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Assessing the Impact of South Carolina's Medicaid Adult Dental Policy on Dental Emergency Department Visits

Victor Kirksey

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Assessing the Impact of South Carolina's Medicaid Adult Dental Policy on Dental
Emergency Department Visits

by

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DEDICATION

Zahara, although you were not yet conceived when I began this journey, this work was highly motivated by you. Olivia we did it. May we continue to pour into the next generation over our personal and professional lives.

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I want to begin by expressing great appreciation for the mentors that have inspired me thus far on this journey. I'd like to thank Dr. Theodore Brown for propelling me to pursue higher (graduate) education during those evening basketball games in your office. To Dr. Christopher Howard, thank you for your passion and concern as my instructor many years ago. In hindsight you were a young accomplished scholar when I began my journey, and your expertise in the field motivated me to pursue my MPH at Morehouse School of Medicine. To my Morehouse School of Medicine family, thank you for instilling confidence in me and providing me with a powerful world view. To Dr. M-R thank you for your leadership and sound advice you've given many times. To Dr. Waldrop, thank you for preparing me to do health policy analysis on the doctoral level. Your health policy course and overall knowledge in the field has been very important to me. To Dr. Booker, I appreciate you specifically for demanding the best from me at all times. To Dr. Warren, thank you for walking by my side during my masters and doctoral process. I can't remember a time you didn't provide a vision for the future. You had and continue to have more belief in me than I do for myself at times. That's love and I appreciate it. Since you've become my mentor, my accomplishments have grown, but most importantly you've assisted in my growth as a man and father. You've taught me the importance of being unapologetically Black. I will continue to work towards improving the health of the less fortunate. To Dr. Probst, thank you for taking a chance on me! There are not many Black men in my position and I could not have done it without you. With your instruction

I feel better equipped to succeed professionally. I will never forget the impact you've had on my life. You were the one professor I trusted while at USC and I'm grateful for your dedication you've shown towards me.

ABSTRACT

Since the implementation of the South Carolina Medicaid adult dental benefit, there has been limited public knowledge on how effective the policy has been in increasing access to dental services for Medicaid adults. The South Carolina Medicaid eligibility dataset, all payer emergency department dataset and, Medicaid dental claims dataset were examined from the period of December 2011- December 2017. Approximately 16% of enrollees had a dental visit since policy initiation. In the adjusted analysis, ED visits made by Medicaid enrollees during the second and first period before policy initiation were more likely to have a non-traumatic dental diagnosis, with respective adjusted odds ratios (AOR's) of 1.070 (95% confidence interval [CI] = 1.022, 1.119) and 1.067 (CI=1.022,1.114) compared to enrollees during the third period before policy initiation. Conversely, non-traumatic dental ED visits were less likely to be made during the first, second, and third period after policy initiation by Medicaid enrollees with respective AOR's of 0.891 (CI=0.853,0.923), 0.770 (CI=0.736,0.807), and 0.343 (CI= 0.324,0.363) compared to non-traumatic dental ED visits made by enrollees during the third period before policy initiation. The findings of this research support that the adult dental benefit decreased dental ED visits among Medicaid adult enrollees in South Carolina with a greater effect in counties with a FQHC.

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LIST OF ABBREVIATIONS

CDT.....	Current Dental Terminology
CMS	Centers for Medicare and Medicaid
ED	Emergency Department
FPL.....	Federal Poverty Level
FQHC.....	Federally Qualified Health Center
HRSA.....	Health Services and Resource Administration
ICD.....	International Classification of Diseases
KFF	Kaiser Family Foundation
MACPAC.....	Medicaid and Chip Payment and Access Commission
NHANES	National Health and Nutrition Examination Survey
PPACA.....	Patient Protection and Affordable Care Act
SCDHHS.....	South Carolina Department of Health and Human Services
SES.....	Socioeconomic Status
UIC.....	Urban Influence Code
USDHHS.....	United States Department of Health and Human Services

CHAPTER 1

INTRODUCTION

This chapter provides an overview of adverse oral health conditions suffered by vulnerable and disadvantaged populations and discusses how these conditions have been associated with an increase in pain related, non-traumatic dental Emergency Department (ED) visits among this population. This chapter then discusses how South Carolina's Medicaid oral health policy can potentially impact access to preventive dental care decreasing dental- ED visit use. Included in this chapter is the problem statement, purpose of study, hypothesis, public health significance, and research questions to be answered.

1.1 Introduction: Importance of Oral Health

Oral and General Health. Access to preventive dental care services is a critical component to oral and general health. The first surgeon general report on oral health, "Oral Health in America" summarizes that an individual cannot be healthy without oral health; therefore, oral health and general health should not be interpreted as separate entities (United States Department of Health and Human Services [USDHHS], 2000). Studies have linked adverse oral health practices and conditions to cardiovascular disease, diabetes, and chronic kidney disease (Vargas & Arevalo, 2009; Vujicic & Nasseh, 2014). Furthermore, an individual's or groups' quality of life, social morbidity or mortality has shown to be affected by their oral health circumstance (Allukian, 2008).

Adverse oral health conditions often occur within vulnerable and socially disadvantaged groups, who suffer from the poorest health outcomes over their life course or during a specific period in life.

Oral Health Disparities within Adult Medicaid Eligibility Groups. Vulnerable and socially disadvantaged groups who struggle with poor oral health outcomes include those of low socioeconomic status, some racial/ethnic minorities, disabled persons, pregnant women, and older persons (Allukian, 2008; Drury et al., 1999; Hartnett et al. 2016; Institute of Medicine 2011). Medicaid, the third largest source of insurance in the U.S, is the main public health insurance program for low income, pregnant, and disabled persons (Choi, 2011; Decker & Lipton, 2015). Furthermore, people of color are more likely than their counterparts to have incomes less than 138% of the federal poverty level (FPL) and qualify for Medicaid (Kaiser Family Foundation [KFF], 2013). However, while every state's Medicaid program provides comprehensive dental care to children; adult benefits vary by state (Choi, 2011).

Low income and racial and ethnic minority oral health disparities. The 2011-2012 National Health and Nutrition Examination Survey (NHANES) documents that among adults aged 20-64 in the U.S, 91% had dental caries and 27% had untreated tooth decay (Dye et al, 2015). Hispanic (36%) and non-Hispanic Black (42%) groups had a higher occurrence of untreated tooth decay than their White (22%) and Asian counterparts (17%) (Dye et al, 2015). Moreover, adults with incomes below 200% of the FPL are less likely to have a dental visit in a given year compared to adults within 200-400% of the FPL (Hinton & Paradise, 2016).

Disabled and older persons oral health disparities. Disabled and older adults suffer from the lack of access to dental care regardless of cost (Institute of Medicine, 2011). Moreover, adults with congenital and developmental disabilities have higher unmet dental needs than the general population (Williams et al., 2015).

Pregnant women oral health disparities. Unlike the aforementioned social and economic vulnerabilities to adverse oral health conditions, pregnancy is a physiologic vulnerability affecting oral health. Pregnant women undergo many changes within their oral cavity during this period which can be linked to periodontal disease, including gingivitis and periodontitis (Hartnett et. al, 2016). Approximately 60%-70% of pregnant women have gingivitis (Naseem et al., 2016). In relation, the oral health of a pregnant woman affects the health status of the unborn child (Hartnett et. Al, 2016).

1.2 Consequences of Lack of Access to Oral Health Care

Lack of Access to Dental Services and Emergency Department Use. The trend of ED use for dental decay is the concern. Causes of concern include non-traumatic ED dental condition visits being identified as a current trend for disadvantaged groups (McCormick, 2013; Okunseri et al., 2012). Dental services within the ER are incomplete and may not treat the underlying problem, as services are often non-restorative, and require patients to follow up with a dentist immediately after the ER visit (Davis et al., 2010).

Nationally, dental ED visits have increased more rapidly than overall ED visits, co-occurring with the decrease in ED's worldwide from 1997-2007 (Wall & Nasseh, 2013). Similarly, over a 3-year study period from 2008-2010 there were more than 1.3 million ED

visits and charges of 1 billion dollars annually due to non-traumatic dental conditions in the U.S (Okunseri, 2015).

1.3 Barriers to Dental Service Access Among Medicaid Recipients

Nationwide Differences in Dental Benefits among Medicaid Recipients. As of 2015, 19 states provide emergency –only adult dental benefits for non-pregnant, non-disabled adults; 27 states cover preventive services; 26 states cover restorative services; 19 states cover periodontal services; and 9 states have an annual dollar limit on covered dental services (Medicaid and Chip Payment and Access Commission [MACPAC], 2015). The inconsistencies in dental coverage through public insurance between states may be the reason that those privately insured are more likely to have had a dental visit compared to those publicly insured (Hinton & Paradise, 2016).

Dental Payment Rates and Provider Participation. Fewer than half of dentists participate in public insurance programs that assist disadvantaged groups, rendering dental health services inaccessible (Davis et al., 2010). Low Medicaid payment rates for dentists has been a factor in limited participation among dentists (Paradise, 2015). Geographic location as an access barrier is evident in rural and underserved communities as these populations are less likely to utilize dental care services, have fewer dentists per population, and greater distances to access care than their urban counterparts (Skillman et al., 2010).

Medicaid Recipients and the Provision of Preventive Dental Services by Federally Qualified Health Centers. Adult Medicaid recipients are affected more by barriers to timely preventive health care services and higher ED utilization, than adults with private insurance (Cheung et al., 2012). Federally qualified health centers (FQHCs) serve

as the most substantial dental safety net that can provide preventive dental care to underserved populations that lack geographic and economic access (Edelstein, 2010; Lee et al., 2012). The FQHC patient demographic mostly consists of patients insured through public insurance programs and low income, and underinsured patients (Lee et al., 2012). In 2017, federal health center grantees provided oral examinations and preventive dental services to roughly 10 million individuals, restorative dental services to roughly 3.7 million individuals, and emergency and surgical services to roughly 1.3 million individuals (Health Services and Resource Administration [HRSA], 2018). Although FQHCs serve as access to health care points for vulnerable and disadvantaged populations, many FQHCs are challenged in providing preventive dental services due to dentist shortages (Reidy et al., 2007).

Problem Statement

Medicaid Adult Dental Coverage Benefit and ED use. When a state eliminates Medicaid comprehensive adult dental coverage benefits, dental-related ED visits increase. Singhal et al. (2015) found that when California Medicaid eliminated comprehensive adult dental coverage in 2009 due to budget constraints, more than 1,800 additional dental ED visits were observed. Similar to the state of California, in 2009 adult dental care benefits were discontinued as part of South Carolina's Medicaid program and the state experienced a rise in dental-related ED visits (Karash, 2017).

South Carolina Medicaid Adult Dental Benefit. In general, the Medicaid program in South Carolina covers groups including the aged and blind, pregnant women and children, family planning, the working disabled, individuals in nursing facilities, and

programs centered on breast and cervical cancer (Healthy Connections a., 2017). As of December 1, 2014, the South Carolina Department of Health and Human Services (SCDHHS) has implemented an adult dental benefit (Healthy Connections, b. 2017). The dental benefits offered include an annual cleaning, oral exams, x-rays, extractions, and fillings up to \$750 per fiscal year (Healthy Connections c., 2017). Since the implementation of the adult health benefit, there has been limited public knowledge on how effective the policy is in increasing access to dental services for Medicaid adults, and whether primary non-traumatic dental ED visits have decreased.

Purpose

The purpose of this research is to assess whether the South Carolina Medicaid adult dental benefit reduced dental ED use among Medicaid recipients. The objectives of this research are to:

- To ascertain the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental health benefit service after the adult dental benefit was added.
- Assess whether the adult dental health benefit has resulted in lower odds of visiting the ED for non-traumatic dental conditions for eligible Medicaid enrollees aged 21 and up in the state of South Carolina.
- Assess whether the presence of a FQHC, a dental safety net provider for publicly insured patients, results in lower odds of receiving dental care from the ED for eligible Medicaid enrollees aged 21 and up within counties in the state of South Carolina.

Hypothesis

We hypothesize that the adult dental health benefit improved access to dental care services and decreased dental ED visits among adult Medicaid enrollees. It is further hypothesized that the effect is greater in counties with a FQHC.

