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Examining Perceived Stress and Diet Quality Among Low-Income Families Engaged with a Nutrition-Based Food Assistance Program

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Abstract

Introduction: Evidence suggests poor-quality diets and high levels of stress have negative impacts on health, especially in low-income families in the southern United States. Nutrition-based food assistance programs were developed to meet nutritional needs of food insecure clients. The purpose of this scholarly project was to explore the relationship between perceived stress and diet quality among low-income families engaged with a nutrition-based food assistance program.

Methods: A retrospective and observational design was used to analyze previously collected survey responses from clients participating in a nutrition-based food assistance program in Nashville, TN ($N = 425$). Descriptive statistics and Spearman's correlation were used to explore relationships between the variables of fruit intake, vegetable intake, Perceived Stress Scale-4 (PSS-4) score, and total number of visits to the nutrition-based food assistance program from change between pre- and post-survey responses ($n = 120$).

Results: The mean change in fruit intake was 0.16 ($n = 119$) and the mean change in vegetable intake was 0.08 ($n = 119$). A negative correlation was found between change in fruit intake and change in PSS-4 score ($r_s = -.182$; $p = .053$), as well as change in vegetable intake and change in PSS-4 score ($r_s = -.026$; $p = .786$).

Conclusion: As found in other studies, diet quality for low-income families improved with consistent access to free healthy foods. PSS-4 scores also declined with increased engagement with a nutrition-based food assistance program. Further research should explore perceived stress and diet quality during a non-pandemic year.

Examining Perceived Stress and Diet Quality Among Low-Income Families Engaged with a

Nutrition-Based Food Assistance Program

According to the United States Department of Agriculture (USDA), approximately 13.8 million people in the United States reported food insecurity in 2020 (USDA Economic Research, 2021). Food insecurity, defined as a lack of consistent access to nutritionally adequate and safe foods by socially acceptable means, is not only a nutritional concern but is also correlated with poor health outcomes and increased health care spending (Bazerghi et al., 2016; Berkowitz et al., 2019; Lombe et al., 2016). In response to food insecurity, public and privately-owned food banks and pantries have been supporting people in need for over 50 years in the United States (Wetherill et al., 2019). Despite these efforts, food insecurity continues to impact cardiovascular, psychological, and general health (Berkowitz et al., 2019). The prevalence of people experiencing food insecurity has increased during the COVID-19 pandemic, making access to nutritious food an immediate priority for low-income populations (Wolfson & Leung, 2020).

To meet the needs of people experiencing food insecurity, food banks and pantries traditionally provide shelf-stable items, which are typically more processed and less nutritious than fresh foods (Wetherill et al., 2019). Nutrition-based food assistance programs differ from traditional food banks by providing access to high-quality, healthful, and often fresh foods (Elbel et al., 2015; Knoblock-Hahn et al., 2017). Additionally, nutrition-based food initiatives promote health through nutritional education and enhance self-efficacy by allowing clients to choose from a variety of nutritious foods (Bazerghi et al., 2016; Bush-Kaufman et al., 2019; Cantor et al., 2020; Elbel et al., 2015). In the 1960s, the federally sponsored Food Stamp Program, now called the Supplemental Nutrition Assistance Program (SNAP) shifted its focus to meet the nutritional needs of its clients, of which 53% reported food insecurity (Leung et al., 2015; Rivera et al.,

2019). Similarly, other non-governmental food assistance programs now offer healthy options by supplying fresh fruits and vegetables (Knoblock-Hahn et al., 2017; Sharma et al., 2017).

Many factors shape diet quality, such as stress, socioeconomic status, cost of foods, and health status (Laraia et al., 2017). Before the COVID-19 pandemic, 12.2% and 9.3% of adults in the United States met the USDA fruit and vegetable intake recommendations, respectively (Lee-Kwan et al., 2015). Early in the COVID-19 pandemic fruit and vegetable intake decreased as stress levels increased due to job losses, shut-downs, stay-at-home orders, and unexpected homeschooling (Shen et al., 2020). School nutrition programs, which normally mitigate child food insecurity, were interrupted during the COVID-19 pandemic, creating a gap in meeting the nutritional needs of low-income children (Patten et al., 2021). School lunch programs continued to serve school-aged children by delivering food to their homes, providing an essential service to low-income families (Patten et al., 2021).

Problem Statement

The economic climate of the COVID-19 pandemic has increased the number of people relying on external sources for food as an estimated 38% of people in the United States are experiencing food insecurity compared to 11-12% for the previous five years (Wolfson & Leung, 2020). According to a June 2020 survey, approximately 73.6% of Americans reported moderate to high levels of stress during the global crisis (Shen et al., 2020). Stress and diet choices impact health outcomes by increasing the risk of cardiovascular, cerebrovascular, and neoplastic disease (Sofi et al., 2014; Yaribeygi et al., 2017). Studies have explored barriers to implementing healthy and fresh foods at food assistance programs (Leung et al., 2013; Wetherill et al., 2019), whereas other studies have explored the relationship between stress and diet (Grenen et al., 2018; Shen et al., 2020). However, limited research exists that examines the relationship between stress and

diet quality among low-income families engaged with nutrition-based food assistance programs, specifically in the southeastern United States. Such research will add to existing evidence on the importance of access to healthy foods for all people, specifically in a region with high prevalence of diet-related chronic diseases (Lee-Kwan et al., 2015). Furthermore, data reflecting perceived stress and dietary choices of low-income families during the COVID-19 pandemic are needed to better understand food insecurity through the context of a global crisis. The relationships between perceived stress, dietary intake, and engagement with a nutrition-based food assistance program will also provide valuable feedback to food assistance programs in the United States.

Purpose

The purpose of this Doctor of Nursing Practice scholarly project was to explore the relationship between perceived stress and diet quality in low-income families engaged with a nutrition-based food assistance program in Nashville, TN. An additional purpose of this project was to examine perceived stress and diet intake of low-income families during the COVID-19 pandemic.

Research Questions and Hypotheses

This project explored the following research questions: 1) What is the relationship between perceived stress and fruit and vegetable intake among low-income families engaged with a nutrition-based food assistance program; 2) What is the relationship between total number of visits to a nutrition-based food assistance program and fruit and vegetable intake among low-income families; 3) What is the relationship between total number of visits to a nutrition-based food assistance program and perceived stress among low-income families?

In an attempt to answer these research questions, the following hypotheses were considered: 1) There is an inverse relationship between perceived stress and fruit and vegetable

intake among low-income families engaged with a nutrition-based food assistance program; 2) There is a positive relationship between total number of visits to a nutrition-based food assistance program and fruit and vegetable intake among low-income families; 3) There is a negative relationship between perceived stress and total number of visits to a nutrition-based food assistance program among low-income families.

