Childhood Caries
DMFT	Decayed, Missing, Filled Teeth
CHIP	Children's Health Insurance Program
SES	Socioeconomic Status
ADHA	American Dental Hygiene Association
ADA	American Dental Association
DH	Dental Hygiene
REALD-30	Rapid Estimate of Adult Literacy in Dentistry
QOL	Quality of Life
OHL	Oral Health Literacy
OHI	Oral Health Instructions
WIC	Women, Infants, and Children
COHL	Carolina Oral Health Literacy
NIDCR	National Institutes of Dental and Craniofacial Research

INTRODUCTION

Health disparities are health differences that are avoidable, unnecessary, and unjust.¹ Unfortunately, oral health disparities are among the most profound health disparities within the United States.² The maintenance of good oral health is vital to the overall health and well-being throughout one's life.³ In spite of advances in oral health status of the United States population, a significantly higher burden of oral diseases and conditions is present in certain parts of the population.³

These oral health disparities are related to determinants of health, such as one's age, income, gender, access to care and medical status.² Individuals from a lower socioeconomic status universally experience a greater burden of oral diseases and conditions than those with more oral health resources.³ Health disparities unfavorably affect groups of people who have systematically experienced greater obstacles to healthcare based on their socioeconomic status, age, cognitive, sensory, or physical disability, geographic location, or other characteristics historically linked to exclusion.⁴ Unfortunately, many low-income, low-educated, and disadvantaged populations have the highest levels of untreated dental disease and lack access to high-quality care.³

In the United States, individuals are more likely to have poor oral health if they are low-income, uninsured, and/or reside in a rural area with insufficient access to appropriate oral health care.⁵ Thus, minimizing oral health care disparities requires providing disadvantaged social groups with equal opportunity to be healthy.⁵ Oral health care disparities represent uneven possibilities to be healthy, making disadvantaged groups even more disadvantaged with regard to their oral health.⁵ To achieve equality in oral health care, inequities must be eliminated.⁵ This

entails ensuring all individuals have access to the same level of treatment for the same level of need and receive the same level of utilization and quality of care.⁵

1. WHAT IS FOSTER CARE?

The foster care system is a complex combination of federal and state organizations designed to care for children and keep them safe. This system has been faced with the task of caring for children who no longer have living parents or have parents who are unfit to care for them.⁶ Foster care placement is meant to be temporary, and its goal is to increase the quality of life for children. Although this is the goal, only about half of the children who enter foster care are reunified with their parents or relatives.⁶ In 2017, the U.S. Department of Health and Human Services reported the United States provided foster care for approximately 691,000 children.⁷ During years in foster care, these children face significant deficits in medical and dental care.⁷ These deficits stem from the foster child's lack of access to all levels of health care. There are numerous reasons why foster children lack access to medical and dental care, a few of which are the lack of federal funding, lack of health record keeping, and a shortage of dentists willing to take Medicaid.⁷

Though intended to be a temporary situation, the foster system often becomes permanent for children whose parents are not qualified to take care of them.⁸ During a child's time in foster care, foster families assume all responsibility for these children, ensuring they are keeping up with their physical and emotional health, and their educational needs throughout their time in the system. Children can be placed into the system for various reasons: child maltreatment/abuse, neglect, or the condition of the parent.

Unfortunately, a child eventually ages out of foster care and ages out of the option of having Medicaid insurance. When a child turns 18, they are legally considered an adult and age out of the system, unless they choose to enter the extended foster care program which goes until

age 21.⁹ When a child is placed into the system, they are placed with foster parents who have gone under extensive training as required by the Minimum Standards for Child-placing Agencies, which ensures that all parents receive orientation and pre-service training.¹⁰ In addition, all foster parents must complete First-Aid, with rescue breathing and CPR for all ages, as well as providing various legal documentation such as proof of age, financial records, safety inspections of your home etc.¹⁰ What is not included in this required training is plans for the child's medical and dental care. Foster parents also encounter difficulties finding healthcare professionals that accept Medicaid and CHIP. Although the foster system provides funds for health care, there is a deficit in medical knowledge of the foster parents and difficulty finding offices that accept the provided medical funds the foster child is given.

Medicaid remains an option until the age 21 but does not ensure access to dental care. Studies show that 39% of youth who have aged out of the foster system do not have dental insurance.¹¹ Only some of those who have aged out of foster care reported receiving regular care while in the foster system and others reported never receiving dental care.¹¹ Those who reported never receiving dental care now have further problems and are unable to afford the extensive care they need due to aging out of the system and Medicaid coverage.¹¹

2. HEALTH COMPLICATIONS OF POOR ORAL HEALTH CARE

Early childhood caries, ECC, is a major oral health problem primarily in socially disadvantaged populations.¹² ECC is defined as the presence of one or more decayed, missing or filled tooth surfaces in any primary tooth in a child younger than 6 years old.¹² If left untreated, ECC can lead to significant long-lasting impacts on a child's health.^{13,14} ECC is associated with other health problems, ranging from local pain, infections, abscesses to difficulty in chewing, malnutrition, gastrointestinal disorders, and difficulty sleeping.¹⁵ Factors such as high sugar intake, lack of oral hygiene, lack of fluoride exposure, and enamel defects are some of the major risk factors associated with the development of ECC.^{16, 17, 18} In 2015, over 620 million children worldwide had untreated ECC, with long term repercussions of ECC including diminished growth and body weight, compromised general health and poorer quality of life.^{13,14, 19} Several epidemiological studies have suggested there being an increased incidence and severity of caries in the permanent teeth among schoolchildren, adolescents and adults with a known history of ECC.^{4, 2, 20}