Research Questions

The research questions for this research are:

- What is the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental health benefit service after the benefit was added?
- Did the likelihood of ED visits for non-traumatic related dental care by Medicaid enrollees aged 21 and up decrease after the state of South Carolina added the adult dental benefit to their Medicaid program?
- FQHCs serve as a substantial dental safety net provider and access point for publicly insured patients. Therefore, did the likelihood of ED visits for non-traumatic related dental care by Medicaid enrollees aged 21 and up decrease in counties with a FQHC in South Carolina, after the state added the adult dental benefit to their Medicaid program?

Significance

When this research is complete, it is expected that a series of practical policy recommendations will be proposed to improve the availability and accessibility to oral health services for socially disadvantaged populations in South Carolina.

CHAPTER 2

LITERATURE REVIEW

This chapter begins with an overview of the Andersen Behavioral Model of Health Services Use Model and how it has been used in health services research prior to the proposed research study. Next, this chapter provides the epidemiology of adverse, preventive dental conditions for adults. Using the constructs of Andersen's model, this chapter will provide a review of predisposing and need factors associated with adverse preventive dental conditions, before providing a review of how health policy as an enabling factor impacts access and utilization to dental services. *Note: The terms Black and African-American are not inherently interchangeable, but for this research these terms will be interchangeable due to the citing and reporting of literature.*

2.1 Andersen Behavioral Model of Health Services Use

History of Andersen Behavioral Model of Health Services Use. The Andersen Behavioral Model of Health Services Use is the theoretical framework used. Andersen's Behavioral Model of Health Services Use was developed by Ronald M. Andersen in the late 1960s to understand why families use health care services; to define equitable access to health care services; and to support policies regarding equitable access to health care services for families (Andersen, 1995). From the late 1960s to the late 1990s the Anderson Behavioral Model of Health Services has evolved from a framework focused on the family as the unit of analysis to the individual due to the challenge of developing

family level measures that incorporate the heterogeneity of family members such as a family summary measure of health status (Anderson, 1995). Although the individual is the unit of analysis, contextual factors such as the community characteristics in which an individual resides, can be applied to the individual unit in the model's attempt to explain and predict health care service use (Anderson & Davidson, 2001). Understanding the contextual dimensions of access to health care allows a more accurate formulation of health policy, and a synergistic health delivery system.

Andersen Model as Theoretical Framework. Andersen's Behavioral Model of Health Services will be used as the theoretical framework because both individual and societal determinants to health care services are analyzed. Moreover, Andersen's model and this proposed study share a value and goal: to achieve equitable distribution of health services, and improved health outcomes for disadvantaged populations (Andersen & Newman, 1973). In the context of this research, components of Andersen's model articulate factors that assist in the understanding of dental services access and use among Medicaid adults. The components of Andersen's model are individual and contextual predisposing factors; individual and contextual enabling factors; and individual and contextual need factors. Together these components are intended to aid in understanding and explaining or predicting the health service use behavior of individuals (Andersen & Davidson, 2001).

Components of the Andersen Model and Examples.

Predisposing characteristics. Predisposing characteristics are described by Andersen (1995) to be demographic, of social structure, or health belief factors. Individual demographic and biological factors such as age and sex represent predisposing

characteristics that may influence an individual's need to utilize health care services. For example, prostate cancer is a disease found in older males primarily, therefore age and sex are the identified predisposing factors of prostate cancer (Brawer, 1999). Furthermore, cervical cancer is one of the most common diseases affecting females in the world; thus, sex is also a predisposing factor to cervical cancer (Franco et al., 2003). In context, depending on the demographics of a community, there will be differing health conditions and health service availability (Andersen & Davidson, 2001).

The social structure aspect of individual predisposing characteristics represents the race/ethnicity, gender, occupation, and education of an individual when considering health care services use. In context, social characteristics of a community affect their access to and utilization of health services (Andersen & Davidson, 2001). Literature supports that social categories such as race/ethnicity, gender, occupation, and education are not mutually exclusive, and in fact intersect to influence the health and lived experience of individuals and groups (Bowleg, 2012; Schulz and Mullings, 2006).

The health beliefs component of individual predisposing characteristics assesses whether an individual's attitude, values, or knowledge about a health condition or health care service affects an individual's use of a health care service (Andersen, 1995). For example, studies indicate mental illness stigma negatively affects attitudes toward seeking mental health care because of socially constructed norms (Corrigan et al., 2012; Corrigan et al., 2015). In addition, trust in medical facilities and physicians may impact the health beliefs an individual or group develops, which may impact their health services use. Literature on the trustworthiness of the U.S medical system support that medical mistrust is a factor in why disadvantaged populations utilize the emergency room more often than

primary care facilities (Arnett et al., 2016; Smirnoff et al., 2018). In context, Andersen and Davidson (2001) state that the health beliefs such as the cultural norms of a community or organization affect the health services use of that community. Understanding how and why individuals utilize health services has been proven to be important to the development, and implementation of health policy (Rosenstock, 2005).

Enabling characteristics. Individual and contextual enabling characteristics are considered by Andersen (1995) to be organizational or financial factors that influence an individual to seek health care services. Individual organizational factors include whether an individual has a usual place of care, transportation to care, or the travel and wait time to care (Babitsch et al., 2012). The organizational factors described are frequently assessed and used as proxies to analyze access to health care services for disadvantaged groups (Caldwell et al., 2016; Caldwell et al., 2017; Miller and Wherry, 2017). Individual financial factors include whether an individual has health insurance, the price of health care services, and the methods for compensating providers (Andersen, 1995; Andersen & Davidson, 2001). Furthermore, health policies such as the policy being analyzed in this study are considered contextual enabling factors that may predict or explain health service access and utilization. Health policies are authoritative decisions, and thereby influence the pursuit of health (Andersen, 1995; Andersen & Davidson, 2001).

Need Characteristics. Andersen (1995) describes an individual's need for health care services as their perceived view regarding their health status or circumstance, which is shaped by social structure and health beliefs. The social phenomenon explained accounts for how individuals view and experience their own general health and functional state (Andersen, 1995; Babitsch et al., 2012). In addition to how individuals view their

experience and general health status, an individual's need for health care services is evaluated by health professionals in the form of medical assessments and objective measurements of health status in Andersen's model (Andersen, 1995; Babitsch et al., 2012). When assessing need, Andersen & Davidson (2001) provide context to need of health care services by differentiating between environmental need factors and population health need factors. Environmental need factors include the quality of housing, water, air and death rates from homicide, and suicide. Population health indices considered when assessing need to health care services include age-adjusted mortality and morbidity rates from health conditions such as, heart disease, cancer, untreated dental caries and strokes (Anderson & Davidson, 2001; Babitsch et al., 2012).

Literature Applying the Andersen Model. The Andersen Behavioral Model of Health Services Use has been used in various health services research studies. Babitsch et al. (2012), conducted a systematic literature review on the Andersen Behavioral Model of Health Services Use with the purpose of assessing the use and implementation of health services studies that explicitly use the Andersen model as the theoretical approach. Babitsch et al. (2012), found that most studies included in their review were secondary data analysis studies. Furthermore, common variables used for predisposing factors were age, marital status, gender/sex, education, and ethnicity. Common variables used for enabling factors were income, health insurance, and having a usual source of care; variables used for need factors included evaluated health status and, self-reported and perceived health status. The method of the systematic search strategy included published studies utilizing the Andersen model from 1998 until 2011 in English or German in the PubMed scientific database. Limitations mentioned in the conclusion explained that out of the 17 included in

the review, there were many variations in the ways predisposing and enabling factor variables were categorized in previous research. One explanation given by Babitsch et al. (2012) was the limited selection on variables in secondary data sets.

The Andersen model is an encompassing model that can be applied to various health services studies aiming to understand and predict health services access and use. Individual and contextual predisposing factors, enabling factors, and need factors are strengths of the Andersen model in understanding and predicting health services access and use.

2.2 Magnitude and Distribution of Adverse Oral Health Conditions

Dental Caries and Periodontal Disease. Dental caries and periodontal disease are two of the most common, preventable and chronic dental health conditions in the world (Benjamin, 2010). Selwitz et al. (2007) defines dental caries as, “the localized destruction of susceptible dental hard tissue by acidic by-products from bacterial fermentation of dietary carbohydrates (p.1)”. The decaying of the tooth is a leading factor of oral pain and tooth loss (Kidd et al., 2004; Selwitz et al., 2007). Periodontal disease, commonly referred to as gum disease, is an infection of the tissues responsible for securing teeth (National Institute of Dental and Craniofacial Research [NIDCR] a., 2018). Although the bacteria that causes dental caries and periodontal disease differ, periodontal disease can cause bleeding gums, pain, and tooth loss (NIDCR a., 2018). In fact, Merchant (2012) and Mattila et al. (2010) conclude that periodontal disease is more likely to occur when dental caries are present. Tooth loss, untreated dental caries, and periodontal disease are indications of limited access to preventive dental care (Griffin et al., 2012).

Disparities in the prevalence of adults with dental caries, missing, or filled permanent teeth. Using data from the National Health and Nutrition Examination Survey (NHANES) for years 1999-2004 the NIDCR b. (2018) currently records the percent of adults with caries, missing or filled permanent teeth; and the percent of adults with untreated dental caries by age (20-34 years, 35-49 years, 50-64 years, 65-74 years, 75+ years), sex (female and male), race/ethnicity (non-Hispanic White, non-Hispanic Black, Mexican American), poverty status (less than 100% FPL, 100% to 199% FPL, Greater than 200% FPL), and education (less than high school, high school, more than high school). Similar to Dye et al.'s (2015) article on oral health disparities using 2011-2012 NHANES, the NIDCR (b. and c.) (2018) reports that 92% of adults 20-64 have had dental caries in their permanent teeth.

Prevalence of dental caries, missing, or filled permanent teeth by age. Adults aged 50-64 years have a higher prevalence of dental caries, missing, or filled permanent teeth (95.63%) compared to all other adult age groups (NIDCR b., c., 2018).

Prevalence of dental caries, missing or filled permanent teeth by sex. Female adults aged 20-64 have a higher prevalence of dental caries, missing, or filled permanent teeth (92.66%) compared to male adults (90.57%) of that age group. Male adults aged 65 and over have a higher prevalence of dental caries, missing, or filled permanent teeth (93.64%) compared to female adults (92.49%) of the same age (NIDCR b., c., 2018).

Prevalence of dental caries, missing, or filled permanent teeth by race/ethnicity. Non-Hispanic White adults aged 20-64 years have a higher prevalence of dental caries, missing, or filled permanent teeth (93.49%) compared to non-Hispanic Black (87.51%) and

Mexican American adults (82.97%) of that age group. Similarly, non-Hispanic White adults aged 65 and over have a higher prevalence of dental caries, missing, or filled permanent teeth (94.86%) compared to non-Hispanic Black (80.20%) and Mexican American adults (83.82%) of the same age (NIDCR b., c., 2018).

Prevalence of dental caries, missing, or filled permanent teeth by poverty status. Adults aged 20-64 with a poverty status greater than 200% of the FPL have a higher prevalence of dental caries, missing, or filled permanent teeth (93.05%) compared to adults with a poverty status less than 200% of the same age. Furthermore, of adults aged 65 and over, adults with a poverty status greater than 200% (95.53%) have a higher prevalence of dental caries, missing, or filled permanent teeth compared to adults with a poverty status less than 200% of the same age (NIDCR b., c., 2018).

Prevalence of dental caries, missing, or filled permanent teeth by education. Adults aged 20-64 years with more than a high school education have a higher prevalence of dental caries, missing, or filled permanent teeth (92.91%) compared to adults with a high school education (92.35%) or less (85.93%) of the same age. Furthermore, adults aged 65 and over with more than a high school education have a higher prevalence of dental caries, missing, or filled permanent teeth (97.04%) compared to those with a high school education (94.27%) or less (83.73%) (NIDCR b., c., 2018).

Disparities in the prevalence of adults with untreated dental caries.

Prevalence of untreated dental caries by age. Adults 20-34 years have a higher prevalence of untreated dental caries (27.88%) compared to other age groups (NIDCR b., 2018).

Prevalence of untreated dental caries by sex. Male adults aged 20-64 have a higher prevalence of untreated dental caries (28.10%) compared to female adults (22.96%) of that age group. Male adults aged 65 and over have a higher prevalence of untreated caries (20.42%) compared to female adults (16.43%) of the same age (NIDCR b., c., 2018).