<div align="center">**Review of Evidence**</div>

Relationships among food insecurity, psychological stress, and diet quality have been explored in the context of low-income populations (Grenen et al., 2018; Laraia et al., 2017; López-Cepero et al., 2020; Oddo & Mabli, 2015). A review of the literature yielded evidence of the health impacts of food insecurity and diet quality, the relationship between stress and diet quality, and barriers to healthy eating, with several studies described in the global context of the COVID-19 pandemic.

Health Impact of Diet Quality and Food Insecurity

The health impact of uncertain access to high quality food extends beyond poor nutritional status to physical and psychological health conditions (Gundersen & Ziliak, 2015). More precisely, Gundersen and Ziliak (2015) reported that food insecure adults were more likely to have depression, poor sleep, diabetes, hypertension, and hyperlipidemia. Additionally, food insecure children were more likely to experience cognitive problems, asthma, anemia, anxiety, depression, poor oral health, and behavioral problems (Gundersen & Ziliak, 2015). Along with these health conditions, those who reported food insecurity spent an average of $1,834 more per year on healthcare than their food secure counterpart (Berkowitz et al., 2019). In a meta-analysis exploring the benefits of Mediterranean diet, which consists of mostly fresh fruits and vegetables, legumes, and fish, Sofi et al. (2014) found nutrient-rich foods were essential to

maintain a healthy weight and reduce risk of mortality from cardiovascular, cerebrovascular, and neoplastic diseases.

Compared to other areas of the United States, the Mid-South region of Tennessee, Alabama, Mississippi, Louisiana, Kentucky, and Arkansas had higher rates of chronic diseases, lower income, higher unemployment, lesser healthcare coverage, and fewer preventative health behaviors (Oates et al., 2017). Based on data from the Behavioral Risk Factor Surveillance System, people in the Mid-South consumed less fruit and vegetables and had greater incidence of chronic health conditions than those in the non-Mid-South (Oates et al., 2017). Leung et al. (2014) also described low-income, food insecure adults as more likely to develop diet-sensitive chronic diseases, such as gestational diabetes, obesity, and type two diabetes. Those with annual income <$25,000 in the Mid-South were also more likely to suffer from obesity, cancer, myocardial infarction, high blood pressure, asthma, chronic obstructive pulmonary disease, diabetes, and depression (Oates et al., 2017). Greater than 29.6% of adults in Louisiana, Mississippi, Kentucky, Alabama, and Tennessee had multiple chronic diseases, such as diabetes or hypertension (Ward & Black, 2016). The repercussions of poor health outcomes related to geographical location and limited access to healthy foods further emphasized the need to remove barriers to healthy eating for low-income populations (Oates et al., 2017).

Diet Quality and Stress

A literature review by Yaribeygi et al. (2017) revealed that stress has an impact on brain function, memory, and cognition, along with function of the cardiovascular, immune, and gastrointestinal systems. Stress has both harmful and beneficial effects in differing circumstances; however, chronic stress has been associated with atrophy of brain mass through the reduction of dendritic branches and neurons (Yaribeygi et al., 2017). Both chronic and acute

stress can lead to poor cardiovascular health and impaired immune function (Yaribeygi et al., 2017). Severe stress has been found to lead to malignancy through its suppression of the immune system by way of decreased activity of cytotoxic T lymphocytes and natural killer cells (Yaribeygi et al., 2017). Low-income families are disproportionately faced with high levels of stress due to financial constraints and limited power over their circumstances (Richardson et al., 2015). Other potential stressors faced by low-income families include persistent systemic discrimination and inequities, living in unstable housing or difficulty accessing affordable medical care (McKnight-Eily et al., 2021). The negative physiological impact of stress and poor diet gives merit to an exploration of their relationship in low-income families engaged with a nutrition-based food assistance program (Yaribeygi et al., 2017).

The association between diet choices and stress was explored in the literature, with poorer quality diets found in those experiencing higher levels of stress (Leung et al., 2013; López-Cepero et al., 2020; Oddo & Mabli, 2015). More specifically, higher levels of stress and participation in food assistance programs were associated with lower intake of fruit and vegetables (Grenen et al., 2018; Leung et al., 2013). According to López-Cepero et al. (2020), food insecurity and perceived stress were associated with emotional eating among Latinos in the United States. Emotional eating was described as a response to internal feelings that leads to intake of nutrient-poor foods, often high in sugar, fat, salt, and calories (López-Cepero et al., 2020). Similarly, Leung et al. (2013) found those who participated in SNAP reported higher levels of psychological stress than their non-SNAP counterparts. Another supporting study found that women receiving assistance from Special Supplemental Nutrition Program for Women, Infants, and Children, demonstrated higher rates of uncontrolled and emotional eating (Richardson et al., 2015). With the use of Cohen's 14-question Perceived Stress Scale,

Richardson et al. (2015) also found that severe obesity was positively associated with stress. From a sample of 800 adults in the United States, Shen et al. (2020) found decreased intake of fruits and vegetables was associated with higher stress during the COVID-19 pandemic. Similarly, a national survey by Grenen et al. (2018) observed an inverse relationship between fruit and vegetable intake and stress related to lack of consistent food sources.

Eating Habits in Low-Income

Barriers to healthy eating found in the literature included limited access, poor cooking skills, inadequate storage, minimal preparation time, lack of self-efficacy, and hedonics (Grenen et al., 2018; Mc Morrow et al., 2017; Wetherill et al., 2019). The COVID-19 pandemic created additional barriers to healthy eating and physical activity, and in 2020, 16 states reported at least 35% of adults were considered obese compared to 12 states in 2019 (Warren et al., 2021). A national survey revealed food insecurity was independently associated with higher consumption of salty snacks, high-fat dairy products, sugary beverages, and processed meat (Leung et al., 2014). Oddo and Mabli (2015) also found that SNAP participants reported higher intake of poor nutrient foods, such as sugary beverages and red meat. In a systematic review, Bazerghi et al. (2016) found food bank clients desired more fruits, vegetables, dairy, meats, and culturally appropriate foods. Though Bazerghi et al. (2016) found that food insecure people desired nutritious foods, a survey of SNAP participants revealed that 13-22% of low-income adults in the United States did not meet any food and nutrient guidelines (Leung et al., 2014).

Leung et al. (2013) interviewed experts and leaders from SNAP to identify means to provide nutritious options for food insecure clients, and suggestions included increasing nutrition education, improving the SNAP retailer environments, and enhancing nutritional policies. Nutritional policies at food assistance programs include providing financial incentives to

purchase nutrient-rich foods, restricting purchase of poor nutrient foods, and enhancing

education about nutrition to clients (Leung et al., 2013). Wetherill et al. (2019) interviewed 30

food bank executives within the Feeding America network, the largest private network of food

banks in the United States, to determine barriers to providing fresh fruits and vegetables to food

insecure clients. Using qualitative measures, Wetherill et al. (2019) found emerging themes of

community-based nutrition education, enhancing access and storage of healthy foods, building

healthier food inventory, and expanding community partnerships for healthy food distribution.