The lack of good oral hygiene practices promotes the development of ECC.²¹ Caregivers' social status, poverty, ethnicity, deprivation, number of years of education, and dental insurance coverage are other factors which influence the oral hygiene habits of children and the severity of ECC.^{22,23} Risk factors such as a lack of access to dental care, lack of community water fluoridation and lack of parental knowledge about prevention are a few that contribute to the formation of dental caries in children.²⁴ It is recommended by the US Surgeon General that children have a dental home within six months of the first tooth eruption and no later than 12

months of age.²⁴ Socioeconomic status has also been associated with low use of dental care and a higher risk for dental caries.²⁴

An eight-year cohort study examined the link between primary dental caries and if it could serve as a risk factor for permanent dental caries.²⁰ The study examined a total of 504 children, 256 boys and 248 girls, which were randomly selected from 11 villages and 4 kindergartens of two representative communities.²⁰ The study's findings showed a substantial association between the prevalence of caries in primary teeth and that in permanent teeth ($r = 0.38, p < 0.001$).²⁰ The study discovered an overall sensitivity of 93.9%, specificity of 20%, and positive predictive value of 85.4% when the caries experience in the primary teeth was used to predict future caries of the same individual.²⁰ According to the results of the Pearson chi-squared test, the overall relative risk for the development of caries was 2.6. This means that compared to children who had healthy primary teeth, those who had caries in their primary dentition were nearly three times more likely to develop it in their permanent dentition.²⁰ The probability of getting caries in their permanent dentition was 3.5 times higher in children with severe ECC (24%) who had dmft scores equal to or higher than 10.²⁰

Dental caries is an infectious condition that, if neglected, might have systemic effects.²⁵ Children's National Medical Center in Washington, D.C., and Columbus (now Nationwide) Children's Hospital in Columbus, Ohio, hosted a longitudinal study of parent-reported oral health-related quality of life (QOL) in preschool children with and without ECC.²⁵ The longitudinal study had two study groups: children with severe ECC and children who were caries-free and had no prior caries experience.²⁵ The findings of this longitudinal investigation led to the following conclusions: according to parents' assessments, children's dental health has a big influence on their overall wellbeing. The dental health-related quality of life of children with

early childhood caries is regarded by parents as being lower than that of children without caries.²⁵ And during the 6- and 12-month follow-ups, a dental intervention has favorable benefits that are significant and improve quality of life across several areas for ECC children.²⁵ According to parental assessments, the general oral health of ECC children as well as their physical, mental, and social functioning were significantly positively impacted by dental treatments.²⁵

The World Health Organization (WHO) Constitution from 1948 said that oral health is essential to overall health and that it contributes to overall wellbeing.²⁶ For both children and adolescence, maintaining oral health is paramount for achieving proper psychophysical development.²⁶ A study performed in Turin, Italy evaluated the frequency and severity of dental caries in foster children.²⁶ In this study, basic features of dental caries and the significance of food and sugar intake were covered in a presentation by a group of dentists and dental hygienists.²⁶ Also, they gave the children instructions on how to practice routine dental hygiene.²⁶ Data on the frequency and severity of dental caries in each patient were gathered, and they were compared to the mean values of dental caries in Italy, which were supplied by the WHO for the same age group (4 to 12-year-olds).²⁶ This study set out to determine if such socioeconomic inequality may result in a statistically significant variation in the distribution of dental caries between the two groups, foster care sample and the general pediatric population in Italy.²⁶ The results of this study indicate that the foster sample not only had a higher caries to caries free ratio than the general pediatric population in Italy, but also higher mean values in DMFT scores.²⁶ In addition to having more decayed, missing, and filled teeth than the comparison group, the foster sample also had 83% more caries than the 22% experienced by the general pediatric population.²⁶

3. ACCESS TO ORAL HEALTH CARE

Multiple factors contribute to inadequate dental hygiene care among foster children. Factors such as their lack of dental awareness, inadequate oral hygiene, nutritional habits, lack of motivation, or neglect by their guardian.⁷ Disruptions in a child's placement occur frequently within the foster care system, and are associated with a variety of maladaptive outcomes, and pose significant risks to foster children's immediate and long-term well-being.²⁷ Between 25% and 50% of foster children experience a disruption in placement and must transition to new homes at some point during their time in the foster care system.^{3,28} In a study focused on the determinants of dental care in children in foster care, interviewees felt the continuity of dental care was compromised due to their frequent moves throughout homes and in and out of foster care.²⁹ Due to reunification being the primary goal in foster care, building a dental home for some can become incredibly challenging. Adding more roadblocks to obtaining the proper oral care the child may need.

