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Dental Care Utilization Among U.S. Children Participating in Early Head Start Programs

Ahlam Ibraheem Joufi
Old Dominion University, ahlam.973@hotmail.com

DENTAL CARE UTILIZATION AMONG U.S. CHILDREN PARTICIPATING IN EARLY HEAD START PROGRAMS

by

Ahlam Ibraheem Joufi
BSDH January 2010, King Saud University, Saudi Arabia
M.S. May 2017, University of North Carolina

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Approved by:

Denise M. Claiborne (Co-Director)

Deanne Shuman (Co-Director)

Harry Zhang (Member)

Hadiza Galadima (Member)

ABSTRACT

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Ahlam Ibraheem Joufi
Old Dominion University, 2023
Co-Director: Dr. Denise M. Claiborne
Co-Director: Dr. Deanne Shuman

Early childhood caries (ECC) remains one of the most common preventable diseases among children under the age of 6 years. Several national stakeholders recommend establishing a continuous collaboration of individuals involved with receiving oral health services (dental home) and routine dental care for the child by 12 months. Despite this recommendation, disparities exist among young, low-income children in preventive dental service utilization. The Early Head Start (EHS) program serves low-income children aged 0-3 years and their families and promotes oral health practices and service utilization within the program. This study aims to examine predictors of dental care utilization among children participating in U.S.EHS programs utilizing Andersen's Behavioral Model of Health Services Use.

Early Head Start Family and Child Experiences Survey (Baby FACES) data from Spring 2009 was used for the analysis. Data were collected on a sample of 782 one-year-old cohort group of children enrolled in 89 U.S. EHS programs. The primary independent variables were constructs from Anderson's Behavioral Model of Health Services Use: predisposing characteristics (mother's age, race, education, and employment), enabling resources (family income, public assistance, WIC, public health insurance, and EHS program's services), and need (household member couldn't see a dentist). The dependent variable was the parent's report of the

child's dental visit. Descriptive statistics, chi-square, and logistic regression models were used to examine the key variables.

The predisposing, enabling, and need variables were insignificant in predicting the use of dental services by EHS-enrolled children. However, this study found that only about a quarter of EHS-enrolled children followed the recommendations of age-one dental visits, as reported by parents in 2009. The EHS programs are important stakeholders in promoting age-one dental visit for children in order to establish a dental home and prevent ECC. Further research is needed utilizing a more recent dataset and larger sample size to better understand the predictors of dental service use among EHS-enrolled children.

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CHAPTER I

INTRODUCTION

Dental caries (tooth decay) is the most common preventable disease among children (Centers for Disease Control and Prevention [CDC], 2022). Early childhood caries (ECC) is defined as "the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six" (American Academy of Pediatric Dentistry [AAPD], 2021). In the United States, 7.8% of children aged 1-5 years had reported dental caries in 2020-2021 (Child and Adolescent Health Measurement Initiative [CAHMI], 2022). The risk factors for dental caries include poor oral hygiene, frequent and high sugar content meals, feedings during sleeping, and previous caries experiences of children or parents (AAPD, 2022a; Kanellis, 2000). Furthermore, sociodemographic factors such as age, race/ethnicity, parental education, and income level were associated with ECC's initiation and progression (Edelstein, 2002; Hooley et al., 2012). Children from low-income families are at a higher risk for developing ECC with unmet dental needs than those from higher-income families (AAPD, 2022a; Edelstein, 2002; Kanellis, 2000).

The dynamic nature of dental caries interrupts the disease in its earlier stages and prevents its progression (Caufield & Griffen, 2000; Dülgergil et al., 2013). Strategies for preventing and treating ECC vary according to the specific risk factors of the disease (AAPD, 2022a). Applying effective oral hygiene measures for children, such as regular toothbrushing and gum cleaning, using fluoride toothpaste, providing a healthy diet, reducing the intake of between meals sugar-containing food and liquids, and avoiding providing milk-containing bottles during

bedtime is essential for preventing ECC (AAPD, 2022a; Association of State & Territorial Dental Directors [ASTDD], 2012a; Dülgergil et al., 2013; Phantumvanit et al., 2018). In addition, the American Academy of Pediatrics (AAP) and the American Academy of Pediatric Dentistry (AAPD) recommend and support establishing a dental home and routine preventive dental care by the age of 12 months (AAPD, 2010, 2018b; Baker et al., 2019). Children who receive regular preventive dental care are less likely to have adverse dental outcomes than children who visit the dentist for oral health problems, such as pain, carious lesions, tooth loss, or trauma (Momen, 2016). However, young children tend to have fewer preventive dental visits than children of older ages (Lebrun-Harris et al., 2019).

Based on data from the Medical Expenditure Panel Survey 2010–2012 for children aged 0 to 17 years, 11.7% of children 0-2 years old and 38% of children 3-4 years old had dental visits that included preventive services compared to approximately half of the children aged 5-14 years (Berdahl et al., 2016). Additionally, data from the National Survey of Children's Health revealed that only small percentages of US children aged 1-3 years old had preventive dental visits in 2003 due to factors related to the cost and access to dental care (Edelstein & Chinn, 2009). The data showed that of the one-year-old children, 10% had parent-reported preventive dental visits, followed by 24% of the two-year-old and 51% of the three-year-old children (Edelstein & Chinn, 2009).

Several public health programs, such as Head Start (HS), Early Head Start (EHS), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and Maternal, Infant, and Early Childhood Home Visiting (MIECHV) have been used to promote oral health among young children in the U.S. (WIC Works Resource System, 2020; Mariani et al., 2016; U.S. Department of Health & Human Services [HHS], 2023; Gerlach, 2019). Head Start and Early

Head Start are U.S. federally funded comprehensive early education programs for children from low-income families (HHS, 2023b). The Head Start program serves children aged 3-5 years, while the EHS program serves pregnant women and children from birth to age 3 (HHS, 2023b). Both programs have oral health standards that provide regulations for applying oral health activities, addressing children's oral health needs, and facilitating children's access to dental health services (HHS, 2023b).

The Early Head Start programs have facilitated children's access to dental services and increased the number of preventive dental visits (Burgette et al., 2017b, Burgette et al., 2018). Children enrolled in EHS tend to have higher numbers of reported preventive dental services from dental and medical providers compared to Medicaid-insured non-EHS enrolled children (Burgette et al., 2018). However, among EHS-enrolled children, the number of dental visits was still lower than the recommended based on their risk for ECC. Factors such as lack of parental engagement and availability of dental care affect the use of dental services by EHS-enrolled children (Burgette et al., 2017b; Goldberg et al., 2011). Therefore, studies are needed to explain factors associated with individualized dental service use among children enrolled in EHS programs (Burgette et al., 2017b; Xue et al., 2014). This current study examined the influence of family and child's sociodemographic characteristics on dental service utilization among children participating in U.S. EHS programs.

Statement of the Problem

Early childhood caries is the most common preventable disease among children under age six (CDC, 2020; Li et al., 2000). Based on the 2018-2019 National Survey of Children's Health (NSCH), of U.S. children 1-5 years old, 6.9% had dental caries in 2018-2019 (CAHMI, 2021). U.S. children from low-income families showed the highest prevalence of dental caries

compared to their peers from higher-income families. Although public insurance is available for eligible children in the U.S., most insured children receive dental services after preschool (Milgrom et al., 2011). Preventing ECC is associated with decreasing the cost of further dental treatment, such as root canal treatment and tooth extraction, and reducing the disease burden for children and their parents (Andiesta et al., 2018; Nowak et al., 2014).

Early dental visits for children before 24 months are associated with the early detection and treatment of dental caries (Beil et al., 2014; Momen, 2016). Professional organizations recommend and support age-one dental visit for children that involves establishing a dental home and receiving routine preventive dental care (AAPD, 2010, 2018b; Baker et al., 2019). An established dental home is the collaboration of all individuals involved with oral health for the child, including parents, and dental and non-dental providers, where comprehensive oral health services can be obtained (AAPD, 2022b, 2018a). Compared to older children, children aged 0-2 years were reported to have the lowest number of dental visits with low percentages of preventive dental services used in the U.S. in 2010-2012 (Berdahl et al., 2016).

Factors affecting dental services utilization among children included age, race/ethnicity, family income level, dental insurance coverage, and parental or caregivers' education (AAPD, 2022a; Edelstein & Chinn, 2009; Kanellis, 2000; Manski & Brown, 2007; Shariff & Edelstein, 2016). Further, Medicaid-enrolled children were found to have low dental services use due to limited or lack of availability for a source of care, access to dental care, parents' oral health knowledge, and low numbers of dental providers accepting Medicaid beneficiaries due to low reimbursement rates (Bouchery, 2013). The EHS programs support children's development by implementing comprehensive educational interventions and health promotion. However, studies reported high percentages of dental caries experience among HS and EHS-enrolled children

(AAPD, 2022a; Kopycka-Kedzierawski et al., 2008; Reed et al., 2016; Vracar et al., 2016, Goldberg et al., 2011).

To the author's knowledge, only two studies investigated factors associated with dental services use among children enrolled in local EHS programs (Burgette et al., 2018; Burgette et al., 2017b). The studies were limited to examining the effect of children's program enrollment on their use of dental care. The findings of these studies indicated that EHS enrollment increased children's dental services use compared to their non-EHS-enrolled peers. Although, based on the professional recommendations for periodicity of preventive dental visits for high caries-risk children, EHS-enrolled children were reported to have a low number of preventive dental visits (AAPD, 2022b; Burgette et al., 2017b).

In addition, a few studies have explored factors associated with access to dental care for HS/EHS-enrolled children (Burgette et al., 2018; Goldberg et al., 2011). These reported factors include the child's insurance type, identification of a dentist who accepts the child's insurance, and dentists' age limitation on providing dental care to young children (Goldberg et al., 2011). The literature suggests that national studies are needed to understand the role of EHS programs and services and the family and child-level sociodemographic characteristics that influence dental service use among young children (Burgette et al., 2017b; Xue et al., 2014).

Scope of the Problem

In 2020, the United States' national dental expenditures reached $146 billion, which increased to $162 billion in 2021 (American Dental Association [ADA], 2023). Early childhood caries remains a public health concern despite this increase, accounting for 21.4% of U.S. children ages 2 to 5 years old, having 8.8% untreated dental caries in 2016 (CDC, 2020; Fleming & Afful, 2018). Based on a national cost estimate, treating dental caries outweigh the cost of

preventing the disease (ADA, 2013). Preventive strategies for ECC include establishing a dental home that provides preventive interventions for children before age one (AAPD, 2021).

Children enrolled in HS/EHS programs were reported to have a high prevalence of ECC compared to the national average (Goldberg et al., 2011). In an HS/EHS program, 216 children were examined, and the average decayed, missing, and filled teeth (DMFT) were calculated to be 2.0 compared to 0.6 nationally (Goldberg et al., 2011). Also, in a sample of 519 EHS-enrolled children, 86.3% were Medicaid insured, 6% had dental caries experience, and 5.4% had untreated dental caries (Vracar et al., 2016). In another study, 43% (n=162) of EHS-enrolled and Medicaid-insured children had dental caries, with more than 17% experiencing severe disease (Kopycka-Kedzierawski et al., 2008). As many of EHS enrolled children are Medicaid beneficiaries, in 2008, of the children enrolled in Medicaid, only 9% aged 1-2 years used preventive dental services, and 2% of the children utilized treatment services (Kopycka-Kedzierawski et al., 2008; Vracar et al., 2016; Bouchery, 2013).

Consequence of the Problem

Early childhood caries affect children's primary teeth before they turn six (AAPD, 2021; Anil & Anand, 2017). Untreated dental caries increase the risk of developing additional carious lesions in the child's mouth (AAPD, 2021; Anil & Anand, 2017). Dental caries' progressive nature increases the need for more extensive and costly dental treatments, including the utilization of emergency units and operating rooms (AAPD, 2021; Anil & Anand, 2017; Casamassimo et al., 2009). Dental emergency utilization was high among young children compared to other age groups (Meyer et al., 2017; Fiehn et al., 2020). Managing the child's dental pain and disease through extensive treatment increases the risk for adverse reactions and negatively impacts the child's quality of life (Casamassimo et al., 2009). In addition, using

emergency units and operation rooms for treating nontraumatic preventable dental diseases increases dental expenditures and affects the community and the health care system (Meyer et al., 2017; Fiehn et al., 2020).