Nutritional education, strong nutritional policies, partnerships within communities, and creating

an environment that promotes healthy eating were common means by which diet quality could be

improved for low-income populations (Leung et al., 2013; Wetherill et al., 2019).

Theoretical Model

The Health Belief Model explores interactions between factors that influence and hinder

the uptake of preventative health behaviors and provides a framework for examining the

relationship between perceived stress, diet quality, and total number of visits to a nutrition-based

food assistance program (Janz & Becker, 1984; Rosenstock, 1974). Originally developed to

examine motivations for people to receive free tuberculosis screenings, the Health Belief Model

explains stimuli and barriers to acceptance of recommended health behaviors (Rosenstock,

1974). The constructs of the Health Belief Model include *perceived susceptibility*, *perceived

severity*, *perceived benefits*, *perceived barriers*, *cues to action*, and *self-efficacy* (see Figure 1;

Laurenhan, 2013). Researchers have used the Health Belief Model as a tool when studying

factors influencing health behaviors and self-management of health conditions. For example, the

Health Belief Model was used in a sample of patients with diabetes to examine self-care

predictors, such as likelihood of medication compliance and checking shoes as an element of

diabetic foot care (Dehghani-Tafti et al., 2015). Furthermore, a recent study by Wong et al.

(2020) applied the Health Belief Model to determine how likely someone would be willing to

receive the COVID-19 vaccine and their willingness to pay for a dose of the vaccine in Malaysia.

Perceived susceptibility and *perceived seriousness* comprise the perceived threat a person

feels about a disease (Rosenstock, 1974). *Perceived susceptibility* is the personal and perceived

vulnerability to a specific medical condition or to illness in general (Janz & Becker, 1984). In the

context of a nutrition-based food assistance program, *perceived susceptibility* may refer to the

degree to which low-income families believe they are at risk of cardiovascular disease, obesity,

neoplastic disease, or cerebrovascular disease (Sofi et al., 2014). *Perceived seriousness* refers to

an individual's belief of how severe the possible illness is, such as the impact and long-term

effects of a stroke or myocardial infarction (Janz & Becker, 1984). Both *perceived seriousness*

and *perceived susceptibility*, when elevated, may increase the likelihood that a person will uptake

a recommended health behavior (Rosenstock, 1974). For example, if a person's family member

dies from cardiac arrest after a myocardial infarction, they may feel more susceptible to

developing cardiovascular disease and recognize the associated risks, increasing the likelihood

they will eat fresh fruits and vegetables to reduce their own risk.

Another construct in the Health Belief Model is *perceived barriers*, or negative aspects of

adopting a health behavior, which in this project may include cost, time, hedonics, perceived

stress, and reliance on food assistance programs during the COVID-19 pandemic (Janz &

Becker, 1984). Conversely, *perceived benefits* include the ways in which a health behavior may

improve one's life, such as eating more fruits and vegetables could lead to weight loss or lower

blood pressure (Janz & Becker, 1984). *Perceived benefits* are considered along with the

perceived barriers and together impact likelihood of adopting a preventative health behavior

(Rosenstock, 1974). Perceived stress, as explored in this study, can serve as both a barrier and a motivator to eat more fruits and vegetables depending on the source of stress. Poverty is associated with toxic stress, which is when someone experiences a biological response to prolonged or unmediated stress (Brisson et al., 2020). Low-income families face unique stressors including limited access to nutritious foods, inadequate housing, minimal local healthcare, and poor-quality schools (Brisson et al., 2020). A person experiencing toxic stress may be less likely to adopt a new health behavior, such as eating fresh fruits and vegetables, because they lack ample preparation time or are unable to afford fresh fruits and vegetables (Brisson et al., 2020; Shen et al., 2020). Alternatively, if a person is experiencing high levels of perceived stress due to the loss of a loved one from a myocardial infarction, they may experience beneficial stress which motivates them to improve their health through a diet rich in fruits and vegetables.

The constructs of *cues to action* and *self-efficacy* directly increase the likelihood of adoption of a recommended health behavior when they are present (Janz & Becker, 1984). *Cues to action* stimulate a person to make a change or participate in a health behavior, such as a food assistance program providing consistent access to free, healthy foods to low-income families (Janz & Becker, 1984). Nutrition education through cooking demonstrations and recipe cards given at nutrition-based food assistance programs serve as *cues to action* to promote nutritious dietary intake. *Self-efficacy* is the confidence one has in their ability to complete a health behavior, such as the process of accessing, preparing, and eating fruits and vegetables (Janz & Becker, 1984). When *self-efficacy* is high, there is a greater chance the person will uptake a new behavior, because they believe in their ability to execute the change. The Health Belief Model serves as a foundation for understanding perceptions and uptake of preventative health behaviors in low-income individuals and families (See Figure 2; Janz & Becker, 1984; Oates et al., 2017).

Project Design

A retrospective longitudinal observational design was used in this study through an analysis of secondary data obtained by a family focused program, which serves low-income families receiving services at the nutrition-based food assistance program located in Nashville, TN. Optional standardized surveys were offered to eligible low-income families in three-month intervals for a duration of 18 months from March 2020 to September 2021. The surveys included a variety of questions about dietary intake, perceived stress, education, employment, and other demographic information. The responses to these questions were used to explore relationships between total number of visits to the nutrition-based food assistance program, perceived stress, and daily fruit and vegetable intake.

Study Setting

Data for this study originated from clients enrolled in the family-focused program at the nutrition-based food assistance program. Opening in March 2020, the nutrition-based food assistance program sought to meet the nutritional needs of local food-insecure families and individuals in Nashville, TN. The family-focused program is a partnership between the nutrition-based food assistance program and a local university to provide case management, free counseling, financial management assistance, food demonstrations, exercise programs, medication management, and music therapy to families who qualify for a state-based grant, focused on a whole-family approach to building strong families.

Located in Nashville, the nutrition-based food assistance program is within one mile of zip code 37203, which encompasses the Edgehill and Music Row neighborhoods. The median household income for residents of the Edgehill and Music Row neighborhoods was $28,651 in 2019, during which the Federal Poverty line was $16,910 for a two-person household or $25,750

for a four-person household (Office of the Assistant Secretary for Planning and Evaluation,

2021; United States Zip Codes, 2021). Additionally, 32% of residents of zip code 37203 were

unemployed and 15% of residents' highest level of education was less than a high school

diploma in 2019 (United States Zip Codes, 2021). The unique location of the nutrition-based

food assistance program in proximity to low-income and less educated individuals and families

was strategic as the plan was to provide services to vulnerable and in-need populations of

Nashville.