A major factor that is brought up when discussing foster children and their access to medical and dental care is Medicaid insurance. In the state of Texas, children in foster care get Medicaid coverage through the STAR Health program, or Children's Health Insurance Program (CHIP).⁹ The benefits that these children are supposed to receive under STAR health include regular checkups at the doctor and dentist, prescription drugs and vaccines, Hospital care, X-rays and lab tests, vision/hearing care, access to medical specialists, treatment of special health needs and previous conditions, a 24/7 nurse hotline, access to the health passport, and internet based electronic health record.⁹ Access to insurance is a major challenge that affects foster children's ability to get medical and dental care. A study that was done in Iowa found that living in foster

care negatively impacted the likelihood of children ages 0-6 utilizing dental services. For the study they interviewed 14 people who all worked in pediatrics or in the foster care system and asked them a series of questions regarding foster children, Medicaid, and dental care. The interviewees stated that there are often cultural and linguistic barriers to obtaining dental care, and many of them also stated that there was a shortage of dental providers that are willing to accept the Medicaid insurance policy.²⁹ It was also brought up that the real issue faced by foster parents is finding good quality dental care that is covered by Medicaid.²⁹

Compared to children from households with higher incomes, Medicaid-eligible children with cavities have twice as many decayed teeth, twice as many visits for pain management, but fewer overall dental visits.³⁰ Children who live in regions with the highest disease prevalence and the lowest amount of dental care have the fastest-growing populations.³⁰ Caries rates are anticipated to return following long-term declines if the substantial association between these subpopulations and dental diseases persists, and the strain on publicly financed dental care will certainly increase.³⁰ Unfortunately, the majority of low-income children who are Medicaid-eligible or enrolled do not receive dental care due to the low acceptance rate of Medicaid insurance in dental practices.³⁰

4. IMPLEMENTATION OF PROGRAMS

A study in Washington State sought to identify potential determinants of dental care use and oral health among children living in foster care.²⁹ They interviewed healthcare workers, social service professionals, and foster families who were experienced in foster care. The researcher identified nine main determinants: linguistic and cultural barriers, lack of dentists willing to accept children's Medicaid dental insurance, lack of resources available to case workers, lack of federal funding for specialized dental care, lack of systematic health record-keeping, child transience leading to the lack of a dental home, foster parents' competing needs, child behavior problems, and lack of dental 'buy in' from adolescents.²⁹ A foster family facing one or more of these determinants can impact the caries prevalence within the foster community.

A study exploring the relationships between children's oral health and their parents' oral health literacy, showed that the child's oral hygiene and status of their oral health was associated with the parents' educational and economic status and strongly influenced by the parental health literacy.³¹ The parent or caregiver should be brushing the child's teeth or assisting in the oral health practices until the child reaches the age of 8 years old.³¹ Within this study, data included that only 4.4% of parents reported that they always brush their child's teeth and another 9.7% reported they sometimes did.³¹ The study further reported that 46.9% of parents reported "always supervising" their child while toothbrushing.³¹ In addition to this data, it was also noted that 22.2% of parents had never gone to a dental visit with their preschool child, whereas 60.1% had taken their child to the dentist for the first check-up.³¹ Only 1.3% of the parents reported that a healthcare professional referred their child to go to a dentist, and 2.1% of parents did not

remember the reasoning for their child's first dental visit.³¹ During this study, it was proven that the parents' education had a strong correlation to their child's oral health.³¹

Throughout the duration of this study, it was also concluded that when one parent reported having good or quite good oral health, the odds of their child having the same reported status were 4.15 times greater than a parent who reported bad oral health.³¹ The chances of the children whose parents reported visiting a dentist within the last six months were 3.92 times greater than those whose parents last dental visit was within the last year or earlier.³¹

Oral health literacy (OHL) has become a significant factor in determining oral health.³² The National Institutes of Dental and Craniofacial Research (NIDCR) defines OHL as "the extent to which individuals have the capacity to access, process, and understand fundamental oral health information and services necessary to make informed health decisions."³³ Low OHL has been linked to a variety of outcomes, including lower oral health status, dental neglect, higher consequences on oral health related quality of life, and irregular utilization of dental services.^{34,35, 36} Due to the crucial role in a person's ability to recognize and understand oral health information and act upon it, it is expected that OHL may influence the manner in which a caregiver reports their child's oral health status.³⁷ A child's oral health related quality of life score is adversely effected by the caregivers' educational level and varies with caregivers age.³⁷ Dental caries, which have been attributed to missed school days, lost parental work time, and financial costs, can potentially have a significant impact on a child's social and psychological well-being, making it a serious public health concern.^{25,38,39,40}

There is compelling medical evidence to support the notion that those with lower health literacy also have less awareness about disease prevention, management, and treatment.⁴¹ With the primary objective of examining oral health literacy in relation to health behaviors and health

outcomes among caregivers, infants, and children enrolled in the Women, Infants, and Children's (WIC) Supplemental Food Program in North Carolina (NC), a socially and economically disadvantaged and medically underserved population. The Carolina Oral Health Literacy (COHL) project began in August 2008 with the main objective of examining oral health literacy in comparison to health behaviors and health outcomes among these individuals.³⁴ Caregivers and children must meet certain health and nutritional risk factors as well as have incomes that are less than 185% of the federal poverty line to be eligible for the WIC program.³⁴ Five categories of information were collected from this study: sociodemographic data, dental health and behavior, profile of the impact of oral health, self-efficacy, and oral health literacy.³⁴ The Rapid Estimate of Adult Literacy in Dentistry (REALD-30), a recently created tool, was used to test oral health literacy.³⁴ Each phrase said properly earns one point toward the REALD-30 score, which is then added together to determine the result. The potential scores range from 0 (lowest literacy) to 30 (highest literacy).³⁴ An individual must comprehend and act on health information, whether it is given to them orally or in writing, to maintain excellent oral health.³⁴ Lower SES populations typically have literacy levels that are lower, according to the evidence.³⁴ The WIC program's objective is to enhance the health outcomes of its members by offering healthy meals, nutritional education, counseling, and referrals for medical and dental treatment as supplements to effective pregnancy, postpartum, infant, and early childhood care.³⁴ WIC is uniquely positioned to identify families with low OHL because its frequent interaction with the disadvantaged population.³⁴