Poor oral health outcomes among children were associated with less school attendance and poor performance (Jackson et al., 2011). Data from the 2018-2019 National Survey of Children's Health indicated that 8.4% of U.S. children aged 1-5 had at least one oral health problem in the past year, including toothaches, bleeding gums, and dental caries (CAHMI, 2021). Children who had dental visits due to pain or infection missed more school days than those who had routine preventive visits (Jackson et al., 2011). Furthermore, children with poor oral health tend to perform poorly in school compared to their peers with excellent/very good oral health (Jackson et al., 2011).

The consequences of ECC impact children's development and socialization (Dülgergil et al., 2013). Dental caries and its complications affect children's nutritional status, daily activities, overall general health, and oral health-related quality of life (AAPD, 2021; Phantumvanit et al., 2018). Premature loss of teeth due to dental caries affects the child's speaking development, self-esteem, and learning ability (Anil & Anand, 2017; Jackson et al., 2011). Given these negative consequences of dental caries, a preventable chronic condition, it is essential to understand factors associated with preventive dental services utilization among young children.

The Behavioral Model of Health Services Use

Overview. Andersen's Behavioral Model of Health Services Use was developed in 1968 to explain the population's differences in their utilization of medical and dental health services (Andersen, 1968). The model helps to understand specific behavioral differences among populations based on their social structures (Andersen, 1968). In 1995, the model was revised to

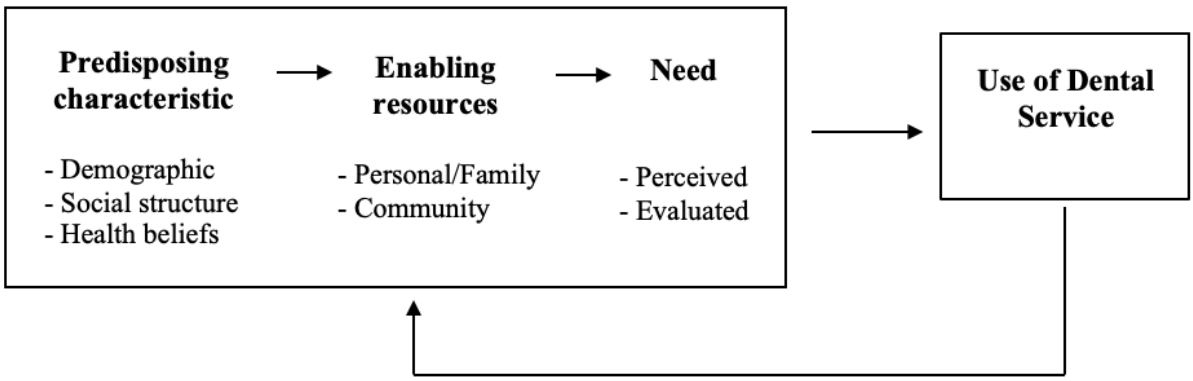
be utilized on the individual level (Andersen, 1995). The revised model involves changing healthcare policies and service delivery systems (Andersen, 2008). The last revision of the model emphasizes the role of contextual characteristics and individual-level factors in explaining health services use (Andersen, 2008). The contextual characteristics also have been categorized into predisposing (demographic, social, and health beliefs), enabling (health policy, financing, and organization), and need factors (environmental and population health indices). Examples of the enabling contextual factors are the age and structure of a community, the predisposing factors: supply of health providers and facilities, and for need: population rates of mortality, morbidity, or disability (Andersen, 2008).

The three main components of the model are predisposing characteristics, enabling resources, and need (Andersen, 1995). The predisposing characteristics include demographic factors, such as age and sex; social structure factors, such as race/ethnicity and socioeconomic status; and health beliefs (Andersen, 1995). The enabling resources include personal and family resources, such as income and health insurance, and community resources, such as the availability of a regular source of care. The need component includes the individual's perceived and professionally evaluated needs (Andersen, 1995). The model's outcome is the use of health services measured by an individual's annual number of medical or dental health services (Andersen, 1995). The model is presented in Figure 1.

Model Applied to Health Service Use. Many studies have utilized Andersen's Behavioral Model of Health Services Use as a conceptual framework to examine the associated constructs related to health services utilization among populations (Blackwell et al., 2009; Mcmanus, 2016; Stockdale et al., 2007). Babitsch et al. (2012) conducted a systematic review to evaluate studies that utilized the model from 1998 to 2011 and to assess the influence of its

constructs on explaining health services use. Common predisposing factors studied include age, sex, race/ethnicity, and education. In most studies, the predisposing factors were significantly associated with health services utilization (Babitsch et al., 2012; Mcmanus, 2016). Also, the enabling resources, including income level, health insurance, having a regular source of care, and availability of health services, were associated with health services use (Babitsch et al., 2012; Mcmanus, 2016; Blackwell et al., 2009; Stockdale et al., 2007). Additionally, evaluated health status was significantly associated with health service use in several studies, and only a few reported that perceived need influenced an individual's use of health services (Afilalo et al., 2004; Babitsch et al., 2012; Dhingra et al., 2010).

Figure 1. Andersen's Behavioral Model of Health Service Use (Andersen, 1995)



Model Applied to Dental Service Use. Andersen's model has been tested for its utilization in explaining factors associated with oral health outcomes (Baker, 2009). The model was applicable for assessing the contextual factors associated with perceived oral health outcomes and dental service use in a sample of adults in the United Kingdom (Baker, 2009). The model also examined factors associated with dental care use in some studies (Alexander et al.,

2013; Alshatrat & Shuman, 2015; Naavaal et al., 2017; Serna et al., 2020; Valente & Vettore, 2018).

One of the studies that utilized the model assessed the association between children's care utilization for dental problems and the type of health insurance coverage for children 2-17 years old (Naavaal et al., 2017). The study found that there was an association between the availability and the type of health insurance coverage (enabling), the presence and urgency of the dental problem (need), and the child's use of dental services (Naavaal et al., 2017). Another study examined factors associated with disparities in preventive dental services use for children from low-income families utilizing the Andersen model of health service use (Wei et al., 2018). Based on the study results, using more preventive dental services has decreased the disparities in preventive dental service use among children from low-income families (Wei et al., 2018).

While only a few studies have used Andersen's model to examine factors associated with preventive dental service or dental care utilization, none have used the model to examine sociodemographic factors among young children enrolled in EHS. Therefore, this study aimed to utilize a nationally representative dataset to investigate the association between family and child's level sociodemographic factors and dental services use among children enrolled in U.S. EHS programs.

Purpose of the Study

This study aimed to examine predictors of dental services utilization among children participating in U.S. EHS programs utilizing Andersen's Behavioral Model of Health Services Use. The research hypothesis is that children's predisposing characteristics, enabling resources, and needs factors are associated with dental services utilization among children participating in U.S. EHS programs.

Research Questions

The research addresses the question, "What predictors of dental services utilization are explained by Andersen's Behavioral Model of Health Services Use among children participating in U.S. EHS programs?"

Specific Research Questions

1. What are the child's and parent's predisposing characteristics associated with dental services utilization among children participating in U.S. EHS programs?
2. What personal and community-enabling resources influence dental services utilization among children participating in U.S. EHS programs?
3. Is there an association between parents' perception of the household member's need for dental care and dental services utilization among children participating in U.S. EHS programs?

Hypotheses

Hypothesis One. Predisposing characteristics of parent's age, race, education, and employment, and child's age, race, and gender are associated with dental services utilization among children participating in EHS programs.

Hypothesis Two. Enabling resources that include household income, public assistance, receiving WIC, public health insurance, availability of a regular source of health care, and EHS program approach are associated with dental services utilization among children participating in U.S. EHS programs.

Hypothesis Three. Parents' perception of a household member who could not see a dentist is associated with dental services utilization among children participating in U.S. EHS programs.

Definition of Terms

Early childhood caries: The presence of a cavity, restoration, or a white spot lesion on any surface of the primary teeth in children under six (AAPD, 2021).

Predisposing characteristics: Sociodemographic factors influencing dental services use include parent's age, race, education, and employment (Andersen, 1995; 2008).

Enabling resources: Resources needed for dental service use include household income, public assistance, receiving WIC, public health insurance, availability of a regular source of health care, and the EHS program approach (Andersen, 1995; 2008).

Need for dental care: Parents' reported perception of a household member who could not see a dentist (Andersen, 1995; 2008).

Dental services utilization: Parent's report of the child's dental visit (Andersen, 1995; 2008; Cannon et al., 2014).

CHAPTER II

LITERATURE REVIEW

Federal public programs such as EHS connect low-income children and families to health and dental services to improve health outcomes (HHS, 2023b). Timely and continuity of preventive dental visits are imperative for children; however, these recommended visits remain low for young children (Berdahl et al., 2016; Bouchery, 2013). While children enrolled in EHS are more likely to obtain dental visits than their non-enrolled peers, continued dental visits remain low and concern for stakeholders (Burgette et al., 2017b; Burgette et al., 2018).

Early Head Start Program (EHS)

The Early Head Start program (EHS) is part of the Head Start program (HS) that was established to provide comprehensive developmental services for children 3-5 years old from low-income families in the United States (U.S. Department of Health & Human Services [HHS], 2023b). Eligibility criteria for HS and EHS include family income lower than 100 to 130 of the federal poverty level, receiving public assistance, such as Temporary Assistance for Needy Families (TANF) or Supplemental Security Income (SSI), homeless, or if the child in foster care (HHS, 2023a).

The HS program has performance standards released in 1975 (HHS, 2023b). The standards have been developed and improved in response to program planning, scientific evidence, and professional partnerships. The program was expanded in 1995 to include EHS, designed to serve pregnant women and children from birth to 3 years old (HHS, 2023b). Head Start and EHS are federally funded programs under the Administration for Children and Families, Department of Health and Human Services. The programs have three service options: home-based, center-based, and family child-care services, designed to deliver health, nutritional,

psychological, and educational services to the children and their families. The programs serve more than a million U.S. children of low-income families annually. Currently, 1,700 HS/EHS programs in the U.S. support children's development and school readiness by applying educational interventions and health promotion (HHS, 2022). In 2021-2022, roughly 191,612 children were served by the EHS program (National Early Head Start, 2022).

In partnership with professional organizations, the Office of Head Start (OHS) sets oral health performance standards that HS/EHS personnel need to follow to prevent ECC and maintain good oral health for children (HHS, 2023b). The standards involve regulating oral health education and promotion practices for children and families, assessing children's oral health needs, and facilitating access to oral health care services. In addition, HS and EHS programs provide oral health training for the staff members and promote oral health education and activities among children, parents/caregivers, and staff members (HHS, 2023b). Oral health activities provided for children enrolled in the EHS program included toothbrushing, toothpaste use, nutrition advice, classroom education, and promoting age-one dental visits (Kranz et al., 2011, 2012; Joufi et al., 2021; HHS, 2023b). For monitoring children's oral health, HS and EHS programs utilize Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) program that is designed to provide data regarding the oral health status and needs of children enrolled in Medicaid that also could be approached by oral health professionals (Centers for Medicare & Medicaid Services, n.d.; HHS, 2023b).

Furthermore, the HS/EHS programs must ensure the child's access to dental services, availability of a regular source of care, and insurance coverage within 30 calendar days of the child's enrollment in the program. Also, the programs should communicate with oral health professionals to obtain updated reports on the child's oral health status and periodic dental visits

within 90 calendar days of the child's enrollment. Additionally, the program must provide parental support and facilitate the continuity of oral health care (HHS, 2023b).

A national descriptive study was conducted to address the oral health needs of HS/EHS enrolled children and to investigate oral health services provided to children, families, and staff members from the programs' health managers' perspectives (Karoly et al., 2016). Of the health managers, 1,465 (73%, n= 1,965) responded to an online survey from 1,902 HS/EHS programs (68%, n=2,778).

