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Familial Income Status, Food Insecurity, and Oral Health in Adolescents in the Prepandemic Era

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Walden University

College of Health Sciences and Public Policy

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Gersom Jimenez

has been found to be complete and satisfactory in all respects,
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the review committee have been made.

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Walden University
2025

Abstract

Familial Income Status, Food Insecurity, and Oral Health in Adolescents in the
Prepandemic Era

by

Gersom I. Jimenez

MPH, Columbia Southern University, 2020

BS, Purdue Global University, 2017

Doctoral Study Submitted in Complete Fulfillment
of the Requirements for the Degree of
Doctor of Public Health

Walden University

January 2025

Abstract

Oral health and hygiene present a significant public health problem that can cause short- and long-term effects among families with adolescents. This quantitative, correlational research design study aimed to investigate associations between food security (FS) levels and familial income status to oral health and hygiene among adolescents aged 13-19 throughout the United States. This study used the health belief model to determine if the perceived susceptibilities, severities, benefits, and barriers can lead to self-efficacy and cues to action among adolescents who experience varying familial income levels. Controlled variables included age, sex, and race. Data were derived from the National Health and Nutrition Examination Survey and included a sample size of 15,560 respondents. Descriptive statistics, Pearson's r correlation, ANOVA, and linear and multilinear regression tests were conducted. Results showed a non-significant association between increased family income and food security for improved oral health in teenagers. Additionally, results showed that with food security as the moderator, the increase in income levels significantly enhances both the food security levels and oral health in teenagers. Future research and policy should focus on ways to assist communities with obtaining accessible foods that correlate with cooking skill and budget management, which will encourage positive oral health and wellness in communities. It will be through conflated efforts that future generations can obtain the skills to maintain not only their health but the health of their future families. Therefore, it will create cascading healthy lifestyles for upcoming societies.

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Dedication

I dedicate this paper and all subsequent efforts in Public Health to the strongest people I know, my mom and my brothers. Mom, without your help, encouragement, and support, I would never have seen the potential in myself to pursue my dreams. To my brothers, you may not know it, but you inspire me every day. You are all great men, and I am blessed to be your brother. I hope I make you proud and will use my skills to help improve other people's lives. Thank you, and I love you.

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Section 1: Foundation of the Study and Literature Review

Introduction

A day in the life of a teenager (aged 13-19) contains complex interactions between emotions, social engagements, insecurities, and the learning of their environment. From that context, identifying this particular group can offer insight into how the development and growth of their personalized idiosyncrasies can assist in interventions for young adults. Although a person will have specific elements that are related to only them, learning about the entire group can help produce generalizable interventions to help the community. A major component of an adolescent's life is the relationships they develop through subjective social status, education, and their perception of their family's socioeconomic status (Rahal et al., 2020). Socioeconomic status may have significant effects on food security (FS) levels, which can also affect an adolescent's view on utilizing food assistance programs and the ramifications they experience in their peer groups (Mmari et al., 2019; Paquin et al., 2021; Tucker et al., 2022). A poignant part of Hazzard et al.'s (2022) study displayed that food insecurity and income levels have exposed adolescents to the probability of suffering from mental health issues, dietary disorders, and hunger due to compensation for low FS levels.

A question for this study appeared in the necessity to prove or disprove that socioeconomic status and FS levels might have implications on adolescent oral health. Therefore, it adds more perspective to the studies that emphasize a need for more studies about oral health (Benzian et al., 2022; Hashemi et al., 2021; Ogwo et al., 2024). The current public health information for the preceding areas has been well documented and

studied, except for oral health in adolescents. However, there is a lack of specificity on the relation between income and FS levels and the impact it has on oral health in adolescents. When studying the diets of adolescents, many studies explain what should be eaten for a healthy body, however, they do not explain what can happen when simple sugars in some of the foods and fruits can do to teeth (Hollis et al., 2020; Janda et al., 2022; Neimeier & Fitzpatrick, 2019; Wang et al., 2022).

The parental experience can end up affecting their children and their need for preventative dental care. Giannoni and Grignon (2022) conducted a study that showed FS levels can determine when adults take their adolescents to receive dental care. It can also be that the parents are afraid or have anxiety from past trauma incurred when experiencing dental procedures (Hedge et al., 2022). During adolescence, the influence of social media, media, friends, and relatives begin to stimulate habits that can be long-lasting and stay with them long into adulthood. Applying connections and correlations of familial income status and FS to oral health can assist public health professionals in developing interventions for communities. Those interventions can also assist in developing initiatives that can be taught and learned by young adults who have left adolescence with no public health assistance. The added layer of a need to understand the family dynamics and adult dental fear and anxiety (DFA) has persuaded adolescents to seek care or dismiss dental concerns.

Familial Income Status

One element of determining how a family approaches public health issues within their household (HH) is to investigate income status. A key determinant of an

adolescent's growth, maturation, and internal view is the actual income that is supporting their HH. Several studies have delved into the social status and subjective social status that occurs in the social setting of adolescents in the environment in which they live (Kukkola et al., 2023; Rahal et al., 2020; Rivenbark et al., 2019; Rivenbark et al., 2020). All of these elements can be tied back to the income level of the family. It was discovered that the adolescent years are of a malleable structure because it is during these years that a person begins to hone the nuances that will become their habits. It is in the later years of adolescence and the beginning of adulthood that one's personality begins to manifest (Kukkola et al., 2023; Rahal et al., 2020). Within the current studies regarding familial income status, there are numerous recollections of the impact that the adolescent's perception of their family's status has on their well-being and other factors of health (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022).

Oftentimes, the environment has a part in how a person perceives their status on the social scale. However, there have been instances when adolescents from the same household (HH) did not have the same opinion of their family's social status (Rivenbark et al., 2020). This is a very definitive point to ensure there is an understanding by researchers that the environment plays a part, but it does not dictate what a person sees as the truth. Additionally, Rivenbark et al. (2020) mentioned that because of this, two people from the same HH might see their environments as completely different. Therefore, their mental and physical health are also on separate paths through the young adult stages of life. In a study that was published a year earlier, Rivenbark et al. (2019)

discussed the idea that it was unknown whether the perceptions of familial income status influenced the adolescent's subjective social status. However, it is also important to note that the adolescent's perception, if deemed higher, led to fewer mental and physical health problems (Rivenbark et al., 2019; Rivenbark et al., 2020).

Systems Thinking Skills and Strategies

Creating a rhythmic and appropriate schedule is a part of growing up. As teenagers navigate through the challenges of adolescence, it becomes more important to find a way to execute the tasks of daily living. Factoring the family income level also presents significant challenges to a growing teenager. While taking as many variations as possible, the current studies have mentioned interventions that include items like life stress mediation, parental education programs, programs targeting status-based perceptions, increasing parental, educator, and clinician involvement, and understanding the adolescent's academic achievements (Rahal et al., 2020; Rivenbark et al., 2019; Rivenbark et al., 2020). Public health professionals work to produce the proper interventions that can benefit the population being studied. In public health studies, many programs take a systems thinking approach to maximize efficiency and effectiveness.

While implementing a systems thinking approach, there is a necessity to know the categorization that exists in community constructs. Hoyt et al. (2019) helped categorize children and adolescent families with financial problems into four classes: consistent high income, consistent low income, increasing income, and decreasing income. A confounding point to Hoyt et al.'s study showed that the protective nature of parents for their children during infancy produces a higher income level. However, as the child

grows into adolescence, the income factors change and grow, therefore it reduces the availability of money for more concerning family needs. These points are relevant because it is from these classes of family income that public health professionals can use to discuss systems-thinking approaches to interventions. To coincide with this, the public health teams must be able to either generalize the programs or ensure they are meticulous to specific groups or families. The realization of the possibility of fluctuating incomes allows the researchers to comprehend how families may react to changes in their income level. Furthermore, this information also assists in building programs and interventions with the right systems working together to achieve maximum reach.

Many studies find that adolescents in low-income families can develop behavioral problems, unhealthy behaviors, poor diet choices, and decreased academic achievement (Hoyt et al., 2019; Kukkola et al., 2023; Rahal et al., 2020; Rivenbark et al., 2019; Rivenbark et al., 2020). However, although those factors are pointed out, it is also noted that there are many instances where income does not correlate with declination in all of the areas previously stated. Therefore, there exists an opportunity to utilize systems for policy change, medical engagement, youth wellness programs, local public health departments, and school administration policies. Each of these systems can produce a singular intervention that would be easily managed and implemented within their purview but the necessity to utilize the systems-thinking approach is emphasized by thinking of the future health of the people who are teenagers, right now.

Population-Based Strategies

The basis of any study or article is rooted in the ability to make advances in the scholarly conversation, assist a specific demographic, generalize the study to be used in multiple areas, and produce data to build interventions. Many of the studies that have been reviewed for this study, for income disparities and adolescents, find a way to get to the subjective social status of the teenage population (Hoyt et al., 2019; Kukkola et al., 2023; Rahal et al., 2020; Richards et al., 2023; Rivenbark et al., 2019; Rivenbark et al., 2020; Smith & Wesselbaum, 2024). A revelation like this brings the construct of income and its effect on teenagers into a more detailed view of the study. It is a vital piece to the understanding of the dynamics in the teenage world. There is also the opportunity for researchers to determine the stakeholders and the interventions that could pay high dividends to the adolescent population.

As scholar-practitioners, the cruciality of the research model begins after the identification of the public health issue. In this instance, socioeconomic status relating to income within families with adolescents has an integral role in how these youngsters approach the challenges in their lives. Some of these research models include but are not limited to Erikson's lifespan theory, the theory of acceptance and commitment (ACT), the family stress model, the family investment model, and the teaching personal, social responsibility model, and collaborative for academic, social, and emotional learning model (Kukkola et al., 2023; Richards et al., 2023). Each of these models has assisted the research teams in developing research questions and hypotheses. In the analysis stages, they then used the models as baselines to which a comparison of the data and the

hypotheses occurred. Ultimately, implementing a model into the research can steer researchers away from preconceived notions.

A common method that has been noted for population strategies to address disparities among adolescents in low-income homes is the creation of programs within the communities. As noted previously, the systems-thinking approach, although labor intensive and containing many nuances for administration, provides a more fundamentally sound product. Another common theme was to not place a singular focus on a specific group. Instead, there was an effort to progress change for the entire adolescent population in an area. Of the selected articles, there was only one where the researchers were conducting a study on the processes, implementation, and effectiveness of a program. Chang et al. (2023) noted that when a program is running throughout a community that is low-income and focuses on the development of adolescents, there are marked improvements and significant improvements in maturation and growth.

Evaluation of Approaches to Inform the Public

Each of the studies and many more within the databases presented the associations between the socioeconomic status of families with adolescents and the subjective social status of teenagers. The value and importance of this relationship were assisted in the research by not only presenting the economic concerns of adolescents but also how they view themselves among their peers. This dynamic can have both positive and negative effects on the young adult and adult lives that those teenagers will inevitably live as they grow older. However, it is the role of the public health community to assess

and provide maintainable programs, policies, and interventions that can help adolescents learn the life skills they can use to enrich their futures.

The presence of interventions was centered on the administration and implementation of programs within the communities or local vicinity in which adolescents are most prevalent. For instance, Richards et al. (2023) researched the following programs: Illinois Physical Activity and Life Skills (iPALS) Wellness Program, Teaching Opportunities to Promote Service (TOPS) in Alabama, and She Hits Hard Body Empowerment Boxing Club in Illinois. The functionality of these programs comes from the desire of parents to keep their children and adolescents involved with physical activities and a learning environment when they are not in school. It is also a way for parents to ensure that their children are taken care of when they are at work. This kind of assurance for parents can pay major dividends for the adolescents who are engaged in the programs. It keeps them off the streets and from getting into trouble while teaching them skills that will come in handy when they are adults. Additionally, it can also help to provide them with like-minded friends who have the same physical activities and experiences that they do.

The next widely found conversation throughout the databases includes advocacy for more and improved policymaking at the legislative branches of local, state, and federal government. The study by Smith and Wesselbaum (2024) made several points on the necessity of creating policies that will increase well-being and should target children during adolescence to get ahead of complications that may occur in their daily lives. A key element of the policy considerations that were annotated was that a teenager or child

has an innate want to “feel safe.” The feeling of safety can be accomplished if the proper policies are put into place that will ensure that governments at all levels can and will act on the problems that exist in their areas.

It may or may not be easy to understand that these policies should have detailed aspects that are transferable or generalizable among both urban and rural demographics. These two vastly different manners of living present very specific difficulties of maintenance for families with adolescents. Some of the areas of concern for rural families are the distance and time that it takes for them to get into a city, social relations, health, and education (Smith & Wesselbaum, 2024). The adolescents may be at the age where they cannot drive themselves to various places or they are old enough to drive but the family cannot afford to provide them with a car. There are possibilities where families can get their children to school on buses. However, that does not ensure that they will have good social interactions as the bus may only take them to and from school.