In a qualitative study, the impact of the foster home setting on children's dental health was investigated.⁴² It sought to get a better understanding of the knowledge, attitudes, and experiences of foster parents in managing the oral health behaviors and care of foster children.⁴²

Fostering arrangements can range from emergency or interim placements for a brief period of time to long-term fostering, when children live with foster families until they are adults.⁴³ Although foster children suffer from the same health issues as children living in other familial environments, they frequently enter the care system in a worse condition of health due to poverty, abuse, and neglect.^{44, 45, 46} Foster parents have spoken about the difficulty of playing both the position of caregiver and an employer, which could make it more challenging for them to set and uphold children's oral hygiene routines.^{47, 48} Given that previous studies have revealed significant associations between parents' attitudes and oral health behaviors (such as brushing their teeth, eating a healthy diet, and visiting the dentist) and their children's attitudes and oral health behaviors, foster parents own knowledge, attitudes, and behaviors may also be crucial.^{49, 50}

Foster parents described children as having poor oral health when they initially came into their care.⁴² The most prevalent dental condition was dental caries.⁴² When they first moved into the foster home, some children didn't know how to brush their teeth, while others had never been to the dentist.⁴² Foster parents voiced concerns about receiving dental treatment and preventing dental caries despite their strong understanding of oral health.⁴² Several of their doubts and queries were a result of their actual interactions with dentists.⁴² Dentists had sent them some ambiguous signals, making it more challenging for foster parents to provide oral health advice, particularly about added sugars in teen diets.⁴² This tension was also noticeable when smaller children were being brought in for their first dentist appointment.⁴² Foster parents described their frustration with dentists who disregarded regulatory advice and refused to treat younger children.⁵¹ Foster parents serve as the primary caregivers, but parental health training programs have mostly neglected this fact and failed to provide practical methods for changing nontraditional families' health behavior.⁵² Foster parents frequently relied on their own resources

and received minimal assistance from other healthcare providers or social care agencies.⁴² The results of this qualitative study imply that foster caregivers may require greater assistance as foster children become young adults and move into independent living situations from other sectors, such as general practitioners and educational programs.⁴²

Oral health concerns can include disease of the gingiva, alveolar bone, and teeth of the oral cavity. These diseases can begin as a small invasion and advance if not treated in a timely manner. A study in Florida was conducted to compare the dental status and treatment needs of children in foster care with other children who were enrolled in Medicaid. Included in the study were nearly 1,200 children, 600 from each population, and ranged from adolescents to young adults.⁷ It was concluded that the children in foster care had more dental needs, higher caries prevalence, and received more dental care than other Medicaid-enrolled children who were around the same age.⁷ There was a 1.6 times greater prevalence of pulpitis, 5.8 times more diagnoses of severe gingivitis, and 3.5 times more diagnoses of periodontitis.⁷ The findings of this study indicate higher numbers of active oral disease in the foster care children on Medicaid than those not in foster care.

5. INTERVENTIONS

Oral health education is an essential component of effective dental health education which should involve oral hygiene instructions and procedures for the eradication of plaque.⁵³ A study conducted in Sanjuali, Shimla, examined the effects of oral health education provided in schools on 12- and 15-year-olds.⁵³ 306 children of both genders were included in the study's initial sample, and 276 of those children were reevaluated three months later.⁵³ Each participant was questioned using a specifically created questionnaire at the initial appointment, and their plaque, gingival health, and caries status were assessed using the WHO Modified DMFT Index, the Loe and Silness Gingival Index, and the Silness and Loe Plaque Index.⁵³ After gathering the baseline data, oral health education was provided to the children, including information on the value of maintaining oral hygiene, use of appropriate oral hygiene aids, and demonstration of the bass toothbrush method.⁵³ Also presented was information on common oral diseases along with how to prevent them. The avoidance of bad breath and tooth decay was stressed by brushing twice a day, every day.⁵³ At the end of three months, the presence of plaque, gingivitis, and dental caries was measured to gauge the effectiveness of the educational program.⁵³

146 schoolchildren in the 12-year-old age group were re-evaluated three months after the initial examination, of whom 79 (54.1%) were males and 67 (45.9%) were females.⁵³ 130 children aged 15 were represented by 71 (54.6%) and 59 (45.4%) males and females.⁵³ The study found that the subjects aged 12 and 15 had significantly lower plaque and gingival scores, following the implementation of the school-based oral health education program.⁵³ During their initial assessment and the reevaluation three months later, the study participants' gingival scores decreased.⁵³ Some gingival score declines, meanwhile, were not as significant as others.⁵³ As

demonstrated by the study, short-term oral health education programs may be beneficial in enhancing oral hygiene and gingival health of school aged children.⁵³