The study found that during 2012-2013, dental caries was a major concern for children in 85.7% (n=1,176) of HS programs and 81.6% (n=726) of EHS programs (Karoly et al., 2016). Regarding oral health screening and dental services for the children, of HS/EHS programs (n=470), 46.5% provided on-site services, 12.4% provided off-site services, 20.4% provided on-site and off-site services, and 20.4% did not provide any services. In addition, of the HS/EHS programs (n=465), 95.7% discussed topics related to oral hygiene with the family of the enrolled children. The programs also provided oral health training for health managers and staff members in dental caries, oral hygiene, and other oral health problems. The study concluded that despite HS/EHS programs providing oral health services, community support and effective professional partnerships are required to meet the children's and their family's oral health needs. Additionally, further investigation is needed to explain the factors associated with dental caries concerns among HS/EHS-enrolled children (Karoly et al., 2016).

Another study found that the EHS program improved children's oral health-related quality of life, as reported by parents (n=468) compared to their peers (n=688) of non-EHS, Medicaid-enrolled children (Burgette et al., 2017a). The oral health-related quality of life was assessed using the Early Childhood Oral Health Impact Scale, which involved items related to

the impact of dental problems or treatment on children and families. The items were categorized into domains that included the child's symptoms, functions, emotions, self-image, and the family's psychological, functional, and financial effects (Burgette et al., 2017a). The study also found that the program has increased dental services use, which improved the participating children's total oral health-related quality of life compared to non-EHS-enrolled children (Burgette et al., 2017a).

Oral Health of EHS-Enrolled Children

The oral health status of children enrolled in HS programs was assessed in several studies that reported high percentages of ECC and unmet dental needs among the children (Batliner et al., 2014; Reed et al., 2016; Siegal et al., 2004; Vargas et al., 2002). However, a few studies investigated the oral health of children in EHS programs (Goldberg et al., 2011; Kopycka-Kedzierawski et al., 2008). A pilot study explored the prevalence of ECC among EHS-enrolled children utilizing teledentistry (Kopycka-Kedzierawski et al., 2008). The study was conducted in an inner-city childcare center in New York for children aged 12-60 months old eligible for Medicaid or Child Health Plus. The study's results showed that 69 (43%, n=162) children who participated in the study had ECC, and 28 of them had severe ECC. Based on the images of the dental screening, only a few children had dental treatment, while most of them remained untreated, which implied a limited use of dental health services (Kopycka-Kedzierawski et al., 2008).

Another study assessed the prevalence of ECC and the factors associated with access to dental health services among children aged 2 to 5 years enrolled in HS/EHS programs in Suffolk County in New York (Goldberg et al., 2011). The study involved clinical examination of children in addition to parents' questionnaires. The study's results indicated a high prevalence of

ECC among the children (n=216) compared to the national average. In addition, only 45% (n=305) of the children had dental visits over two years, as reported by parents; of them, 24% experienced issues with seeking dental care, such as the child's young age and insurance coverage and type (Goldberg et al., 2011).

In 2014-2015, the oral health status of children enrolled in Florida HS and EHS programs was assessed at the state level using a cross-sectional descriptive survey to identify their oral health needs (Vracar et al., 2016). Based on the screening results, of the children enrolled in EHS programs (n=519), 6% had dental caries experience, 5.4% had untreated dental caries, and 5.3% needed early dental care. Of the HS-enrolled children (n=1183), 32.1% had dental caries experience, 20.8% had untreated dental caries, and 5.3% needed dental care. Regarding dental treatment services, only 0.8% (n=519) of EHS and 16.1% (n=1183) of HS-enrolled children received dental caries treatment. The study recommended continuous evaluation and monitoring of HS/EHS enrolled children's oral health required to identify their health needs. In addition, professional collaboration is needed to reduce barriers to receiving preventive dental services and reduce oral health disparities among minority racial and ethnic groups (Vracar et al., 2016).

Dental Services Utilization among U.S. Children

Children's dental visits have been used as an indicator of their utilization of dental services in the U.S. (Edelstein, 2002). Of the U.S. children aged 1-5 years, 61.8% had a reported preventive dental visit in the previous year in 2018-2019 (CAHMI, 2021). Regarding the types of reported preventive dental services, 65% of the children received dental check-ups, 47.5% received dental cleanings, 5.1% had dental sealant placed, 17.6% had dental X-rays, 30.4% received fluoride treatment, 34.2% received oral health care instructions (CAHMI, 2021).

Early dental visit for children is associated with the early detection of carious lesions (Beil et al., 2014; Momen, 2016). However, young children are less likely to utilize dental services compared to others of older ages (Berdahl et al., 2016; Bouchery, 2013). For example, according to the 2010–2012 Medical Expenditure Panel Survey for children aged 0 to 17 years, children 0-2 years old in the U.S. had the lowest number of dental visits with low percentages of preventive dental services use compared to children from older age groups (Berdahl et al., 2016). Additionally, based on data from the National Survey of Children's Health in 2003, 10% of U.S. children aged one year and 24% aged two years old had preventive dental visits, as reported by parents (Edelstein & Chinn, 2009). This percentage increased for children aged 3 years, as half of them had a preventive dental visit in 2003 (Edelstein & Chinn, 2009). In a sample of children younger than six years old (n=90), delaying the first dental visit to later ages was associated with a 10% monthly increase in the risk of dental caries (Momen, 2016). Furthermore, children who received routine preventive dental care before the age of 24 months (n=136) were more likely to have positive dental outcomes than children who visited the dentist for oral health problems (n=24) that included pain, carious lesions, tooth loss, or trauma (Momen, 2016).

Evidence supports the importance of early dental visits for high caries-risk children (Beil et al., 2012; Nowak et al., 2014). In an 8-year longitudinal study, children from low-income families aged 0-8 years who were enrolled in Medicaid (n=42,532) and had their first dental visit before turning four years old (40%) received a smaller number of dental treatment procedures with lower cost compared to children who had their first dental visit after aged four years (60%) (Nowak et al., 2014). In another sample (n=19,888), children with existing dental caries who received preventive interventions that involved reducing complications of the disease and restoring the function by age 18 months (n=14,389) had fewer dental treatment procedures with a

lower cost at age 43-72 months compared to others who had their first preventive interventions at older ages (Beil et al., 2012).

Literature indicated that several sociodemographic factors are associated with dental services utilization among children (AAPD, 2021; Edelstein & Chinn, 2009; Kanellis, 2000; Manski & Brown, 2007; Shariff & Edelstein, 2016). Factors such as age, race/ethnicity, family income level, dental insurance coverage, and parental or caregivers' education affect children's use of dental services. Based on the 2018-2019 NSCH, children aged 1-5 years whose family's income was considered low, with a low parental education level and no dental insurance, had a low number of preventive dental visits and preventive dental services received (CAHMI, 2021).

Gerlach (2019) investigated the influence of a child's demographic characteristics on the utilization of preventive dental services among Medicaid-enrolled children aged 0-18 in the Northeast region of the U.S. The study utilized data from the Centers for Medicare and Medicaid Services and data from Medical Expenditure Panel Survey for 2016 (Gerlach, 2019). The study found that a child's age was significantly associated with preventive dental services use, with variation in the direction of the relationship based on the specific population characteristics in each state. Regarding race/ethnicity, White children had the highest percentage of using preventive dental services (59.8%, n=32,872) compared to Hispanics (50.75%, n=16,539), Black (44.1%, n=9,240), American Indians (52.6%, n=4,410), and Asians (53.8%, n=3,354). Conversely, the lowest percentage of service use was observed among children of Black origin with more than half of the children remaining untreated. Also, sex was associated with the children's dental services use, as females were more likely to use preventive dental services than males. The study suggested the need for national representative studies investigating the effect of

comprehensive child and community-level characteristics on children's use of dental services (Gerlach, 2019).

Research on Dental Services Use among EHS-Enrolled Children

Dental care use was reported to be higher among EHS-enrolled children compared to their non-enrolled peers (Burgette et al., 2017b). A study reported that compared to non-EHS-enrolled children, EHS-enrolled children had a higher number of preventive dental visits and received more preventive dental services from both dental and medical health providers at baseline and two years follow-ups (Burgette et al., 2018). The services included oral health assessment, nutrition advice, and fluoride application. The study also reported that children enrolled in EHS were more likely to receive oral health assessment and fluoride application from dental providers than from medical providers, indicating the EHS program's role in increasing the children's access to dental care and establishing a dental home. Of the children enrolled in EHS, 76% (n=364) received a dental assessment, and 55% (n=266) received dental fluoride from dental providers compared to 54% (n=378) dental assessment and 45% (n=317) dental fluoride recipients of non-EHS-enrolled children over two years period (Burgette et al., 2018).

Burgette et al. (2017b) conducted a two-year study using parents' interviews, which revealed that 81% (n=479) of EHS-enrolled children had overall dental visits in 2012–2014 compared to 59% (n=699) of non-EHS enrolled. In addition, the study found that children enrolled in the EHS program had a higher number of preventive dental visits (79%, n=479) than their non-enrolled peers (56%, n=699). Although, there was no significant difference between the numbers of treatment or emergency dental visits for both groups. However, according to the professional recommendations for periodicity of preventive dental services (2 per year for low caries-risk children), the total number of preventive dental visits of the EHS-enrolled children

was found to be insufficient for high caries-risk children (recall every three months) over two years period (AAPD, 2018b; AAPD, 2022a; Burgette et al., 2017b). Factors that affected the continuity of preventive dental care for the EHS-enrolled children included lack of parental collaboration and availability of a regular source of care (Burgette et al. 2017b).

Andersen's Model Applied to Health Service Use

Andersen's Behavioral Model of Health Services Use was utilized in many studies to explain the influence of associated constructs on an individual's health services use (Blackwell et al., 2009; McManus, 2016; Stockdale et al., 2007). The constructs of the model include predisposing factors (demographic, social, and health beliefs), enabling factors (health policy, financing, and organization), and need factors (environmental and population health indices; Andersen, 2008).

Babitsch et al. (2012) conducted a systematic review to investigate the studies that have applied the model as a conceptual framework. The review evaluated the effect of the model's constructs as they are related to health services utilization among different populations (Babitsch et al., 2012). The review included studies published during 1998-2011 in English and German on adult populations. The review results yielded a total of 16 quantitative studies in general health, primary care, outpatient care, physician and hospital services, and mental health services. Only three included studies were original research, while the other 14 used secondary datasets for analysis. The studies utilized different versions of the model based on the population that has been studied. Among the populations studied are samples of low-income immigrants and specific ethnic groups. Regarding the variables applied to the model's constructs, the studies utilized predisposing, enabling, and need factors. The main outcomes of the included studies were access and utilization of health care services (Babitsch et al., 2012).

Based on the systematic review results, the most common predisposing factors used are age, sex, marital status, race/ethnicity, and education (Babitsch et al., 2012). Age and sex were significantly associated with health services use, considering the characteristics of the populations included in the studies. Additionally, race/ethnicity was significantly associated with health services use among the studies' participants, especially vulnerable and minority groups. For example, white non-Hispanic populations in the U.S. were more likely to utilize health services than black non-Hispanic and Hispanic groups. Education was a significant predictor of health services use among African Americans, immigrants, and low-income children and adults. Relative to low-educated people, highly educated participants were reported to be more likely to access and use health services. Marital status also was a predictor for health services use in most of the studies included in the review, with different relationship directions that varied based on the characteristics of the studies' populations, such as sex, race/ethnicity, family size, and type of health service. Other predisposing factors included employment status, number of children, immigrant status, region of residence, and family structure (Babitsch et al., 2012).

Regarding the enabling factors, the most common factors used in the studies included in the systematic review are income level, health insurance, and having a regular source of care. Income level was associated with health services use with differences in the direction of the relationship according to the type of health service (Babitsch et al., 2012). Among the studies assessing the association between income level and health services use in the U.S., two found that adults with high-income levels were more likely to use health services than low-income level adults (Blackwell et al., 2009; Stockdale et al., 2007). Insurance was a significant predictor for health services use as insured participants had more likelihood of accessing and utilizing health services. However, the type of health insurance affects health service use, especially

among underserved populations. Regarding the regular source of care, studies reported that people who had a usual source of care had more routine health visits and physician contacts, which increased their overall health service use compared to people with no regular source of care (Thode et al., 2005; Blackwell et al., 2009; Dhingra at al., 2010). Other enabling factors included the availability of health services, education, social/emotional support, accessibility to care, and employment status (Babitsch et al., 2012).