They will have the opportunity to interact and be among people of the same age, but it will be limited to existing only while in school. It is in these situations that policymakers will have a tremendous job to create, maintain, and improve the development of positive and reinforcing interventions, programs, and policies to help children in rural areas. Adolescents who live in rural areas may also be a part of their family’s business in farming. Therefore, they are an integral part of the family’s ability to earn money and ensure the house is cared for in all facets. The importance of understanding rural families’ challenges is in direct relation to urban-based families who live in food deserts where it is difficult for them to get nutrient-dense foods in the home.

Although it is in a different environment, the healthy food availability index (HFAI) can prove to be low for rural HHs as well.

When observing and studying groups of adolescents in urban areas, there are still the same problems, but some of them will be more prevalent than those for adolescents in rural areas. Some commonalities exist among urban and rural families with adolescents. The financial situation can be hard, socializing might be at a minimum, and education at local schools may be strained and low-tiered because of budget issues in the school district. Although no study was found that links substance or alcohol abuse to the familial income level, there is an assumption that it does exist and can play a role in the management of a family home. As previously noted, the programs within a community, when properly funded and managed, can help families and adolescents obtain valuable life skills that will be projected into their adult lives. As such, there are key elements that must be discussed to ensure a proper evaluation of programs, policies, and interventions; efficiency and effectiveness of the status of the programs in the locations as they are run (Chang et al., 2023).

Many programs are available and assist children with psychosocial problems that can develop due to low-income situations, single-parent home dynamics, and a lack of protective factors that are needed to properly mature as they get older (Chang et al., 2023). Of note, adolescents raised in single-parent homes are more likely to be introduced to income instability, lower-quality education, substance abuse, emotional abuse, and criminal acts (Chang et al., 2023; Rahal et al., 2020; Rivenbark et al., 2019).

Considering these revelations, adolescents who are subjected to these elements throughout their lives may feel a sense of abandonment, anger, low self-esteem, depression, and delinquent and criminal behaviors. Therefore, the efficiency of these programs will rest on the advertisement, distribution, and accessibility of them to the target audience of families with teenagers. Accompanying those elements, a baseline for the programs will need to exist through community needs assessments or studies that are focused on the same group. As that information is completed or accessible to the research teams, it will be necessary to keep a good understanding of the number of adolescents who are attending or using the programs. At that time, their progress, or lack thereof, can be monitored with little interaction or diversion by the researchers. From the information gathered for this study, the data link positive outcomes for adolescents who utilize policies, programs, and interventions to their advantage (Chang et al., 2023; Kukkola et al., 2023; Rahal et al., 2020; Richards et al., 2023; Smith & Wesselbaum, 2024).

Food Insecurity of Adolescents

FS levels are a public health topic that is not new nor is it unstudied. There are numerous studies showing that FS levels are a sizable portion of the singular aspect of determining what affects communities around the world. As it stands, food insecurity is a part of 11 to 13% of HHs in the United States (Paquin et al., 2021; Tucker et al., 2022). In more detailed terms and for clarification within this study, approximately one in six or 6 to 13 million children and adolescents are considered food insecure (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022). Each of these staggering numbers helps to inform public health professionals

of the importance of addressing this issue. This is due to the many variations of adverse experiences or coping strategies that are learned during this critical period of an adolescent's life (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Tucker et al., 2022). Those adverse experiences and coping strategies range from stealing, selling drugs, prostitution, going without food to supplement younger siblings, to even homelessness. Therefore, the studies that cover food insecurity among adolescents often have secondary and tertiary effects that accompany it.

The growth, maturation, and habits that are utilized by young adults (aged 20-25) can be the direct result of the experiences and environments in which they grew up. Particularly, some of the negative behaviors can be the use of cannabis or other illicit drugs, decreased academic abilities, prostitution for young girls or selling drugs or stealing for young boys, decrease in physical activity, and impaired cognitive development (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022). None of these choices are what can be considered the most optimal way of approaching food insecurity. However, there may be a need that adolescents perceive so that they can ensure either they or their siblings are being fed.

Neimeier and Fitzpatrick's (2019) mentioned that adolescent behaviors are a very reliable source of information when predicting adult behaviors. This is an important aspect as it pertains to this study in that the ability to ascertain FS levels as seen through the eyes of teenagers is critical. That is due in part to most of the studies and databases seeking information from parents, guardians, or older members of families. It is further

strengthened in its point of view in the study done by Hazzard et al. (2022). In it, they mentioned that there is a propensity for adults to shield their children from the effects of a low socioeconomic status, which leads to food insecurity by going without food to ensure the children get fed. Herein lies the conundrum of where the data are coming from for studies that involve or are focused on adolescents. Teenagers can add a perspective of food insecurity that might shed light on the actual income levels in a family. Hazzard et al. alluded to this factor by mentioning teens notice a low level of food in the house but are unaware of the income status of the family.

When using adolescents as the focal point of a study, it will be critical to ensure that their perceptions are analyzed and then can be longitudinally studied to determine the full extent of the information. In the literature review for FS levels, it was noted that some researchers opted to create different surveys that made certain that teenagers would feel comfortable answering (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Tucker et al., 2022). These strategies were able to provide ample data sets that covered behavioral health, family involvement, peer interactions, academic struggles, and neighborhood influences. Once again, the information accesses new ways of approaching the state in which a teenager experiences the world around them. It also predicts the possibilities that the same adolescents will experience and their responses to situations when they become young adults.

Systems Thinking Skills and Strategies

Commonly in public health issues, there might not be a singular point or aspect that can influence or shape the way a community faces an issue. This is the case with FS

levels throughout the United States. Mmari et al. (2019) mentioned the potential for families in low-income areas of cities and towns to be in a food desert. A food desert is a geographic area where residents lack a grocery store with one-quarter of a mile from their home, a median income that is below 185% of the federal poverty line, the population of that area has a greater than 30% chance of having no access to a vehicle, and the HFAI is low (Mmari et al., 2019). Although that is an astounding list to classify a food desert, it is not misrepresented. It can be assumed that a family in a food desert must find innovative ways to gather food for the family for set periods or utilize resources already available in the community.

Population-Based Strategies

To combat food insecurity within a family, there may be resources within the city or community that are provided to assist them. One possible resource could be a food bank that operates mobile distribution sites that are provided with nutrient-dense foods to combat the food shortages in areas of the cities. These can be done in concert with public health professionals to aid in planning not only the food distribution but also food choice classes that can teach about which foods are better for their growing children and teenagers. Those are examples of systems thinking methods that may need to happen to close the gap in the FS system and food deserts.

Food insecurity is and may continue to be a detrimental condition that many people face often or over the entire course of their lives. It is also an affliction that can affect people who have lived most of their lives very securely in receiving food. It also has the propensity to create additional problems for individuals, groups, and families.

Some of these nuanced difficulties include mental health issues, use of illegal substances, alcohol abuse, and homelessness (Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022). This is not to say that the aforementioned problems are only related to adults or the elderly, they are also very prominent in the daily lives of adolescents and in that light; thus, this study focused on additional factors that occur due to food insecurity. More issues exist, and they include increased bullying from peers, increased potential for school dropouts and decreased academic completion, negative psychosocial and physical outcomes, and poor food management coping mechanisms (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022).

As Neimeier and Fitzpatrick (2019) and Tucker et al. (2022) discussed in their studies, there are enough data to understand and achieve saturation by utilizing the experiences and facts of the adolescent population. It is also noted that the identification of “self-scale” based mechanisms plays a part in how a teenager deals with food insecurity. The “self-scale” based mechanisms include self-efficacy, self-awareness, and self-control (Neimeier & Fitzpatrick, 2019). The development of adult habits and behaviors has an entirely different meaning for teenagers. This is a time that they will ascertain the methods that work best for them. It is also a time that is quite fluid in that all elements in the world that influence them can inadvertently become a huge part of their personality. It will be from that personality that scholar-practitioners of public health must be aware of when developing policies, programs, and interventions to assist adolescents as they grow into adults.

Throughout the studies that were used to create this review, the approaches varied from interviews with individuals, surveys that were available through hard copy and on the internet, focus groups, and data collection through federal government agencies (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022). These approaches were beneficial to the researchers because they were not diluted by the parents or guardians who would normally submit the information to a survey. The teenage perspective does not require special training or access to ensure that the information collected is dependable. It will only take the same respect and care when conducting any type of engagement with people throughout the country or the world.

Evaluation of Approaches to Inform the Public

To accomplish data saturation, scholar-practitioners must account for all environmental considerations that exist in the area or city that they want to study. For example, Mmari et al. (2019) had to consider the details surrounding teenagers within the Baltimore City demographic while Paquin et al. (2021) studied Quebec, Canada, while comparing the data to numbers from the United States teenage demographic. It would be greatly beneficial for researchers to be able to generalize their studies and implement strategies to work for any city and area in the world but with each new area and person, new methods must be manifested to approach those people. Of course, it can also be expressed that there are points of conversation that can be generalized when they match across all spectrums of teenagers all over the world.

Notably, the engagements with the teenagers in the studies seemed to produce the best data when assessing their FS levels and coping mechanisms. Researchers were able to identify what the teens were facing when conducting actions like prostitution, stealing, selling drugs, binge eating, skipping meals so their siblings could eat, or other impulsive behaviors (Hazzard et al., 2022; Mmari et al., 2019; Tucker et al., 2022). Many of those choices are what a teenager considers to be necessary to not only aid in their growth but also the growth and well-being of their family, namely their siblings. As researchers, getting insight directly from the teenagers who are facing food insecurity provides viable and accessible direct data from the source.

Mmari et al. (2019) studied the effect that food insecurity had on teenagers (aged 14-19) who live in the Baltimore City area and throughout six different neighborhoods. This study was quite poignant in that girls decided to use their bodies in the form of prostitution to obtain money to eat and take care of themselves while the boys were said to be selling drugs or stealing to help themselves and their families to eat. Additionally, it was well-known that older boys would often recruit younger boys into the “hustle in the streets.” This type of mentorship may have been easy when the older boys approached the younger boys as it showed them a way to get fast and easy money. Even though the study mentioned some high-risk reward actions there were some other ways some teens choose to manage food insecurity. These alternative ways were begging for money or food, cleaning car windows, and the final one used was asking a trusted friend for food (Mmari et al., 2019).

The Mmari et al. (2019) study paints a harsh reality for many young people who struggle every day to take care of themselves and their families. However, it is necessary to know, understand, and discuss these types of mechanisms used by teenagers to implement interventions that can yield the most productive means of care for adolescents. Tucker et al. (2022) offered some recommendations on ways to approach the teenage food insecurity problem and provide fewer abrasive ways for them to learn how to manage that same food insecurity. One of the first ones is to access the schools and the districts to help identify students who may be food insecure. Creating a process like this can come from the information that school districts will have already. Some families will enroll in food assistance programs that will ensure their kids eat at school. Due to this fact, an intervention or program can become a part of the student's class schedule that teaches them about nutrition and ways to cope with FS levels. The education curriculum can be instituted into the health education classes that are already a part of the school district's approved curriculum.

Furthermore, Savoie-Roskos et al. (2019) validated another type of intervention that showed immense promise. The only caveat is that the article did not specify the demographic that it was targeting, and it was assumed that the course was directed toward adults who were enrolled in the Supplemental Nutrition Assistance Program (SNAP). The utility of a program like this could pay major dividends to the teenage demographic. Just as mentioned before, a curriculum development that entails cooking classes, physical activity recommendations, and nutritional education with proper ways to shop for food can be added to the health class curriculum that is already in use. The

modification would require assistance from nutrition experts, certified cooking experts, and strength and conditioning coaches or physical therapists. As another option to the systems thinking tactic, this health education will provide a lifetime of nutritional and physical activity methods for a healthy lifestyle. Plus, given that the course had a 97% approval rate from the participants, it would be worth the effort to implement a course for teenagers.

Oral Health Care and Treatment

This study addressed the possible associations between FS levels, familial income levels, and oral health and dentition. As a public health issue, oral health needs the attention that would garner significant consideration for feasible interventions that would encourage and facilitate preventive care for adolescents. Specifically, it is noted that the need for preventative measures is dire for adolescents who might live in low to middle-income communities (Benzian et al., 2022; Hashemi et al., 2021; Hedge et al., 2022; Ogwo et al., 2024). Creating a study that can identify and bring attention to oral health and subsequent treatment for adolescents can provide more evidence and thought processes to develop programs or policies to help families take care of their children. Oral hygiene, dental care, and any dentition that needs to happen in low- and middle-income families may present some major challenges in budget constraints, which can directly tie into work hours and income brought into the home.