Based off a 21 day-and-night brush intervention that was implemented at a school, there was a 25% increase in the number of school children brushing their teeth twice a day, and a further 8% improvement after 6-12 months.⁵⁴ Although brushing alone does not treat oral health issues, it is great at prevention. Through the 21-day program, they saw improvements several months later in DMFT/dmft scores.⁵⁴ At baseline, 39.6% of the children in the intervention group in Nigeria exhibited good oral hygiene.⁵⁴ During the course of the program, there was an upward trend in oral hygiene, reaching 65.7%, 64.5%, and 79.9% of children with good oral hygiene at 3, 8 and 24 weeks.⁵⁴ 50.8% of the children in the control group had good oral hygiene at the beginning of the study.⁵⁴ Contrary to the intervention group, oral hygiene deteriorated during the 24-week period (44.8%, 38.8%, and 39.7% of children at 3, 8, and 24 weeks had good oral hygiene).⁵⁴ With the exception of the 8-week time point, improvement was shown in the intervention group relative to the control group in children who had poor oral hygiene at baseline.⁵⁴ This study demonstrates that children who complete the 21-day program can maintain good oral hygiene for six months without employing further assistance.⁵⁴

A study addressing the children's oral health inequalities before and after the implementation of an oral health program was performed in France.⁵⁵ A citywide initiative to promote oral health in schools was created in 2005.⁵⁵ Children ages 3-5 who attended nine schools with moderate to high levels of dental caries and located in underprivileged or slightly underprivileged regions of the city were a part of the program.⁵⁵ The program's objective was to foster an encouraging learning environment for these children in school to lessen the disparities in oral health.⁵⁵ The program concentrated on enhancing dental hygiene practices associated

with the use of fluoride toothpastes.⁵⁵ Children with untreated carious lesions were also recommended to be seen by a dentist.⁵⁵ The program involves a variety of instructional activities carried out with the children's caregivers (parents, teachers, and school nurses).⁵⁵ Oral hygiene, nutrition, and dental care promotion guidelines were created and distributed to caregivers.⁵⁵ A year later, the program's effectiveness was assessed, and some positive results were found.⁵⁵ While the number of filled teeth increased slightly, there was a noticeable improvement in children's oral hygiene.⁵⁵

Overall, roughly 90 percent of carious lesions are found in the pits and fissures of permanent posterior teeth, with molars being the most susceptible tooth type.⁵⁶ Unfortunately, about 20 percent of children age 6-11 years old and from a low-income family have received sealants.⁵⁷ School sealant programs can be an important intervention to increase the receipt of sealants, especially among those who do not have a dedicated dental home or are of a lower income family.⁵⁸ Health care professionals often help provide preventative services in schools to protect and promote the health of students.⁵⁸ School programs can increase access to services, such as dental sealant placement, among vulnerable children less likely to receive private dental care.⁵⁸

Effective toothbrushing skills primarily depend on coordination, individual skills, and the ability to understand and develop motor skills.⁵⁹ With a child's chronological age being an acceptable predictor of these different factors, this would explain why the different toothbrushing methods would be taught at different ages.⁵⁹ For children aged six months to ten years, the use of a simple toothbrush method and floss picks implemented by hygienists would be ideal during the educational service. A study published in the *European Journal of Pediatric Dentistry* suggests that both the horizontal scrub and Fones technique are the recommended toothbrushing methods

for children.⁵⁹ It was also presented that the horizontal scrub technique was found to be the more effective method of the two.⁵⁹ Although horizontal scrubbing is found to be more effective, if used too often it can lead to receding gums, exposed and sensitive root surfaces, and wearing down of the root surfaces.⁶⁰ Due to these results, it is best to educate young children on using the Fones toothbrushing method. This technique utilizes a soft bristle toothbrush in a circular pattern against the teeth.⁶¹ This toothbrushing technique is easy to grasp for both the child and the parental figure to ensure adequate biofilm removal. Incorporating a more advanced method of toothbrushing could cause confusion and less compliance. However, children 11 years and older, due to more manual dexterity, could be educated on a more advanced toothbrushing technique such as the Bass method and c-shape flossing. The Bass method uses a soft bristle toothbrush at a 45-degree angle towards the gumline in a short vibratory motion.⁶¹ In the study mentioned above, it was revealed that the different toothbrushing techniques had similar effects over time in the plaque index scores. This demonstrates the foundational importance of toothbrushing training in children.⁵⁹

Reaching out to dental organizations for donations of toothbrushes and toothpaste to use for demonstration purposes and take-home kits would increase the likelihood that adolescents are more receptive to the techniques taught. Organizations such as ADA, ADHA, local dental hygiene associations, and toothbrush companies could assist by donating supplies and/or funding for hygienist-led educational programs. The inclusion of these organizations can help expand the programs reach on the foster population.

CONCLUSION

Plentiful evidence indicates that foster children suffer from a lack of dental care. There are numerous reasons as to why these foster children lack access to medical and dental care: a few of which being the lack of federal funding, lack of health record keeping, and a shortage of dentists willing to take Medicaid.⁷ Although foster children have access to Medicaid coverage, Medicaid-eligible children tend to experience twice as many decayed teeth and visits for pain management but encounter fewer interactions with dental professionals when compared to children in higher income households.³⁰

There was also evidence that the oral health of the child is dependent on the parent's own knowledge of oral health understanding. Based on previous data, relating parents' oral health literacy and their child's oral health, using hygiene professionals to educate teachers could potentially correlate to a better oral health literacy amongst foster children and their caregivers, and a decrease in the prevalence in oral health disparities. The issue of child transience, or movement between caregivers, could also result in one caregiver being more knowledgeable than the previous or new family. This could be beneficial or detrimental to the oral health understanding of the foster child.