The nutrition-based food assistance program was designed to provide a traditional

grocery shopping experience by offering clients choices of fresh produce, dairy, and other

ingredients, with limited processed foods. The food assistance program also provided cooking

demonstrations and recipe cards to promote the consumption of fresh fruits and vegetables. The

grocery store model was altered between March 2020 and July 2021 to comply with COVID-19

pandemic health guidelines and clients instead received pre-filled bags of groceries. Clients were

referred to the nutrition-based food assistance program by local healthcare partners, community

resource organizations, and human rights associations.

Project Population

A purposive sampling strategy was used to select 120 individuals from low-income

families in Nashville, TN, from a total of 425 families enrolled in the family-focused program

within the nutrition-based food assistance program who agreed to complete at least one survey.

The population estimate for Metro-Nashville Davidson County is 694,144, which is comprised of

56.3% white alone, 27.4% black alone, 10.4% Hispanic or Latino, 4.0% Asian alone, 0.5%

American Indian alone, 0.1% Native Hawaiian alone, and 2.5% reported Two or More Races

(United States Census Bureau, 2021). About 89.1% of Nashville residents have at least

completed high school and although the median household income for residents of Nashville, TN, is $60,388, about 12.6% of Nashville residents have annual income below the federal poverty line (United States Census Bureau, 2021). Prior to the COVID-19 pandemic, an estimated 79,290 or 11.5% of people in Davidson County were food insecure (Feeding America, 2021). In April 2020, about 15.8% of Tennessean adults were unemployed, but as the economy re-opened during the pandemic, that rate has fallen each month, and in September 2021 the state unemployment rate was 4.4% (TN Department of Labor & Workforce Development, 2021). Although the unemployment rate was high in April 2020, beginning March 26, 2020, Emergency Cash Assistance provided two monthly cash payments to families who were employed as of March 11, 2020, and had since lost a job or at least 50% of their income due to the COVID-19 pandemic (TN DHS, 2020). Eligible Tennessee families were able to receive $500 for households with two or fewer persons, $750 for three to four persons, and $1000 for five or more persons in addition to any unemployment benefits they may have been receiving (TN DHS, 2020).

To register for food assistance at the nutrition-based food assistance program, families were required to show documentation of any of the following: TennCare or Medicaid health insurance, food stamps, Electronic Benefit Transfer card, Temporary Assistance for Needy Families, Supplemental Security Income, disability, unemployment, Housing and Urban Development or Metropolitan Development and Housing Agency housing vouchers, child on free or reduced lunch, W-2 income form indicating income below the federal poverty level, termination letter from employment, or paystubs showing income below the federal poverty threshold. Exclusion criteria for this project were grant-eligible families receiving services at the nutrition-based food assistance program who chose not to enroll in the family-focused program

and families who only completed the pre-survey. The pre-survey was provided in both Spanish and English, but the post-survey was only offered in English to English-speaking individuals. Completion of surveys was optional and did not preclude receiving services or food from the nutrition-based food assistance program, and each adult household representative gave consent for their de-identified responses to be used in research studies.

Data Collection Instruments

Survey questions used for this study were developed and collected for the family-focused program to meet reporting requirements for a grant. In addition to demographic data, the survey questions about perceived stress, daily fruit intake, and daily vegetable intake were used for this study. The two questions regarding diet quality originated from the 2020 Expanded Food and Nutrition Education Program (EFNEP) by Murray et al. (2017). The diet quality questions addressed the number of times the respondent ate fruit and vegetables per day and responses were reported using a six-point Likert scale ranging from rarely to four or more times per day. The EFNEP food and physical activity questionnaire has been nationally tested and is published online for public use (Murray et al., 2017). Bradford et al. (2010) tested the EFNEP questionnaire for reliability ($\alpha = .72$) and conducted a Spearman correlation for nutrition ($r_s = .20$) and though the validity had a low correlation coefficient, it was consistent with similar instruments and studies.

To evaluate perceived stress, four questions were included in the survey comprising the Perceived Stress Scale-4 (PSS-4) by Cohen et al. (1983). Questions on the PSS-4 assessed the frequency with which the participant feels they can control important things in their lives, have confidence in their ability to handle personal problems, feel things are going their way, and are able to overcome piling difficulties. Two of the four questions are reverse scored and higher

scores out of 16 are associated with more stress (Cohen et al., 1983). The PSS-4 is the abridged version of the PSS-14 and though the PSS-4 has less internal reliability ($\alpha = .72$) than the PSS-14, it can be useful in large samples and shows acceptable validity when compared to similar tools (Cohen et al., 1983). The American Sociological Association owns the copyright for the PSS-4 and granted permission for its use in the analysis of the secondary data, but requires additional permissions be obtained prior to publication. Since completion of the project, ownership of the copyright for the PSS-4 scale was transferred to Sheldon Cohen. Permission for publication of the PSS-4 scale was not granted without a fee. See "A Global Measure of Perceived Stress" by Sheldon Cohen (1983) for the complete scale. Total numbers of encounters at the nutrition-based food assistance program per household were recorded by staff members.

Survey Collection Process

During the modified curbside pick-up model at the nutrition-based food assistance program, clients were expected to park in a designated location upon arrival for food assistance. After parking, each family was asked to report the number of persons in their household to determine the number of servings of fruits, vegetables, and other foods they were to be given. If eligible families chose to participate in the family-focused program, they were given a printed survey to complete by pen or pencil while bags of groceries were loaded into their car. One adult from each household responded to survey questions as individuals and answered demographic questions about their family.

Data Retrieval

On September 1, 2021, the program evaluator retrieved the secondary data from the period of March 2020 to August 30, 2021, through an application of specific filters using Qualtrics software. Qualtrics (2021) is an online cloud-based database designed to securely

house and store survey information with password protection. The program evaluator for the

nutrition-based food assistance program was the only individual with access to identifiable data

collected from survey responses. Filters used by the program evaluator excluded survey

questions not being studied in this project. Data obtained included fruit intake responses,

vegetable intake responses, PSS-4 responses, demographic information, and timestamps of visits

to the nutrition-based food assistance program. Demographic information included education

level, race/ethnicity, employment status, number of adults in the household, number of children

in the household, and gender. Prior to sending the exported data, the program evaluator de-

identified the data to eliminate any risk of identifying the clients by assigning each individual

and each household a separate 14-digit alphanumeric code. The unique code assigned to each

family allowed for aggregate data regarding total number of visits to the nutrition-based food

assistance program, PSS-4 scores, and fruit and vegetable intake responses. Additionally,

demographic and encounter data were extracted, de-identified by the program evaluator, and

securely shared with the principal investigator (PI).