Prevalence of untreated dental caries by race/ethnicity. Non-Hispanic Black adults aged 20-64 years have a higher prevalence of untreated dental caries (40.45%) compared to non-Hispanic White (20.84%) and Mexican American adults (38.35%) of that age group. However, Mexican American adults aged 65 and over have a higher prevalence of untreated dental caries (41.19%) compared to non-Hispanic Black (36.78%) and non-Hispanic White adults (15.92%) of the same age (NIDCR b., c., 2018).

Prevalence of untreated dental caries by poverty status. Adults aged 20-64 with a poverty status less than 100% of the FPL have a higher prevalence of untreated dental caries (43.88%) compared to adults with a poverty status greater than 100% of the same age. Furthermore, of adults aged 65 and over, adults with a poverty status less than 100% (33.22%) have a higher prevalence of untreated dental caries compared to adults with a poverty status greater than 100% of the same age (NIDCR b., c., 2018).

Prevalence of untreated dental caries by education. Adults aged 20-64 years with less than a high school education have a higher prevalence of untreated dental caries (45.20%) compared to adults with a high school education (33.03%) or more (16.48%) of the same age. Moreover, adults aged 65 and over with less than a high school education have a higher prevalence of untreated dental caries (26.16%) compared to those with a high school education (17.68%) or more (14.30%) (NIDCR b., c., 2018).

Disparities in the prevalence of adults with periodontal disease. Similar to their reporting on the prevalence of treated and untreated dental caries, the NICDR (d. and e.) (2018) reports the prevalence of periodontal disease using 1999-2004 NHANES data. Furthermore, the NICDR reports periodontal disease prevalence by age (20-34 years, 35-49 years, 50-64 years, 65-74 years, 75+ years), sex (female and male), race/ethnicity (non-Hispanic White, non-Hispanic Black, Mexican American), poverty status (less than 100% FPL, 100% to 199% FPL, Greater than 200% FPL), and education (less than high school, high school, more than high school).

Prevalence of periodontal disease by age. Adults 50-64 years have a higher prevalence of periodontal disease (11.88%) compared to other age groups (NIDCR d., e., 2018).

Prevalence of periodontal disease by sex. Male adults aged 20-64 have a higher prevalence of periodontal disease (10.65%) compared to female adults (6.4%) of that age group. Male adults aged 65 and over have a higher prevalence of periodontal disease (8.56%) compared to female adults (16.43%) of the same age (NIDCR, 2018).

Prevalence of periodontal disease by race/ethnicity. Non-Hispanic Black adults aged 20-64 years have a higher prevalence of periodontal disease (16.81%) compared to non-Hispanic White (5.82%) and Mexican American adults (13.76%) of that age group. Similarly, non-Hispanic Black adults aged 65 and over have a higher prevalence of periodontal disease (23.92%) compared to Mexican American adults (17.23%) and non-Hispanic White adults (8.99%) of the same age (NIDCR, 2018).

Prevalence of periodontal disease by poverty status. Adults aged 20-64 with a poverty status of 100% to 199% of the FPL have a higher prevalence of periodontal disease (15.34%) compared to adults of differing status of the same age. However, of adults aged 65 and over, adults with a poverty status less than 100% (17.49%) have a higher prevalence of periodontal disease compared to adults with a poverty status greater than 100% of the same age (NIDCR, 2018).

Prevalence of periodontal by education. Adults aged 20-64 years with less than a high school education have a higher prevalence of periodontal disease (17.33%) compared to adults with a high school education (9.34%) or more (5.78%) of the same age. Moreover, adults aged 65 and over with less than a high school education have a higher prevalence of periodontal disease (16.56%) compared to those with a high school education (8.3%) or more (8.9%).

Disparities in the prevalence of adults with moderate or severe periodontal disease.

Prevalence of moderate or severe periodontal disease by age. Adults 75 years and older have a higher prevalence of moderate or severe periodontal disease (20.75%) compared to other age groups (NIDCR, 2018).

Prevalence of moderate or severe periodontal disease by sex. Male adults aged 20-64 have a higher prevalence of moderate or severe periodontal disease (6.74%) compared to female adults (3.46%) of that age group. Male adults aged 65 and over have a higher prevalence of moderate or severe periodontal disease (20.61%) compared to female adults (14.26%) of the same age (NIDCR, 2018).

Prevalence of moderate or severe periodontal disease by race/ethnicity. Non-Hispanic Black adults aged 20-64 years have a higher prevalence of moderate or severe periodontal disease (8.3%) compared to non-Hispanic White (4.15%) and Mexican American adults (6.43%) of that age group. Similarly, non-Hispanic Black and Mexican American adults aged 65 and over have a higher prevalence of moderate or severe periodontal disease (24.47%) (24.20) compared their non-Hispanic White adult counterparts (15.47%) (NIDCR, 2018).

Prevalence of moderate or severe periodontal disease by poverty status. Adults aged 20-64 with a poverty status of 100% to 199% of the FPL have a higher prevalence of periodontal disease (15.34%) compared to adults of differing status of the same age. However, of adults aged 65 and over, adults with a poverty status less than 100% (17.49%) have a higher prevalence of periodontal disease compared to adults with a poverty status greater than 100% of the same age (NIDCR, 2018).

Prevalence of moderate or severe periodontal by education. Adults aged 20-64 years with less than a high school education have a higher prevalence of periodontal disease (17.33%) compared to adults with a high school education (9.34%) or more (5.78%) of the same age. Moreover, adults aged 65 and over with less than a high school education have a higher prevalence of periodontal disease (16.56%) compared to those with a high school education (8.3%) or more (8.9%) (NIDCR, 2018).

Disparities in the non-receipt of needed dental care and dental visits by region. Thus far, the prevalence of adult treated, and untreated dental caries, periodontal disease, and severity of periodontal disease has been documented. However, data on the

aforementioned health conditions by region are not well documented in oral health literature. Nonetheless, the southern region of the United States and locations outside metropolitan statistical areas (MSAs) have a larger percentage of individuals not receiving dental care services due to cost, and lesser dental visits in the past year (Department of Health and Human Services a. [DHHS], 2016).

Social Structure and Inequitable Access to Dental Services. As evidenced by the NIDCR data, adult groups with the largest percentage of untreated dental caries have the largest percentage of periodontal disease and moderate to severe periodontal disease. Furthermore, social structure affects whether adults have treated or untreated dental caries, periodontal disease, or severe periodontal disease. For example, although 92% of adults have dental caries in their permanent teeth, Black and Mexican American adults; adults with lesser education; and poor adults have greater percentages of untreated dental caries, periodontal disease, and moderate to severe periodontal disease. Anderson (1995), defines equitable access as “occurring when demographic and need variables account for most of the variance in utilization” (pg.4). In contrast, inequitable access occurs when social structure, health beliefs, and enabling factors determines who uses medical care (Anderson, 1995).

2.3 Predisposing Characteristics of Dental Disease

Age and Dental Disease. Age is a well-known risk factor to chronic diseases such as coronary heart disease, diabetes, and respiratory disease (Dhingra and Vasan, 2012; Kirkman et al., 2012; Kovacs et al., 2013). Research indicates that there is a link or association between periodontal disease and each of the aforementioned chronic diseases

(Azarpazhooh and Leake, 2006; Humphrey et al., 2008; Preshaw et al., 2012). Nevertheless, older adults have more difficulty accessing preventive health services than their younger counterparts, as more older adults have tooth loss, untreated dental caries, and periodontal disease (Dye et al., 2007; Griffin et al. 2012; NIDCR d.,e., 2018; Peterson and Yamamoto, 2005).

Cost is the greatest barrier to seniors accessing health care, and the use of dental services are likely to decline as an individual age (Griffin et al., 2012; Pew Charitable Trust, 2016). Similar to cost, health insurance has been shown to be a barrier to accessing preventive dental services for older adults. Medicare, a federal insurance program for seniors 65 and older, narrowly spends for preventive and restorative dental care; while Medicaid benefits vary in comprehensiveness by state (Griffin et al., 2012; Pew Charitable Trust. 2016). However, many dentists are opposed to participating in public insurance programs (Davis et al., 2010; Patrick et al., 2006).

Other factors or barriers associated with aging and dental disease include xerostomia, or dry mouth, and the resulting exposure of root surfaces to decay (Griffin et al., 2012; Peterson and Yamamoto, 2005; Shetty, 2012). Dry mouth occurs when glands in an individual's mouth fail to adequately produce saliva. Saliva allows individuals to digest food; protects against tooth decay; and prevents infection in the mouth by limiting fungi and bacteria (Shetty, 2012). Often, as individuals age they endure chronic health conditions that require medication. However, medications prescribed to treat varying chronic conditions influence dry mouth, thereby causing the root surfaces of teeth to be exposed to an increased number of bacteria (Griffin et al., 2012; Shetty, 2012).

Race/Ethnicity and Dental Disease. Research supports that racial categories have little biological and scientific significance, but have considerable political, social, and economic implications (Templeton, 2013; Williams et al., 1994). Therefore, race is a societally constructed taxonomy based on an ideology that some human groups are inherently more superior than others. A groups' race in the U.S conveys more of the lived experience than biology, as there are more biological differences within racial categories than between them (Williams et al., 1994). The oppression and injustice endured historically by those deemed racial and ethnic minorities in the U.S by those considered the racial majority has directly and indirectly influenced the health inequalities observed in these populations, which reflect inequalities of wealth, income, education, housing, and overall racial discrimination (Krieger, 2000).

The pigment of skin does not predispose anyone to adverse oral health conditions. However, as a result of the aforementioned inequalities in U.S society, the dental delivery system has not afforded everyone the opportunity to be healthy. Those deemed racial and ethnic minorities, namely Non-Hispanic Blacks, Hispanics, and Latinos reside in communities that have more untreated tooth decay than their White counterparts and are more likely to lose their teeth due to dental disease (Dye et al., 2015). Moreover, periodontitis disparities have increased over time between Black and White adults as racial and ethnic minorities are more likely to be exposed to adverse health conditions in their physical and social environments (Borrell et al., 2007). Consistent with untreated tooth decay and periodontitis among racial and ethnic minority populations, there is an increasing trend of dental ER visits for the Black population, the uninsured, and those aged 18-44 years (Lee et al., 2012; Wu et al., 2013).

Sex/Gender and Dental Disease. Most clinical research on the association between sex and dental decay focus on the metabolic and hormonal differences females endure during pregnancy (Doyal and Naidoo, 2010; Harnett et al., 2016; Lukacs, 2010). Oral complications commonly include gingivitis and periodontal disease (Gajendra and Kumar 2004; Harnett et al., 2016; Lukacs, 2010; Silk et al., 2008). Periodontal disease has been shown to be associated with adverse pregnancy outcomes of women. The mechanisms by which this occurs are unclear, but preterm birth is the leading cause of neonatal morbidity in the U.S (Silk et al., 2008).

Research on the biological differences between males and females in relation to oral health conditions has not been researched in-depth beyond female reproduction. While insightful, research in this area is limited as reproduction is not a reality for all females. Therefore, much more research is needed on the biological implications of oral health conditions.

Research supports that women engage in more healthy behaviors and health promoting activities than men (Courtenay, 2000; Walker et al., 1998). One explanation to this difference is the cultural difference in concepts concerning femininity and masculinity individuals adopt from their culture, social institutions, and social environment which influence health behaviors (Courtenay, 2000; Pleck et al., 1994). For example, through male gender socialization, males in the U.S are instructed to be independent, fearless, and to avoid the use of emotions throughout their life course (Garfield & Rogers, 2008). If these concepts of masculinity and manhood are not adhered to males will often be described as exhibiting feminine characteristics, which may have severe social consequences (Courtenay, 2000; Garfield & Rogers, 2008). Therefore, health care seeking and

utilization, socially constructed as feminine traits, are often rejected by males who seek to appear more powerful and masculine by minimizing health concerns (Coutenay, 2000; Garfield & Rogers, 2008).

In general, as it relates to medical utilization and preventive care seeking, research has shown that women use more health care services than men (Bertakis et al., 2000). Similar to general medical services, women are more likely to utilize preventive dental services than men (Swank et al., 1986). Although science has supported that females suffer from more dental disease and tooth decay than men due to hormonal differences and pregnancy, preventive health-seeking behaviors may in part explain why some women have better oral health conditions than men.