Due to there being over half a million children in the foster system as of 2017 and findings indicating the disparities they face; this becomes a significant public health issue that needs to be further addressed. Previous research has shown that including dental hygienists in school-based oral hygiene programs is successful. The program developer might reduce expenses while executing the programs by working together to collect oral hygiene goods through the ADA, ADHA, and other local dental hygiene organizations for the creation of oral hygiene kits.

The implementation of sealant day programs in schools and educational tooth lectures led by hygienists can be a straightforward way to raise awareness among children, especially foster children who lack access to oral health care. These educational tooth lectures can include instructions on the usage of either the Fone's or Bass toothbrush technique, based on the age of the children receiving the lecture.

We believe that placing dental hygienists on the front lines, whether directly in a school system or in other areas of the community, would greatly improve the disparities that foster children have. Targeting the school system allows foster children or any child of any socioeconomic status the opportunity to become educated on the importance of oral health. Sealant day programs within a school can help manage the future of pit and fissure lesions amongst children. The educational tips provided by dental professionals can be reiterated during parent-teacher conferences to help promote the prevention of oral health diseases.

Most of the current findings are broad studies impacting the general population. It is now important to direct our focus on this distinct population. More studies and results emphasizing the oral health disparities of the foster care population specifically, will further stress the concern this particular population faces and what can be done to reduce the deviation from other pediatric populations. Future studies should include but not limited to, hygiene-led school programs and the effects it has on foster children within the United States. With more research-based evidence that further proves the disparities of the foster children population, along with more trials of oral health education implementation, we can find the ultimate solution to diminish the barriers this population faces.

REFERENCES

1. Whitehead M. The concepts and principles of equity and health. *Int J Health Serv.* 1992;22(3):429-445. doi:10.2190/986L-LHQ6-2VTE-YRRN
2. Saethre-Sundli HB, Wang NJ, Wigen TI. Do enamel and dentine caries at 5 years of age predict caries development in newly erupted teeth? A prospective longitudinal study. *Acta Odontol Scand.* 2020;78(7):509-514. doi:10.1080/00016357.2020.1739330
3. Helton JJ. Children with behavioral, non-behavioral, and multiple disabilities, and the risk of out-of-home placement disruption. *Child Abuse Negl.* 2011;35(11):956-964. doi:10.1016/j.chiabu.2011.06.004
4. Cortellazzi KL, Tagliaferro EP, Pereira SM, et al. A cohort study of caries incidence and baseline socioeconomic, clinical and demographic variables: a Kaplan-Meier survival analysis. *Oral Health Prev Dent.* 2013;11(4):349-358. doi:10.3290/j.ohpd.a30480
5. Northridge ME, Kumar A, Kaur R. Disparities in Access to Oral Health Care. *Annu Rev Public Health.* 2020;41:513-535. doi:10.1146/annurev-publhealth-040119-094318
6. Schor EL. Foster care. *Pediatr Clin North Am.* 1988;35(6):1241-1252. doi:10.1016/s0031-3955(16)36581-6
7. Morón EM, Tomar SL, Souza R, Balzer J, Savioli C, Shawkat S. Dental Status and Treatment Needs of Children in Foster Care. *Pediatr Dent.* 2019;41(3):206-210.
8. Solis-Riggioni A, Gallardo-Barquero C, Chavarria-Bolaños D. Prevalence and Severity of Dental Caries in Foster-Care Children and Adolescents. *J Clin Pediatr Dent.* 2018;42(4):269-272. doi:10.17796/1053-4628-42.4.5
9. Star Health. Texas Health and Human Services. <https://www.hhs.texas.gov/services/health/medicaid-chip/medicaid-chip-programs-services/foster-care-youth/star-health>. Accessed December 16, 2022.
10. Texas Department of Family and Protective Services (DFPS). DFPS. https://www.dfps.state.tx.us/Child_Protection/Foster_Care/Training.asp. Accessed December 16, 2022.

11. Carrellas A, Day A, Cadet T. Oral Health Care Needs of Young Adults Transitioning from Foster Care. *Health Soc Work*. 2018;43(1):22-29. doi:10.1093/hsw/hlx044
12. Anil S, Anand PS. Early Childhood Caries: Prevalence, Risk Factors, and Prevention. *Front Pediatr*. 2017;5:157. Published 2017 Jul 18. doi:10.3389/fped.2017.00157
13. Heinrich-Weltzien R, Monse B, Benzian H, Heinrich J, Kromeyer-Hauschild K. Association of dental caries and weight status in 6- to 7-year-old Filipino children. *Clin Oral Investig*. 2013;17(6):1515-1523. doi:10.1007/s00784-012-0849-3
14. Wong HM, McGrath CP, King NM, Lo EC. Oral health-related quality of life in Hong Kong preschool children. *Caries Res*. 2011;45(4):370-376.
15. Finlayson TL, Siefert K, Ismail AI, Sohn W. Psychosocial factors and early childhood caries among low-income African-American children in Detroit. *Community Dent Oral Epidemiol*. 2007;35(6):439-448.
16. Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: a systematic review of the literature. *Community Dent Health*. 2004;21(1 Suppl):71-85.
17. Milgrom P, Riedy CA, Weinstein P, Tanner AC, Manibusan L, Bruss J. Dental caries and its relationship to bacterial infection, hypoplasia, diet, and oral hygiene in 6- to 36-month-old children. *Community Dent Oral Epidemiol*. 2000;28(4):295-306. doi:10.1034/j.1600-0528.2000.280408.x
18. Uribe S. Early childhood caries--risk factors. *Evid Based Dent*. 2009;10(2):37-38. doi:10.1038/sj.ebd.6400642
19. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge [published correction appears in *Lancet*. 2019 Sep 21;394(10203):1010]. *Lancet*. 2019;394(10194):249-260. doi:10.1016/S0140-6736(19)31146-8
20. Li Y, Wang W. Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. *J Dent Res*. 2002;81(8):561-566. doi:10.1177/154405910208100812
21. Lam PPY, Chua H, Ekambaram M, Lo ECM, Yiu CKY. Does Early Childhood Caries Increase Caries Development among School Children and Adolescents? A Systematic