Regarding the need factors, based on the results of the systematic review, the need was categorized into evaluated health status and perceived health need (Babitsch et al., 2012). The evaluated health status was found to be a significant predictor for health service use in most of the studies. However, some studies found associations between perceived need and self-rated health and health services use, as people who are in higher need were more likely to use health services, especially among those who were seeking psychiatric or emergency health care (Afilalo et al., 2004; Babitsch et al., 2012; Dhingra et al., 2010).

Alexander et al. (2013) conducted a qualitative study to explain factors associated with parents' characteristics (n=28) and the use of preventive health services among children aged 3-5 years in Australia. The authors utilized a semi-structured interview based on the constructs of Andersen's Behavioural Model of Health Services Use (Alexander et al., 2013). The outcome variable of the study was the children's use of preventive health services, which was measured by parents' satisfaction with the services received in the past few years. The explanatory variables included environmental factors (living location, health care system, and health policies), population characteristics (predisposing characteristics, enabling resources, and perceived need), and health behaviors (Alexander et al., 2013).

The results revealed that the perceived need variable was associated with using preventive health services influenced by the birth order and the child's age (Alexander et al., 2013). Children of the first order in the family and those of young age were more likely to use preventive health services than the other children. In addition, parents' culture, health beliefs, family history, social influence, health behaviors, and satisfaction with health services affected the children's use of preventive health services and the continuity of care (Alexander et al., 2013).

Andersen's Model Applied to Adults' Dental Services Use

Several studies utilized Andersen's model to explain differences in dental services use, indicating that the model was applicable in identifying sociodemographic and contextual factors associated with dental services use among populations (Alexander et al., 2013; Alshatrat & Shuman, 2015; Baker, 2009; Naavaal et al., 2017; Serna et al., 2020; Valente & Vettore, 2018). Baker et al. (2009) assessed the relationship between the model's constructs, including predisposing, enabling, and need factors in addition to the personal behavior of UK adults (n=3,815) and perceived oral health outcome. The study utilized Oral Health Impact Profile for measuring perceived oral health outcomes (Baker, 2009). Variables of the predisposing characteristics included participants' household income, professional qualification, and social class. For the enabling resources, variables included participants' oral health education and dental anxiety and the type and cost of dental services. Additionally, evaluated and perceived need variables were considered for measuring the need factor. Furthermore, variables measuring personal behavior and dental services use included toothbrushing behavior, participant's attitude toward dental visits, and dental visit in the past year (Baker, 2009).

The study showed significant interrelated associations between the model's constructs (Baker, 2009). Results of the predisposing variables indicated that higher income level, social class, and qualifications accounted for a greater influence of predisposing characteristics, with income being the most influential variable. For the enabling resources, getting oral health education and the absence of dental anxiety, and receiving private and non-expensive dental treatment were the most influential enabling resources. In addition, participants perceived need and attitudes toward dental visits were the most influential variables for the need and the personal behavior and dental services use factors consequently. The study recommended that more research is needed utilizing several contextual predictors to comprehensively explain factors related to oral health outcomes and dental services (Baker, 2009).

Alshatrat and Shuman (2015) used Andersen and Newman's Framework of Health Services Utilization (1973) to investigate the predictors of using preventive and emergency dental services by an adult population with diabetes in the U.S. on the individual level. The authors identified the association between the model's constructs and their differences in explaining dental services use (Alshatrat & Shuman, 2015). The 2001-2002 National Health and Nutrition Examination Survey dataset was utilized for secondary data analysis. The study identified outcome variable was dental services use measured by visiting a dentist in the past year. Variables of predisposing characteristics included age, sex, marital status, education, and race/ethnicity. For the enabling resources, variables included the household income, dental insurance coverage, and availability of a source of care. Additionally, the illness level construct of the model involved evaluated and perceived need variables (Alshatrat & Shuman, 2015).

As with the previous study, the results revealed significant associations between the majority of the model's constructs and their ability to predict dental services use among the

diabetic population (Alshatrat & Shuman, 2015). For the predisposing characteristics, being female, married, highly educated, and of non-Hispanic White origin increased the likelihood of using dental services. Regarding the enabling resources, people with high-income levels, dental insurance, and available source of dental care were more likely to use dental services than those with low-income levels and a lack of dental insurance or available source of dental care. Additionally, the evaluated need was significantly associated with dental services use among diabetic individuals, as patients with oral concerns were less likely to utilize dental care than those without oral concerns (Alshatrat & Shuman, 2015).

For explaining the differences between the variables in predicting preventive dental services use, predisposing characteristics (age, sex, marital status, and education), enabling resources (income, dental insurance, and availability of source of care), and illness level (perceived and evaluated needs) were significantly associated with the use of preventive services among diabetic individuals with the availability of a source of care being the most influential variable (Alshatrat & Shuman, 2015). Additionally, for explaining the differences between the variables in predicting emergency dental services use, predisposing characteristics (age, marital status, and education), enabling resources (dental insurance and availability of a source of care), and illness level (perceived and evaluated needs) were significantly associated with emergency services use among diabetic individuals. However, a major limitation of this study was its small sample size (n= 4,707; Alshatrat & Shuman, 2015).

In a cross-sectional study, Serna et al. (2020) assessed factors related to dental services use among 278 adults of Hispanic migrant farmworkers. The authors used Andersen's model's predisposing, enabling, and need factors to test the relationship between the variables in predicting dental services use (Serna et al., 2020). The outcome variable was dental services use

measured by visiting a dentist in the past year. For that study, the predisposing characteristics consisted of participants' demographics (age, sex, country of origin, education, relationship status, and religious beliefs) and oral health behaviors, such as dental caries preventive practices and frequency of toothbrushing. The enabling resources variables consisted of participants' employment status, insurance coverage, acculturation, and availability of sources of care and social support. Additionally, perceived and evaluated need for dental care variables were included for measuring the need factor (Serna et al., 2020).

The study found that frequency of tooth brushing, availability of social support, and perceived oral health status variables were significantly associated with dental services use among Hispanic migrant farmworkers (Serna et al., 2020). Participants who indicated that they brushed their teeth once a day was more likely to have a dental visit in the past year than others who reported brushing their teeth more frequently. Also, those who received social support were more likely to have a dental visit in the past year than those other who did not. Additionally, being knowledgeable about preventive oral health practices and perceiving oral health status as good increased the likelihood of having a dental visit in the past year (Serna et al., 2020).

Andersen's Model Applied to Children's Dental Services Use

Three studies utilized Andersen's model to investigate dental care use among children (Naavaal et al., 2017; Wei et al., 2018; Finlayson et al., 2018). Naavaal et al. (2017) assessed the influence of the dental problem and the type of health insurance on dental services use among U.S. children aged 2-17 years using data from the 2008 National Health Interview Survey. The outcome variable was the child's use of dental services measured by visiting a dentist or a medical doctor in the past six months due to dental problem experience as reported by parents (Naavaal et al., 2017). The predisposing characteristics included the child's age, sex, birthplace,

and race/ethnicity, in addition to the parent's level of education. The enabling resources comprised the child's health insurance coverage and the type and family income level. For the need variable, children's dental problems reported by parents were classified into urgent and non-urgent needs. For example, dental caries, pain, and trauma were considered urgent conditions requiring urgent dental treatment, while stained, misaligned, and shedding teeth were considered among the non-urgent conditions. Additionally, the region variable was used to further contextualize the explanation of the factors associated with dental services use, including supply and fees of dental services and reimbursement rates for dental providers (Naavaal et al., 2017).

The results of that study indicated that of the predisposing characteristics, parents' level of education was significantly associated with the child's dental services use for the dental problem (Naavaal et al., 2017). High-level parental education increased the likelihood of their children using dental services. Regarding the enabling resources, the results showed that the family's income level and the child's insurance coverage were significantly associated with dental services used for a dental problem. Also, there was a significant association between the urgency of children's dental needs, as reported by parents, and dental services used for a dental problem. The study found that the high-income level of the family increased the likelihood of the children using dental care. Also, children with urgent dental needs were more likely to use dental care than those with non-urgent needs. In addition, children with health insurance coverage were more likely to utilize urgent dental services than those uninsured.

The study also found differences in the children's use of dental services influenced by health insurance coverage and type, in addition to the urgency of dental need. For example, children enrolled in Medicaid or State Children's Health Insurance Program were more likely to

use urgent dental services than privately insured or uninsured children. The study suggested a need to identify barriers associated with children's use of dental services (Naavaal et al., 2017).

Wei et al. (2018) evaluated factors associated with disparities in preventive dental services use among U.S. children from low-income families. The authors utilized data from the 2001–2002 and 2013–2014 Medical Expenditure Panel Survey (Wei et al., 2018). Andersen's model was used to explain differences in preventive dental services used by race/ethnicity among children and adolescents aged 2-18. For that study, the outcome variable was the child's preventive dental services use measured by visiting a dentist in the past 12 months. The preventive dental services were categorized into evidence-based services, including dental sealant and professionally applied fluoride, and non-evidence-based services, which included professional dental cleaning only. In addition to the child's race/ethnicity, other predisposing characteristics had the child's age, sex, and parental education. The enabling resources variables consisted of health insurance coverage and type. In addition, the need variable was measured by parents' perceived general health status of the child that was used due to a lack of data on children's oral health (Wei et al., 2018).

That study found significant associations between parental education, child's health insurance coverage, type, and child's health status and preventive dental services use that varied among different racial/ethnic groups (Wei et al., 2018). Based on the study's results, evidence-based preventive services were more likely to be utilized by non-Hispanic white children. In contrast, non-evidence-based services were more likely to be utilized by non-Hispanic black children. The study also found a reduction in preventive dental service use disparities among children from low-income families, which was the overall increase in the number of recipients of non-evidence-based dental services (Wei et al., 2018).

Finlayson et al. (2018) explored factors related to dental service use by children aged 2-17 years in the Child Welfare System (CWS) using Andersen's model of health service utilization. The study used the National Survey of Child and Adolescent Well-Being (NSCAW-II) data. The dependent variable was going to a dentist or a dental hygienist in the past year. The predisposing factors of that study were the child's age, gender, race/ethnicity, emotional or behavioral problems, type of maltreatment, family risk, number of other children in the household, caregiver's relationship with the child, and living in a metropolitan area or not. The enabling resources involved the child's health insurance coverage, availability of a regular source of healthcare for the child, annual household income, caregiver's education, and caregiver's employment. The need factors included caregivers' responses to questions related to the child's experience of dental problems and if the child needed dental care but could not afford it in the past year. The study performed a hierarchical structure and a single-level multivariable logistic regression model for the data analysis (Finlayson et al., 2018).

The authors found that among the predisposing characteristics, the child's age was significantly associated with dental service use in the past year (Finlayson et al., 2018). Children six years and older had higher odd ratios than children 2-5. Regarding the enabling resources, the study reported that the availability of a regular source of care and caregivers' education were significantly associated with dental service use in the past year. Children with an available healthcare source were more likely to utilize dental services in the past year compared to those without an available healthcare source. Children of parents with higher levels of education were more likely to utilize dental services in the past year than those of parents with lower education levels. For the need variables, the study found that children with dental problems were more likely to utilize dental services in the past year compared to children without dental problems.

Additionally, children who needed dental care but could not afford it were less likely to utilize dental services in the past year compared to those who could afford it.

The study recommended that dental service use among young children involved with CWS should be encouraged and promoted through dental referrals, caregivers' education, and eliminating barriers to improve their oral health (Finlayson et al., 2018).

Limitations of Existing Studies

Oral health policies and professional organizations recommend that a child's first dental visit be early in the child's life before turning one (AAPD, 2010, 2018b; Baker et al., 2019). Children enrolled in the EHS program were reported to have fewer dental visits than the professionally recommended for high-risk children (AAPD, 2018b; AAPD, 2022a; Burgette et al., 2017b). Studies that have examined dental services use among children enrolled in local EHS programs are insufficient. In addition, there is a gap in investigating the effect of family and child-level characteristics on explaining differences in dental services use among EHS-enrolled children (Burgette et al., 2017b, 2018).

Several studies have investigated factors associated with the use of dental services among populations utilizing Andersen's model, finding that the majority of the model's constructs were significantly associated with dental services use (Alexander et al., 2013; Alshatrat & Shuman, 2015; Baker, 2009; Naavaal et al., 2017; Serna et al., 2020; Valente & Vettore, 2018). However, to the best of this author's knowledge, only three studies have used the model to examine the influence of sociodemographic factors on dental services use among children, and none have focused on young children (Naavaal et al., 2017; Wei et al., 2018; Finlayson et al., 2018).