From studies that were reviewed for this study, it was noted that the conversation for oral health stems from the sheer number of people who are affected and need assistance throughout the world and in our country. Currently, 45% of the world's

population has some form of dental or oral issue that needs attention (Benzian et al., 2022). That equates to 3.5 billion people. These numbers are further exacerbated by the fact that it also equals three people in every four who reside in low- and middle-income countries and areas. Then to break the numbers down into the realm of adolescents, of that total number 530 million of them are adolescents who have dental caries and 57% of the teens in the United States have caries (Calderon et al., 2023; Wang et al., 2022). Analyzing and understanding the gravity of the worldwide numbers has helped to centralize the problem to the United States and see the potential for public health interventions. With that in mind, it is also necessary to delve into some of the extenuating circumstances that may translate into why oral health and dentition are a chief problem for public health professionals.

An element that can present as an overlooked issue is the role that parents can play in ensuring their children receive the proper preventative treatment for dental issues. The biggest one that was found comes from the influence that parents have from their own negative experiences with dental treatment. This is presented as DFA (Hedge et al., 2022; Sumita et al., 2022). However, although DFA can be an inhibitor for parents to take their children to get dental care, it can increase the possibility of self-dental utilization. In other words, the parents are so worried and anxious about their fears that they will be doing all preventative care on their own. This does not mean that they are performing dental procedures but instead, they are brushing for two minutes twice a day and flossing very consistently. The translation of this for children is that the same parents

who have DFA will begin toothbrushing with their kids at an early age to avoid having to take them to the dentist for care.

Being that dental care and prevention are a major concern for adolescents, it is crucial to also know what they are and any procedures to prevent or eliminate them. Dental caries destroy the tooth structure and can be related to cariogenic diets, the action of bacteria, susceptible tooth structure, and time (Ogwo et al., 2024). Bearing in mind the role of the parents from the information above, the study must also refer to the reasons that it is also the environment from which teenagers learn and gather the tools they will use in early adulthood. Notably, just like many other idiosyncrasies, adolescence is the pique time for individuals to learn about proper care and learn socially what is acceptable for them to carry through their lives. The maturation of teenagers has been referenced many times in this discussion and it is no different when utilizing it in oral health conversation.

An ultimate point to describe the oral health issue will be to present the cost, treatment modalities, and reaching the adolescent demographic. An approximate cost of \$387 million shows that there are tremendous concerns with access to care and budget constraints throughout the world's population (Benzian et al., 2022). Therefore, the lack of care and knowledge for adolescents can lead to lowered physical and mental well-being, lower productivity (in school, at home, and work), social inclusion, and development of healthy habits (Benzian et al., 2022; Calderon et al., 2023; Giannoni & Grignon, 2022). Ogwo et al. (2024) noted a very important aspect of teaching and instituting the correct prevention measures in one's life. Just as it can take 5 to 10 years

for cavitation to show in a person's teeth, it will take 5 to 10 years of follow-up studies to realize if the prevention measures are working in the selected population.

As for the treatments that are currently being utilized by the dental community, they are what can be considered traditional and do not vary in many ways. As dental professionals engage their patients, it is possible to identify any parental DFA or DFA that exists among the teenagers that they are about to treat. From gaining this knowledge, an understanding is garnered that can lead to new, innovative, or alternative treatment measures that can assist in changing the view their patients have about receiving care (Hedge et al., 2022). The study goes on to clarify that eliminating any potential DFA, an increase of approximately 41% happened among the people who needed treatment but were originally scared. Aside from facilitating contemporary and alternative medical treatments, further research will have to occur to properly discover new ways to approach the dental treatment of individuals who present with DFA.

Systems Thinking Skills and Strategies

Engaging a systems thinking approach, just as it is with the other public health issues mentioned in this study, must achieve concurrence from all the stakeholders. The direct demographic that needs to have the information is the parents and the adolescents. A major hurdle that will need to be overcome is to divest the teenagers of the mindset they do not need preventative care because they are not old enough to worry about it (Sumita et al., 2022). It is assumed that as it is with many teenagers, their youth precludes them from the necessity of preventive care of any type. Therefore, they may be more apt

to ignore any type of policies or programs that are meant for the progress toward a long and healthy adulthood.

As scholar-practitioners and public health professionals, it will be vital to gather appropriate stakeholders for each community, city, or area that will be the focus of the policies, programs, or interventions. These stakeholders can include, along with adolescents, but are not limited to the local, state, and federal health departments, local community leaders, school district administrators, school administrators, teachers, medical and dental professionals, parents or guardians, and local community center administrations. The most crucial element that is needed for all of these stakeholders to consider is to ensure that there are varying age ranges for the people who are in the stakeholder meetings. This can be done to meet all the requirements that teenagers may view as necessary components of a well-produced intervention or program. The insights of teenagers (aged 13-19) can provide a sizable influence on the directions that the stakeholders can take while still achieving a manageable and well-thought-out plan. A caveat can be explored by starting a discussion on the current policies, programs, and interventions that have been instituted in previous studies.

Hashemi et al. (2021) conducted a study that focused on the oral health self-efficacy and self-care behaviors of students. The study was done in Iran, but several key points were discovered that can assist in the understanding of adolescent oral health practices. In it, they mentioned that healthy children turn into healthy adults (Hashemi et al., 2021). Utilizing this framework as an underpinning for seeking to create positive behavior traits that emphasize the importance of oral hygiene in adolescents can steer the

systems thinking approach towards achievable goals. In another point, it was gathered that when the teachers who are among the students also practice good oral hygiene, it is more likely that the students will grab ahold of the information and utilize it for their well-being. Those revelations can produce a high return on a follow-on study that seeks to determine if the systems thinking approach has worked or to decide if they assembled the proper group of stakeholders to help grow the correct policies, programs, and procedures.

Evaluation of Approaches to Inform the Public

Implementation of interventions or programs can be done correctly, or they can be disastrous in every facet leading up to and beyond execution. Wang et al. (2022) pointed out in their study that the classic procedures of conversations, brochures, and paper-created surveys are not as effective as they once were. They decided to look at alternate means of informing and influencing the public. Additionally, they used the health belief model (HBM) and the six constructs that make up the model to develop innovative ways to reach the populations in the areas they were researching. To clarify its purpose, here are the six tenets within the model: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action (Boslaugh, 2022; Sumita et al., 2022; Wang et al., 2022). The great thing about using HBM is the constructs and how the research and stakeholder teams can institute those tenets into the study. Wang et al. (2022) were able to concentrate on applying the self-efficacy and cues to action and achieved positive results.

While seeking to improve any public health issue, additional research must be done on the habits and actions that are already everyday occurrences. For instance, Wang et al. (2022) and Calderon et al. (2023) found that the screen time that adolescents spend on their phones can be advantageous to their study. Also, even when teenagers are not physically looking at their phone it is remarkably close to them, and they are hyper-aware of any activity on it. Consequently, they evaluated text messages and interactivity through applications that can be tied to equipment like the Oral-B toothbrush (Calderon et al., 2023). By accentuating phone use and the proximity of phones to people consistently throughout their daily lives, both studies achieved positive results. The daily, weekly, and monthly text reminders were set up as questions or informational-laden messages that were meant to encourage the increase of preventative dental care. Moreover, the application that was linked to the toothbrush provided data such as the actual time spent brushing teeth and the number of times per day without adding a requirement for the participants to log their brushing times.

Creating “calls to action” for preventative oral hygiene gained positive ground for oral health as a public health issue, but Sumita et al. (2022) also employed risk aversion in their study to help influence both the age-defying characteristics of adolescents and to help remove any possible DFA that existed among participants. Ogwo et al. (2024) employed machine learning as a model to utilize as a highly predictable product that would also help to tailor interventions to young adults and adolescents. The key point to the presentation of these two studies is the fact that the models or tactics are not anything new, they were just never put into action through a study. Moreover, the answers needed

to continue to generate the necessary conversations to progress innovative ideas and ways of approaching oral health care initiatives for adolescents.

Identified Gaps in the Three Variables

The three variables of familial income status, FS levels, and oral health and dentition carry with them their cases and validity to create and present a well-defined gap that needs to be studied. To ameliorate these gaps to produce an addition to the scholarly conversation will lie in the demonstration of how they will promote the research questions and gaps for this study. The adults or guardians of adolescents often directly report income status. Although this is a reliable means of learning about any demographic, it is not sufficient for this study in that the impact may be seen uniquely for adolescents. The reliability of information gathered directly from teenagers has proven to be of the highest quality and can offer new insights into the struggles of individuals and families who require assistance (Neimeier & Fitzpatrick, 2019).

In this study, I looked to determine the associations between the effects of familial income level and FS levels as they happen and are perceived by adolescents. To clarify, I sought to understand the relationship between income and FS levels and their overall association with oral health: caries, root caries, and subsequent treatments that occur due to these teeth issues. No information was found that can clearly state the associations, if any, regarding the three variables. It is believed that this study adds to the ability of public health professionals to approach oral health as a public health concern. These points were made in the studies conducted by Benzian et al. (2022), Hedge et al. (2022), and Ogwo et al. (2024).

The next gap is in whether FS levels will help or degrade the effects of oral health and dentition in adolescents when it is used as a moderator. The thought process is that the socioeconomic factor of income may or may not have direct effects on the growth and maturation of adolescents. The study used FS levels as the mediator as an intervening variable to produce outcomes that can answer the research question that inserts FS as the moderator.

The goal is to extend the current, limited conversation on both oral health and dentition for adolescents. Although this study does have a focal point of adolescents as the population of interest, it can still present data and information in a new way that other researchers can build from to create new interventions and approaches. It also will extend information about FS and income levels with teenagers as the main population instead of the background group as reported by adults or guardians.

Problem Statement

The issue that prompted the decision to research the possible associations between familial socioeconomic status by way of income, FS levels, and oral health and dentition was partly due to firsthand experiences and a desire to help communities. As teenagers, the environments in which they grow up are instrumental to the development, decisions, and habits that are formed and used in their adult lives (Hollis et al., 2020). Studies have shown that the factors of low-income levels have influenced the deciding factors for families when it comes to the utilization of preventative dental care and treatment (Calderon et al., 2023; Giannoni & Grignon, 2022; Hedge et al., 2022; Sumita et al., 2022; Wang et al., 2022). In this study, I retrospectively considered data collected by the

Centers for Disease Control and Prevention (CDC) through the National Health and Nutrition Examination Survey (NHANES).

From the literature review, I found no studies that investigated the connections, if any, that exist between the three variables listed above. Consequently, highlighting the population of teenagers and considering how their lives are affected by familial income status while ameliorating it with FS levels will submit a new wrinkle to oral health and dentition practices. The statistical analysis of the already collected NHANES, January 2017-March 2020 survey eliminates the pandemic as an additional conflating factor that can skew the data. The testing will start a new conversation that will have oral health as the independent variable, which needs public health's attention (Giannoni & Grignon, 2022; Hedge et al., 2022; Sumita et al., 2022; Wang et al., 2022).

Purpose of Study

The purpose of the study was to create a new element to the limited studied public health issue of oral health and dentition and inquire how the population of adolescents is affected daily. A new lens was used to address the overarching issue of oral health and dentition by using familial income and FS status as possible associators for positive and negative aspects as they relate to dental care for adolescents. NHANES provided the information from their annual data collection during the years of January 2017 to March 2020. Having the focus on this period allowed for data to be unaffected by the COVID-19 pandemic that began in April 2020 and lasted until 2022. In addition to that, the following year of 2023 was still presented with pockets of information that were closely,

if not totally, tied directly to COVID-19 as it still had lasting effects on the communities throughout the country.

The retrospective information from the dates listed allowed for the selection and application of the correct information streams that created the most effective production of statistical analysis. More data were needed to understand the impact of family income levels on the adults to decide on when was the most promising time to get their children dental care (Calderon et al., 2023; Hedge et al., 2022; Sumita et al., 2022; Wang et al., 2022). From these data, it was seen that the choice to forego dental care for perceived “minor teeth issues” had to be made to ensure that FS levels were maximized in HHs. Therefore, many families did not use dental care options unless necessary.

Research Questions and Hypotheses

Research Question 1: What is the association between socioeconomic status (income), FS levels, and oral health in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race?

H₀1: There is no association between socioeconomic status (income), FS levels, and oral health in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race.

H₁1: There is an association between socioeconomic status (income), FS levels, and oral health in adolescents (aged 13-19) during the prepandemic era (Jan 2017-March 2020) when controlling for sex and race.

Research Question 2: What is the association between oral health and socioeconomic status (income) when mediated by FS levels in adolescents (aged 13-19)

during the prepandemic era (January 2017-March 2020) when controlling for sex and race?

H₀2: There is no association between oral health and socioeconomic status (income) when mediated by FS levels in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race.

H₁2: There is an association between oral health and socioeconomic status (income) when mediated by FS levels in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race.