Socioeconomic Status and Dental Disease. An individual's health has shown to be associated with the socioeconomic status (SES) of the community in which the individual resides (Robert, 1998). SES inequalities have been shown to affect the morbidity and mortality of individuals and groups and has been studied extensively by multidisciplinary researchers (Elo, 2009). SES determines the societal resources individuals and groups have access to, therefore affecting the health outcomes of those with low and high SES disproportionately (Link & Phelan, 1995). When SES is measured by an individual's educational attainment and family economic status, adults with lower SES categories are more likely to have untreated tooth decay, tooth loss, and gingivitis (which could lead to periodontal disease) than adults in higher SES categories (Drury et al., 1999). Furthermore, individuals with minimal annual incomes, or who are unemployed are more likely to report oral health problems while adults living near neighborhood resources are less likely to report poor oral health status (Finlayson et al., 2010; Zabos et al., 2002).

Rural environment and Dental Disease. Individuals in the U.S that reside in rural environments experience adverse dental health conditions, due primarily to lack of access to services (Harrison et al., 2007). Barriers to dental health services in rural environments include geographic isolation, higher rate of poverty than metro areas, and provider shortages (National Advisory Committee on Rural Health and Human Services, 2018). When compared to their urban counterparts rural residents are more likely to be poor and less likely to have insurance (Cohen and Stitzel, 2015). Moreover, rural communities are less likely to have water fluoridation and experience greater travel distances to care (Cohen and Stitzel, 2015; National Advisory Committee on Rural Health and Human Services, 2018).

2.4 Enabling Characteristics of Dental Disease

Cost of Dental Services and Access to Care. A common reason cited by adults in research for forgoing dental care treatment is the cost of services (Nasseh et al., 2015). Dental service cost barriers are more common compared to other health services and is partly due to private employers and the federal government's limited negotiating leverage with dentists as compared to physicians; thereby, benefit packages shift more costs to the patient or employee than other health care services (Bailit and Beazoglou, 2010; Nasseh et al., 2015). The Patient Protection and Affordable Care Act (PPACA) and Medicaid Expansion has lessened cost barrier challenges. For instance, prior to the PPACA, from 2000 to 2010 cost barriers for dental services continued to rise among all age groups except children, however from 2010-2014 cost barriers have declined among all age and income groups except the elderly (Nasseh et al., 2015). Despite improvements in cost barriers and access to dental care, additional research is needed to inform stakeholders of the dental

delivery system of best practices to alleviate cost barrier challenges for vulnerable populations.

Usual Source of Care. Studies show that a usual place of care is associated with higher preventive services utilization and better health outcomes (Blewett et al., 2008; DeVoe et al., 2003; Spatz et al., 2010). Having a usual source of dental care is a consistent and significant factor in whether an individual receives a dental visit, and thus is important to understanding and explaining dental utilization among vulnerable populations (Anderson and Davidson, 1997). Regardless of geographic location residents with a usual source of dental care have an increased probability of having a preventive dental visit within the past year (Khan et al., 2017).

One strategy utilized nationally to mitigate challenges for vulnerable populations concerning a usual place of care and access to dental health services is the dental safety net. Federally Qualified Health Centers (FQHCs) are an integral component of the dental safety net and are required to be located in geographic areas that are considered medically underserved areas whether rural, and or urban (Beazoglou et al., 2010; Isringhausen et al., 2014). The patient demographic at FQHCs mainly consist of patients that have a low income, are under-insured, or on a public assistance program (Lee et al., 2008). FQHCs are an integral component of the dental safety net due to the financial grants awarded to them by the federal government to provide care for vulnerable populations regardless of their ability to pay (Beazoglou et al., 2010). From 2006-2012 research indicates that there has been a growing demand for dental care at FQHCs as dental visits rose by 74% (Koppelman and Singer-Cohen, 2017; Vujicic, 2015). Furthermore, as part of the PPACA, and Medicaid expansion the federal government invested additional funding into FQHCs

by establishing the health trust fund which provides over 70% of federal health center grant funding (Rosenbaum et al., 2017). Although FQHCs endure challenges such as provider shortages and provider dissatisfaction, they have been recognized through research as providing high quality and cost-effective treatment (Friedburg et al., 2017; Isringhausen et al., 2014; Proser, 2005; Reidy et al., 2007).

In general, studies find that expenditures for various health care conditions decrease and ED non-emergent usage is less likely if an individual receives care at a FQHC or an individual resides in zip codes located within 0.5 miles of a FQHC (Chen et al., 2015; Nocon et al., 2016). However, among older Medicaid-Medicare enrollees that utilize a FQHC for care, more ED visits are observed depending on a patient's race (Potter et al., 2016; Wright et al., 2017). Therefore, the impact of FQHCs in relation to ED utilization regarding general health services varies. Despite studies on FQHCs in relation to ED utilization regarding general health services; there is a dearth of research on the impact of FQHCs in relation to dental-ED utilization.

Travel Burdens to Dental Care. Transportation to dental care remains a barrier to care in low income, older adult and rural populations. Among barriers commonly cited concerning access to dental care in older adults are transportation challenges (Davis and Reisine, 2015; Montini et al., 2014). One qualitative study documented that many older adults in low income senior housing state that they must rely on and sometimes pay relatives and friends for transportation. If unavailable, they must endure the burden of paying for transportation, which negatively affects the fixed income many seniors have. Furthermore, functional disabilities of the elderly impact the type of transportation needed which may add an additional burden to accessing dental care (Davis and Reisine, 2015). In

general, research shows that older adults residing in rural environments experience limited access to health care, and transportation difficulties remain a consistent barrier to care (Goins et al., 2005).

Without transportation, delays in care may exacerbate chronic conditions and adverse health outcome are often the result (Syed et al., 2013). Similar to older populations, transportation challenges affect whether low income and rural individuals receive dental care. In a research study that analyzed 1,258 individuals on the Iowa Dental Wellness Plan and their dental care utilization, it was found that 11% of respondents reported unmet dental needs due to transportation issues (McKernan et al., 2017). In addition, when seeking medical or dental care, research shows that rural residents and African Americans experience greater travel burdens to care when compared to their urban and White counterparts (Probst et al., 2007).

Medicaid and Dental Care Access. Health insurance is an enabling factor that must be assessed when predicting dental service use and accessibility. Literature indicates that dental insurance is associated with the likelihood of a recent dental visit and untreated caries (Decker and Lipton, 2015). Furthermore, dental coverage is a robust determining factor in whether an individual will seek preventive services (Singhal et al., 2017). Despite the advantages dental coverage affords; Medicaid, the largest insurance program for socially disadvantaged groups offers adult dental benefits, but benefits vary by state. For example, only 27 states cover preventive services, although research shows that access to preventive services reduce the development of tooth decay and subsequent painful dental conditions being treated in the ED (Pourat et al., 2015).

The Medicaid Expansion, as part of the PPACA has improved the access to adult dental services and adult dental treatment. Despite the health benefits the Medicaid Expansion continues to produce, all states have not expanded their state program, particularly southern states. Currently, 31 states have expanded Medicaid in their state, and 29 of those states offer the same adult dental benefits to their traditional Medicaid population as their expansion population (Hinton and Paradise, 2016). As a result of the Medicaid Expansion, Medicaid childless adults residing in a state that expanded Medicaid, utilized greater dental services from years 2010-2014 (Singhal et al., 2017). However, some studies show that since the PPACA ED visits have increased (Nikpay et al., 2017). In Kentucky it was found, using State Department Databases from years 2010-2014, that oral health ED visits have increased significantly for adults covered by Medicaid (Chalmers et al., 2016). This suggests that the availability to the dental delivery system for Medicaid enrollees is a challenge, regardless of dental benefits and the expansion of Medicaid.

Dental Provider Participation in Medicaid. The geographic maldistribution of dentists accepting Medicaid patients has been a concern for policy makers (Hinton and Paradise, 2016). For instance, a study focused on demographic and practice characteristics of Medicaid dentists in Florida documented that in South Florida Black and Hispanic dentists are more likely to treat Medicaid patients (Logan et al., 2014). Considering that the dental workforce is not representative of the U.S population this is of concern in regard to the accessibility and availability of dental care for underserved groups (Health Policy Institute, 2015).

There has been informed research policy debates concerning the need to expand dental therapist programs due to the lack of dentists available to accept and treat low-income, and special needs populations, such as Medicaid enrollees (Blue and Kaylor, 2016; Edelstein, 2011; Warder and Edelstein, 2017). Among the reasons dentist decline to participate in Medicaid programs are poor perceptions of the program's administration and the patient population (Kateeb et al., 2015). In a research study centered on barriers to Medicaid participation among Florida dentists, it was found that two non-reimbursement factors affecting Medicaid dental participation are dentists' perception of social stigma from their peers for Medicaid participation, and a lack of specialists to refer patients (Logan et al., 2015). Furthermore, studies on the perceptions of Medicaid by dentists in Louisiana, Texas, and California indicate that among the key reasons for dentist dissatisfaction were patient noncompliance, perceived low dental IQ, and broken appointments (Blackwelder and Shulman, 2007; Damiano et al., 1990; Shulman et al., 2001).

Dental provider reimbursement and participation in Medicaid. Dental provider payment rates are a common factor cited by dentists regarding Medicaid participation, as Medicaid dental payment rates are generally lower than patients with private insurance and consist of more cumbersome administrative responsibilities (Blackwelder and Shulman, 2007; Damiano et al., 1990; Shulman et al., 2001). Research shows that the success of Medicaid programs depends on the reimbursement rates to dentists (Gupta et al., 2017; Thuku et al., 2012; Vujicic, 2015).

Medicaid Adult Dental Coverage Benefit and ED Use. Andersen documents that health policies are considered enabling factors that may predict and explain health service access and utilization (Andersen, 1995; Andersen & Davidson, 2001). The purpose of this

research is to assess whether the South Carolina Medicaid adult dental benefit reduced dental ED use among Medicaid recipients. Therefore, literature on dental policies and subsequent ED use provides insight into what may be for the state of South Carolina since the addition of the adult dental benefit.

When states implement and administer changes to their Medicaid dental policies, grave consequences may result and increase ED visits. Individuals lacking access to dental care may use the ED for care as seen in Massachusetts, Maryland, and California. In these states ED visits increased when Medicaid cut its adult dental benefit from their program (Cohen et al., 2002; Neely, 2014; Singhal et al., 2015). Furthermore, a research study based on Arizona's cost containment system and dental related ED visits found that a shift in payer type was observed since the 2010 cut in dental benefits, as self-paid patients increased in EDs (Mohamed et al., 2017).

2.5 Need Characteristics and Dental Care

Perceived Need of Dental Care. As previously documented, untreated oral health morbidity is greatest in racial and ethnic minority populations, low income populations, and older adults. In addition to the barriers of receiving dental health services described in this chapter, the perceived need for dental care is a barrier that must be addressed. Research has shown that oral health beliefs and perceptions are associated with dental utilization, and patient preferences are often a reflection of one's socio-demographic and cultural background (Atchison and Gift, 1997; Butani et al., 2008; Kelesidis, 2014).

Race/Ethnicity and perceived need of dental care. Studies show that African-Americans and Hispanics suffer most from lack of access to oral health care, untreated oral

health morbidity, and adverse oral health perceptions (Kelesidis, 2014; Lugo et al., 2014). However, in one study it was found that over 60% of free clinic patients reported a perceived need for dental services, but limited access to dental care suggesting that access to dental care services for underserved populations may be the greater barrier (Kamimura et al., 2017).

Age and perceived need of dental care. As part of socio-demographics, age may be a predictor into whether adults view a need for dental care. Research indicates that adults older than 55 years are more likely to report no need for dental care, while adults 55 years and younger are more likely not to utilize dental services due to cost and fear (Kelesidis, 2014). Nonetheless, fear is also evident in older populations as a deterrent to dental care. In a study centered on dental fear and utilization in Appalachia-West Virginia it was found that a high level of fear is present within the population 18 years and over, which affects dental utilization (Wiener, 2015). Moreover, in a study on the effect of dental fear and utilization it was found that fear of the dentist could lead to dental avoidance or delay of treatment (Meng et al., 2007).