Knowledge Gaps Answered by the Present Study

While only a few studies have investigated dental services utilization among children enrolled in local EHS programs, none have examined the differences between family and child-level characteristics in explaining dental services use (Burgette et al., 2017b, 2018). The current study used a national representative dataset (Baby FACES 2009-2012; the cross-section of 2009) to examine the influence of family and child's level sociodemographic factors associated with dental services use among EHS-enrolled children. This study addressed the question of what predictors of dental services utilization are explained by Andersen's Behavioral Model of Health Services Use among children participating in U.S. EHS programs, measured in terms of the child's visit to a dentist.

CHAPTER III

METHODOLOGY

Study Design

A cross-sectional secondary data analysis was conducted utilizing a national representative dataset, the Early Head Start Family and Child Experiences Survey (Baby FACES), Spring 2009-Spring 2012 (Cannon et al., 2014); specifically, for this study, 2009 cross-section data were used. The Baby FACES 2009-2012 dataset was utilized specifically for its inclusion of the variables of interest essential in conducting analysis regarding dental service utilization. It should be noted that these variables were not present in the more recent Baby FACEC 2018 dataset (Cannon et al., 2014, 2020).

Baby FACES is a national comprehensive descriptive study performed by Mathematica Policy Research company and funded by the Office of Planning, Research, and Evaluation (OPRE) (Mathematica Policy Research, 2023; Xue et al., 2014). The Baby FACES study was designed to answer questions related to the EHS program's services and staff's characteristics in addition to the characteristics and outcomes of children and families. The dataset includes child and family-level cross-sectional and longitudinal weighted data. Baby FACES data collection methods consisted of in-person interviews and observations of teachers and home visitors, telephone interviews and self-administered questionnaires for parents and program directors, and direct in-home child assessments. The child's assessment involved assessing the child's height and weight in addition to the child's skills, including language and comprehension, receptive vocabulary, expressive communication, and parent-child interaction.

Previous analyses using this data have examined factors affecting children's development and behaviors, including EHS program services, family engagement, parenting

behaviors, and continuity of care (Cherry et al., 2019; Choi et al., 2019; Jeon et al., 2018, 2020; C. Kuhns et al., 2018; Kuhns, 2019). To the best of this authors' knowledge, no prior studies have examined factors affecting dental care utilization among EHS-enrolled children. The variables of interest for the present study are available among data collected by parents' interviews, which was utilized for the analyses. The dataset includes essential demographic family and child-level characteristics that were used to determine and measure the child's dental services utilization. These variables include parent and family-level characteristics (mother's age, parent's race, parent's education, parent's employment, household income, public assistance, receiving WIC, family-level approach to the EHS program, and a household member couldn't see a dentist) and child-level characteristics (age, gender, race, public health insurance, available source for healthcare, and dental visits). This study used the birth mother's data for the parent-level variables because they represented the largest percentage of respondents to the parents' interview and the self-administered questionnaires. The Old Dominion University's Institutional Review Board (IRB) approved this study (Approval # 1713536-2).

Sample Population

Baby FACES 2009-2012 study employed a stratified clustered sampling design to obtain cohorts of parents with newborns and children aged one year who were enrolled in U.S. EHS programs (Cannon et al., 2014). The Head Start Program Information Report data was utilized for the sampling procedure. A stratified clustered sample design was performed for all children enrolled in 89 EHS programs to represent the national population. Baby FACES data collection was conducted over four years, from Spring 2009 to Spring 2012 (Cannon et al., 2014). Data were collected from a sample of (n=971) children's parents who responded to parent interviews and self-administered questionnaires. The study began with two cohorts of eligible children

(n=194 newborns and n=782 children aged one year) and parents consenting to participate in the study. Parental consent was obtained annually by on-site coordinators in EHS programs whom Mathematica's Baby FACES coordinators recruited (Cannon et al., 2014).

The analytical sample for this study was defined based on the American Academy of Pediatric Dentistry's policy on ECC and policy on the dental home. The policies recommend that children have their first dental visit after the first tooth eruption or by twelve months of age (AAPD, 2021; AAPD, 2018b). Therefore, this study used the 2009 age one-year cohort cross-section data files. The study included data on all the children enrolled in EHS and aged 12 to 18 months at the time of the survey in 2009. Also, the study included data on children under 12 months old (10-11 months old) who had a reported dental visit in 2009. The study excluded children under 12 months old who had not yet had a dental visit. This was because these children still have time to receive dental services and including them in the study would have been premature based on the qualifying characteristics.

Key Study Variables

Outcome Variable. The outcome variable of this study is a child's dental visit, defined as the parent's report of the child's dental visit "child had dental visit". This nominal binary variable has values of yes and no.

Predisposing Characteristics. Based on Andersen's model, predisposing characteristics are measured by a combination of an individual's biological factors, social structure, and health beliefs that influence people's use of health services (Andersen, 1995). Predisposing characteristics are sociodemographic factors influencing dental service use, including parent's age, gender, race/ethnicity, education, and occupation (Andersen, 1995, 2008). For this study, parent's demographics, including the mother's age and race, in addition to social structure

(education and employment), were used. The dataset shows that the mother's age is a categorical variable ranging from less than or equal to 18 to more than 30 years (Cannon et al., 2014). This study categorized the mother's age variable into four categories: ≤18, 19-24, 25-30, and >30 years. The mother's race also is nominal with four values (non-Hispanic White, non-Hispanic African American, Hispanic/Latino, and mixed/other). The mothers' responses to a question about completing the highest grade or school year were used for education. The mother's education is a nominal variable, which includes less than high school, high school or equivalent, some college, or bachelor's degree or higher. Mothers' employment was measured by their responses to whether they have worked at a job for pay or income in the past year using a nominal variable of values yes and no. Additionally, predisposing variables included the child's age, gender, and race. The child's age is a continuous variable ranging from 10 to 18 months. The child's gender is a nominal variable with male and female values. The child's race is a nominal variable with the same four values as the mother's race variable.

Regarding health beliefs, Andersen (1995) suggested that individuals' health beliefs construct has less explanatory power for individuals' differences in health services use compared to enabling resources and needs variables. For this study, health beliefs variables were not included in the analysis due to a lack of data about parents' oral health beliefs (values, attitudes, and knowledge) in Baby FACES 2009-2012 (Cannon et al., 2014).

Enabling Resources. Andersen (1995) indicated that the availability of personal and community health resources, such as the presence of health facilities within the individuals' geographic locations and the means to access and use the health services, are required to predict and explain individuals' use of health services. The enabling resources are defined as resources needed for dental service use (Andersen, 1995, 2008). For this study, the personal enabling

resources variables used from the dataset consisted of household income and the child's public health insurance coverage (Cannon et al., 2014). The household income is a categorical variable of the total annual household income in the past year with six categories ranging from $0- $5,000 to $25,000 or more. The child's public health insurance coverage is a nominal variable with yes and no values.

Regarding the community-enabling resources, the variables are nominal and measured by parents' responses to questions related to receiving public assistance, receiving WIC, the availability of a regular healthcare provider, and the family-level approach to the EHS program. The public assistance variable involved receiving Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), or Supplemental Security Income (SSI) in the past 12 months with yes and no values. A household member who received WIC in the past 12 months has values of yes, and no. The availability of a regular source of care was measured by parents' responses to whether the child has a regular healthcare provider or not. The program approach variable is nominal with four values: center-based, home visitor-based, family childcare (FCC), and a combination of center and home visitor-based service (Cannon et al., 2014).

Need. Assessment of health services use requires understanding individuals' needs for the services, including perceived and evaluated needs (Andersen, 1995). The perceived need variable is developed by the interacting with an individual's social structure and health beliefs, while the evaluated need is a biological variable determined by health professionals (Andersen, 1995). Although the evaluated need assists in measuring the type and quantity of services used, perceived need accounts for most of the explanation of individuals' need for using the services and the continuity of care (Andersen, 1995). For this study, the perceived need is defined as the

parent's report of "a household member who couldn't see a dentist." The need variable is nominal with yes and no values (Cannon et al., 2014).

Control Variables. Previous studies utilizing the Baby FACES 2009-2012 dataset controlled for factors such as type of EHS services, parent's education, family income and structure, and child's age and sex (Cherry et al., 2019; Kuhns et al., 2018; Kuhns, 2019). While this study aims to examine the family and child's sociodemographic characteristics as they relate to dental services use, all the theoretical model variables are included (mother and child's age and race, child's gender, mother's education, and employment, household income, child's public health insurance coverage, public assistance, and WIC received, need for dental care and dental visit).

Missing Data. Previous studies that have utilized the Baby FACES 2009-2012 dataset employed procedures such as multiple imputations (MI) and full-information maximum likelihood (FIML) for handling the missing data (Cherry et al., 2019; Jeon et al., 2018, 2020; Kuhns et al., 2018; Kuhns, 2019). The MI was used in two studies because it estimates the missing data values in multiple datasets based on the available values (Jeon et al., 2018; Kuhns et al., 2018; Patrician, 2002). Additionally, three studies chose to use FIML due to its ability to manage missing data within the statistical model and calculate the approximate model fit and other parameters based on the values of the available data (Cherry et al., 2019; Enders, 2001; Jeon et al., 2020; Kuhns, 2019). For the current study, a large number of missing data was detected because of the use of parent interviews and self-administered questionnaires. Some of the missing data was due to the nature of the data collection instruments, which included a skip logic of parents' responses to the variables of interest. The missing data was handled by replacing the variables that have more than 5% missing values with other variables that have no logic skip

values and can still answer the research question of this study. For example, the child's dental insurance coverage variable was replaced with the child's public health insurance as EHS-enrolled children are eligible for Medicaid, which includes dental benefits (Centers for Medicare & Medicaid Services, n.d.; HHS, 2023b). Hence, the missing values of each included variable didn't exceed 5% of the data.

Additionally, to reduce the missing data on the outcome variable, this study defined a cut-off point of the children's age for the study's sample. The analytic sample included EHS-enrolled children aged 12 to 18 months at the time of the survey in 2009 and children 10-11 months old with a reported dental visit in 2009.

Statistical Analysis

Statistical analysis was performed using Stata® 15.1 software. The child-level data were received from Baby FACES in three source files for each year from 2009-2012 and a constructed data file that includes all the three years' variables combined in addition to the weights. This study used most of its variables from the one-year-old cohort constructed data file in addition to three variables that were only available in the 2009 one-year-old source data file (a household member received WIC, the child has a regular healthcare provider, and a household member couldn't see a dentist). First, the two data files were cleaned and merged by child ID. Then, weighted descriptive statistics were performed to examine the percentages, confidence intervals, and distribution of the study's variables. Baby FACES 2009-2012 used the Taylor Series method to estimate the variance from the clusters' variation. To address the stratified clustered sample design of the dataset, this study used (Strata-R), (D1_ID) combined with a cross-sectional sampling weight, which all were provided by Baby FACES 2009-2012. Similar to Choi et al. (2019), this study used (W1P) weight, which is a child-level cross-sectional weight for children

whose parents consented to participate in the Baby FACES 2009-2012 study and completed the parent interview at age one (Cannon et al., 2014; Inter-university Consortium for Political and Social Research [ICPSR] User Support, Child and Family Data Archive at the University of Michigan, Personal communication, January 31st, 2023).

A Chi-square and t-test were performed to assess the effect of the family and child-level variables on the children's dental service use outcome. Similar to Gerstein et al. (2021), this study performed multiple logistic regression tests to identify the influence of the independent variables as predictors for dental services use. Logistic regression was used since the dependent variable of this study (dental services use) is nominal with two values (yes, no). Prior to running the analysis, the assumptions were tested, including linearity and independence of errors. Three model tests were created to examine differences between the variables of the Andersen model constructs in explaining dental services use among children. The first model included the parent's predisposing variables (mother's age, race, education, and employment) in addition to the child's predisposing variables (child's age, race, and gender); the second model, the enabling variables (household income, public assistance [TANF, SNAP, SSI], receiving WIC, the child had public health insurance and the child had regular healthcare provider); and the third model, the need variable (a household member could not see a dentist). The model's dependent variable was the child's visit to the dentist. Additionally, a full model was created that included all three constructs' variables of Andersen's model (predisposing characteristics, enabling resources, and need variable). A *p*-value of .05 was used to determine the statistical significance of the results.