Data Analysis

Specific statistical analyses for these data included examining the relationship between

change in PSS-4 score from the first to second completed surveys, change in fruit and vegetable

intake from the first to second surveys, and total number of visits to the nutrition-based food

assistance program. The Statistical Package for the Social Sciences version 28 software was used

for statistical analyses (IBM Corp, 2021). A Spearman's correlation was used to examine the

relationship between the scale-level variable change in PSS-4 score out of 16 and the ordinal-

level variables of change in fruit and vegetable intake. For the second research question, an

additional Spearman's correlation was conducted to explore the relationship between the scale-

level total number of visits to the nutrition-based food assistance program and scale-level change

in PSS-4 score. For the third research question, a Spearman's correlation was also used to

examine the relationship between the scale-level variable of total number of visits to the

nutrition-based food assistance program and ordinal variable of change in daily fruit and

vegetable intake. Additional descriptive statistics were conducted to describe demographic

groups, number of persons in each household, education levels, occupational statuses, and the

research question variables. An additional analysis was conducted using the same variables and

research questions with only those who visited at least 20 times between March 2020 and August

30, 2021.

Risks and Benefits to Humans Subjects

Subjects involved in this scholarly project did not incur any harm or risk. Belmont

University's Institutional Review Board granted exempt status for this project in April 2021.

Results

Demographic Characteristics

Sociodemographic characteristics of the 425 participants in the family-focused program

are presented in Table 1 ($N = 425$). Of the 425 participating households, 120 families ($n = 120$)

were included in the Spearman's correlation; 301 were excluded from the statistical analysis due

to only completing the pre-survey and four were excluded due to incomplete data or the presence

of outliers for a total of 305 excluded respondents ($n = 305$). One respondent included in the

statistical analysis did not provide demographic information ($n = 1$). For participants who

responded to multiple surveys and provided demographic data ($n = 119$), 77.3% were female and

22.7% were male. Of the total family-focused program participants, 22.0% had four or more

children in their household, compared to 30.2% of those who completed more than one survey.

Additionally, 9.2% of households included in the statistical analysis had four or more adults in

the household ($n = 11$) compared to 5.6% of those excluded ($n = 17$). About three-fourths of the

included participants were unemployed (74.8%; $n = 89$), similar to 74.5% of the total family-

focused program survey participants. The highest level of education for about one-third of

participants included in the statistical analysis was less than a high school diploma (30.2%; $n =$

36) and similarly 27.2 % ($n = 83$) of families excluded. Black/African American was the most

represented race/ethnicity in those who responded to multiple surveys (63.9%, $n = 76$).

Individuals who reported Hispanic ethnicity in the inclusion group, who completed multiple

surveys, represented 16.8% ($n = 20$) versus the exclusion group of 28.2% ($n = 86$).

Descriptive Statistics

Descriptive statistics for the research variables of fruit intake, vegetable intake, PSS-4

score, and total number of visits are found in Table 2. Change between the first and second

survey completed was calculated for fruit intake, vegetable intake, and PSS-4 score to explore

engagement with the nutrition-based food assistant program. The mean fruit intake was 3.99 for

the first survey and 4.15 for the second survey, with a mean change of 0.16 ($n = 119$). The mean

vegetable intake response was 4.24 for the first survey and 4.32 for the second survey, with a

mean change of 0.08 ($n = 119$). The mean PSS-4 score was 7.51 for the first survey and 7.44 for

the second survey, with a mean change of -0.07 ($n = 114$). The standard deviation for the change

in PSS-4 score was 2.953. The mean total number of visits was 20.16, the median was 16.00, and

the standard deviation was 14.683.

Spearman's Correlation of Variable Relationships

See Table 3 for results of Spearman's correlation analysis of each research question,

examining the relationships between PPS-4, fruit intake, vegetable intake, and total number of

visits to the nutrition-based food assistance program. One participant ($n = 1$) did not complete the questions regarding fruit and vegetable intake and five participants ($n = 5$) did not provide responses to each of the four questions of the PSS-4. Using Spearman's correlation, change in daily fruit intake and change in PSS-4 score had a weakly negative correlation ($r_s = -.182$) with non-statistically significant results ($p = .053$). Change in vegetable intake and change in PSS-4 score were also weakly negatively correlated ($r_s = -.026$) with non-statistically significant results ($p = .786$). Change in daily fruit intake and total number of visits to the nutrition-based food assistance program had a negative correlation without statistical significance ($r_s = -.040$; $p = .670$). Change in vegetable intake and total number of visits had a weak positive correlation without statistical significance ($r_s = .103$; $p = .267$). Change in PSS-4 score and total number of visits had a weakly negative correlation ($r_s = -.114$; $p = .226$).

Secondary Analysis of Participants with Greater than 20 Visits

A secondary analysis was conducted exploring variables of fruit intake, vegetable intake, PSS-4 score, and total number of visits, in individuals with at least 20 visits to the nutrition-based food assistance program. A total of 54 ($n = 54$) out of 119 survey participants visited the nutrition-based food assistance program 20 or more times during the 18-month study period. See Table 4 for descriptive statistics of the secondary analysis group. For this group, the mean number of visits was 33.96, the median was 35.00, and the standard deviation was 9.660. The mean first survey PSS-4 score for all individuals completing multiple surveys was 7.51 compared to those who visited at least 20 times with a mean first survey PSS-4 score of 8.83. Additionally, the mean change in PSS-4 score between the first two surveys was -0.07 in the full group included in statistical analyses and -0.5 in those who visited at least 20 times.

See Table 5 for the Spearman's correlation results of the secondary analysis group. Among those that visited at least 20 times, a weak negative correlation was found between change in fruit intake and change in PSS-4 score ($r_s = -.272$; $p = .051$). A minor positive correlation was seen between change in vegetable intake and change in perceived stress ($r_s = .057$; $p = .690$). Between fruit intake, vegetable intake, and PSS-4 score with total number of visits were very weak positive correlations ($r_s = .033$, $r_s = .169$, and $r_s = .122$, respectively) with no statistical significance.

Discussion

Findings from this scholarly project add to existing literature exploring relationships between stress, diet quality, nutrition-based food assistance programs, and food insecurity among low-income families in the United States (Grenen et al., 2018; Laraia et al., 2017; López-Cepero et al., 2020; Oddo & Mabli, 2015). The longitudinal nature of this scholarly project provides a comparison of baseline data with subsequent survey responses during a period of engagement with a nutrition-based food assistance program. The sample of over 400 families who participated in the family-focused program provides evidence of the interest in and need for a holistic nutrition-based food assistance program in middle Tennessee. This scholarly project additionally discovered valuable demographic information about low-income families in need of food support in Nashville.

Stress and Diet Quality

The results from this scholarly project confirmed the hypothesis that there was an inverse relationship between perceived stress and fruit and vegetable intake among low-income families engaged with the nutrition-based food assistance program, though results were not statistically significant. Whereas previous studies involving clients of food assistance programs found higher

levels of stress were associated with lower intake of fruits and vegetables, the opposite was found in this project (Grenen et al., 2018; Leung et al., 2013; Shen et al., 2020). Food assistance programs serving nutritious foods may have a greater capacity to impact the overall diet quality and stress levels of their low-income clients compared to traditional foodbanks. Emotional eating was found to be a common barrier to healthy eating among low-income SNAP participants (Richardson et al., 2015). Shen et al. (2020) similarly described barriers to adopting recommended health behaviors for people experiencing high levels of toxic stress.