Framework for Study

Correlational Research

Given that the association and relationship are very closely related and are synonyms, it was essential to search for and find a research design that would complement and help to prove or disprove the research questions. Dziak (2023) explained that correlational research seeks to determine how variables that range from statistics, behaviors, or measurable or observable factors relate to one another. An element of this design is also to understand that the research does not prove with certainty how variables relate to each other. However, since public health is a scholar-practitioner-based profession, it helps to use it to continue or create new conversations that can lead to improved policies, programs, or interventions. Another enriching part of the design is that the achievement of the data comes from surveys or observations (Dziak, 2023). The current study worked well with this framework and aided in data saturation. To

complement the use of correlation, linear regressions were run in SPSS to present data found in NHANES in a statistical format.

HBM

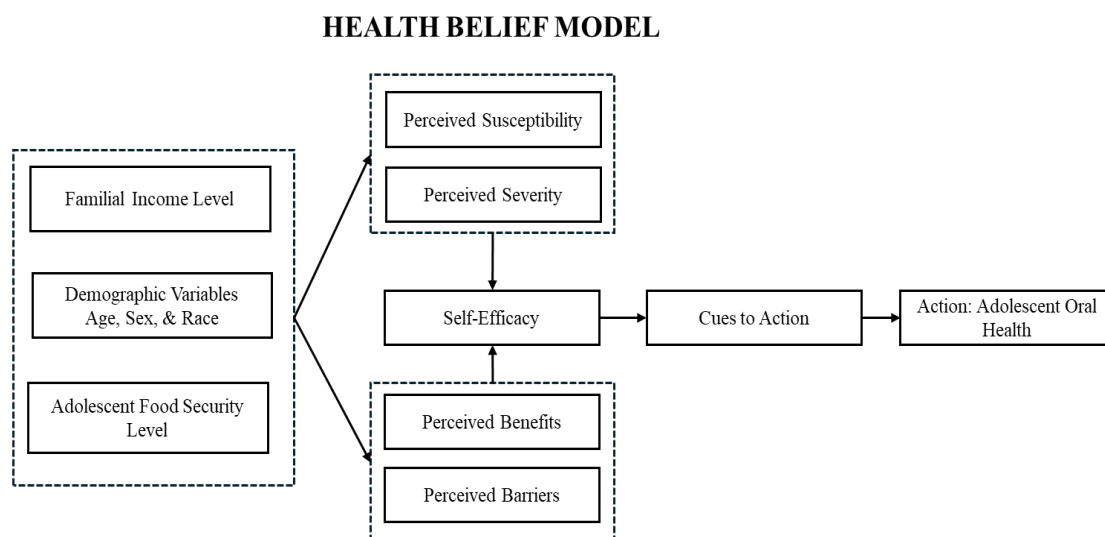
Instituting the HBM helped to add the proper foundation to base the entire study on to garner results that are actionable or increase the knowledge of public health practitioners. The model was developed in the United States in the 1950s by Godfrey Hochbaum, Irwin Rosenstock, and others in the U.S. Public Health Service (Boslaugh, 2022). HBM helped to comprehend how and why people chose or did not choose to utilize public health services. Advancements in study principles have led HBM to continue to improve and now the following six elements can be presented in studies to learn how variables interact or do not interact. These elements are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action (Boslaugh, 2022; Sumita et al., 2022; Wang et al., 2022).

For the current study, I used the HBM to learn the perceived severity, perceived barriers, self-efficacy, and cues to action. These elements of the HBM were used to assess the data from and about adolescents that might affect their oral health and dentition. It has been noted that parents and guardians may be delaying any kind of dental care due to what may be perceived as minor dental issues among their children (Hedge et al., 2022; Sumita et al., 2022). This decision-making process had to be considered when performing the literature review and the subsequent proposal. Due to the perceived severity, or lack thereof, the decision is made to try home remedies or to decide between the treatment and feeding the family. In that case, the monetary concerns of many low–

and middle-income families become a major factor in determining how to care for the oral health of their children. As a conflating slice of the family dynamic, income also has a vote in the way families choose the foods necessary to feed their children. Therefore, those can be perceived as barriers to maintaining proper dental care. This study may help to provide methods or directions for public health scholar-practitioners to progress in intervention creation. The goal of this study is to teach, deliver, and produce the skills of dental care to the parents, guardians, adults, and adolescents in the family to be able to become self-sufficient in preventative dental care. It is also necessary to ensure they understand all the health factors, positive and negative. Figure 1 illustrates how the HBM was used in this study.

Figure 1

Health Belief Model



Literature Search Strategies

The process for the literature review and search was an in-depth and meticulous course that was necessary to ensure that the proper types of information were found and related to the research questions. Part of the investigation and brainstorming was to first ask and create the questions in which the data points necessary would come to life. The next part was to begin the process of thinking through the elements or possible tools or sources that could be used to obtain these data points and literature for review. My committee and I were instrumental in assisting in the thought process to get to the final rudiments of this literature review.

Upon concluding the brainstorming sessions, I used the following databases, academic search engines, and internet search engines. The databases included National Center for Biotechnology Information (NCBI) database, National Institutes of Health (NIH) database, World Health Organization (WHO) journal database, Google Scholar, Biomed Central, Child Care & Early Education Research Connections database, Cumulative Index to Nursing & Allied Health Literature (CINAHL), MEDLINE database, Directory of Open Access Books (DOAB), Directory of Open Access Journals (DOAJ), EBSCO eBooks, Education Resources Information Center (ERIC), Health and Environmental Research Online, Library, Information Science & Technology Abstracts (LISTA), National Academies Press, National Bureau of Economic Research, National Center for Health Statistics, ProQuest Health & Medical Collection, ProQuest Nursing & Allied Health Database, PubMed Database, SAGE Journals, and U.S. Department of Health and Human Services statistics database. The keywords that were used in those

databases included *food insecurity, teenager opinion of food security, food chain management, food relationships, food pantry, food banks, adolescent dental procedures, adolescent root caries, root canals, oral health, and hygiene, access to health care, access to dental care, family income statues and level, socioeconomic impacts on adolescents, income status effects on adolescents, subjective social status in high school, subjective social status and income, adolescent independence and food choices, adolescents as food shoppers for the family, impacts of food security on dental health, family financial security level, finances, and operational management.*

Literature Review Related to Key Variables

All articles selected were in English, peer-reviewed, and no older than 2019. The only exceptions were the encyclopedia entries used to describe the framework for the study. The concluding number of articles was 73 articles. However, due to the repetitiveness of the information, it was decided to reduce the article number to 24. I felt that I reached saturation of the data and did not wish to degrade the study with an excessive number of articles that repeatedly mentioned the same information in different manners.

I used the NHANES. The database is created and maintained by the CDC and updated annually or in increments determined by the organization. A deep dive was conducted throughout this database. I studied the period from January 2017 to March 2020. This period offered the most conducive data that was not intertwined with the COVID-19 pandemic that hit the globe in April 2020. After the selection of the era, it was already decided that the population to study would be adolescents with an age range

of 13-19. As some of the references have shown, the development, maturation, and habit development that follow a person into adulthood begin at this critical time of a person's life. NHANES contains the variables that were used in the statistical analysis and research portion of this study. Those variables are HH FS category, family income level and status, oral health, and dentition, dental caries, and dental caries restoration, with controlling factors of sex and race.

Definitions

Adolescent: The chosen population for which the study was based and is utilized throughout to seek any associations between the variables.

Adolescent food insecurity: An interpretation or perception of FS levels that is gathered through survey data as reported by either an adolescent or an adult within the HH (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Paquin et al., 2021; Tucker et al., 2022).

Dental fear and anxiety (DFA): These are terms that are often conflated to describe diverse types of fear a person has when in a dental environment (Hedge et al., 2022; Sumita et al., 2022).

Familial income level and status: This can also be defined as socioeconomic status with a focus on income. This is the level or amount of income that is brought into the HH as it is earned by the people who work in the family (Rahal et al., 2020; Rivenbark et al., 2019; Rivenbark et al., 2020).

Healthy Food Availability Index (HFAI): The measurement used to identify the accessibility and availability of healthy food options within a food store for families in

that area with scores ranging from 0 to 28.5. The higher the score the higher the availability of healthy foods. (Biel et al., 2017, as cited in Mmari et al., 2019).

Health belief model: A public health model that was first created in the 1950s and has since evolved to allow researchers to use it in studies following the areas of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action (Boslaugh, 2022; Sumita et al., 2022).

National Health and Nutrition Examination Survey (NHANES): A program of studies designed to assess the health and nutrition status of adults and children in the United States (CDC, 2023).

Oral health: The preventative, management, and maintenance of the teeth, gums, and areas within the mouth which when not taken care of properly can lead to caries, diseases, cancers, and loss of teeth (Benzian et al., 2022; Hashemi et al., 2021; Ogwo et al., 2024).

Prepandemic era: The period that is denoted and used to reference the time before the official start of the global COVID-19 virus pandemic.

Self-scale: A pictorial scale used to measure the psychological sense of community and the inclusion of others (Aron & Aron, 1986; McMillan & Chavis, 1986 as cited in Neimeier & Fitzpatrick, 2019).

Subjective social status: The perceived status and local area inequality that may exist within a demographic like adolescence and can affect the self-scale of a person in that environment (Rivenbark et al., 2019; Rivenbark et al., 2020).

Assumptions

NHANES prepandemic era January 2017-March 2020 datasets were used in answering the research questions for this study. The secondary data were appropriate in that the information from sequential data from April 2020 to December 2023 contained influential information from COVID-19 that could skew the relevancy of the statistical analysis for adolescents and the impact of FS levels and familial income status on their oral health. The assumptions were that the datasets contained the appropriate random sample sizes, and appropriate samples needed, and the quality of the measurements has been assured by the reliability and validity of their uses by both the HBM and for a correlational research design. The population of adolescents between the ages of 13 and 19 was critical to this study in that they may predict the impact and institution of behavioral habits that could continue with them into their young adult stage of life and their later adult stages of life. These assumptions helped to lead the study in a manner that could predict the necessary components that are needed to be an independent and highly functioning adult.

Scope and Limitations

The literature review and analysis of the data within those found articles discovered that the population of adolescents can be studied when referring to FS levels, familial income levels and status, and dental healthcare. There is also sufficient evidence to support that access to nutrient-dense foods across income levels can affect the subjective social status as perceived by the same population (Hollis et al., 2020; Janda et al., 2022; Mmari et al., 2019). Consequently, there is no concrete evidence showing how

food selection and income level might be associated with the dental care and treatment of adolescents.

Furthermore, Neimeier and Fitzpatrick (2019) utilized the population to help solidify the reliability and validity of the information as teenagers report it. The normality of surveillance and reporting for any database has rested on the facts given to research teams by parents, guardians, or adults in the HH. The gap from this shows that the adults in the HH may not have as much time during the day with the teenagers as they once did when they were younger and needed their help to survive. A poignant part of Hazzard et al.'s (2022) study displayed that food insecurity and income levels have exposed adolescents to the probability of suffering from mental health issues, dietary disorders, and hunger due to compensation for low FS levels.

When investigating the dental healthcare issues that exist in the adolescent years, it was noted that the studies for this particular area were limited (Benzian et al., 2022). However, it did provide insight into the possible elements that may be caused by limited access to proper dental care. Of note, dental fear, and anxiety from past traumatic or preconceived notions about dental care, in parents, can be a major component of how often a child or adolescent receives care (Hedge et al., 2022; Sumita et al., 2022). It is because of this that Sumita et al. (2022) were able to connect the lack of care or apathy from college students when they studied how to suggest that preventative care or regular checkups would help maintain health in college students.

The limitations of this study rest in both the existing body of information and the data that was used to create the statistical analysis. The literature review emphasized that

each variable is documented and has studies that either show the intimate details of the public health issue or that the area needs more research. However, there has not been any literature found that supports the associations, if any, that exist for the three variables in a singular study. This known gap assisted as a determining factor in conducting the study to strengthen and further the conversation regarding dental care for adolescents and to add to the conversations regarding FS levels and familial income levels and status. Concurrently, the study is limited to the secondary data that were gathered through the NHANES database. That secondary data makes it necessary to note that there can be a limitation when data are self-reported, they can be skewed or produced in a manner to protect their family. The belief is that the collection, selection, and randomization of sample sizes are sufficient to enhance the possibilities of associations or disprove that any exist entirely.

Significance

The extent to which each variable is discussed provides the basis needed to ensure that a viable and well-developed research plan existed for this study. The exhaustive and extremely detailed backgrounds and studies for FS levels and familial income level and status cannot be understated. There are major implications for why those are so detailed and specific for their associated topics. The significance of dental care is understated and very limited in the studies that delve into the determinants that make it a public health concern. It is in that light that the need for studies about adolescent dental care and its associations with various other public health issues must be advanced to ensure that all groups of people are considered when creating interventions. Additionally, the necessity

to understand how parents approach dental concerns for their children is as equally important as the information provided to adolescents for them to recognize how they can care for themselves as they grow older. The information from this study adds a new conversation for public health professionals to utilize to advocate for policy changes or updates, programs, and interventions that can be generalizable or specific to communities or groups of people.