Pain in the oral cavity is important to whether individuals have a perceived need to receive dental services. A perceived need to relieve dental pain affects an individual's oral health related quality of life (Seirawan et al., 2011). In the absence of pain, it may difficult for older adults to recognize adverse oral health symptoms and need for preventive dental health services (Slaughter and Taylor, 2005).

Pregnant women and perceived need of dental care. Literature shows that many pregnant women in the U.S receive insufficient dental care, although they are at risk for

adverse oral health conditions while pregnant (Marchi et al., 2010). Knowledge on oral health and the importance of care is shown to depend on race and ethnicity and maternal education (Boggess et al., 2011). Studies focused in Maryland and California indicate that a lack of a perceived need was a key factor in why women have not received dental care. Major factors with non- receipt of care were no usual source of care, non-European race/ethnicity, low income, and lack of private prenatal insurance (Marchi et al., 2010; Singhal et al., 2015).

2.6 Literature Review Conclusion

Predisposing, enabling, and need characteristics that often affect preventive dental diseases and subsequent dental utilization has been discussed in this chapter. Each of these characteristics assist in explaining and understanding dental health health behaviors and utilization. Dental health policy is the focal point of this study as the goal is to assess the effect the South Carolina Medicaid adult benefit had on non-traumatic ED visits. Therefore, based on the literature review, the policy provision serves as an enabling factor to dental disease and subsequent care. Assessing the predisposing and need characteristics of dental disease will allow us to control for predisposing and need factors in our analysis which will enable the Medicaid dental policy to be analyzed independently to assess its effectiveness.

CHAPTER 3

METHODS

3.1 Research Questions

The research questions for this study are:

- What proportion of eligible South Carolina Medicaid recipients utilized the adult dental health benefit service after the benefit was added?
- Did the likelihood of ED visits for non-trauma related dental care by Medicaid enrollees aged 21 and up decrease after the state of South Carolina added the adult dental benefit to their Medicaid program?
- FQHCs serve as a substantial dental safety net and access point for publicly insured patients. Therefore, did the likelihood of ED visits for non-traumatic related dental care by Medicaid enrollees aged 21 and up decrease in counties with a FQHC in South Carolina, after the state added the adult dental benefit to their Medicaid program?

3.2 Data Sources

Data Sources and Study Design. This was a retrospective study for which the South Carolina Medicaid eligibility dataset and Medicaid dental claims dataset stored by the South Carolina Revenue and Fiscal Affairs Office were linked and used. Data were examined three years after the adult dental benefit, which began on December 14, 2014

Data from the eligibility file were needed to determine the number of persons who meet study inclusion criteria, but who had no claims during the period. Therefore, we assessed data from the period of December 2014- November 2017 to ascertain the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental health benefit service at least once after the benefit was added.

Furthermore, data from the South Carolina Medicaid eligibility claims dataset and the all payer emergency department dataset stored by the South Carolina Revenue and Fiscal Affairs Office were linked and used. Data from the eligibility file were needed to identify person level characteristics not available in the eligibility file. The data were examined for a primary diagnosis of a non-traumatic ED visit three years before and after the adult dental benefit. Thus, we used data from the period of December 2011- December 2017 to assess whether the South Carolina Medicaid adult dental benefit reduced dental ED use among Medicaid recipients.

3.3 Study population and variables. The study population was restricted to enrollees 21 years and older of South Carolina Medicaid during the study period because the adult dental benefit is only available to members 21 years and older (Healthy Connections, b. 2017). Included adults in this study are pregnant enrollees, and enrollees who were members for 10 months out of the year to account for any momentary lapses in coverage. Enrollees residing in nursing homes were excluded from the analysis due to their institutionalized setting.

3.4 Measures

Dependent variables. To measure primary procedural dental benefit visits, current dental terminology codes (CDT) were used. The South Carolina Medicaid dental office reference manual was used to select specific CDT codes covered by the adult dental benefit (SCDHHS, 2018; <https://www.dentaquest.com/getattachment/State-Plans/Regions/South-Carolina/Dentist-Page/SC-Healthy-Connections-ORM.pdf/?lang=en-US>). The CDT codes for diagnostic services covered were: D0120, D0140, D0150, D0210, D0220, D0230, D0272, D0274, and D0330. The CDT code for preventive services was: D1110. The CDT codes for restorative services were D2140, D2150, D2160, D2161, D2330, D2331, D2332, D2335, D2391, D2392, D2393, and D2394. CDT codes for oral and maxillofacial surgery were D7140, D7210, D7220, D7230, D7240, D7241, and D7250. CDT codes for adjunctive general services were D9222, D9223, D9230, D9239, D9243, D9248, and D9420. Enrolled Medicaid members who received a dental benefit outpatient office service during the period after policy initiation for the covered CDT codes were coded as one, and enrollees without a visit were coded as zero.

To measure primary non-traumatic ED visits, the International Classification of Diseases, 9th and 10th Revision (ICD-9-CM) (ICD-10-CM) diagnosis codes were used for dates before October 15, 2015 (Centers for Medicare and Medicaid [CMS] ICD revision change). Following previous work, the following ICD-9-CM diagnosis codes were used for non-traumatic dental conditions: 520.0-520.9, 521.0-521.9, 522.0-522.9, 523.0-523.9, 525.0-525.9 (Anderson et al., 2010; Sun et al., 2015). ICD-10-CM diagnosis codes K00.0-K00.9, K03.0-K03.9, K04.0-K04.99, K05.0-K05.6, K08.0- K08.9 were used for non-traumatic dental conditions after October 15, 2015. For this study enrolled Medicaid

members who have had a non-traumatic dental ED visit will be coded as 1 and all other ED visits will be coded as 0.

Independent variables. The independent variables for the first research question were patient and contextual level characteristics, including race/ethnicity, sex/gender, age, pregnancy status and rural/urban county status. These variables are predisposing characteristics to dental disease and were utilized conceptually as part of the Andersen Behavioral Model of Health Services Use.

Race/Ethnicity was categorized as White, Black, Hispanic, and other. Other racial/ethnic categories consist of those who identify as federally recognized Native Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Sex/gender was coded as male and female. Age was categorized as 21-39, 40-64, and 65 and older. Rurality was defined using 2013 Urban Influence Codes (UIC) from the United States Department of Agriculture. UICs categorize counties in a continuum from 1 to 12 based on their adjacency to metropolitan areas. UICs 3 or greater represent rural counties (United States Department of Agriculture, 2019).

The independent variable for the second and third research question was time. Time was measured by month and year of admission. The study was divided into a pre and post-benefit period. The pre-benefit period consists of dates December 2011-November 2014. The post-benefit consists of dates December 2014- November 2017. The pre and post-benefit periods are each divided into three periods. The three periods within the pre-benefit period are described as the “third period before policy”, “second period before policy”, and

the “first period before policy”. The third period before policy initiation was coded for dates December 2011-November 2012; the second period before policy initiation was coded for dates December 2012-November 2013; the first period before policy initiation was coded for dates December 2013- November 2014.

The three periods within the post-benefit period are described as the “first period after policy”, “second period after policy”, and the “third period after policy”. The first period after policy initiation was coded for dates December 2014-November 2015. The second period after policy initiation was coded for dates December 2015-November 2016. The third period after policy initiation was coded for dates December 2016- November 2017.

Covariates. Covariates used included patient and contextual level characteristics such as race/ethnicity, sex/gender, education, age, pregnancy status, and rural/urban status. Race/Ethnicity was categorized as White, Black, Hispanic, and other. Other racial/ethnic categories consist of those who identify as federally recognized Native Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Sex/gender was coded as male and female. Age was coded as 21-39, 40-64, and 65-100. County of residence was coded according to the county the Medicaid member resides. Rurality was defined using 2013 Urban Influence Codes (UIC) from the United States Department of Agriculture. UICs categorize counties in a continuum from 1 to 12 based on their adjacency to metropolitan areas. UICs 3 or greater represent rural counties (United States Department of Agriculture, 2019). A new variable was created for counties that have an FQHC and counties that do not. Counties with a FQHC were coded as 1 and counties without were coded as 0.

3.5 Analysis

Univariate analysis. The univariate analysis was performed to describe the characteristics of the study population. The total number and percentage of enrollees with outpatient dental office visits, the total number and percentage of overall and primary non-traumatic ED visits made by enrollees during the study period by pre and post benefit periods, county FQHC status, pregnancy status, race/ethnicity, sex/gender, age, and rural/urban county status were calculated.

Bivariate analysis. The bivariate analysis, using chi-square tests was performed to determine the independent association [unadjusted analysis] between the study period and outpatient dental office visits. Furthermore, chi-square tests were performed to determine the independent association between pre and post benefit periods and primary non-traumatic dental ED visits. Group comparisons by race/ethnicity, sex/gender, age, pregnancy status, rural/urban county status, and FQHC status were made between enrollees receiving the benefit and enrollees who did not; and primary non-traumatic dental ED visits made by enrollees and visits not made.

Multivariable analysis. A multivariable analysis, using logistic regression was performed to determine the adjusted odds ratios and the associated confidence intervals of enrollees receiving the benefit during the study period by population characteristics, and primary non-traumatic dental ED visits made by enrollees during the study period by pre and post benefit periods, and population characteristics. The statistical software package used to perform the analysis was SAS 9.4.

3.6 Model Statement

The logistic regression models for the proposed research questions are:

- Logit (Outpatient Dental Office Service)= $L_i = \ln(P_i/1-P_i) = \beta_0 + \beta_1 \text{ RACE}_i + \beta_2 \text{ SEX}_i + \beta_3 \text{ AGE}_i + \beta_4 \text{ RURALITY}_i + u_i$
- Logit (Non-trauma Dental ED Visit)= $L_i = \ln(P_i/1-P_i) = \beta_0 + \beta_1 \text{ TIME}_i + \beta_2 \text{ RACE}_i + \beta_3 \text{ SEX}_i + \beta_4 \text{ RURALITY}_i + \beta_5 \text{ AGE}_i + \beta_6 \text{ FQHC}_i + u_i$

CHAPTER 4

RESULTS OF PREVENTIVE DENTAL BENEFIT USE

4.1 Introduction: South Carolina Adult Dental Benefit.

The Medicaid program in South Carolina covers categorical groups, including the aged and blind, pregnant women and children, family planning, the working disabled, individuals in nursing facilities, and programs centered on breast and cervical cancer (Healthy Connections a., 2017). In 2009, adult dental care benefits were discontinued as part of South Carolina's Medicaid program (Karash, 2017). When a state eliminates Medicaid comprehensive adult dental coverage benefits, research shows that dental-related ED visits and unmet dental health care needs increase as preventive dental services decrease. (Cohen et al., 2003; Wallace et al., 2011; Singhal et al., 2015). However, studies show that when adult Medicaid dental benefits are in effect, an associated increase of dental services results (Singhal et al., 2017; Abdus and Decker, 2019).

As of December 14, 2014, the South Carolina Department of Health and Human Services (SCDHHS) has implemented an adult dental benefit (Healthy Connections, b. 2017). The dental benefits offered include an annual cleaning, oral exams, x-rays, extractions, and fillings up to \$750 per fiscal year (Healthy Connections c., 2017). Since the implementation of the adult health benefit, there has been limited public knowledge on

the uptake of the adult dental benefit. Therefore, the research question for the study presented here is, what proportion of eligible South Carolina Medicaid recipients utilized the adult dental health benefit service after the benefit was added?

4.2 Methods

4.2.1 Study Design and Data Sources. This was a retrospective study for which the South Carolina Medicaid eligibility dataset and Medicaid dental claims dataset stored by the South Carolina Revenue and Fiscal Affairs Office were linked and used. Data were examined three years after the adult dental benefit, which began on December 14, 2014.

Data from the eligibility file were needed to determine the number of persons who meet study inclusion criteria, but who had no claims during the period. Therefore, we assessed data from the period of December 2014- November 2017 to ascertain the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental health benefit service at least once after the benefit was added.

4.2.2. Study population and variables. The study population was restricted to enrollees 21 years and older of South Carolina Medicaid during the study period because the adult dental benefit is only available to members 21 years and older (Healthy Connections, b. 2017). Included adults in this study are pregnant women, and enrollees who have been members for 10 months out of the year to account for any momentary lapses in coverage. Enrollees residing in nursing homes were excluded from the analysis due to their institutionalized setting.