The full group of survey respondents ($n = 119$) had a lower baseline PSS-4 score of 7.51 compared to a PSS-4 score of 8.83 in respondents who visited at least 20 times ($n = 54$). It is possible that those with greater food insecurity had higher levels of stress, confirming findings by Grenen et al. (2018). About 65.1% of households participating in SNAP reported food insecurity when beginning the program, which may indicate that those who have less food insecurity may be less likely to consistently utilize a food assistance program (Keith-Jennings et al., 2019). Additionally, counter to what was hypothesized, there was a weakly positive correlation between PSS-4 score and vegetable intake among survey respondents who visited the nutrition-based food assistance program at least 20 times, though not statistically significant. Potentially, those who visited at least 20 times had greater overall needs and more confounding stressors in addition to food insecurity, such as unstable housing, discrimination, or lack of access to medical care, as found by McKnight-Eily et al. (2021). It is also possible that those with greater need had less means and time with which to prepare the food provided, such as slicing tools, storage space, cooking devices, and time to prepare the vegetables, as found by Shen et al. (2020).

Total Visits and Diet Quality

As hypothesized, a positive relationship was also found between total number of visits to a nutrition-based food assistance program and vegetable intake among low-income families, though results were not statistically significant. Evidence has shown the impact of a diet rich in vegetables, legumes, and fruits on reduction of risk of cardiovascular, cerebrovascular, and neoplastic diseases, which gives practical significance to this finding (Sofi et al., 2014). The Mid-South region has higher rates of chronic diseases, such as type two diabetes, and obesity, which further give meaning to the importance of risk reduction through preventative measures, such as access to fruits and vegetables (Oates et al., 2017). Additionally, people in the Mid-South with income <$25,000, which would qualify for services from the nutrition-based food assistance program explored in this scholarly project, display higher rates of cancer, high blood pressure, and myocardial infarction (Oates et al., 2017). However, a weakly negative relationship was found between fruit intake and total number of visits, which may have occurred due to the contextual setting of the COVID-19 pandemic, during which emotional eating increased (Shen et al., 2020). Shen et al. (2020) found that ignoring internal hunger cues and foods high in fat and sugar were more likely to be consumed due to low cost and convenience.

In the group with only the survey participants who visited the nutrition-based food assistance program greater than 20 times ($n = 54$), a weakly positive relationship was found between number of visits and fruit intake, though results were not statistically significant. Of note, the average baseline daily fruit intake was 3.99 in those who completed two or more surveys, as compared to 3.96 in only those who visited the nutrition-based food assistance program at least 20 times. As described by Cantor et al. (2020), diet quality improved with access to free healthy foods, and the additional element of nutrition education through recipe cards and cooking demonstrations may have led to improvement in diet quality. Different from

findings reported by Elbel et al. (2015) who saw no diet change after implementation of a

government-subsidized supermarket in a high-need area, diet overall improved for participants in

this scholarly project. Furthermore, the referral system through which clients were notified of the

services of the nutrition-based food assistance program may have increased the likelihood of

uptake.

Total Visits and Stress

As predicted in the hypotheses, a negative relationship was found between perceived

stress and total number of visits to a nutrition-based food assistance program among low-income

families, though results were not statistically significant. These findings confirm findings of a

study by Oddo and Mabli (2015), which described how increased engagement with a nutrition-

based food assistance program was correlated with a decrease in perceived stress. However,

unlike the hypothesis, for participants with 20 or more visits, a positive relationship was found

between engagement with the nutrition-based food assistance program and PSS-4 Score, though

results were not statistically significant. As mentioned previously, those with greater need for

and reliance on external food sources may have had stressors beyond what could be impacted by

a consistent nutritious food supply. Yaribeygi et al. (2017) explored stress in the human body

and its negative impacts on cardiovascular health and immune function and Shen et al. (2020)

found that stress was associated with emotional eating.

Health Belief Model

Principles from the Health Belief Model describing the influence of perceptions on

uptake of recommended health behaviors provided a framework for interpreting results from this

scholarly project. Perceived stress may have been a *perceived barrier* to consistently eating fresh

fruits and vegetables, and as stress decreased, intake of fruit and vegetables increased. Those

who visited the nutrition-based food assistance program at least 20 times had higher levels of

baseline stress compared to those who visited less than 20 times, which confirms findings by

Grenen et al. (2018) that resource stress may be correlated with worse diet quality. Those with

longer duration of need for services at the nutrition-based food assistance program also had

higher stress and therefore may have been more likely to rely on external sources for nutrition.

The overall increase in fruit and vegetable intake, or the health behavior of interest, was

correlated with overall decreased stress and increased engagement with a nutrition-based food

assistance program. *Self-efficacy*, or the confidence that one can consistently access, prepare, and

eat the recommended servings of fruits and vegetables, was not easily measured in this project,

but would provide a strong foundation for future research. The *cue to action* or stimulating

factors to encourage a person to uptake a health behavior like the nutrition-based food assistance

program, was found to increase healthy eating through the overall increase of fruit and vegetable

intake (Janz & Becker, 1984). The nutrition-based food assistance program explored in this study

promoted *self-efficacy* through cooking demonstrations and recipe cards to further increase the

uptake of a high-quality diet among low-income clients.

Limitations and Future Directions

One major limitation to the findings from this study was that the post-survey was only

offered to those who indicated ability to understand English. The demographic data of

participants of the family-focused program who completed at least one survey revealed that

25.0% of participants identified as Hispanic, however only 16.8% of those who completed at

least two surveys identified as Hispanic. López-Cepero et al. (2020) found an association

between perceived stress and emotional eating among Latinos, and it would be helpful to

determine the relationship between perceived stress and diet quality. Hispanic adults reported

higher rates of psychological stress related to food security than other racial groups in a study by McKnightley et al. (2021). Data should be examined in a sample that speaks Spanish, English, and other languages with the pre- and post-surveys offered in each associated language. Further research should additionally explore perceived stress and diet quality among clients of nutrition-based food assistance programs stratified by race and ethnicity.

The COVID-19 pandemic also created a historical bias, influencing stress levels and dietary intake, as evidence revealed an increase in stress levels globally and worsened diet quality (Shen et al., 2020). It is likely that stress levels for many different populations fluctuated during the 18-month data collection period due to loss of employment, strain on essential workers, remote learning, and fewer meals provided by schools. However, the sample from this scholarly project demonstrated an overall decrease in stress between the first and second visits to the nutrition-based food assistance program, as was hypothesized. Having consistent access to free nutritious food and decreased stress may improve the overall health of low-income families in the South, who typically have more chronic diseases associated with elevated stress (Oates et al., 2017). For a deeper understanding of the relationship between diet and stress, an additional study should be repeated during a non-pandemic year. Obtaining data of the presence of chronic diseases among low-income families engaged in a nutrition-based food assistance program would also add further meaning.