Data Security Plan

This research utilized child-level public use data files of Baby FACES 2009-2012 that have restricted access (Cannon et al., 2014). The data files are deidentified as they do not include

participants' names, social security numbers, or geographic locations. In addition, limited analytic values and rare events were excluded from the data files. The Inter-university Consortium for Political and Social Research (ICPSR) and the Child and Family Data Archive at the University of Michigan required a data security plan (Inter-university Consortium for Political and Social Research, 2021). The ICPSR data access application portal provides options for data security plans. After consulting the Information Technology Services (ITS) at Old Dominion University, the plan includes using a private-networked computer for restricted-use data. Computers used for storing the data are encrypted and have a currently supported operating system, antivirus, and antimalware software. As suggested by the ITS, these data are stored on a university-managed computer that is hardened with a security system and managed by the university ITS. Strict role-based access controls exist with two-factor authentication, up-to-date antivirus, malware, etc. Any removable media, such as backups, are stored securely in an encrypted data center with controlled access. At the end of the contract period, the university ITS will use the *KillDisk* erasure program to erase computer data securely. The data and files will not be shared with any other institution or investigator not listed in the data use agreement.

CHAPTER IV

RESULTS

Descriptive Statistics

The descriptive statistics for children, mothers, and family characteristics are reported based on Andersen's model, including predisposing, enabling, and need factors related to dental service use. Weighted demographic descriptive statistics are presented in Tables 1 and 2.

The analytic sample (n=567) of the current study includes the 2009 one-year cohort aged 10-11 months with a reported dental visit or aged 12-18 months. Of the included mothers, 35.66% (95% CI=31.14, 40.45) were aged 19-24 years, and 36.30% (95% CI=31.04, 41.91) reported having less than a high school education. Mothers responding as non-Hispanic White comprised 44% of the sample (95% CI=36.90, 52.51), followed by 32.47% (95% CI=25.30, 40.58), Hispanic/Latinos. Among the mothers, 55.32% (95% CI=50.38, 60.16) reported employment during the past year. For the annual household income, 28.51% (95% CI= 24.75, 32.59) of the respondents reported an annual household income of $25,000 or more, 65.68% (95% CI=60.41, 70.58) reported that a parent received public assistance (TANF, SNAP, SSI), and 82.89% (95% CI=79.22, 86.03) reported that a household member received WIC. Less than a quarter (18.02%, 95% CI=14.38, 22.33) of the respondents reported that a household member couldn't see a dentist. Regarding the family-level approach to the EHS program, about half of the children, 49.99% (95% CI=41.52, 58.46), received services through home visiting, and 44.18% (95% CI=35.37, 53.37) were enrolled in a center-based approach.

At the time of the survey, the child's mean age was (m=13.81, SD= 1.41) months. More than half of the children (52.45%, 95% CI=47.77, 57.09) were males, and 36.82% (95% CI=29.50, 44.81) were Hispanic/Latino, followed by 35.80% (95% CI=29.05, 43.17) non-Hispanic, White. In terms of health insurance coverage, most of the children (82.46%, 95%

CI=78.41, 85.89) were covered by public health insurance, and 94.87% (95% CI=92.82, 96.36) had a regular healthcare provider. Slightly over a quarter of children, 26.73% (95% CI=21.09, 33.26), had a reported dental visit. Out of the total analytic sample (n=567), only 6% (95% CI=3.39, 9.73) had a reported dental visit by the age of 12 months.

Table 1. Weighted Percentages of Mother and Family Demographic Characteristics 2009 (n= 567)

Predisposing characteristics		**% [95% CI]**
Age in years		
	≤18	8.46 [5.79, 12.20]
	19-24	35.66 [31.14, 40.45]
	25-30	33.75 [29.38, 38.42]
	>30	21. 12 [17.33, 25.47]
	Missing	1.02 [0.42, 2.45]
Race		
	Non-Hispanic White	44.57 [36.90, 52.51]
	Non-Hispanic African American	16.42 [11.59, 22.74]
	Hispanic/Latino	32.47 [25.30, 40.58]
	Mixed/Other	5.69 [3.31, 9.62]
	Missing	0.85 [0.33, 2.16]
Education		
	Less than high school	36.30 [31.04, 41.91]
	High school or equivalent	32.69 [28.34, 37.36]
	Some college	22.93 [18.82, 27.62]
	Bachelor's degree or higher	4.22 [2.74, 6.44]
	Missing	3.87 [2.40, 6.17]
Employment		
	Yes	55.32 [50.38, 60.16]
	No	41.28 [36.52, 46.20]
	Missing	3.40 [1.98, 5.78]
Enabling Resources		
Annual household income		
	$0- $5,000	9.55 [7.09, 12.75]
	$5,001-$10,000	13.62 [10.61, 17.33]
	$10,001-$15,000	19.16 [16.13, 22.61]
	$15,001-$20,000	10.77 [8.51, 13.54]
	$20,001-$25,000	9.03 [6.62, 12.19]
	$25,000 or more	28.51 [24.75, 32.59]
	Missing	9.36 [6.47, 13.37]
A parent receiving public assistance (TANF, SNAP, SSI) [a]	Yes	65.68 [60.41, 70.58]
	No	28.51 [23.95, 33.56]
	Missing	5.81 [3.81, 8.78]
A household member received WIC [b]		
	Yes	82.89 [79.22, 86.03]
	No	11,99 [9.26, 15.39]
	Refused	0.21 [0.3, 1.56]
	Missing	4.91 [3.11, 7.67]
EHS program approach		
	Center-based	44.18 [35.37, 53.37]
	Home visitor based	49.99 [41.52, 58.46]
	FCC[c]	0.48 [0.14, 1.71]
	Combo[d]	4.66 [1.98, 10.57]
	Missing	0.69 [0.22, 2.13]

Table 1. (continued)

Need		
Any household member couldn't see dentist		
	Yes	18.02 [14.38, 22.33]
	No	79.24 [74.76, 83.10]
	Missing	2.75 [1.55, 4.83]

Notes: W1P weight was applied, n is not weighted.
[a] (TANF= Temporary Assistance for Needy Families, SNAP= Supplemental Nutrition Assistance Program, SSI= Supplemental Security Income) [b] WIC= Special Supplemental Food Program for Women, Infants, and Children. [c]FCC = Family childcare. [d] Combo = Combination of center and home visitor-based service.

Table 2. Weighted Percentages of Child Demographic Characteristics 2009 (n=567)

Predisposing characteristics		**% [95% CI]**
Age in months m (SD)	13.81 (1.41)	
Race		
	Non-Hispanic White	35.80 [29.05, 43.17]
	Non-Hispanic African American	16.37 [11.51, 22.76]
	Hispanic/Latino	36.82 [29.50, 44.81]
	Mixed/Other	11.00 [7.51, 15.85]
Gender		
	Female	47.55 [42.91, 52.23]
	Male	52.45 [47.77, 57.09]
Enabling Resources		
Covered by public health insurance		
	Yes	82.46 [78.41, 85.89]
	No	12.63 [9.95, 15.90]
	Missing	4.91 [3.11, 7.67]
Regular healthcare provider		
	Yes	94.87 [92.82, 96.36]
	No	2.03 [1.12, 3.66]
	Don't know	0.07 [0.01, 0.54]
	Missing	3.03 [1.78, 5.10]
Dental Service Use		
The child had a dental visit		
	Yes	26.73 [21.09, 33.26]
	No	68.35 [61.66, 74.37]
	Missing	4.91 [3.11, 7.67]

Notes: W1P weight was applied, n is not weighted.

Bivariate Analysis

Using bivariate analysis (Chi-square and t-test were used), while there were differences between children who had a reported dental visit and those who had not at the time of the survey, these differences were not statistically significant. However, the within-column percentages were used to determine the proportion of children who had reported dental visits by each covariate.

With regard to mother and family characteristics (Table 3), the proportion of children who had a reported dental visit was the highest among mothers aged 25-30 years (38.48%; 95% CI=29.05, 48.86), Hispanic/Latino (39.57%; 95% CI= 28.88, 51.37), with less than a high school education (37.56%; 95% CI= 29.72, 46.11), or employed (56.30%; 95% CI= 47.34, 64.87), families with $25,000 or more household income (33.66%; 95% CI= 25.61, 42.78), a parent who received public assistance (TANF, SNAP, SSI; 62.55%; 95% CI= 50.34, 73.35), or a household member who received WIC (90.64%; 95% CI= 82.93, 95.08). Additionally, children enrolled in a center-based family approach to the EHS program (47.75%; 95% CI= 36.28, 59.47) and those without any household member who couldn’t see a dentist (79.73%; 95% CI= 70.23, 86.77) had the highest proportions of reported dental visits.

Regarding children's characteristics (Table 4), the proportion of reported children who had dental visits was the highest among males (55.39%; 95% CI= 45.78, 64.62) of Hispanic/Latino origins (44.56%; 95% CI= 32.80, 56.97), covered by public health insurance (86.77%; 95% CI= 80.08, 91.45), and those who had regular healthcare providers (79.50%; 95% CI= 92.16, 99.24).

Table 3. Weighted Percentages of Mother and Family Characteristics by Child's Reported Dental Service Use (n= 567)

Predisposing Characteristics	**The child had a dental visit (No) % [95%CI]**	**The child had a dental visit (Yes) % [95%CI]**	**p-value**
Age in years			0.7426
≤18	8.75 [5.27, 14.19]	7.22 [3.91, 12.96]	
19-24	36.63 [30.90, 42.77]	32.09 [24.70, 40.49]	
25-30	33.74 [27.87, 40.16]	38.48 [29.05, 48.86]	
>30	20.87 [15.57, 27.40]	22.21 [16.22, 29.64]	
Race			0.3265
Non-Hispanic White	47.32 [37.99, 56.84]	38.61 [28.99, 49.23]	
Non-Hispanic African American	16.56 [11.20, 23.81]	15.76 [9.32, 25.39]	
Hispanic/Latino	30.32 [22.39, 39.63]	39.57 [28.88, 51.37]	
Mixed/Other	5.80 [3.37, 9.80]	6.06 [2.56, 13.67]	
Education			0.9719
Less than high school	37.76 [31.99, 43.90]	37.56 [29.72, 46.11]	
High school or equivalent	34.11 [28.61, 40.08]	32.36 [25.70, 39.81]	
Some college	23.72 [18.86, 29.37]	25.28 [17.06, 35.76]	
Bachelor's degree or higher	4.41 [2.57, 7.46]	4.80 [2.08, 10.72]	
Employment			0.8937
Yes	56.99 [50.97, 62.81]	56.30 [47.34, 64.87]	
No	43.01 [37.19, 49.03]	43.70 [35.13, 52.66]	
Enabling Resources			
Annual household income			0.7708
$0- $5,000	11.00 [7.79, 15.30]	9.35 [5.40, 15.72]	
$5,001-$10,000	15.92 [12.26, 20.42]	12.72 [7.58, 20.56]	
$10,001-$15,000	21.39 [16.98, 26.58]	20.49 [15.44, 26.68]	
$15,001-$20,000	12.12 [9.20, 15.81]	11.27 [6.97, 17.74]	
$20,001-$25,000	8.97 [6.11, 13.00]	12.51 [8.06, 18.93]	
$25,000 or more	30.60 [25.43, 36.31]	33.66 [25.61, 42.78]	
A Parent receiving public assistance (TANF, SNAP, SSI) [a]			0.1209
Yes	72.51 [66.52, 77.79]	62.55 [50.34, 73.35]	
No	27.49 [22.21, 33.48]	37.45 [26.65, 49.66]	
A household member received WIC [b]			0.2467
Yes	86.09 [81.83, 89.49]	90.64 [82.93, 95.08]	
No	13.91 [10.51, 18.17]	9.36 [4.92, 17.07]	
EHS program approach			
Center-based	42.74 [32.63, 53.49]	47.75 [36.28, 59.47]	0.5665
Home visitor based	51.98 [42.33, 61.48]	46.41 [34.15, 59.13]	
FCC[c]	0.71 [0.14, 1.80]	0.00	
Combo[d]	4.57 [1.84, 10.91]	5.84 [2.15, 14.90]	

Table 3. (continued)

Need			
Any household member couldn't see dentist			0.6040
Yes	17.81 [13.68, 22.85]	20.27 [13.23, 29.77]	
No	82.19 [77.15, 86.32]	79.73 [70.23, 86.77]	

Notes: W1P weight was applied, n is not weighted, and the total may not add to the full sample size (n=567) due to missing values. Missing values are not included in the crosstabs analysis.
[a] (TANF= Temporary Assistance for Needy Families, SNAP= Supplemental Nutrition Assistance Program, SSI= Supplemental Security Income) [b] WIC= Special Supplemental Food Program for Women, Infants, and Children.
[c]FCC = Family childcare. [d] Combo = Combination of center and home visitor-based service.