4.2.3. Measures

Dependent variables. To measure primary procedural dental benefit visits, current dental terminology codes (CDT) were used. The South Carolina Medicaid dental office reference manual was used to select specific CDT codes covered by the adult dental benefit (SCDHHS,2018; <https://www.dentaquest.com/getattachment/State-Plans/Regions/South-Carolina/Dentist-Page/SC-Healthy-Connections-ORM.pdf/?lang=en-US>). The CDT codes for diagnostic services covered were: D0120, D0140, D0150, D0210, D0220, D0230, D0272, D0274, and D0330. The CDT code for preventive services was: D1110. The CDT codes for restorative services were D2140, D2150, D2160, D2161, D2330, D2331, D2332, D2335, D2391, D2392, D2393, and D2394. CDT codes for oral and maxillofacial surgery were D7140, D7210, D7220, D7230, D7240, D7241, and D7250. CDT codes for adjunctive general services were D9222, D9223, D9230, D9239, D9243, D9248, and D9420. Enrolled Medicaid members who received a dental benefit outpatient office service during the period after policy initiation for the covered CDT codes were coded as one, and enrollees without a visit were coded as zero.

Independent variables. The independent variables for this study were patient and contextual level characteristics, including race/ethnicity, sex/gender, age, pregnancy status and rural/urban county status. These variables are predisposing characteristics to dental disease and were utilized conceptually as part of the Andersen Behavioral Model of Health Services Use.

Race/Ethnicity was categorized as White, Black, Hispanic, and other. Other racial/ethnic categories consist of those who identify as federally recognized Native

Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Sex/gender was coded as male and female. Age was categorized as 21-39, 40-64, and 65 and older. Rurality was defined using 2013 Urban Influence Codes (UIC) from the United States Department of Agriculture. UICs categorize counties in a continuum from 1 to 12 based on their adjacency to metropolitan areas. UICs 3 or greater represent rural counties (United States Department of Agriculture, 2019).

4.2.4 Analysis

Univariate analysis. The univariate analysis was performed to describe the characteristics of the study population. The total number and percentage of enrollees with an outpatient dental office visit during the period by their race/ethnicity, sex/gender, age, pregnancy status and rural/urban county status were calculated.

Bivariate analysis. The bivariate analysis, using chi-square tests was performed to determine the independent association [unadjusted analysis] between the study period and outpatient dental office visits. Group comparisons by race/ethnicity, sex/gender, age, pregnancy status and rural/urban county status were made between enrollees receiving the benefit and enrollees who did not.

Multivariable analysis. A multivariable analysis, using logistic regression was performed to calculate the adjusted odds ratios and the associated confidence intervals of enrollees receiving the benefit during the study period by population characteristics. The statistical software package used to perform the analysis was SAS 9.4.

4.3 Results

4.3.1 Population Studied. A total of 600,778 South Carolina Medicaid enrollees, not residing in nursing homes, were enrolled during the period of the study. Most enrollees were non-Hispanic White (43.79%), non-Hispanic Black (40.18%), female (69.59%), aged 21-39 (56.65%), non-pregnant (90.42%) and resided in an urban environment (80.37%). Approximately 16% of enrollees had at least one outpatient dental office visit after the initiation of the dental benefit program. Further characteristics of outpatient dental office visits are described in (*Table 4.1*).

4.3.2. Dental Benefit Receipt After Program Initiation. Approximately 16% of enrollees had a dental visit since 2014. Results indicate that roughly 17% of enrollees aged 21-39 received an outpatient dental office visit, versus 15.39% among enrollees aged 40-64, and 11.82% among enrollees 65 or older (*Table 4.1*). Roughly 18% of non-Hispanic Black enrollees had a visit, compared to 15.08% for non-Hispanic Whites, 9.86% for Hispanics, and 14.82% for other racial and ethnic groups. Male enrollees were less likely to have made at least one dental visit with 11.16 % making visits, versus 18.09% of female enrollees. Pregnant enrollees were more likely to have made at least one visit with 28.66% compared to non-pregnant enrollees with 14.64%. Furthermore, enrollees residing in rural counties were more likely to have received a covered outpatient dental office visit with 18.17% making visits, versus 15.45% of urban enrollees.

Diagnostic services were the most common service received by South Carolina Medicaid enrollees after program initiation (49.45%; *Table 4.2*). Oral and maxillofacial surgery (22.41%), and restorative services (18.40%) were most utilized after diagnostic

service utilization. Preventive services (7.62%), and adjunctive general services (1.1%) were the least utilized services.

In the adjusted analysis, non-Hispanic Black enrollees had an adjusted odds ratio (AOR) of 1.180 (95% confidence interval [CI] = 1.163, 1.198) and thus, more likely than their non-Hispanic White counterparts to have had a dental office outpatient visit (Table 4.3). Males were less likely to have had at least one dental office outpatient visit (AOR= 0.577) (CI= 0.567, 0.587) compared to females. Enrollees aged 40-64 and 65-100, respectively were less likely to have had at least one dental office outpatient visit (AOR= 0.944) (CI= 0.930, 0.959) (AOR= 0.675) (CI= 0.656, 0.694) compared to enrollees aged 21-39. Pregnant enrollees were more likely to have had at least one dental outpatient office visit than non-pregnant enrollees (AOR=2.145) (CI=2.100, 2.191). Finally, enrollees residing in a rural environment were more likely to have had at least one dental office outpatient visit (AOR= 1.201) (CI= 1.181, 1.221) compared to their urban counterparts. Further unadjusted and adjusted odds ratio estimates are described in *Table 4.3*.

4.4 Discussion

Dental Benefit Receipt Findings. The South Carolina Medicaid eligibility claims dataset was analyzed to ascertain the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental benefit service at least once after the adult dental benefit was added. There are three main findings for this research.

The first major finding answers the purpose of this research. Roughly 16% of Medicaid enrollees had at least one outpatient dental office visit utilizing the adult dental benefit. Most research on the impact of Medicaid dental coverage and dental visits report the probability of dental visits among enrollees within states that offer the adult dental

health benefit, versus enrollees in states without the benefit (Choi, 2011; Abdus and Decker, 2019). However, this research reports the uptake of dental visits after the state of South Carolina added the adult dental health benefit. Furthermore, this research improves on previous work as population-based claims data are used. Thus, this is among the first studies to our knowledge which used population-based claims data and reported the uptake of outpatient dental office visits after the initiation of a state Medicaid adult dental benefit program. Interestingly, 24 % of Massachusetts adults enrolled in MassHealth received dental care prior to dental benefit cuts, which then decreased to 11% (Nasseh and Vujicic, 2013). This suggests that the initiation of the adult dental benefit program influences a greater uptake of dental care services. Literature supports that Medicaid adult dental coverage beyond emergency-only coverage results in more dental visits per year for enrollees than their counterparts (Singhal et al., 2017). Furthermore, having dental insurance is associated with regular receipt of regular preventive care (Choi, 2011; Wallace et al., 2011).

The second major finding is that diagnostic services (49.45%) were the most utilized dental service by South Carolina Medicaid enrollees followed by oral and maxillofacial surgery (22.41%), restorative services (18.40%), preventive services (7.62%), and adjunctive general services (1.1%). Oral and maxillofacial surgery services covered by the South Carolina Medicaid adult dental benefit are the extractions of teeth; restorative services covered are primarily teeth fillings, and preventive services are teeth cleanings. This finding suggests that many Medicaid enrollees were suffering with adverse dental conditions before the initiation of the program, and upon examination were required to utilize surgical and restorative services. Moreover, since South Carolina Medicaid does

not cover endodontic procedures and extended restorative services, oral and maxillofacial surgery percentages are likely greater than they would be if additional tooth saving procedures were covered.

The third major finding is the population characteristics associated with having a dental visit following program initiation. Enrollees with the largest likelihood of an outpatient dental office visit include non-Hispanic Blacks; enrollees who reside in rural counties, women, and enrollees aged 21-39. Each of these groups had a higher likelihood of a dental visit than their comparators.

Literature is consistent in reporting the dental challenges endured by non-Hispanic Blacks. Studies show that African- Americans and Hispanics suffer most from lack of access to oral health care, untreated oral health morbidity, and adverse oral health perceptions (Kelesidis, 2014; Lugo et al., 2014). However, when the Medicaid adult dental benefit took effect data indicate that non-Hispanic Black enrollees are more likely to utilize services than other racial/ethnic groups. This finding is consistent with Medicaid enrolled adults in New York and Oklahoma. After the initiation of their adult dental benefit programs Hispanics in New York and Non-Hispanic Blacks in Oklahoma had higher utilization rates for oral health services in dental offices or clinic than other racial/ethnic groups in each state (Surdu et al., 2016). Hispanic and other racial/ethnic enrollees were less likely to visit outpatient dental office services than their White counterparts. Although, this finding is consistent with the literature on limited access to dental care services for minorities, it is inconsistent with their non-Hispanic Black minority counterpart's study finding. Further research is required to investigate Hispanic enrollees' access and use of outpatient dental office care in South Carolina.

After program initiation rural enrollees were more likely to have an outpatient office visit when compared to their urban counterparts. Generally, individuals in the U.S that reside in rural environments experience adverse dental health conditions, due primarily to lack of access to services (Harrison et al., 2007). The data show that an expansion of dental benefits has positive implications for rural enrollees.

Women enrollees were more likely to have a dental visit after program initiation than their male counterparts. This finding is consistent with literature on preventive health care seeking between men and women. In general, as it relates to medical utilization and preventive care seeking, research has shown that women use more health care services than men (Bertakis et al., 2000). Similar to general medical services, women are more likely to utilize preventive dental services than men (Swank et al., 1986).

Older enrollees were less likely to have a dental visit after program initiation. This finding is consistent with the literature on age and access to dental care services. Older adults have more difficulty accessing preventive health services than their younger counterparts, as more older adults have tooth loss, untreated dental caries, and periodontal disease (Dye et al., 2007; Griffin et al. 2012; NIDCR d.,e., 2018; Peterson and Yamamoto, 2005).

Limitations. Important limitations are present in this research. The conceptual model and analyses utilized known factors to dental utilization. However, the variables utilized for analyses were limited to what was available within the South Carolina Medicaid eligibility claims dataset. The Anderson Model, the theoretical framework for this research reports health beliefs as important predisposing characteristics when assessing health services utilization. Health beliefs were not present in the dataset, and therefore absent the

analyses. Requiring Medicaid enrollees to be continuously enrolled in a 10-month period to be eligible for this research likely influenced fewer male enrollees and additional women enrollees. However, Medicaid is traditionally a women and children's program, and the state of South Carolina has not expanded the program under the PPACA; therefore, it is possible the 10-month period requirement had little effect. Furthermore, because the purpose of this research was to ascertain the proportion of eligible South Carolina Medicaid recipients that utilized the adult dental health benefit service at least once, this research did not report dental outpatient office visits by year. Many enrollees were eligible during multiple years during the period after the benefit was added. Thus, trend analyses could not be assessed on dental outpatient office visits.

The race groups included in this research are categorized as non-Hispanic Black, non-Hispanic White, Hispanic, and Other. The category label "Other" encompasses those who identify as Federally recognized Native Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Dental health challenges expand beyond Non-Hispanic Black and Hispanic groups, and groups mentioned in the "Other" category endure these challenges. However, few data were available in the dataset on each racial group, and when combined data were still scarce.

Conclusion. The findings of this study provide further evidence that when state Medicaid programs offer an adult dental benefit, it is likely the benefit will be utilized. Providing local dental services through state policy change is the collaboration needed to reduce dental care disparities. Moreover, this research supports the importance of health services policy for vulnerable populations suffering from an inequitable health care system.

Although the Medicaid adult dental benefit was utilized in South Carolina, dental access and availability challenges remain. Challenges such as provider participation in Medicaid and residing in a dental HPSA demand further investigation. Mitigating adverse dental challenges among vulnerable populations requires a collaborative public health and medical infrastructure paradigm shift. A shift, that will ensure dental services are available and accessible for individuals with the greatest dental care need.