The nutrition-based food assistance program was designed to normalize the grocery experience and provide nutritious fresh fruits and vegetables to low-income persons. Due to health protocols to protect clients and staff during the COVID-19 pandemic, the grocery store experience was changed to a curbside pick-up model for families. The element of self-efficacy, which was found to be desired based on studies of other nutrition-based food assistance

programs, was limited due to COVID-19 health policies (Bazerghi et al., 2016; Bush-Kaufman et al., 2019; Cantor et al., 2020; Elbel et al., 2015). Self-efficacy is also an important factor in the Health Belief Model as a characteristic found in those who successfully participate in a health behavior.

Variability was found in the total number of visits to the nutrition-based food assistance program during the 18-month data collection period. Inconsistency was also seen in length of time between surveys completed, though they were each completed at least three months apart. Data collected from March through June 2020 was entered into and stored in an electronic database on June 17 and 18, 2020, creating additional difficulties in determining the exact date of the first survey. Consistent data collection every three months would lend to more consistent evaluations of variables of stress and diet quality. Further studies should aim to store and collect data more consistently, having participants complete the surveys as close to every three months as possible.

Implications

Results from this scholarly project have implications for policymakers, clinicians, dieticians, public health professionals, and food assistance program leaders. Clinical significance was found in the overall increase in fruit and vegetable intake and decrease of stress for low-income families engaged with a nutrition-based food assistance program. The potential impact of promoting the intake of fresh fruits and vegetables could be transformational for low-income families in the South, who are at increased risk of severe chronic diseases. Making it a priority to support, fund, and refer low-income clients to nutrition-based food assistance programs could decrease overall healthcare spending and improve the health of children and their parents.

Conclusion

Overall, this scholarly project contributes to existing research and suggests that there may be a correlation between diet quality, perceived stress, and engagement with a nutrition-based food assistance program. Despite the previously discussed limitations, this scholarly project provides a platform for future studies with nutrition-based food assistance programs to consider stress and diet quality, as the health impact can be significant. With existing literature supporting the intake of an adequate amount of daily fresh fruits and vegetables, it is essential to continue to support efforts to make a high-quality diet possible for all people, regardless of income, location, or education level. Further research is needed to better understand the complex relationship between stress and diet quality among low-income families engaged with a nutrition-based food assistance program.

References

Bazerghi, C., McKay, F., & Dunn, M. (2016). The role of food banks in addressing food

   insecurity: A systematic review. *Journal of Community Health*, *41*(4), 732-740.

   https://doi.org/10.1007/s10900-015-0147-5

Berkowitz, S. A., Basu, S., Gundersen, C., & Seligman, H. K. (2019). State-level and county-

   level estimates of health care costs associated with food insecurity. *Preventing Chronic

   Disease: Public Health Research, Practice and Policy, 16.*

   https://doi.org/10.5888/pcd16.180549

Bradford, T., Serrano, E. L., Cox, R. H., & Lambur, M. (2010). Development and testing of a

   nutrition, food safety, and physical activity checklist for EFNEP and FSNE adult

   programs. *Journal of Nutrition Education and Behavior*, *42*(2), 123–130.

   https://doi.org/10.1016/j.jneb.2008.11.005

Brisson, D., McCune, S., Wilson, J. H., Speer, S. R., McCrae, J. S., & Calhoun, K. H. (2020). A

   systematic review of the association between poverty and biomarkers of toxic stress.

   Journal of Evidence-Based Social Work, 17(6), 696-713.

   https://doi.org/10.1080/26408066.2020.1769786

Bush-Kaufman, A., Barale, K., Walsh, M., & Sero, R. (2019). In-depth qualitative interviews to

   explore healthy environment strategies in food pantries in the western United

   States. *Journal of the Academy of Nutrition and Dietetics*, *119*(10), 1632-

   1643. https://doi.org/10.1016/j.jand.2019.05.010

Cantor, J., Beckman, R., Collins, R. L., Dastidar, M. G., Richardson, A. S., & Dubowitz, T.

   (2020). SNAP participants improved food security and diet after a full-service

supermarket opened in an urban food desert. *Health Affairs*, *39*(8), 1386-

1394. https://doi.org/10.1377/hlthaff.2019.01309

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress.

Journal of Health and Social Behavior, 24(4), 385-396. https://doi.org/10.2307/2136404

Dehghani-Tafti, A., Mazloomy Mahmoodabad, S. S., Morowatisharifabad, M. A., Afkhami

Ardakani, M., Rezaeipandari, H., & Lotfi, M. H. (2015). Determinants of self-care in

diabetic patients based on health belief model. *Global Journal of Health Science*, *7*(5),

33–42. https://doi.org/10.5539/gjhs.v7n5p33

Elbel, B., Moran, A., Dixon, L. B., Kiszko, K., Cantor, J., Abrams, C., & Mijanovich, T. (2015).

Assessment of a government-subsidized supermarket in a high-need area on household

food availability and children's dietary intakes. *Public Health Nutrition*, *18*(15), 2881-

2890. https://doi.org/10.1017/S1368980015000282

Feeding America. (2021). *Food insecurity in Davidson County before COVID-19.*

https://map.feedingamerica.org/county/2019/overall/tennessee/county/davidson

Grenen, E., Kent, E. E., Hennessy, E., Hamilton, J. G., & Ferrer, R. A. (2018). Association

between nutrition resource stress and dietary consumption: Results from a US nationally

representative survey. *Health Education & Behavior*, *45*(4), 524-

531. https://doi.org/10.1177/1090198117741940

Gundersen, C., & Ziliak, J. P. (2015). Food insecurity and health outcomes. *Health

Affairs*, *34*(11), 1830-1839. https://doi.org/10.1377/hlthaff.2015.0645

IBM Corp. (2021). *IBM SPSS Statistics for Macintosh, Version 28.0.* Armonk, NY: IBM Corp.

Janz, N. K., & Becker, M. H. (1984). The Health Belief Model: A decade later. *Health

Education Quarterly, 11*(1), 1-47. https://doi.org/10.1177/109019818401100101

Keith-Jennings, B., Llobrera, J., & Dean, S. (2019). Links of the Supplemental Nutrition

     Assistance Program with food insecurity, poverty, and health: Evidence and potential.