Table 4. Weighted Percentages of Child Characteristics by Child's Dental Service Use (n=567)

Predisposing characteristics	**The child had a dental visit (No) % [95%CI]**	**The child had a dental visit (Yes) % [95%CI]**	**p-value**
Age (m, [95%CI])	13.79 [13.61, 13.97]	13.73 [13.30, 14.16]	
Race			0.3164
Non-Hispanic White	38.07 [29.97, 46.90]	29.39 [20.69, 39.91]	
Non-Hispanic African American	16.03 [10.64, 23.42]	16.85 [9.97, 27.06]	
Hispanic/Latino	34.03 [26.16, 42.89]	44.56 [32.80, 56.97]	
Mixed/Other	11.87 [7.77, 17.74]	9.20 [4.30, 18.60]	
Gender			0.4904
Female	48.07 [43.27, 52.90]	44.61 [35.38, 54.22]	
Male	51.93 [47.10, 56.73]	55.39 [45.78, 64.62]	
Enabling Resources			
Covered by public health insurance			0.9857
Yes	86.70 [82.11, 90.25]	86.77 [80.08, 91.45]	
No	13.30 [9.75, 17,89]	13.23 [8.55, 19.92]	
Regular healthcare provider			0.6685
Yes	98.10 [96.46, 98.99]	97.50 [92.16, 99.24]	
No	1.90 [1.01, 3.54]	2.50 [0.76, 7.84]	

Notes: W1P weight was applied, n is not weighted, and the total may not add to the full sample size (n=567) due to missing values. Missing values are not included in the analysis.

Logistic Regression

Multiple logistic regression models did not reveal any significant predictors of dental visits. However, a marginal statistical significance was observed for a parent receiving public assistance (TANF, SNAP, SSI) and the report of a dental visit among children in both the enabling model and the full model. (Tables 5 and 6).

When examining enabling resources only as a predictor of a child-reported dental visit, a marginal statistical significance was observed for the covariate of public assistance (TANF, SNAP, SSI). Specifically, parents that received public assistance (TANF, SNAP, SSI) had a lower tendency to report that their child had a dental visit than those who didn't receive public assistance (OR= 0.61, 95% CI= 0.33, 1.10, p=0.099). This tendency and marginal statistical significance remained the same in the final regression model (OR= 0.56, 95% CI= 0.31, 1.02, p=0.058).

Table 5. Adjusted Odds Ratios of the Three Logistic Regression Models for Mother and Child-Level Characteristics Using Anderson's Model (n=567)

Predisposing Characteristics Model		
Predisposing Characteristics	**OR [95% CI]**	**p-value**
Mother's age in years		
≤18	REF	
19-24	1.02 [0.35, 2.93]	0.974
25-30	1.30 [0.49, 3.49]	0.593
>30	1.16 [0.83, 3.53]	0.793
Mother's Race		
Non-Hispanic White	REF	
Non-Hispanic African American	0.92 [0.20, 4.32]	0.918
Hispanic/Latino	1.28 [0.47, 3.48]	0.621
Mixed/Other	1.45 [0.49, 4.25]	0.497
Mother's Education		
Less than high school	REF	
High school or equivalent	1.08 [0.69, 1.70]	0.727
Some college	1.20 [0.61, 2.38]	0.59
Bachelor's degree or higher	1.17 0.38, 3.66]	0.78
Mother's employment		
No	REF	
Yes	1.06 [0.69, 1.61]	0.792
Child's age in months	0.98 [0.79, 1.23]	0.893
Child's race		
Non-Hispanic White	REF	
Non-Hispanic African American	1.43 [0.30, 6.74]	0.645
Hispanic/Latino	1.45 [0.55, 3.82]	0.451
Mixed/Other	0.94 [0.30, 2.98]	0.92
Child's gender		
Female	REF	
Male	1.20 [0.80, 1.80]	0.377
Enabling Resources Model		
Enabling Resources	**OR [95% CI]**	**p-value**
Annual household income		
$0- $5,000	REF	
$5,001-$10,000	0.84 [0.32, 2.18]	0.71
$10,001-$15,000	1.01 [0.42, 2.41]	0.988
$15,001-$20,000	0.93 [0.39, 2.20]	0.867
$20,001-$25,000	1.30 [0.52, 3.30]	0.57
$25,000 or more	1.04 [0.46, 2.38]	0.918

Table 5. (continued)

A parent receiving public assistance (TANF, SNAP, SSI) [a]		
No	REF	
Yes	0.61 [0.33, 1.10]	0.099
A household member received WIC [b]		
No	REF	
Yes	1.80 [0.87, 3.69]	0.109
Child covered by public health insurance		
No	REF	
Yes	1.06 [0.57, 2.00]	0.848
Child has regular healthcare provider		
No	REF	
Yes	0.80 [0.23, 2.73]	0.714
EHS program approach		
Home visitor based	REF	
Center-based	1.38 [0.77, 2.48]	0.281
Combo[c]	1.54 [0.69, 3.44]	0.285
Need Model		
Need	**OR [95% CI]**	**p-value**
Any household member couldn't see dentist		
No	REF	
Yes	1.17 [0.64, 2.16]	0.604

Notes: W1P weight was applied, n is not weighted, and the total may not add to the full sample size (n=567) due to missing values. Missing values are not included in the regression analysis.
[a] (TANF= Temporary Assistance for Needy Families, SNAP= Supplemental Nutrition Assistance Program, SSI= Supplemental Security Income) [b] WIC= Special Supplemental Food Program for Women, Infants, and Children. [c] Combo = Combination of center and home visitor-based service. The family childcare program approach variable automatically dropped due to a very small number of observations.

Table 6. Adjusted Odds Ratios of the Full Logistic Regression Model for Mother and Child-Level Characteristics Using Anderson's Model (n=567)

Predisposing Characteristics	**OR [95% CI]**	**p-value**
Mother's age in years		
≤18	REF	
19-24	1.45 [0.36, 5.86]	0.598
25-30	1.79 [0.50, 6.48]	0.368
>30	1.40 [0.34, 5.71]	0.637
Mother's Race		
Non-Hispanic White	REF	
Non-Hispanic African American	0.56 [0.10, 3.06]	0.500
Hispanic/Latino	1.18 [0.42, 3.31]	0.752
Mixed/Other	1.11 [0.34, 3.66]	0.859
Mother's Education		
Less than high school	REF	
High school or equivalent	1.11 [0.67, 1.86]	0.682
Some college	1.18 [0.59, 2.34]	0.642
Bachelor's degree or higher	1.03 [0.35, 3.04]	0.957
Mother's employment		
No	REF	
Yes	0.86 [0.50, 1.47]	0.579
Child's age in months	0.99 [0.80, 1.23]	0.928
Child's Race		
Non-Hispanic White	REF	
Non-Hispanic African American	2.02 [0.38, 10.88]	0.406
Hispanic/Latino	1.61 [0.57, 4.57]	0.369
Mixed/Other	1.09 [0.34, 3.47]	0.889
Child's gender		
Female	REF	
Male	1.25 [0.83, 1.88]	0.277
Enabling Resources	**OR [95% CI]**	**p-value**
Annual household income		
$0- $5,000	REF	
$5,001-$10,000	0.87 [0.32, 2.39]	0.782
$10,001-$15,000	1.03 [0.41, 2.57]	0.945
$15,001-$20,000	0.82 [0.36, 1.88]	0.639
$20,001-$25,000	1.34 [0.52, 3.46	0.536
$25,000 or more	1.13 [0.47, 2.72]	0.779

Table 6. (continued)

A parent receiving public assistance (TANF, SNAP, SSI) [a]		
No	REF	
Yes	0.56 [0.31, 1.02]	0.058
A household member received WIC [b]		
No	REF	
Yes	1.58 [0.76, 3.30]	0.220
Child covered by public health insurance		
No	REF	
Yes	1.12 [0.55, 2.27]	0.748
Child has regular healthcare provider		
No	REF	
Yes	0.89 [0.24, 3.34]	0.860
EHS program approach		
Home visitor based	REF	
Center-based	1.56 [0.82, 2.96]	0.171
Combo[c]	1.30 [0.58, 2.90]	0.525
Need	**OR [95% CI]**	**p-value**
Any household member couldn't see dentist		
No	REF	
Yes	0.99 [0.50, 1.96]	0.966

Notes: W1P weight was applied, n is not weighted, and the total may not add to the full sample size (n=567) due to missing values. Missing values are not included in the regression analysis.
[a] (TANF= Temporary Assistance for Needy Families, SNAP= Supplemental Nutrition Assistance Program, SSI= Supplemental Security Income) [b] WIC= Special Supplemental Food Program for Women, Infants, and Children. [c] Combo = Combination of center and home visitor-based service. The family childcare program approach variable automatically dropped due to a very small number of observations.

CHAPTER V

DISCUSSION

Overview of Findings

This study utilized nationally representative data from the Baby FACES 2009 age one-year cohort to examine predictors of dental service use based on Andersen's behavioral model. Overall, the study found that in 2009, slightly over a quarter of children enrolled in the EHS program aged 10-18 months were reported as having a dental visit. The professional recommendation for a child's first dental visit is by age one or within six months of the first tooth's eruption (AAPD, 2010, 2018b; Baker et al., 2019). However, in the U.S., young children consistently have a lower percentage of dental visits than older children (Lebrun-Harris et al., 2019). Establishing a dental home by age one ensures that children receive regular dental care and preventive services (AAPD, 2010, 2018b; Baker et al., 2019). Early dental visits of children help to address potential oral health problems and prevent the onset and progression of ECC (Beil et al., 2014; Momen, 2016).

Two studies utilized Andersen's model to examine dental service use among U.S. children 2-17 years old. Naavaal et al. (2017) used 2008 National Health Interview Survey data, and Finlayson et al. (2018) used data from the National Survey of Child and Adolescent Well-Being 2008-2009. Both studies found that children 2-5 years old had the lowest percentages of reported dental service use compared to children of older age groups (Naavaal et al., 2017; Finlayson et al., 2018). However, none of the studies have utilized Andersen's model to specifically assess predictors of children's dental visits by age one (Naavaal et al., 2017; Finlayson et al., 2018). Data from Medical Expenditure Panel Survey 2010–2012 reported that of the U.S. children aged 0-2 years, only 11.7% had dental visits (Berdahl et al., 2016). Similarly,

the current study found an overall lower percentage of EHS-enrolled children (10-18 months old) with a reported dental visit (26.73%, n=567).

Early head start programs increase the opportunity for dental care due to the oral health standards set by the Office of Head Start (OHS) in partnership with professional organizations (HHS, 2023b). The standards were established to direct and promote oral health education and promotion activities for children, parents/caregivers, and staff members and to ensure children's access to oral health services (HHS, 2023b). The standards involve monitoring children's oral health, assessing their oral health needs, and providing essential oral health training and resources to the EHS staff members (HHS, 2023b). Enrolling in EHS programs has improved children's oral health (Burgette et al., 2017b; Burgette et al., 2018). Only two studies investigated the dental service use of EHS-enrolled children in North Carolina (Burgette et al., 2017b; Burgette et al., 2018). In a longitudinal study from 2012 to 2014, the proportion of parent-reported dental visits of children aged 0-24 months was higher among EHS-enrolled children (81%, n=479) than those not enrolled in EHS (59%, n=699; Burgette et al., 2017b). However, the number of dental visits among EHS-enrolled children was insufficient based on professional recommendations for the periodicity of preventive dental visits for high caries-risk children (Burgette et al., 2017b; Goldberg et al., 2011).