Table 4.1: Characteristics of study sample, by whether an adult dental benefit was received after program initiation, South Carolina Medicaid, 2014-2017 (n =600,778)

Characteristic	Total		Dental Visit		No Visit		P value
	N	%	N	%	N	%	
Period	600,778	100.00%	96,032	15.98	504,746	84.02	<.0001
Race/Ethnicity							<.0001
Non-Hispanic Black	241,364	40.18%	43,018	17.82%	198,346	82.18%	
Hispanic	18,917	3.15%	1,865	9.86%	17,052	90.14%	
Other	77,439	12.89%	11,478	14.82%	65,961	85.18%	
Non-Hispanic White	263,058	43.79%	39,671	15.08%	223,387	84.92%	
Sex							<.0001
Female	418,061	69.59%	75,642	18.09%	342,419	81.91%	
Male	182,717	30.41%	20,390	11.16%	162,327	88.84%	
Age							<.0001
21-39	340,353	56.65%	57,799	16.98%	282,554	83.02%	
40-64	208,602	34.72%	32,109	15.39%	176,493	84.61%	
65-100	51,823	8.63%	6,124	11.82%	45,699	88.18%	
Rural/Urban							<.0001
Rural	117,935	19.63%	21,434	18.17%	96,501	81.83%	
Urban	482,843	80.37%	74,598	15.45%	408,245	84.55%	
Pregnancy Status							
Not Pregnant	543,242	90.42%	79,542	14.64%	463,700	85.36%	<.0001
Pregnant	57,536	9.58%	16,490	28.66%	41,046	71.34%	

Table 4.2: Dental service types received after adult dental benefit program initiation South Carolina Medicaid, 2014-2017 (n=772,944)

Characteristic	N	% Service Type
Dental Services Type	772,944	100%
Diagnostic Services	382,258	49.45%
Preventive Services	58,882	7.62%
Restorative Services	142,226	18.40%
Oral and Maxillofacial Surgery	180,976	23.41%
Adjunctive General Services	8,602	1.11%

Table 4.3: Factors associated with receipt of dental visit after adult dental benefit program initiation, South Carolina Medicaid, 2014-2017 (n=600,778)

	Unadjusted OR	95% CI	P value	Adjusted OR	95% CI	P value
Characteristic						
Race/Ethnicity						
Non-Hispanic Black	1.221	1.203, 1.240	<.0001	1.183	1.165, 1.201	<.0001
Hispanic	0.616	0.586, 0.658	<.0001	0.514	0.489, 0.540	<.0001
Other	0.980	0.958, 1.002	<.0001	1.099	1.074, 1.125	<.0001
Non-Hispanic White	Ref					
Sex						
Female	Ref					
Male	0.569	0.559, 0.578	<.0001	0.639	0.628, 0.650	<.0001
Age						
21-39	Ref					
40-64	0.889	0.876, 0.903	<.0001	1.082	1.065, 1.099	<.0001
65-100	0.655	0.637, 0.674	<.0001	0.781	0.759, 0.804	<.0001
Rural/Urban						
Rural	1.216	1.195, 1.236	<.0001	1.202	1.181, 1.222	<.0001
Urban	Ref					
Pregnancy Status						
Not Pregnant	Ref					
Pregnant	2.342	2.297, 2.388	<.0001	2.145	2.100, 2.191	

CHAPTER 5

RESULTS OF NON-TRAUMATIC ED USE

5.1 Introduction: South Carolina Medicaid Adult Dental Benefit.

The trend of ED use for non-traumatic dental decay is a concern. Causes of concern include non-traumatic ED dental condition visits being identified as a current trend for disadvantaged groups (McCormick, 2013; Okunseri et al., 2012). Dental services within the ER are incomplete and may not treat the underlying problem, as services are often non-restorative, and require patients to follow up with a dentist immediately after the ER visit (Davis et al., 2010).

Nationally, dental ED visits have increased more rapidly than overall ED visits, co-occurring with the decrease in ED's worldwide from 1997-2007 (Wall & Nasseh, 2013). Similarly, over a 3-year study period from 2008-2010 there were more than 1.3 million ED visits and charges of 1 billion dollars annually due to non-traumatic dental conditions in the U.S (Okunseri, 2015).

When states withdraw adult dental benefits from their Medicaid dental policies, grave consequences result into added ED visits. Individuals lacking access to preventive dental care may use the ED for care as seen in Massachusetts, Maryland, and California. In these states ED visits increased when Medicaid cut its adult dental benefit from their

program (Cohen et al., 2002; Neely, 2014; Singhal et al., 2015). Furthermore, a research study based on Arizona's cost containment system and dental related ED visits found that a shift in payer type was observed since the 2010 cut in dental benefits, as self-paid patients increased in EDs (Mohamed et al., 2017).

In general, the Medicaid program in South Carolina covers groups including the aged and blind, pregnant women and children, family planning, the working disabled, individuals in nursing facilities, and programs centered on breast and cervical cancer (Healthy Connections a., 2017). As of December 14, 2014, the South Carolina Department of Health and Human Services (SCDHHS) has implemented an adult dental benefit (Healthy Connections, b. 2017). The dental benefits offered include an annual cleaning, oral exams, x-rays, extractions, and fillings up to \$750 per fiscal year (Healthy Connections c., 2017). Since the implementation of the adult health benefit, there has been limited public knowledge on how effective the policy is in increasing access to dental services for Medicaid adults, and whether dental ED visits have decreased.

If greater access and availability to outpatient dental office services is the goal, benefits of the adult dental benefit in South Carolina must be investigated. Thus, research here addresses two questions:

- Did the likelihood of ED visits for non-trauma related dental care by Medicaid enrollees aged 21 and up decrease after the state of South Carolina added the adult dental benefit to their Medicaid program?
- FQHCs serve as a substantial dental safety net and access point for publicly insured patients. Therefore, did the likelihood of ED visits for non-traumatic

related dental care by Medicaid enrollees aged 21 and up decrease in counties with a FQHC in South Carolina, after the state added the adult dental benefit to their Medicaid program?

5.2 Methods

5.2.1. Study Design and Data Sources. This was a retrospective study for which data from the South Carolina Medicaid eligibility claims dataset and the all payer emergency department dataset stored by the South Carolina Revenue and Fiscal Affairs Office were linked and used. Data from the eligibility file were needed to identify person level characteristics not available in the eligibility file. The data were examined for a primary diagnosis of a non-traumatic ED visit three years before and after the adult dental benefit. Thus, we used data from the period of December 2011- December 2017 to assess whether the South Carolina Medicaid adult dental benefit reduced dental ED use among Medicaid recipients.

5.2.2. Study population and variables. Data were restricted to enrollees 21 years and older of South Carolina Medicaid during the study period because the adult dental benefit is only available to members 21 years and older (Healthy Connections, b. 2017). The study population was restricted to enrollees 21 years and older of South Carolina Medicaid during the study period because the adult dental benefit is only available to members 21 years and older (Healthy Connections, b. 2017). Included adults in this study are pregnant women, and enrollees who have been members for 10 months out of the year to account for any momentary lapses in coverage. Enrollees residing in nursing homes were excluded from the analysis due to their institutionalized setting.

5.2.3. Measures

Dependent variables. To measure non-traumatic ED visits, the International Classification of Diseases, 9th and 10th Revision (ICD-9-CM) (ICD-10-CM) diagnosis codes were used for dates before October 15, 2015 (Centers for Medicare and Medicaid [CMS] ICD revision change). Following previous work, the following ICD-9-CM diagnosis codes were used for non-traumatic dental conditions: 520.0-520.9, 521.0-521.9, 522.0-522.9, 523.0-523.9, 525.0-525.9 (Anderson et al., 2010; Sun et al., 2015). ICD-10-CM diagnosis codes K00.0-K00.9, K03.0-K03.9, K04.0-K04.99, K05.0-K05.6, K08.0-K08.9 were used for non-traumatic dental conditions after October 15, 2015. For this study enrolled Medicaid members who have had a primary non-traumatic dental ED visit will be coded as 1 and all other ED visits will be coded as 0.

Independent variables. The independent variable for this study was time. Time was measured by month and year of admission. The study was divided into a pre and post-benefit period. The pre-benefit period consists of dates December 2011-November 2014. The post-benefit consists of dates December 2014- November 2017. The pre and post-benefit periods are each divided into three periods. The three periods within the pre-benefit period are described as the “third period before policy”, “second period before policy”, and the “first period before policy”. The third period before policy initiation was coded for dates December 2011-November 2012; the second period before policy initiation was coded for dates December 2012-November 2013; the first period before policy initiation was coded for dates December 2013- November 2014.

The three periods within the post-benefit period are described as the “first period after policy”, “second period after policy”, and the “third period after policy”. The first period after policy initiation was coded for dates December 2014-November 2015. The second period after policy initiation was coded for dates December 2015-November 2016. The third period after policy initiation was coded for dates December 2016- November 2017.

Covariates. Covariates used for this study included patient and contextual level characteristics such as race/ethnicity, sex/gender, education, age, rural/urban status, pregnancy status, and FQHC status. Race/Ethnicity was categorized as White, Black, Hispanic, and other. Other racial/ethnic categories consist of those who identify as federally recognized Native Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Sex/gender was coded as male and female. Age was coded as 21-39, 40-64, and 65-100. County of residence was coded according to the county the Medicaid member resides. Rurality was defined using 2013 Urban Influence Codes (UIC) from the United States Department of Agriculture. UICs categorize counties in a continuum from 1 to 12 based on their adjacency to metropolitan areas. UICs 3 or greater represent rural counties (United States Department of Agriculture, 2019). A new variable was created for counties that have an FQHC and counties that do not. Counties with a FQHC were coded as 1 and counties without were coded as 0.

5.2.4. Analysis

Univariate analysis. The univariate analysis was performed to describe the characteristics of the study population. The total number and percentage of overall and primary non-traumatic ED visits made by enrollees during the study period by pre and post benefit periods, county FQHC status, race/ethnicity, sex/gender, age, and rural/urban county status were calculated.

Bivariate analysis. The bivariate analysis, using chi-square tests was performed to determine the independent association [unadjusted analysis] between pre and post benefit periods and primary non-traumatic dental ED visits. Group comparisons by pre and post-benefit, FQHC status, race/ethnicity, sex/gender, age, pregnancy status and rural/urban county status were made between enrollees with one or more primary non-traumatic dental ED visits and those without a visit.

Multivariable analysis. A multivariable analysis, using logistic regression was performed to determine the adjusted odds ratios and the associated confidence intervals of primary non-traumatic dental ED visits made by enrollees during the study period by pre and post benefit periods, and population characteristics. The statistical software package used to perform the analysis was SAS 9.4.

5.3 Results

5.3.1 Population studied.

The study assessed a total of 1,390,297 ED visits made by adult Medicaid enrollees across the period 2011-2017. Most of all ED visits (58.36%) were made by enrollees aged 21-39, versus 35.27% made by enrollees aged 40-64, and 6.37% made by enrollees aged

65-100 (*Table 5.1*). Female enrollees made most of all ED visits with 76.52% compared to men with 23.48%; and non-Hispanic Black enrollees made most of all ED visits than their comparators with 43.19%, although non-Hispanic White enrollees were in proximity accounting for 42.89% of all ED visits. Non-pregnant enrollees made most of all ED visits with 85.77% compared to pregnant enrollees with 14.23%. Furthermore, data in (*Table 5.1*) show that enrollees residing in urban counties (78.94%), and in counties with a FQHC (77.10%) had most of all ED visits compared to their counterparts.

Over the study period the number of ED visits made each year increased, from 194,303 during the pre-benefit period to 256,608 during the post-benefit period (*Table 5.1*). Thus, ED visits continued to rise among Medicaid enrollees in South Carolina.