Review and Meta-Analysis. *Int J Environ Res Public Health*.2022;19(20):13459.
Published 2022 Oct 18. doi:10.3390/ijerph192013459

22. Ramos-Gomez FJ, Weintraub JA, Gansky SA, Hoover CI, Featherstone JD. Bacterial, behavioral and environmental factors associated with early childhood caries. *J Clin Pediatr Dent*. 2002;26(2):165-173. doi:10.17796/jcpd.26.2.t6601j3618675326
23. Aida J, Ando Y, Aoyama H, Tango T, Morita M. An ecological study on the association of public dental health activities and sociodemographic characteristics with caries prevalence in Japanese 3-year-old children. *Caries Res*. 2006;40(6):466-472. doi:10.1159/000095644
24. Blackburn J, Morrisey MA, Sen B. Outcomes Associated With Early Preventive Dental Care Among Medicaid-Enrolled Children in Alabama. *JAMA Pediatr*. 2017;171(4):335-341. doi:10.1001/jamapediatrics.2016.4514
25. Cunnion DT, Spiro A 3rd, Jones JA, et al. Pediatric oral health-related quality of life improvement after treatment of early childhood caries: a prospective multisite study. *J Dent Child (Chic)*. 2010;77(1):4-11.
26. Valpreda L, Carcieri P, Cabras M, Vecchiati G, Arduino PG, Bassi F. Frequency and severity of dental caries in foster care children of Turin, Italy: a retrospective cohort study. *Eur J Paediatr Dent*. 2020;21(4):299-302. doi:10.23804/ejpd.2020.21.04.8
27. Vreeland A, Ebert JS, Kuhn TM, et al. Predictors of placement disruptions in foster care. *Child Abuse Negl*. 2020;99:104283. doi:10.1016/j.chiabu.2019.104283
28. Connell CM, Katz KH, Saunders L, Tebes JK. Leaving Foster Care—the influence of child and case characteristics on foster care exit rates. *Children and Youth Services Review*. 2006;28(7):780-798. doi:10.1016/j.childyouth.2005.08.007
29. Melbye, M., Huebner, C. E., Chi, D. L., Hinderberger, H., & Milgrom, P. (2013). A first look: determinants of dental care for children in foster care. *Special care in dentistry : official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry*, 33(1), 13–19.
30. Edelstein BL. Disparities in oral health and access to care: findings of national surveys. *Ambul Pediatr*. 2002;2(2 Suppl):141-147. doi:10.1367/1539-4409(2002)002<0141:diohaa>2.0.co;2

31. Chawłowska E, Karasiewicz M, Lipiak A, et al. Exploring the Relationships between Children's Oral Health and Parents' Oral Health Knowledge, Literacy, Behaviours and Adherence to Recommendations: A Cross-Sectional Survey. *Int J Environ Res Public Health*. 2022;19(18):11288. Published 2022 Sep 8. doi:10.3390/ijerph191811288

32. Horowitz AM, Kleinman DV. Oral health literacy: the new imperative to better oral health. *Dent Clin North Am*. 2008;52(2):333-vi. doi:10.1016/j.cden.2007.12.001

33. National Institute of Dental and Craniofacial Research, National Institute of Health, U.S. Public Health Service, Department of Health and Human Services. The invisible barrier: literacy and its relationship with oral health. A report of a workgroup sponsored by the National Institute of Dental and Craniofacial Research, National Institute of Health, U.S. Public Health Service, Department of Health and Human Services. *J Public Health Dent*. 2005;65(3):174-182. doi:10.1111/j.1752-7325.2005.tb02808.x

34. Lee JY, Divaris K, Baker AD, Rozier RG, Lee SY, Vann WF Jr. Oral health literacy levels among a low-income WIC population. *J Public Health Dent*. 2011;71(2):152-160. doi:10.1111/j.1752-7325.2011.00244.x

35. Divaris K, Lee JY, Baker D, Vann WF., Jr Oral health literacy and subjective oral health. *J Dent Res*. 2010;89:873.

36. Lee JY, Divaris K, Baker AD, Rozier RG, Vann WF Jr. The relationship of oral health literacy and self-efficacy with oral health status and dental neglect. *Am J Public Health*. 2012;102(5):923-929. doi:10.2105/AJPH.2011.300291

37. Divaris K, Lee JY, Baker AD, Vann WF Jr. Caregivers' oral health literacy and their young children's oral health-related quality-of-life. *Acta Odontol Scand*. 2012 Sep;70(5):390-7. doi: 10.3109/00016357.2011.629627. Epub 2011 Dec 8. PMID: 22150574; PMCID: PMC3305855.