Summary

The use of the HBM is founded in its development through the constructs that were created in its inception in the 1950s to the six tenets as they exist today (Boslaugh, 2022; Sumita et al., 2022; Wang et al., 2022). Then the addition of utilizing a correlational research design created a solid foundation to which the study could develop into what is being presented. Namely, it rests on the use of statistics, behaviors, and other measurable and observable factors (Dziak, 2023). Therefore, the framework for this study has the structure needed to ensure that the information is not frivolous but instead is value-added to the conversation of oral health and dental healthcare for adolescents.

In the studies completed by Benzian et al., (2022) Hashemi et al., (2021), and Ogwo et al. (2024), they began the investigation into the global public health issue of oral health. They also presented data that showed that 45% of the world's population is affected by the lack of knowledge and lack of precedence for addressing dental healthcare issues among numerous communities. This equates to approximately 3.5 billion people who are untreated and need to have their dental concerns addressed appropriately. Furthermore, the numbers are not subsiding; they are growing and have

grown by approximately 1 billion people in the past 30 years (Benzian et al., 2022). To reemphasize why the use of the HBM was critical for this study, the possibility of aiding in the cues to action and self-efficacy constructs was essential to approach the concern. Providing communities and individuals with the proper methods and knowledge for oral health can minimize the need to seek acute dental care and can accentuate how preventative care leads to money saved and benefits to mental health and subjective social status.

Conclusion

The study aimed at seeking and showing any associations between FS levels, familial income level and status, and oral health care and dentition. The population selected to study was determined to be adolescents between the ages of 13 and 19. The reason for selecting this population was due to the implications, habit development, and concerns that may be presented through the adult decision-making process and how these teenagers will approach their care as young adults (aged 20-24). During this critical time of development, new behaviors and coping strategies become a defined portion of a person's repertoire in everyday life (Hazzard et al., 2022; Mmari et al., 2019; Neimeier & Fitzpatrick, 2019; Savoie-Roskos et al., 2019; Tucker et al., 2022). The thought exists that when the correct data are ascertained in a sound methodology and noninvasive to the chosen demographic, in turn, they will be put to use in an equally acceptable and noninvasive manner in their lives.

In the reviewed studies, the interventions include parental engagement, use of social media and technology, peer influence, and teacher involvement and influence

(Calderon et al., 2023; Hashemi et al., 2021; Hedge et al., 2022; Ogwo et al., 2024; Sumita et al., 2022; Wang et al., 2022). These interventions were innovative and specifically directed for the implementation and assistance of teenagers and adults in their lives. With the guidance and influence of the people who are already in their lives, the research teams were able to show that positive habits can be instituted and maintained. However, it is also important to present that Ogwo et al. (2024) stated that to properly account for positive behavior changes, it would take 5 to 10 years to see the results. Bearing that in mind, this study shows how the advancement of oral health and preventative care can add to scholarly conversations.

Section 2: Research Design and Data Collection

Introduction

As with any study, the variables were the first part that needed to be chosen, and the framework was built from there. Following the framework, it was also critical to ensure that the variables were unique in that they added to the scholarly conversation. In the case of this study, the limited literature and current studies regarding oral health were key elements for the selection of the three variables (Benzian et al., 2022; Hashemi et al., 2021; Ogwo et al., 2024). At this juncture, the variables were filtered down to socioeconomic status (SES) as it pertained to familial income status, FS levels for adolescents, and oral health and dentition in adolescents.

With the variables identified, it was then decided that obtaining data from a secondary source was necessary. It would have been highly time-consuming and extensive work to receive the required data points for an adequately executed study. Thus, secondary data were collected from the NHANES, where the information was already broken into datasets and converted to numbers, which then justified a quantitative study. Additionally, the theory needed to mesh well with the framework. In this instance, the HBM displayed the most viable elements that complemented the entirety of the study. Each of the discussed sections makes up what is needed to ensure that the survey is appropriately executed, adds to the scholarly conversation, and produces an extension of the existing data.

Research Design and Rationale

The variables offer the initial stage of the study development in that they point the study toward gaining new points of reference for public health professionals. The questions start by leading the study toward collecting quantitative data through a secondary source. In this study, the secondary source was the NHANES. NHANES is a database maintained by the CDC. It is the depository for all the data points collected during set periods that the CDC obtains through surveys, interviews, and focus groups throughout the United States. This study used the period annotated as the prepandemic era, with the dates ranging from January 2017 to March 2020. This period was chosen because it is possible that any surveys completed after March 2020 would also contain elements of the COVID-19 pandemic and might offer a skewed version of the data given the restrictions and illness from the virus. Therefore, that time frame allowed for a consistent set of activities and nuances for the selected population and their families to live as they usually do daily. In turn, the changes in lifestyle due to the COVID-19 virus were not a factor in the data inputs, outputs, and interpretation of those results for this study.

The theory that provided the most impact on this population and the associated data was the HBM. This value expectancy theory model analyzes the reasons and prohibitions in an individual's mind as to why they do not utilize various interventions (Boslaugh, 2022). In this case, it was used to ascertain the reasons for not utilizing oral health facilities and interventions to keep the children in families healthy. The HBM rests upon six tenets, which public health professionals use to determine the root cause of non-

use in a family's or individual's thinking process. Those tenets are perceived threats (susceptibility and severity), perceived barriers, perceived benefits, self-efficacy, and cues to action (Boslaugh, 2022). The model in Figure 1 shows how I sought to answer the research questions through data points in NHANES for the prepandemic era of January 2017 and March 2020.

Few studies have offered insight into the reasons for the potential lack of use or inability to get oral health care to teenagers or families (Benzian et al., 2022; Hashemi et al., 2021; Ogwo et al., 2024). However, there are some inclinations and studies that not only help illuminate oral health as a public health issue but also some of the potential barriers that adolescents face. Concurrently, the two variables of familial income level and FS levels might provide insight through any existing associations and their relationship to when a family decides that they must provide oral healthcare to their children.

Methodology

Population

The chosen population consisted of adolescents aged 13 to 19. The selection of this population stemmed from the possibility of expanding the research to not only that group but also to a young adult cohort between the ages of 20 and 25. As teenagers enter their newly acquired independence, several factors can influence their behaviors. These factors include social media, friends, peer groups, daily social interactions, and relatives (Hedge et al., 2022; Hollis et al., 2020). This moldable time in a person's life can assist in preparing them for a healthy adult life with positive behaviors that can span their lifetime.

However, there are also negative behaviors that adolescents may receive due to those same factors. One of the most pivotal secondhand experiences comes from their parents and their DFA. Parental DFA stems from the traumatic experiences in the parents' lives and then translates to their children (Hedge et al., 2022). This fear can lead parents to either avoid oral healthcare altogether or to independently conduct over-protection methods of early preventative dental care. Aside from those areas, it is also necessary to relate any possibilities of young adult behaviors to adolescents' social interactions.

When discussing familial income levels and the effects that they have on teenagers, it is vital to realize that although parents try to protect their children from what occurs at their level, it is not possible to stop subjective social status from happening (Kukkola et al., 2023; Rahal et al., 2020; Rivenbark et al., 2019; Rivenbark et al., 2020). Subjective social status is how the interpretation sees a person of others in their peer group. For teenagers, it happens while they are in school and at work. While in school, the children may be enrolled in food assistance programs that their classmates will be aware of and, therefore, will judge them for having to utilize them. The flip side is that the family may have to choose between feeding the whole family or getting an adolescent preventive or needed dental care (Giannoni & Grignon, 2022). In this light, it was critical to understand how the FS level plays into the families' SES and then falls into any association with their oral healthcare.

Sampling From CDC Database: NHANES

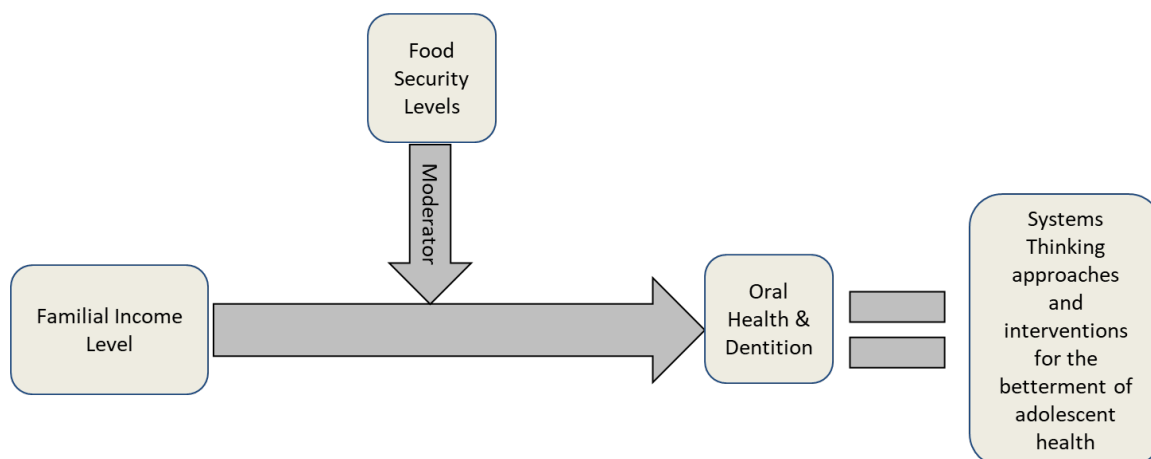
Selecting the proper variables from NHANES was crucial for the study and can aid in creating a new part of the oral health conversation in the public health arena. First,

the demographic data consisted of identifying and using the age range of 13 to 19, including all the nationalities of White, Black, Hispanic, and non-Hispanic. These were chosen due to the ability to have enough participants to create a viable dataset for testing. They were also categorized as the controlling factors for the study. The independent variables came from the HH FS category and family socioeconomic status (income). These two variables determined if there were any associations between them and oral health and dentition (dental caries, root caries, and treatments). The dependent variable was oral health and dentition, including dental caries, root caries, and subsequent treatments.

By implementing these three variables, they can directly answer the research questions. The first orientation analyzed familial income and HH FS levels to determine whether associations link them to oral health and dentition. The next set of calculations searched for correlations of familial income levels to oral health and dentition with HH FS levels as the mediator. All calculations included sex and race as the controlling factors. Figure 2 shows the framework for the research questions and their institution in SPSS version 29.0 to gather data and obtain outputs for the study (International [IBM], 2020).

Figure 2

Linear Regression Design for the RQs, Seeking Associations Between Income and Oral Health with a Moderator



Study Sample Size and Power Analysis

This study's sample size heavily relied on the information and datasets available in NHANES. Specifically, it was necessary to determine the sample size through the NHANES codebook, which is listed as Oral Health. I also cross-referenced the sample sizes in the FS and income codebooks. These additional datasets for the other variables helped to determine whether the sample sizes can be sufficient to calculate in SPSS and find the true significance of the data following calculations. Additionally, it can assist in providing the numbers into G*Power to obtain the power levels and determine how effective the sample size will be for the statistical tests (Bartlett, 2019; Faul et al., 2009). I found it necessary to determine the sample size for correlations between the independent variables and multiple linear regression. Figure 3 shows the distribution chart for the G*Power test that was run for the study and to assist with the research questions. It showed that there was an 80% chance of correctly rejecting the null

hypothesis of no difference between Group A and Group B correlations with 141 participants per group, or a total of 282 participants. Figure 4 shows the distribution chart for the multiple linear regression test. The minimum sample size is 68 with the parameters of effect size: 0.15, alpha at 0.05, power at 0.8, and number of predictors equaling 2.