5.3.2. Dental Non-Trauma Emergency Department Visits. There were approximately 1.4 million ED visits for Medicaid enrollees in the study, including roughly 23,000 (1.65%) for non-traumatic dental visits (*Table 5.1*). During the pre-policy period, the proportion of non-traumatic dental ED visits among all ED visits increased steadily. There were 3,687 (1.90% of all ED visits) visits during the third period before policy initiation, 4,103 (2.02% of all ED visits) visits during the second period, and 5,026 (2.09% of all ED visits) visits during the first period (*Table 5.1*). In contrast, during the post policy period, non-traumatic dental ED visits decreased steadily. There were 4,429 (1.77% of all ED visits) visits during the first period after policy initiation, 3,840 (1.57% of all ED visits) visits during the second period, and 1,827 (0.71% of all ED visits) visits during the third period (*Table 5.1*)

Demographic factors were also associated with the likelihood of a non-trauma dental ED visit. During the study period, 1.83% of visits for non-traumatic dental

conditions relative to all ED visits were made by enrollees residing in counties without a FQHC, versus 1.59% visits made by enrollees residing in counties with a FQHC. Enrollees aged 21-39 made 2.16% of non-traumatic ED visits relative to all ED visits, compared to non-traumatic ED visits made by those aged 40-64 with 1.05%, and non-traumatic ED visits made by those aged 65-100 with 0.27%. A higher proportion of non-traumatic dental ED visits relative to all ED visits were made by females (1.69%) as compared to males (1.51%) (*Table 5.1*). Of all racial/ethnic groups, a higher proportion of non-traumatic ED visits relative to all ED visits were made by non-Hispanic Whites (2.04%), versus 1.45% visits made by non-Hispanic Blacks, 0.68% visits made by Hispanics, and 1.09% visits made by other racial and ethnic groups. Pregnant enrollees made 1.74% non traumatic ED visits relative to all ED visits, versus 1.63% for non-pregnant enrollees. Moreover, enrollees residing in urban counties made 1.66% of non-traumatic ED visits relative to all ED visits, compared to non-traumatic ED visits made by enrollees residing in rural counties with 1.6%.

In the adjusted analysis, ED visits made by Medicaid enrollees during the second and first period before policy initiation were more likely to have a non-traumatic dental diagnosis, with respective adjusted odds ratios (AOR's) of 1.070 (95% confidence interval [CI] = 1.022, 1.119) and 1.067 (CI=1.022,1.114) compared to enrollees during the third period before policy initiation (*Table 5.2*). Conversely, non-traumatic dental ED visits were less likely to be made during the first, second, and third period after policy initiation by Medicaid enrollees with respective AOR's of 0.891 (CI=0.853,0.923), 0.770 (CI=0.736,0.807), and 0.343 (CI= 0.324,0.363) compared to non-traumatic dental ED visits made by enrollees during the third period before policy initiation.

ED visits made by Medicaid enrollees residing in counties without a FQHC had an AOR of 1.109 (CI=1.075, 1.143) and thus, were more likely than ED visits by enrollees who reside in a county with a FQHC to have a non-traumatic dental diagnosis (*Table 5.2*). Non-Hispanic White enrollees had an AOR of 1.00 (reference group), compared to non-Hispanic Black (AOR=0.738) (CI=0.717, 0.759), Hispanic (AOR=0.329) (CI=0.281, 0.385) and other race groups (AOR=0.673) (CI=0.640, 0.708). Therefore, ED visits made by enrollees who are non-Hispanic Black, Hispanic, or of other racial and ethnic groups were less likely to have a non-traumatic dental diagnosis. Non-traumatic dental ED visits were less likely to be made by pregnant enrollees when compared to non pregnant enrollees (AOR=0.858) (CI=0.825,0.892). Furthermore, ED visits made by male enrollees were less likely than ED visits by female enrollees to have a non-traumatic ED diagnosis (*Table 5.2*).

5.4 Discussion

The purpose of this research was to assess whether the adult dental benefit has resulted in lower odds that an ED visit among eligible Medicaid enrollees aged 21 and up in the state of South Carolina would be due to non-traumatic dental conditions. Moreover, it sought to assess whether the presence of a FQHC in the county of residence results in lower odds that an ED visit among Medicaid enrollees aged 21 and up in the state of South Carolina would be due to non-traumatic dental conditions. This research has two main findings.

The first main finding is from December 2011-November 2017, 1.65% of all ED visits were for dental non-traumatic conditions. However, findings indicate a steady decrease in dental non-traumatic conditions after the initiation of the South Carolina Medicaid adult dental benefit. Non-traumatic dental ED visits in proportion to overall ED

visits were consistent or higher than national averages totaling 1.9-2.09% prior to policy initiation (Ranade, 2018; Sun et al., 2015; Darling et al., 2015; Nakao, 2010). Nevertheless, after policy initiation non-traumatic dental ED visits decreased significantly to 0.71% of all ED visits during the last period of analysis. The gradual decrease in non-traumatic dental ED visits in proportion to all ED visits indicates the positive effect of the Medicaid adult dental benefit policy in South Carolina. Furthermore, results indicate that there was a decline in the actual number of non-traumatic dental ED visits each year after policy initiation, and not solely in percentage as overall ED visits continued to rise during the study period. This finding is consistent with literature that supports when Medicaid dental benefits are expanded, outpatient dental office visits increase and ED visits among enrollees decrease (Singhal et al., 2015; Singhal et al., 2017).

The second main finding is enrollees residing in counties with FQHCs are less likely to have a primary non-traumatic ED visit when compared to enrollees residing in counties without FQHCs. Although many FQHCs are challenged with dentist shortages, they serve as an integral gateway to dental care for underserved communities (Jones et al., 2013; Reidy et al., 2007). The findings of this research are consistent with previous research on the benefits of FQHCs and access to health and dental care services.

5.5 Limitations

This research has several limitations to consider. The theoretical and conceptual model of this research was used to analyze known factors to dental utilization. However, variables utilized in the analyses of this research were limited to the South Carolina

Medicaid eligibility claims dataset. Therefore, known factors of dental utilization such as oral health beliefs and behaviors were absent from the analyses.

Medicaid has traditionally been insurance for low-income women and children. The state of South Carolina has not expanded the program under PPACA; therefore, women are much more represented in the dataset than men. Representation limitations are also present in the racial/ethnic group, FQHC, Age, and rural/urban categories. The category label “Other” encompasses those who identify as Federally recognized Native Americans, other Native Americans, Alaska Natives, Asian, Native Hawaiian/Pacific Islander, and those who identify as more than one race. Many of these groups described in the “Other” category experience oral health challenges, however data were scarce on racial/ethnic groups in this category. The number of Hispanics included in this research were also much less than non-Hispanic Black and non-Hispanic White enrollees. Furthermore, most enrollees in this research resided in urban counties with a FQHC and aged 21-39.

5.6 Conclusion

The findings of this research support the hypotheses that the adult dental benefit decreased dental ED visits among adult Medicaid enrollees in South Carolina with a greater effect in counties with a FQHC. Non-traumatic dental conditions are preventable, thus policy strategies such as the expansion of Medicaid dental benefits appear to have a positive effect on decreasing dental ED visits among this population. However, the policy’s impact could have a greater effect if challenges such as nationwide provider participation in Medicaid and dentist shortages in underserved communities are mitigated. Literature indicates that non-traumatic dental ED use could remain an issue in areas with a scarcity

of dentists (Fingar et al., 2015). Furthermore, increasing dentists within FQHCs will likely bolster their impact on the Medicaid population and other vulnerable groups who suffer from adverse dental health conditions.

Table 5.1: Characteristics of study sample with non-trauma dental emergency department visits before and after adult dental benefit program initiation, South Carolina Medicaid, 2011-2017 (n=1,390,297)

	Total		One or more non-trauma dental ED visits		No non-trauma dental ED visit		P value
Characteristic	N	%	N	%	N	%	
Period	1,390,297	100.00	22,912	1.65	1,367,385	98.35	<.0001
Pre-benefit Period							
3 rd Period before Policy	194,303	13.98	3,687	1.90%	190,616	98.10%	
2 nd Period before Policy	203,422	14.63	4,103	2.02%	199,319	97.98%	
1 st Period before Policy	241,005	17.33	5,026	2.09%	235,979	97.91%	
Post-benefit Period							
1 st Period after Policy	250,045	17.99	4,429	1.77%	245,616	98.23%	
2 nd Period after Policy	244,914	17.62	3,840	1.57%	241,074	98.43%	
3 rd Period after Policy	256,608	18.46	1,827	0.71%	254,781	99.29%	
FQHC							<.0001
County with FQHC	1,071,906	77.10%	17,092	1.59%	1,054,814	98.41%	
County without FQHC	318,391	22.90%	5,820	1.83%	312,571	98.17%	
Race/Ethnicity							<.0001
Non-Hispanic Black	600,481	43.19%	8,715	1.45%	591,766	98.55%	
Hispanic	23,272	1.67%	159	0.68%	23,113	99.32%	
Other	170,249	12.25%	1,857	1.09%	168,392	98.91%	
Non-Hispanic White	596,295	42.89%	12,181	2.04%	584,114	97.96%	
Sex/Gender							<.0001
Female	1,063,834	76.52%	17,968	1.69%	1,045,866	98.31%	

Male	326,463	23.48%	4,944	1.51%	321,519	98.49%	
Age							<.0001
21-39	811,316	58.36%	17,520	2.16%	793,796	97.84%	
40-64	490,417	35.27%	5,153	1.05%	485,264	98.95%	
65-100	88,564	6.37%	239	0.27%	88,325	99.73%	
Rural/Urban							0.0235
Rural	292,821	21.06%	4,687	1.60%	288,134	98.40%	
Urban	1,097,476	78.94%	18,225	1.66%	1,079,251	98.34%	
Pregnancy Status							
Non-Pregnant	1,192,406	85.77%	19,477	1.63%	1,172,929	98.37%	<.0001
Pregnant	197,891	14.23%	3,435	1.74%	194,456	98.26%	<.0001

Table 5.2: Factors associated with non-trauma emergency department visits before and after adult dental benefit, South Carolina Medicaid, 2011-2017 (n =1,390,297)

	Unadjusted OR	95% CI	P value	Adjusted OR	95%CI	P value
Characteristic						
Period						
Pre-benefit						
3 rd Period before Policy	Ref			Ref		
2 nd Period before Policy	1.064	1.017, 1.113	<.0001	1.073	1.025, 1.122	<.0001
1 st Period before Policy	1.101	1.055, 1.149	<.0001	1.076	1.031, 1.124	<.0001
Post-benefit						
1 st Period after Policy	0.932	0.892, 0.974	<.0001	0.908	0.868, 0.949	<.0001
2 nd Period after Policy	0.824	0.787, 0.862	0.4531	0.785	0.750, 0.822	0.0055
3 rd Period after Policy	0.371	0.351, 0.392	<.0001	0.349	0.330, 0.369	<.0001
FQHC						
County with FQHC	Ref			Ref		
County without FQHC	1.149	1.115, 1.184	<.0001	1.106	1.073, 1.141	<.0001
Race/Ethnicity						
Non-Hispanic Black	0.706	0.687, 0.726	<.0001	0.741	0.720, 0.762	<.0001
Hispanic	0.330	0.282, 0.386	<.0001	0.332	0.284, 0.388	<.0001
Other	0.529	0.503, 0.555	<.0001	0.670	0.637, 0.704	0.0623
Non-Hispanic White	Ref			Ref		
Sex						
Female	Ref			Ref		

Male	0.895	0.867, 0.924	<.0001	1.105	1.069, 1.143	<.0001
Age						
21-39	Ref			Ref		
40-64	0.481	0.466, 0.496	<.0001	0.448	0.433, 0.463	<.0001
65-100	0.123	0.108, 0.140	<.0001	0.858	0.825, 0.892	<.0001
Rural/Urban						
Rural	0.964	0.933, 0.995	<.0001	0.986	0.954, 1.019	0.4049
Urban	Ref			Ref		
Pregnancy Status						
Non-Pregnant	Ref			Ref		
Pregnant	1.064	1.026, 1.103	<.0001	0.858	0.825, 0.892	<.001

CHAPTER 6

LESSONS LEARNED

6.1 Lessons Learned

During this dissertation process I've learned that health policy establishes social norms in public domains. What is clear is, when states decide to expand dental benefits there are an uptake in outpatient dental office visits and a decrease in non-traumatic dental ED visits. In contrast, when states decide to limit dental benefits, literature shows that less dental visits and greater non-traumatic ED visits are observed. Health policy enactment has shown to be a factor for either dental despair or dental relief. Although health policy enactment is important, the infrastructure to implement such change is necessary.

Lack of provider participation in Medicaid and residents residing in dental HPSAs are threats to the impact of health policy enactments. Adult Medicaid enrollees consist of vulnerable populations that suffer from access to dental care services and adverse dental challenges. Without adequate dental health professionals or providers in a community, how can those with the greatest health need access services? Therefore, the availability of dental care services is of concern and is a topic to be investigated in future research.

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