The EHS program serves children of low-income families who were found in the current study to have a low percentage of dental service use. That finding is consistent with Edelstein and Chinn's (2009) report using Medical Expenditure Panel Survey data in 2004, which stated that low-income families had lower percentages of dental service use than those of higher-income families (Burgette et al., 2017b; Edelstein & Chinn, 2009).

Race and ethnic disparities in dental service use among children remain a public health problem (Edelstein & Chinn, 2009). Edelstein & Chinn's (2009) report found that dental service utilization was lower for black and Hispanic children than for white children. However, in the current study, Hispanic/Latino children reported more dental visits than non-Hispanic white children (44.56% vs. 29.39%, n=567). Wei et al. (2018) found that among children of low-income families, no disparity was detected between Hispanic and non-Hispanic white in preventive dental service use in 2013-2014. The current study showed higher percentages of reported dental visits among non-Hispanic White and Hispanic/Latino children than other race and ethnicity groups.

In the current study, reported dental visits were higher among parents with less than a high school education than among parents with higher educational attainment. Edelstein and Chinn's 2009 report found that children of parents with less than a high school education had lower percentages of dental service use than those with higher educational attainment (Edelstein & Chinn, 2009). Plausible explanations for the inconsistencies with the current study may be related to the higher percentage of mothers who reported having less than a high school education than those with reported higher educational attainment. Additionally, the EHS program offer oral health education and promotion to children, parents, and staff members, which may increase awareness on the importance of dental visits. Lastly, the EHS program provides dental referrals for the children, which is another mechanism for oral health promotion.

While the regression models did not yield significant results, there were marginally significant findings for children whose parents received public assistance (such as TANF, SNAP, and SSI) and their reported dental visits. The enabling and full models both showed similar results. Thomas et al. (2019) examined data from the National Health Interview Study 2013-

2016 for children aged 2 to 17 years. The study indicated that families who experienced food insecurity were 105.5% (n= 29,341) more likely to report that their children needed dental care but couldn't afford it than food-secure families (Thomas et al., 2019). Additionally, Morrissey & Mille (2020) examined data from the National Health Interview Survey of children under 18 years and found that 10% of low-income children (n=38,500) needed dental care but couldn't afford it in 2008-2010. Regarding receiving public assistance, among low-income families, SNAP-eligible were 2.06 percentage points more likely to report that their children needed dental care but could not afford it compared to SNAP-ineligible families (Morrissey & Mille, 2020). The authors indicated that receiving SNAP has assisted families with identifying their children's dental needs but was not associated with meeting their needs by obtaining the required preventive dental care.

Consistent with Thomas et al., 2019 and Morrissey & Mille 2020, this current study found that parents that received public assistance (TANF, SNAP, SSI) had a lower tendency to report that their children had dental visits than those who didn't receive public assistance, which was marginally significant in the enabling model and the full regression model. Families who struggle to obtain basic needs like food, housing, or transportation may prioritize those needs over their child's preventative dental care.

Research Limitations

One limitation of the current study is the use of an older dataset. The use of Baby FACES 2009-2012 data is due to the availability of the variables of interest related to dental services use that was not found in the more recent dataset, Baby FACEC 2018 (Cannon et al., 2014, 2020). Although the dataset is not current, several recent studies have used Baby FACES 2009-2012 for secondary data analysis (Cherry et al., 2019; Cherry & Gerstein, 2022; Choi et al., 2019; Cook et

al., 2023; Diemer et al., 2023; Jeon et al., 2018, 2020; Kathan, 2023; Kuhns et al., 2018; Kuhns, 2019; Lombardi et al., 2023; Shenberger & Zinsser, 2022). Therefore, a thorough literature search was conducted to support the consistency of the research conclusions with the current program's characteristics and services (Kranz et al., 2011, 2012; HHS, 2023b). In addition, studies that described current oral health activities implemented in EHS for staff, children, and caregivers were systematically reviewed (Joufi et al., 2021). Furthermore, studies on the influence of enrollment in EHS programs on children's oral health outcomes and quality of life were documented (Burgette et al., 2017b, 2018).

The second limitation is using a retrospective, cross-sectional study design examining one year of the data. The cross-sectional design was used to investigate the children's use of dental services by age one, which is the analytic sample of this study whose data is available in the one-year-old cohort 2009 data file. Another reason for using the 2009 cross-sectional data is that the sample size of Baby FACES 2009-2012 decreased throughout the study period from 782 in 2009 to 469 in 2011 due to changes in children's eligibility for the program and their parental consent status, which impact the generalization of the study findings (Cannon et al., 2014). Although this current study used the 2009 cross-section data, the unweighted analytic sample size (n=567) and the percentage of reported dental visits, which was slightly over a quarter, are small. A larger sample may have increased the power and probability of obtaining significant results.

The third limitation is the number of variables in the dataset that can be utilized to examine their influence on dental service use. The dataset does not include some of Andersen's Behavioral Model of Health Services Use constructs variables, such as health beliefs and evaluated health status. In addition, the dataset includes a large proportion of missing values of

variables related to the children's use of dental services specifically, the child's dental insurance coverage and the child's need for dental care that were replaced with other variables of less than 5% missing values. Also, for measuring the outcome variable, the child's dental service use measured by the child's visit to the dentist, the dataset does not include the type of dental visit (treatment vs. preventive). Furthermore, the absence of clinical data on child's dental visits is a limitation of this study.

The fourth limitation is that the use of parents' interviews and self-administered questionnaires in Baby FACES 2009-2012 for the data collection, which may result in item non-response or social desirability bias of parents' self-reporting and recalling the information. In addition, the large number of questions included in the interview and the questionnaire may result in parents' response burden, which affects the internal validity. Furthermore, using computer-assisted telephone interviews for parents and completing the self-administered questionnaire at home during the child's assessment visit could result in environmental bias, affecting the external validity.

CHAPTER VI

CONCLUSION

The results of the predisposing, enabling, and need factors of this study were insignificant in predicting the use of dental services by EHS-enrolled children. However, the results of this study revealed that dental service use among EHS-enrolled children aged 10-18 months is low. Of EHS-enrolled children, about a quarter had dental visits, and only 6% followed the professionally recommended age-one dental visit, as reported by parents in 2009. The results of this study suggest that the EHS programs may need to leverage resources and stakeholders to promote age-one dental visit recommendations. Data on EHS-enrolled children's use of dental services beyond a dental visit is minimal. Further research utilizing more recent datasets that include variables related to children's dental service use and larger sample size is needed to better describe the sociodemographic predictors of dental service use among EHS-enrolled children who are at high risk for ECC.

Primary Contributions of this Study

To the researcher's knowledge, this is the first study that utilized a nationally representative dataset to examine predictors of dental service use by EHS-enrolled children. The findings of this study will contribute to the emerging literature that examines sociodemographic factors that predict and influence dental service utilization among children enrolled in EHS programs. Lastly, findings from this study will promote the need for current data on dental visits and services utilization among EHS-enrolled children.

Policy Implications

The current study promotes the American Academy of Pediatric Dentistry's policy on ECC and policy on the dental home (AAPD, 2021; AAPD, 2018b). The policies state that

children are recommended to have their initial dental visit and establish a dental home after the eruption of the first tooth or by the age of 12 months. Federal programs, such as the EHS, are ideal stakeholders for encouraging age-one dental visit since the program serves children aged 0-3 years and their families. Interprofessional collaboration of health care and dental providers along with EHS programs is essential for the promotion of age-one dental visit recommendations among children.

Suggestions for Future Research

Further research is needed to examine factors affecting dental service use among EHS-enrolled children using a more recent dataset and a multilevel approach that include program, family, and child-level characteristics. Future research also can focus on analyzing clinical oral health outcomes, including dental problems, treatment received, and the number and type of dental visits of the children. Additionally, future research could identify barriers to obtaining dental care among EHS-enrolled children. Future studies should consider using a larger sample size to enhance the statistical power and improve the generalizability of the study's results. Although sample size attrition is a limitation of longitudinal data, a longitudinal approach may provide a thorough understanding of factors affecting the children’s use of dental services over time at ages one, two, and three. Additionally, the longitudinal approach will identify the trend of dental service use among children enrolled in the EHS program.

Studies that have utilized Andersen's model to examine sociodemographic factors influencing children's use of dental services have identified several significant predictors, including the education level of the parent, the income level of the family, the child's health insurance coverage, the need for dental care, and the availability of healthcare sources (Naavaal

et al., 2017; Wei et al., 2018; Finlayson et al., 2018). These predictors should be considered as potential significant predictors in future studies.

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APPENDIX

Old Dominion University Institutional Review Board (IRB) Approval

OLD DOMINION UNIVERSITY

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

Physical Address
4111 Monarch Way, Suite 203
Norfolk, Virginia 23508
Mailing Address
Office of Research
1 Old Dominion University
Norfolk, Virginia 23529
Phone(757) 683-3460
Fax(757) 683-5902

DATE:	April 1, 2021
TO:	Denise Claiborne, PhD
FROM:	Old Dominion University Institutional Review Board
PROJECT TITLE:	[1713536-2] Dental Care Utilization Among U.S. Children Participating in Early Head Start Programs
REFERENCE #:	21-019
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	April 1, 2021
NEXT REPORT DUE:	March 31, 2022
REVIEW TYPE:	Expedited Review
REVIEW CATEGORY:	Expedited review category # *5*

Thank you for your submission of New Project materials for this project. The Old Dominion University Institutional Review Board has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulations.

This project has been determined to be a MINIMAL RISK project. Based on the risks, this project does not require continuing review. You will receive an annual check in reminder. Please complete the annual check in form and submit it for administrative approval by your next report due date of March 31, 2022.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Danielle Faulkner at (757) 683-4636 or dcfaulkn@odu.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been issued in accordance with all applicable regulations, and a copy is retained within Old Dominion University Institutional Review Board's records.

VITA

Ahlam Ibraheem Joufi
Email: ajouf001@odu.edu
Phone number: (757) 752-6355

EDUCATION

- August 2023, PhD. in Health Services Research, College of Health Sciences, Old Dominion University, Norfolk, VA.
- May 2017, MS in Dental Hygiene Education with a minor in Clinical Education, School of Dentistry, University of North Carolina at Chapel Hill, NC.
- Jan 2010, BSDH in Dental Hygiene, College of Applied Medical Sciences, King Saud University, Riyadh, Saudi Arabia.

PROFESSIONAL POSITIONS

- 2017–2020, Graduate research assistant. Old Dominion University, Norfolk, Virginia.
- 2017–2018, Graduate teaching assistant. Old Dominion University, Norfolk, Virginia.
- 2015–2017, Graduate teaching assistant. University of North Carolina at Chapel Hill, North Carolina.
- 2011–2014, Instructor. College of Applied Medical Sciences, King Saud University. Saudi Arabia.

PUBLICATIONS

- Wilder, R., Kanzigg, L., Carter, B., Cunningham, K., Joufi, A., Dsouza, R. (2016). Peer Education: Reviews of the Literature (PERLs). Critical Thinking. *Journal of Dental Education, 81*(1):116–118.
- Joufi AI, Wilder RS, Curran AE, Brame JL. (2018) Saudi dental hygienists' opinions regarding establishing a professional association. *Int J Dent Hyg, 16*(3):322–328.
- Claiborne, D. M., Poston, R., & Joufi, A. (2020). Innovative, collaborative service-learning experience among dental hygiene and nurse practitioner students: A pediatric oral health pilot study. *Journal of Dental Hygiene, 94*(3).
- Joufi, A. I., Claiborne, D. M., & Shuman, D. (2021). Oral health education and promotion activities by Early Head Start programs in the United States: A systematic review. *Journal of Dental Hygiene, 95*(5).

HONORS AND AWARDS

- 2022 Dr. Deanne Shuman Endowed Scholarship in Health Services. Old Dominion University. Norfolk, VA.
- 2021, Graduate Summer Award. Old Dominion University's Graduate School and Office of Research. Norfolk, VA.
- 2019–2020, Dissertation fellowship, Old Dominion University. Norfolk, VA.
- 2016–2017, Ann and G. Randolph Babcock Fellowship, University Of North Carolina at Chapel Hill, NC.
- 2016, New Scholar Award, King Saud University, Riyadh, Saudi Arabia.