Figure 3

*G*Power Calculation for Determining Sample Size for Correlations from Two Independent Pearson r 's Distribution Plot*

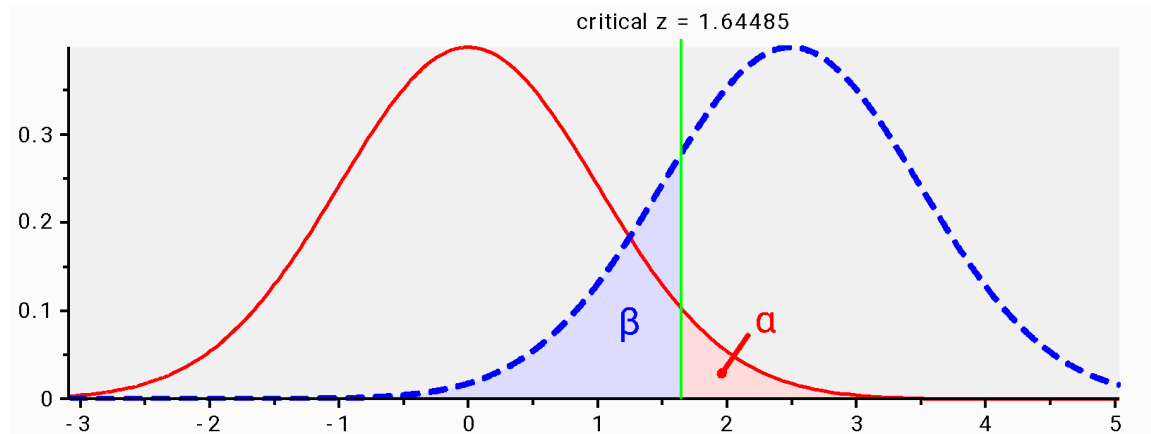
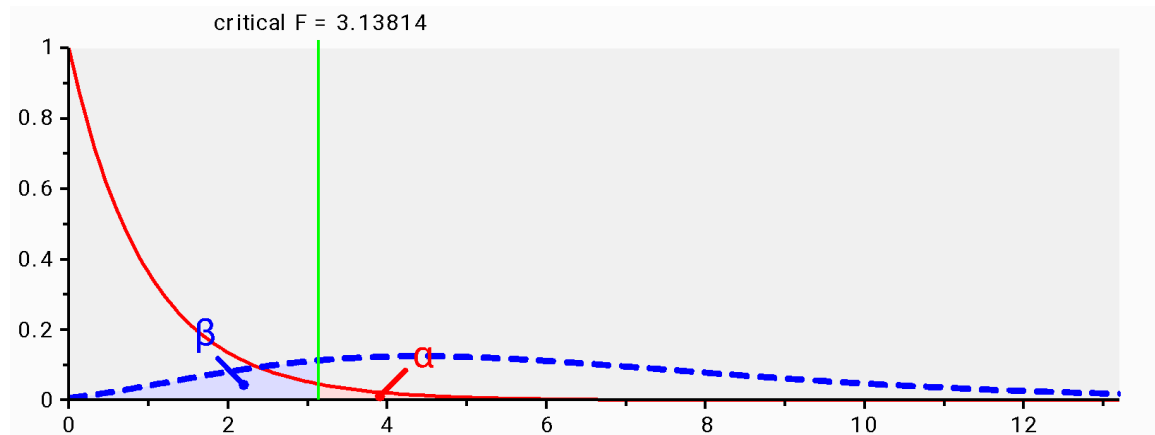


Figure 4

*G*Power Calculation for Determining Sample Size for Multiple Linear Regression with Two Predictors Statistical Test Distribution Plot*



Süt et al. (2022) stated that the sample size and power analysis are crucial to ensuring that the published work meets the criteria for a compelling study. Additionally, they noted that it helps to test the number of participants needed for a predetermined hypothesis or the power to find a relationship with the given sample size. This was an essential element for this study as well. Although NHANES has numbers and sample sizes already identified, the power analysis further strengthens or eliminates those numbers in their possible use in this study. They explained that the type of scientific study does not matter as conducting the power analysis is always beneficial because it helps conserve resources, time, and effort (Süt et al., 2022).

Operationalization of Variables

To correctly and efficiently utilize the selected variables, it was necessary to operationalize them by adding measurable properties to them. Because the associations sought to depend on oral health, I address HH FS levels in this section. The properties

considered were as follows: HH FS category, HH emergency food received, HH FS benefit received in the last 12 months, and HH FS benefit currently received. These properties helped identify how FS levels affect adolescents' day-to-day lives in the prepandemic era. The selection also showed the families currently utilizing nutritional assistance in the form of The Emergency Food Assistance Program (TEFAP) or other nutritional assistance programs from the federal government. It was optional to include properties focused on women or children as they do not fall within the age group identified for this study.

When including the familial income numbers in this study, NHANES is limited in that it only has two properties that can be used for this study. However, they were both used to help calculate the associations. The section includes an age range of 0 to 150 years and is further delineated by male and female. The two property sets include the family monthly poverty level index and monthly poverty level category. Both property sets were used as catalysts for the study. While executing the preliminary data searches, these two categories were sufficient to produce the information needed to complete the study. An additional property is found in the demographic data labeled ration to family income to poverty. If the power analysis determined that more data sets are needed, this property would have been added to the tests.

Finally, the most extensive data set comes from oral health and oral health and dentition. To keep within the limits of this study, it was necessary to ensure that the operationalization of the correct properties was used. The properties of oral health that need to be used include past years of needing dental care but not getting it, being unable

to afford the cost, being afraid or not like dentists, and being too busy. These properties offer a direct tie back to the elements that were discussed in the literature review, which included adult DFA and income barriers. Next, under oral health and dentition, the property categories include coronal caries: tooth count 2-31, coronal caries: surface condition 2-31, coronal caries: second restoration 2-31, root caries, root caries restoration, and dental sealants: 2-31. Each property category offers an in-depth look into the reasons for expanding the public health conversation regarding oral health. More data sets cover the recommendation for care and have more properties that could be used for this study. They include decayed teeth, gum disease or problems, and oral hygiene.

Statistical Tests and Interpretation of Results

The statistical tests were multiple linear regression for both research questions. The independent variables were the predictor variables that were input to determine if there was an effect from those two variables on the outcome variable of oral health in adolescents. Complementing the regression test included descriptive statistics, ANOVA, and Pearson's r correlation tests. These tests offered comparison tests for the variables and checked whether there was a correlation between cause and effect among the variables. The interpretation of the data was done in conjunction with APA 7 guidelines and through the rubric to ensure they are adequately presented in this study.

Threats to Validity

As a condition of the research study, it has been high on the priority list to ensure that all avenues of approach for the testing process are unbiased. However, as the end goal may be, it is only sometimes obtainable. As mentioned, this study relied on

secondary data gathered through the CDC's NHANES database from January 2017 to March 2020. This is also known as the prepandemic era. The CDC (2023, May 31) stated that the survey is conducted using a population of 5,000 people each year. The makeup of these people is that they live in 15 counties from across the country. It is noted that there is an over-sampling of the ages of 60 and older, African Americans and Hispanics, so there are reliable statistics (CDC, 2023, May 31). The surveys are conducted in the respondent's home, and the teams comprise physicians, medical and health technicians, and dietary and health interviewers.

The validity of the data comes from the limited number of 5,000 people who participated in the study. They can report for their entire HH, which can lead to questions about the strength of the data for adolescents. There can be some well-intentioned misreporting to protect the children in the HH and not avoid garnering unneeded or unwanted inquiries from other agencies. Coupled with that, the reporting may be skewed by the respondent in that they may elevate their circumstances in fear of reprisal or government interjection into their family.

Summary

To summarize this section, the research design and rationale were presented to display quantitative data that utilizes the HBM to develop any associations between the variables. The HBM helps create interventions when the associations are found and can present new avenues for informing communities on ways to get oral healthcare. Subsequently, adolescents need assistance developing meaningful and beneficial healthy habits to carry into adulthood. The interactions and conversations created through this

study can positively impact communities that can expand beyond current issues and influence the future. The proper implementation and operationalization of the variables into SPSS can provide viable data to create a well-articulated output for this research study. Even though there were some threats to the validity of the information within the study, it is not enough to impede the study from enriching the public health profession with an advancement in the oral health conversation.

Section 3: Presentation of the Results and Findings

Introduction

Population

Researching and selecting the most logical group and correct period was essential to ensure that the study would provide a well-rounded and new topic of discussion in the Public Health profession. It was also vital to seek a demographic that was not only susceptible to oral health issues but also not so far gone that interventions would need to be almost desperate. By that, it means that oral health issues may be at a point where surgeries and other interventions are the only recourse for saving the person's teeth. Therefore, the process landed on the adolescent group. I included the ages of 18 and 19. Although a smaller portion of the demographic, they represent the newly minted adults within society. Therefore, they have a fine mixture of adolescent and adult behaviors with attributes that can extend into the young adult population of 20 to 25.

Data Collection

This quantitative study aimed to identify associations between familial income status, FS levels, and oral health among adolescents aged 13-19 in the United States during the prepandemic era of January 2017-March 2020. Many implications were presented in the literature throughout the research leading up to the study. For instance, scholar-practitioners had sufficient evidence to equate the necessity for additional research for each variable: income status, food insecurity, and oral health (Gassman-Pines et al., 2023; Janda et al., 2022; Neimeier & Fitzpatrick, 2019; Sumita et al., 2022).

The oral health issues among people of all ages accentuated the vitality to learn and understand how familial income and FS levels affect adolescent teeth health.

This study used secondary data from NHANES to analyze the impacts of family income and FS levels on adolescent oral health issues. The data regarding oral health showed that necessary scholastic conversations needed to be extended to determine whether there were associations among the three. Specifically, some studies delve into the existence of adult DFA, which has the possibility of inhibiting the advancement of teenage oral health (Hedge et al., 2022). Calderon et al. (2023) discussed the importance of providing oral health messages to parents, guardians, and teenagers to help curb negative oral health patterns. At the same time, the extensive collection of studies covering income and FS levels did not reference oral health.

Subsequently, this study used the dependent variable of oral health, which were measured using the phrase, "Rate the health of your teeth." For this statement, the respondents were given a scale of one to five and annotated as 1-*excellent*, 2- *very good*, 3- *good*, 4- *fair*, and 5- *poor*. Additionally, the independent variables of familial income and FS levels were utilized similarly, with income being scaled into three levels on the family monthly poverty level category: 1-1.30, 2-1.30 < 1.85, and 3- > 1.85. The HH FS level was measured as follows: 1-HH full FS, 2-HH marginal FS, and 3-HH low FS. Control variables were instituted to maintain observed changes from the independent variables: age, sex, and race. The age control was set to the specified range for this study to avoid adding any other biases.

Results

Descriptive Results

The statistical analysis began in the second section of this study. In that area, it was necessary to obtain a G*Power calculation to determine the optimal number of participants that would be needed to efficiently produce values that show sizable and usable results (Bartlett, 2019). There were two separate calculations used to represent the linear and multiple linear regression models that were used to obtain the statistics for this study. Consequently, it was found that for a linear regression model, a minimum of 141 people in two groups were needed, which totals 282. Additionally, for the multiple linear regression model, a minimum of 68 people were needed for justifiable datasets. The assessment of the NHANES datasets showed that for both research questions, there were a total of 9993 respondents. Given those totals, the determination was made to utilize all the respondents to the surveys to maximize the results. These totals are found in Tables 1 and 4, and the table represents the descriptive values of the statistical analysis.

The study population was cleaned and is displayed in Table 1. The first datasets to be examined are the control variables of age, gender, and race. From the 15,560 adult respondents, there was a total of 1,740 adolescents who were reported to be among the families that were surveyed. The respondents that participated were represented in a fairly even number with 49.6% being male and 50.4% being female. This was advantageous to the study as it eliminated any possibility of bias with an even number of participants per gender group. Relating to the race of the adult participants a majority of the respondents were either non-Hispanic White or non-Hispanic Black (33.9% and

26.3% respectively). As a collective, the Hispanic groups were at a comparable number of 22.7%.

In breaking down the independent variables, it shows that the middle- and low-income families account for 13% and 41.7% with an accumulative total of 54.7%. It is also critical to note that the highest reported group is the low-income families. However, when looking at the data for HH FS levels, the low and very low FS categories only make up 14.7% and 8.5%. Additionally, the personal ratings given by respondents for their interpretations for the health of their teeth and gums have a poor rating equating to 6.9%.

The next figure (Figure 5) is a histogram that shows the mean and the standard deviation for the research questions and their calculations. Coupled with Table 1, it is shown that the data is symmetrical and displays comparable results. Analysis of Table 1 results shows that the data set meets the criteria identified through use of the G*Power analysis tool and has an even distribution of the population being surveyed. Alternatively, the use of a moderator in the model shows the median at 1.78 with a standard deviation of 1.05. This information shows that the spread is within approximately three standard deviations on each side of the mean.