38. Blumenshine SL, Vann WF, Jr, Gizlice Z, Lee JY. Children's school performance: impact of general and oral health. *J Public Health Dent*. 2008;68:82-7.

39. Locker D, Jokovic A, Stephens M, Kenny D, Tompson B, Guyatt G. Family impact of child oral and oro-facial conditions. *Community Dent Oral Epidemiol*. 2002;30:438-48.

40. Ramos-Gomez FJ, Shepard DS. Cost-effectiveness model for prevention of early childhood caries. *J Calif Dent Assoc*. 1999;27:539-44.

41. Dewalt DA, Berkman ND, Sheridan S, Lohr KN, Pignone MP. Literacy and health outcomes: a systematic review of the literature. *J Gen Intern Med.* 2004;19(12):1228-1239. doi:10.1111/j.1525-1497.2004.40153.x
42. Muirhead V, Subramanian SK, Wright D, Wong FSL. How do foster carers manage the oral health of children in foster care? A qualitative study. *Community Dent Oral Epidemiol.* 2017;45(6):529-537. doi:10.1111/cdoe.12316
43. Keshavarzian G. Family for Every Child. The Place of Foster Care in the Continuum of Care Choices: A Review of the Evidence for Policymakers. 2015.
44. Martin A, Ford T, Goodman R, Meltzer H, Logan S. Physical illness in looked-after children: a cross-sectional study. *Arch Dis Child.* 2014;99:103-107.
45. Mooney A, Statham J, Monck E, Chambers H. Promoting the Health of Looked After Children. A Study to Inform Revision of the 2002 Guidance. 2009.
46. Simkiss DE, Stallard N, Thorogood M. A systematic literature review of the risk factors associated with children entering public care. *Child Care Health Dev.* 2013;39:628-642.
47. Schofield G, Beek M, Ward E, Biggart L. Professional foster carer and committed parent: role conflict and role enrichment at the inter-face between work and family in long-term foster care. *Child Fam Soc Work.* 2013;18:46-56.
48. Blythe SL, Halcomb EJ, Wilkes L, Jackson D. Perceptions of long-term female foster-carers: i'm not a carer, i'm a mother. *Br J Soc Work.* 2013;43:1056-1072.
49. Isong I, Zuckerman K, Rao S, Kuhlthau K, Winickoff J, Perrin J. Association between parents' and children's use of oral health services. *Pediatrics.* 2010;125:502-508.
50. Kelly SE, Binkley CJ, Neace WP, Gale BS. Barriers to care-seeking for children's oral health among low-income caregivers. *Am J Public Health.* 2005;95:1345-1351.
51. Department for Education, Department of Health. Promoting the health and well-being of looked after children, Statutory guidance for local authorities, clinical commissioning groups and NHS England. 2015.

52. Everson-Hock ES, Jones R, Guillaume L, et al. The effectiveness of training and support for carers and other professionals on the physical and emotional health and well-being of looked-after children and young people: a systematic review. *Child Care Health Dev.* 2012;38:162-174.
53. Bhardwaj VK, Sharma KR, Luthra RP, Jhingta P, Sharma D, Justa A. Impact of school-based oral health education program on oral health of 12 and 15 years old school children. *J Educ Health Promot.* 2013;2:33. Published 2013 Jul 31. doi:10.4103/2277-9531.115820
54. Melo P, Fine C, Malone S, Taylor S. Impact of the Brush Day & Night Programme on Oral Health Knowledge and Behaviour in Children. *Int Dent J.* 2021;71(Suppl 1):S4-S14. doi:10.1016/j.identj.2021.01.014
55. Tubert-Jeannin S, Leger S, Manevy R. Addressing children's oral health inequalities: caries experience before and after the implementation of an oral health promotion program. *Acta Odontol Scand.* 2012;70(3):255-264. doi:10.3109/00016357.2011.645059
56. Macek MD, Beltrán-Aguilar ED, Lockwood SA, Malvitz DM. Updated comparison of the caries susceptibility of various morphological types of permanent teeth. *J Public Health Dent.* 2003;63(3):174-182. doi:10.1111/j.1752-7325.2003.tb03496.x
57. Dye BA, Tan S, Smith V, et al. Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital Health Stat 11.* 2007;(248):1-92.
58. Gooch BF, Griffin SO, Gray SK, et al. Preventing dental caries through school-based sealant programs: updated recommendations and reviews of evidence. *J Am Dent Assoc.* 2009;140(11):1356-1365. doi:10.14219/jada.archive.2009.0070
59. Ceyhan D, Akdik C, Kirzioglu Z. An educational programme designed for the evaluation of effectiveness of two tooth brushing techniques in preschool children. *Eur J Paediatr Dent.* 2018;19(3):181-186. doi:10.23804/ejpd.2018.19.03.3
60. The Children's Hospital of Philadelphia. Brushing and toothpaste for children. Children's Hospital of Philadelphia. <https://www.chop.edu/conditions-diseases/brushing-and-toothpaste-children>. Published August 24, 2014. Accessed March 26, 2023.
61. Boyd LD, Mallonee LF, Wyche CJ. *Wilkins' Clinical Practice of the Dental Hygienist*. Burlington (Mass.): Jones & Bartlett Learning; 2021.