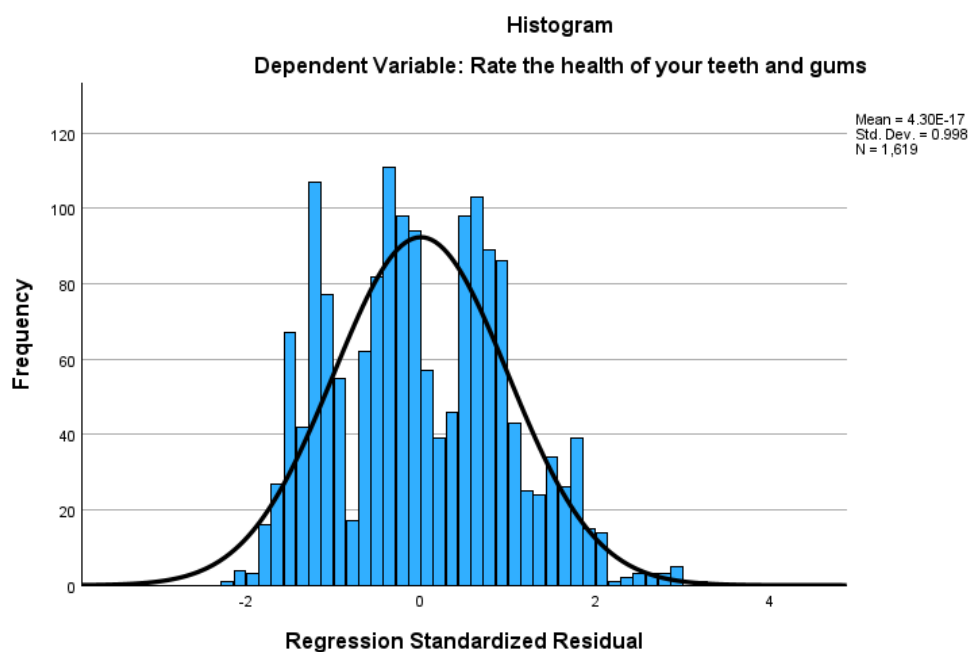
Table 1*Descriptive Statistics of the Study Population*

Variable	Frequency	Percent
Gender		
Male	7721	49.6%
Female	7839	50.4%
Age: Adolescents		
13-15 (258=1.7%, 286=1.8%, 233=1.5%)	777	5.0%
16-17 (248=1.6%, 254=1.6%)	502	3.2%
18-19 (234=1.5%, 227=1.5%)	461	3.0%
Race/Hispanic origin		
Mexican American	1990	12.8%
Other Hispanic	1544	9.9%
Non-Hispanic White	5271	33.9%
Non-Hispanic Black	4098	26.3%
Other race	2657	17.1%
Familial income level		
Monthly poverty level index = 1.30	5142	33.0%
1.30 < monthly poverty index = 1.85	2028	13.0%
Monthly poverty level index >1.85	6495	41.7%
Household food security category		
HH full food security	8668	55.7%
HH marginal food security	2197	14.1%
HH low food security	2289	14.7%
HH very low food security	1322	8.5%
Personal rating of teeth and gums health		
Excellent	3000	19.3%
Very good	3578	23.0%
Good	4684	30.1%
Fair	2631	16.9%
Poor	1081	6.9%

Note. N = 15,560

Table 2*Descriptive Data Table*

Variables	Mean	Std. Deviation	N
Rate the health of your teeth and gums	2.35	0.996	1619
Family monthly poverty level category	2.24	1.630	1619
Household food security category (moderator)	1.78	1.05	1619
Gender	1.48	0.500	1619
Adolescents	1.80	0.82	1619
Race/Hispanic origin	3.23	1.284	1619

Figure 5*Histogram and Descriptive Table for Research Questions*

Baseline Variables and Model Summary

To ensure that the dependent variable was compared to the proper independent variables, it was necessary to determine which variables would be used as the baselines for comparison. The baseline variables were identified as gender: male or female, race: Hispanic origin, HH FS category, family monthly poverty level category, and adolescents (aged 13-19). The age range had to be grouped as a dummy variable so that there would be no additional information from all the other age ranges within NHANES. The model summary in Table 3 shows the output of the statistical analysis. There is a strong relationship indication from the Pearson correlation (β) with the R showing a .043 and .269 for each of the research questions. Effectively, the R^2 further displays that there is little variance in the data as they show 0.002 and 0.072 for their associated datasets. Finally, the significance shows that there is a reliable predictability that the independent variables can predict the dependent variable with both calculations being at 0.083 and 0.000.

Table 3*Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.043 _a	0.002	0.001	0.996	0.002	3.003	1	1617	0.083
2	.269 _b	0.072	0.070	0.961	0.071	30.681	4	1613	0.000

a. Predictors: (Constant), Family monthly poverty level category

b. Predictors: (Constant), Family monthly poverty level category, Adolescents,

Gender=Female, Race/Hispanic origin, Household food security category

c. Dependent Variable: Rate the health of your teeth and gums

ANOVA Results

The results displayed in the ANOVA analysis sought to determine whether the regression and residual were statistically significant for the group mean. It is noted in Table 4 that the data output for model one is nonsignificant at a significance level of $<.083$. There is a statistically significant difference between groups as determined by one-way ANOVA ($F 1, 1617) = 3.003, p = <.083$; ($F 5, 1613) = 25.190, p = <.001$).

Table 4*ANOVA Results*

	Model	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Sig.
1	Regression	2.978	1	2.978	3.003	.083 ^b
	Residual	1603.450	1617	0.992		
	Total	1606.427	1618			
2	Regression	116.351	5	23.270	25.190	<.001 ^c
	Residual	1490.077	1613	0.924		
	Total	1606.427	1618			

a. Dependent Variable: Rate the health of your teeth and gums

b. Predictors: (Constant), Family monthly poverty level category

c. Predictors: (Constant), Family monthly poverty level category, Adolescents, Gender=Female, Race/Hispanic origin, Household food security category

Coefficient (β) Results for Both Research Questions

As a point of reference, the research questions will follow to display where the variables were derived from for the study.

Research Question 1: What is the association between socioeconomic status (income), FS levels, and oral health in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race?

Research Question 2: What is the association between oral health and socioeconomic status (income) when mediated by FS levels in adolescents (aged 13-19) during the prepandemic era (January 2017-March 2020) when controlling for sex and race?

The coefficient (β) table allows for the presentation of the data to describe how the independent variables assist or prohibit the advancement of the null hypothesis or the same for the additional hypotheses. In Table 4, the constant is the respondent's information for the "rate the health of your teeth and gums." The independent and dependent variables for both models expressed that there is a statistically significant trend for the values. In the model for Model 1, an example of the calculation illustrates the health of the teeth and gums = $2.409 - 0.094$. The interpretation of those numbers means that males with a value of zero are less likely to present with unhealthy teeth and gums. Alternatively, in the table for Model 2, the constant is the same. However, a moderator is introduced that takes the HH FS category and adds the FS level together. Therefore, the calculation for the constant = $2.027 + 0.188$.

The explanation of this follows the same principle as gender has in both models. The difference is that instead of a negative numeral, there is a positive numeral. Following that example, it is to say that the constant is positively affected by growing age in adolescents. A more fitting description can state that as a teenager grows in age, the health of their teeth and gums grows. To come to this conclusion, the age and gender were recoded to keep within the demographics and to clearly identify what the variables do to specific individuals. The remaining variables and breakdown follow the same principle in that the value of B and the statistical significance determine how the numbers interact and explain the data output from SPSS.

Table 5Coefficient (β) Results

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	95.0% Confidence Interval for B		
	B	Std. Error	Beta	t		Lower Bound	Upper Bound	
1	(Constant)	2.409	0.042		57.319	0.000	2.327	2.492
	Family monthly poverty level category	-0.026	0.015	-0.043	-1.733	0.083	-0.056	0.003
2	(Constant)	2.027	0.109		18.590	0.000	1.813	2.241
	Family monthly poverty level category	-0.005	0.015	-0.008	-0.316	0.752	-0.034	0.025
	Household food security category (moderator) Adolescents	0.175	0.023	0.183	7.442	0.000	0.129	0.221
		0.188	0.029	0.154	6.424	0.000	0.131	0.245
	Race/Hispanic origin	-0.083	0.019	-0.107	-4.448	0.000	-0.120	-0.046
Gender=Female	-0.094	0.048	-0.047	-1.960	0.050	-0.188	0.000	

a. Dependent Variable: Rate the health of your teeth and gums.

Summary

Data analysis is crucial to all studies in that it adds to the research that is conducted throughout a literature review. In the instance of this study, it was necessary to research, collect, analyze, and interpret the data as they were found in the NHANES database. This information is accessible in a quantitative form and allows for entry into SPSS for analysis. Concurrently, the data produced outputs that revealed that each of the variables were statistically significant in their relationship to the constant, “rate the health of your teeth and gums.” Therefore, a conclusion of disproving the null hypothesis was reached as the support from the data output helped in that decision. As an additional

aspect to that, it is ascertainable that each of the independent variables influences the respondent's description of the health of their adolescents' teeth and gums.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The advancement of this study has been resting on the shoulders of any associations that might exist between independent and dependent variables. The results in Section 3 allow for the interpretation and dissemination of the data outputs to assist in spreading the word about oral health among adolescents throughout the Public Health community. As scholar-practitioners, it is vital to include the community members and take notice of both society as a whole and the individualistic nature of a person's day-to-day life. The limitations and recommendations must look beyond the external and integrated approach. That thought process is not to say a complete negligence of the comprehensive approach but an inclusion of the nuances for individuals. This is where the HH FS level and income levels were essential to use as independent variables. The implementation of these areas added immense value to an additional look into oral health for adolescents.

Oral health can be a detailed yet broad subject and therefore that could be a reason there is very little data on it relating to studies. However, to fully understand the implications of oral health and the negative effects of limited care, the need for interventions is crucial at all levels. This means that the local, state, and federal levels must be open to restructuring the current policies. Concurrently, the officials must look at how the economy is affecting the way that families are spending their money in grocery stores. Furthermore, ascertaining if families obtain the skills to prepare food from scratch is another area that should be approached without offending any families.

Interpretation of Findings

Association of Oral Health to FS Level and Income

The information from Table 4 shows how the associations from the coefficients (β) interact with the dependent variable. The two variables (FS category and poverty level category) and the control variables (gender, race/Hispanic origin, adolescents) all presented as statistically significant to the results for the data input. For the first two control variables, gender and race both revealed a negative interaction with the dependent variable at -0.094 and -0.083, respectively. Moreover, the control variable for age (adolescents) bore a positive reaction at 0.188. As for the independent variables, there was a mixture of positive and negative interactions with the FS category showing 0.175 and the poverty level category at -0.005.

Further explaining the data, gender was input as 1 = *male* and 2 = *female*. The values for race/Hispanic origin went as follows: 1 = *Mexican American*, 2 = *Other Hispanic*, 3 = *Non-Hispanic White*, 4 = *Non-Hispanic Black*, 5 = *Other race - including multiracial*. The adolescent group was formed to recognize the set age ranges from 13 to 19 years old. The independent variable data description for HH FS level is as follows: 1 = HH full FS: 0, 2 = HH marginal FS: 1-2, 3 = HH low FS: 3-5 (HH w/o child) / 3-7 (HH w/child), 4 = HH very low FS: 6-10 (HH w/o child) / 8-18 (HH w/child). Next, the data description for the family monthly poverty level category is as follows: 1 = *monthly poverty level index < -1.30*, 2 = *1.30 < monthly poverty level index < 1.85*, 3 = *monthly poverty level index > 1.85*. Finally, the dependent variable of rating the health of your

teeth and gums showed as the following: 1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fair*, 5 = *poor*.

To interpret the data, I had to take a deep dive into the variables and make sure that the values given to each data set would line up to aid in negating or approving the null hypothesis. Each of the parameters that were outlined in the previous paragraphs allowed for a conclusion that the data was viable to create a result that led to the disapproval of the null hypothesis. Therefore, the output shows that Mexican American teenagers who are food insecure and whose family has limited income are more susceptible to having oral health issues. In this instance, research question one has associations between the independent and dependent variables presenting a need for interventions and policy measures.

Association of Oral Health and Income When Moderated by FS Level

The control, independent, and dependent variables for this research question remained mostly the same aside from the moderator. In this research question, HH FS level was utilized as a moderator between family monthly poverty level category and rate the health of teeth and gums. Being set up in SPSS, it was necessary to import both datasets for HH FS and poverty level categories to create a standardized value. From there, the linear regression was run to help find the outputs that could prove or disprove the null hypothesis. The data output for the datasets remained remarkably close to the results that were shown in Question 1. The calculations were shown as the following: gender = -0.094, race/Hispanic origin = -0.083, poverty level category = -0.005, adolescents = 0.188, and moderator = 0.0175.

Once again, the information provided in SPSS allows for a conclusion that the null hypothesis is negated. This provides the knowledge that there are associations between the variables and that the moderator had a positive influence on the overall relationship. Therefore, the results are virtually identical. However, given that the moderator was both statistically significant and with a positive output, high FS levels can improve a teenager's oral health. On the contrary, it also shows the opposite. The lower the FS level in an HH, the worse it will be for the oral health maintenance of the teenagers in that HH.

Findings From Literature to the Theoretical Framework

Calderon et al. (2023) provided a great example of how to implement and establish "cues to action" that are utilized in the HBM. The use of social media to influence preventative oral hygiene was ingenious. They approached the junior high students' demographic while distributing information through social media. In a related study, the use of the HBM discussed the fruition of preventative oral hygiene measures (Sumita et al., 2022). The researchers emphasized how mobile health can encourage and change the modalities of susceptibility, severity, and benefits to work in the community's favor. These studies supported the use of the HBM in this study. Subsequently, both referenced studies sought to reach self-efficacy among the test groups. Upon reaching a sufficient level, the interventions can be proven reliable and generalizable to other researchers and Public Health professionals.

Limitations of the Study

A major limitation revealed within this study is that the use of secondary data kept the information within the constraints of the survey conducted by the CDC through the NHANES database (see CDC, 2023). Another confounding factor to the secondary data from the CDC is that there is a break from March 2020 to August 2021. Also, the data for the current data set (2023) is not completed in that it is not available on the NHANES website. Therefore, there are gaps of 18 months with no data and an additional 2 years (August 2021 to August 2023) that are unavailable for analysis. Although this is not optimal to determine any current associations to the research for this study, the data set selected was the most optimal for use. Other limitations can produce some more areas of concern for future studies.

The review of the NHANES data noted that the survey is conducted using a random family selection and on an annual basis (CDC, 2023). The requisite for participation is an agreement by the parents, guardians, or adults in the HH to present the information to the CDC data collectors. This revelation leads to a limitation that all the data come from a singular source within the HH. These points can be diluted in that the adults may not understand their children for the status of the HH's income and FS levels. There is a gap in that there is no evidence that points to the way families utilize their money within a grocery store. A conflating issue is that no knowledge points to how the food is prepared in a HH. This issue may lead to a family buying and feeding their family with foods that are highly processed and easily heated up in a microwave or oven. Moreover, the limitation within the family structure of being unable to cook healthier

meals may show associations with a higher level of oral health among the children in the family.

Recommendations

Current Policy Status and Restructure

The current structure of the federal government's policy, located in the Farm Bill, for nutritional assistance, has been in deliberation since the most recent version expired in September 2023 (Jones, 2024; United States Department of Agriculture (USDA), n.d.a). This is highly discouraging regarding the fact that the programs have only continued by the request and requisition of extensions. It is currently being recorded that the budget is supposed to be enacted and agreed on by the beginning of fiscal year 2025. One of the points that must be considered for this study is the placement of the nutritional assistance programs in the Farm Bill and the distribution of programs like Supplemental Nutrition Assistance Program – Education (SNAP-Ed) throughout the states (USDA, 2024).

A factor that families must consider when utilizing nutritional assistance programs is the inflation rates that have been recorded in the past eight years. For the period noted in this study (January 2017-March 2020), the average inflation rate was approximately 1.9% (US Inflation Calculator, n.d.). Then looking at the rates for 2021 to the present day they averaged approximately 4.85% with the highest rate recorded in the year 2021 with a rate of 7%. Although the current rate is at 2.5%, the lowest it has been in 4 years, families may still be struggling financially and might still be working to catch up monetarily.

The current structure of the Farm Bill contains more than just the nutritional assistance program guidelines; it also includes other areas like conservation, disaster assistance, and farm loans for various activities (USDA, n.d.a.). This arrangement of the Bill does not leave much room for improvement or adjustment to the nutrition programs. The other measures and programs must all be debated and lobbied to meet the intent of their respective cohorts. In this light, developing a standalone Bill for the nutritional assistance programs would be beneficial. This would allow for the proper implementation and maintenance of the programs to grow and develop in a manner that can assist families without having to debate other topics.

Local, State, and Federal Public Health Initiatives

Looking at the information that is currently available, it is necessary to implement things at the state level that are provided by the federal government that can be passed on to the local governments. To accurately project the assets needed, the states must submit the forms correctly (USDA, 2024). The states must look at ways to maximize those programs by providing additional elements to those programs. Of note, SNAP-Ed provides program guides that include budgetary advice and cooking skills classes (USDA, n.d.b.).

The states can pass this information on to the local health departments and encourage the use and implementation of these resources in the communities as they fit. It should also be encouraged to deliver the information in a manner that will not offend caregivers or insult their monetary management or cooking skills. It can benefit families by knowing how to shop the outside portions of grocery stores. These areas are usually

fresh products that would require a good set of cooking skills. A way to present this to families is to deliver it to connect with all members of their family. The families can come together on one day of the week to prepare food for the week, to not allow food to spoil. They can then freeze the meals, then thaw and rewarm the food on the days they choose to eat them. As a result of this, families are not only building stronger bonds within their home structure, but they are also earning more quality time that can be spent with their family members.

Community Enrichment and Advancement

The goal of this study is to not only encourage movement in the area of oral health as a public health topic but also to ensure that communities are built with a solid foundation for progress. The state of Texas has many resources that the government has implemented and partnered with the federal government to get oral health information to communities (Barzel & Holt, 2023; Texas Health and Human Services, 2024, May 14). Barzel and Holt (2023) compiled several programs that exist throughout the Nation which could be gleaned from, and similar programs can be developed in other states. An important aspect to take into account is whether or not schools and local agencies are aware of the information. For instance, do schools access these resources and add them to the curriculum within their system to help children and adolescents learn how to take care of their teeth? Similarly, the state of Texas (2024) has a lot of valuable oral health information on its publicly accessible website. It also breaks the ages of children into categories which can help parents determine what ways to approach their children about teeth care.

Another approach is for the local government officials to seek out and engage the community leaders within their city or town. The involvement of these leaders will not only grant access to the specific communities but also give clarity to the true nuances that exist and can remove the assumptions that may exist in the policy development process. The beauty of this relationship is that it can also help to create ways of approaching other public health issues in those same neighborhoods. Overall, the goal needs to be to encourage and facilitate the empowerment of self-reliance and self-awareness in each individual and family. These personalities may already exist within the fabric of the separate communities, and they can spread valuable information to their neighbors and other families in other parts of the city or town.

Implications for Professional Practice and Social Change

Researchers

During this study's research and literature review, the most prominent and impactful information came from studies that outlined oral health issues but also discussed the lack of research on the same topic (Benzian et al., 2022; Calderon et al., 2023). Therefore, I found it incredibly inspiring to continue the scholarly conversation in the hope that it will develop further research. The fact that Ogwo et al. (2024) took the issue and looked towards teaching and creating prevention measures that can help with oral hygiene also solidifies the need for more research. It is a strong desire to assist families in learning how to prevent and care for themselves.

Public Health Professionals

As professionals in any field, it is easy to get lost in the day-to-day operations and the status quo that occurs from repetition. It is here where the scholar-practitioners in the Public Health field must continue to think outside of the box and find the areas that need attention in their communities. Regarding this study, the literature review revealed a need to engage and create new ways to advance the oral health conversation. It goes beyond the chosen demographic in this study. It is assumed that young and older adults have continued with behaviors and habits that they learned or did not learn as children or adolescents. Those elements can produce negative effects on a person's oral health. Therefore, a deeper look must be taken to establish where and when those negative behaviors began to manifest. From that recollection, Public Health professionals can find engagement tactics that will improve their areas while being generalizable for communities throughout the country and eventually, the world.

Positive Social Change

This study introduces an opportunity to not only improve the field of Public Health by seeking more studies regarding oral health but also by teaching transferrable skills to communities. When thinking about the independent variables, adults need the tools to know how to manage their budget while instilling healthy food habits for their children. A major factor for this is to learn and understand the constraints that families who have a limited budget and how they control those resources. A partner point of this is to help families learn how to shop for whole foods that are either unprocessed or completely natural. Then the conflating aspect is to realize that there are people who do

not know how to cook. It is critical to find ways to approach these elements in a manner that encourages growth, both personal and community holistically. The thought process, which was described earlier, is to empower families while bringing them together with learning. Then the ultimate benefit is that when teaching budget skills, grocery shopping strategies, cooking skills, time management plans, and oral health tactics, communities will be getting time back for family events and quality time.

Conclusion

In this study, I sought to find associations between the independent variables of FS levels and familial income levels as they relate to oral health in teenagers. It was found that there are associations between each of the variables and the influence each of them has on oral health. Specifically, the lower the FS level and the higher a family is within the poverty level category, the more likely it is that teenagers and children can be impacted. To ensure that this study can have an impact on communities, families, and individuals is yet to be seen but the optimism of continuing the need for more oral health conversations is high. The information in this study has brought about a new appearance of the oral health issue in adolescents. It is also framed so that the conversation can continue with studies for the young adult demographic aged 20 – 25.

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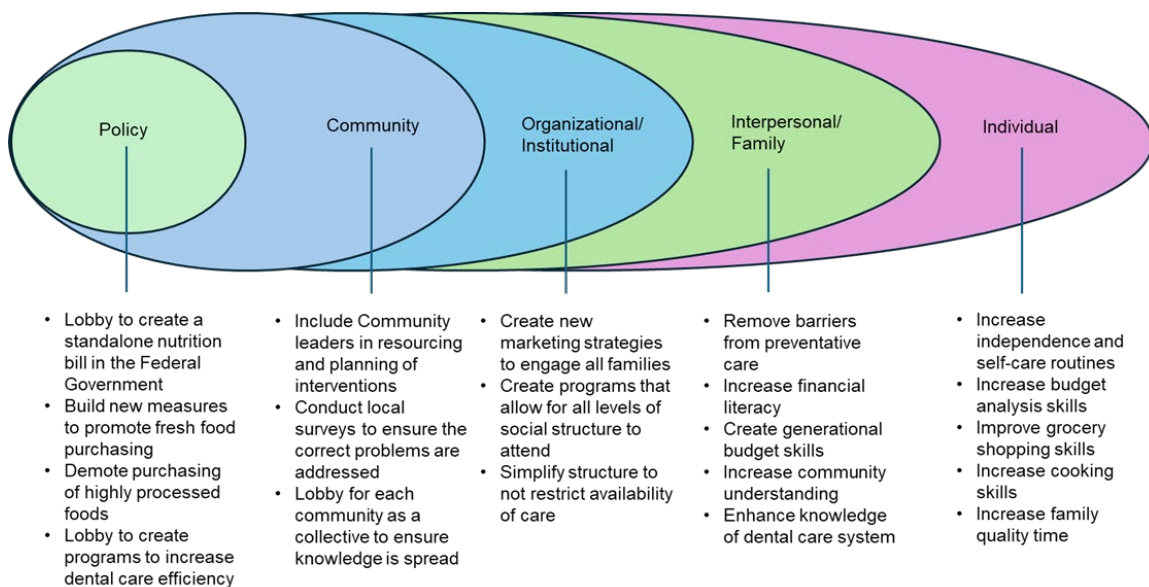
Appendix A: Policy Brief Memo

Chewing Through Oral Health

Throughout our society, there exist groups or individuals who are uncomfortable with going to receive dental care. Subsequently, this less than desirable action can be passed down to their children. These levels of discomfort can be reminiscent of past experiences or from hearing about the bad experiences of others in their social circle. Due to this, it is important to present the ways that dental care has developed and that traumatic events should not prevent them from taking their children for care. In other words, the vitality of changing the narrative must be approached in a new manner. Primarily, preventative measures do not always include regular dental visits, although those are critical as well. However, by changing the focus of teeth and oral care to habitual methods of buying healthier foods. To approach this method, there is a requirement for officials at all levels of government to present the message the proper way.

Community leaders must be highly involved within their neighborhoods so that the proper concerns are presented to local and state leaders. Those interests are what the individual and families see as the most important areas for the care of their children. Therefore, lobbying for a standalone nutrition bill that can emphasize or empower families to shop for less-processed foods and more nutrient dense foods can help change the tide of oral health. The bill will also need to emphasize how to maximize the financial means that middle to lower economic level families work with daily. It can also adjust current food and budget education to help families adjust.

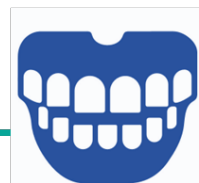
Appendix B: Intervention Plan Framework



Appendix C: Facts Sheet

Take A Bite Out of Oral Health Problems

Recent studies show a need to engage families regarding their teeth and oral health habits that influence their teenagers' lives. Some of the findings showed that income level and food security levels can also cause additional oral health concerns. By learning about preventative care measures, budgetary, and food management, it is possible to reduce the negative effects on teenagers as they grow into adulthood.



Do You Know ?

57% of teens in the United States lack any knowledge about proper teeth and oral care. This leads to dental and root caries. It can also lead to tooth loss (Calderon et al., 2023; Wang et al., 2022).

Influencing Factors



Low Family Income



Negative Budget Management



Energy Dense Food



What Is a Proper Diet?



Little to No Cooking Experience

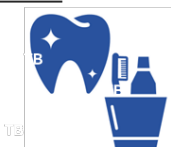


Lack of Time

In case of any of questions or severe oral or dental issues call or visit your nearest dental clinic



Methods to Improve Oral health



Oral Health Knowledge

- Preventative Care



Avoid Foods that Ruin Teeth

- Sugary and Processed Foods

Changes to Make at Home



Manage Adult Dental Fear and Anxiety (DFA)



Foster Healthy Habits



Connect Family with Community



Learn About Dental Programs

PAST TRAUMATIC DENTAL EXPERIENCES

Not only negatively affect adults but also their children.

Approaches to Helping Your Family



Utilize Federal Nutrition Programs

- SNAP, SNAP-Ed, Food Banks



Better Diagnostics & Treatments

- Regular checkups reduce dental caries



Treatment for Adolescents

- Develop habits that last throughout adulthood



Education of Dental Care

- Can help manage DFA and create realistic expectations