     American Journal of Public Health, 109(12), 1636-1640.

     https://doi.org/10.2015/AJPH.2019.305325

Knoblock-Hahn, A., Murphy, A., Brown, K., & Medrow, L. (2017). Integrative nutrition and

     health models targeting low-income populations: A pilot intervention in three food

     banks. *Journal of the Academy of Nutrition and Dietetics*, *117*(1), 128-

     131. https://doi.org/10.1016/j.jand.2016.04.011

Laraia, B. A., Leak, T. M., Tester, J. M., & Leung, C. W. (2017). Biobehavioral factors that

     shape nutrition in low-income populations: A narrative review. *American Journal of*

     Preventive Medicine, *52*(2S2), S118–S126. https://doi.org/10.1016/j.amepre.2016.08.003

Laurenhan. (2013). *The Health Belief Model* [Photograph]. Wikimedia Commons.

     https://commons.wikimedia.org/wiki/File:The_Health_Belief_Model.pdf

Lee-Kwan, S. H., Moore, L. V., Blanck, H. M., Harris, D. M., & Galuska, D. (2015). Disparities

     in state-specific adult fruit and vegetable consumption – United States. *Morbidity and*

     Mortality Weekly Report, 66(45), 1241-1247. https://doi.org/10.15585/mmwr.mm6645a1

Leung, C. W., Epel, E. S., Ritchie, L. D., Crawford, P. B., & Laraia, B. A. (2014). Food

     insecurity is inversely associated with diet quality of lower-income adults. *Journal of the*

     Academy of Nutrition and Dietetics, *114*(12),

     1943. https://doi.org/10.1016/j.jand.2014.06.353

Leung, C. W., Epel, E. S., Willett, W. C., Rimm, E. B., & Laraia, B. A. (2015). Household food

     insecurity is positively associated with depression among low-income Supplemental

Nutrition Assistance Program participants and income-eligible nonparticipants. *The Journal of Nutrition, 145*(3), 622-627. https://doi.org/10.3945/jn.114.199414

Leung, C. W., Hoffnagle, E. E., Lindsay, A. C., Lofink, H. E., Hoffman, V. A., Turrell, S., Willett, W. C., & Blumenthal, S. J. (2013). A qualitative study of diverse experts' views about barriers and strategies to improve the diets and health of supplemental nutrition assistance program (SNAP) Beneficiaries. *Journal of the Academy of Nutrition and Dietetics*, *113*(1), 70-76. https://doi.org/10.1016/j.jand.2012.09.018

Lombe, M., Nebbitt, V. E., Sinha, A., & Reynolds, A. (2016). Examining effects of food insecurity and food choices on health outcomes in households in poverty. *Social Work in Health Care, 55*(6), 440-460. https://doi.org/10.1080/00981389.2015.1133469

López-Cepero, A., Frisard, C., Bey, G., Lemon, S. C., & Rosal, M. C. (2020). Association between food insecurity and emotional eating in Latinos and the mediating role of perceived stress. *Public Health Nutrition*, *23*(4), 642-648. https://doi.org/10.1017/S1368980019002878

McKnight-Eily, L. R., Okoro, C. A., Strine, T. W., Verlenden, J., Tasha, Hollis, N. D., Njai, R., Mitchell, E. W., Board, A., Puddy, R., & Thomas, C. (2021). Racial and ethnic disparities in the prevalence of stress and worry, mental health conditions, and increased substance use among adults during the COVID-19 pandemic – United States, April and May 2020. *Morbidity and Mortality Weekly Report, 70*(5), 162-166. https://doi.org/10.15585/mmwr.mm7005a3

Mc Morrow, L., Ludbrook, A., Macdiarmid, J. I., & Olajide, D. (2017). Perceived barriers towards healthy eating and their association with fruit and vegetable

consumption. *Journal of Public Health*, *39*(2), 330-

338. https://doi.org/10.1093/pubmed/fdw038

Murray, E. K., Auld, G., Baker, S. S., Barale, K., Franck, K., Khan, T., Palmer-Keenan, D., &

Walsh, J. (2017). Methodology for developing a new EFNEP food and physical activity

behaviors questionnaire. *Journal of Nutrition Education and Behavior*, *49*(9), 777-

783. https://doi.org/10.1016/j.jneb.2017.05.341

Oates, G. R., Jackson, B. E., Partridge, E. E., Singh, K. P., Fouad, M. N., & Bae, S. (2017).

Sociodemographic patterns of chronic disease: How the mid-south region compares to

the rest of the country. *American Journal of Preventive Medicine*, *52*(1S1), S31–S39.

https://doi.org/10.1016/j.amepre.2016.09.004

Oddo, V. M., & Mabli, J. (2015). Association of participation in the supplemental nutrition

assistance program and psychological distress. *American Journal of Public

Health*, *105*(6), e30-e35. https://doi.org/10.2105/AJPH.2014.302480

Office of the Assistant Secretary for Planning and Evaluation. (2021). U. S. federal poverty

guidelines used to determine financial eligibility for certain federal programs.

https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines/prior-hhs-

poverty-guidelines-federal-register-references/2019-poverty-guidelines

Patten, E. V., Spruance, L., Vaterlaus, J. M., Jones, M., & Beckstead, E. (2021). Disaster

management and school nutrition: A qualitative study of emergency feeding during the

COVID-19 pandemic. *Journal of the Academy of Nutrition and Dietetics, 121*(8), 1441-

1453. https://doi.org/10.1016/j.jand.2021.04.012

Qualtrics. (2021, March 24). *Experience management software.* https://www.qualtrics.com/

Richardson, A. S., Arsenault, J.E., Cates, S. C., & Muth, M. K. (2015). Perceived stress,

     unhealthy eating behaviors, and severe obesity in low-income women. *Nutrition Journal,*

     14(122), 1-12. https://doi.org/10.1186/s12937-015-0110-4

Rivera, R. L., Maulding, M. K., & Eicher-Miller, H. A. (2019). Effect of supplemental nutrition

     assistance program–education (SNAP-Ed) on food security and dietary

     outcomes. *Nutrition Reviews*, *77*(12), 903-921. https://doi.org/10.1093/nutrit/nuz013

Rosenstock, I. M. (1974). Historical origins of the Health Belief Model. *Health Education*

     Monographs 2(4), 328-335. https://doi.org/10.1177/109019817400200403

Sharma, S. V., Chow, J., Pomeroy, M., Raber, M., Salako, D., & Markham, C. (2017). Lessons

     learned from the implementation of brighter bites: A food co-op to increase access to

     fruits and vegetables and nutrition education among low-income children and their

     families. *Journal of School Health*, *87*(4), 286-295. https://doi.org/10.1111/josh.12497

Shen, W., Long, L. M., Shih, C. H., & Ludy, M. J. (2020). A humanities-based explanation for

     the effects of emotional eating and perceived stress on food choice motives during the

     COVID-19 pandemic. *Nutrients*, *12*(9), 2712. https://doi.org/10.3390/nu12092712

Sofi, F., Macchi, C., Abbate, R., Gensini, G., & Casini, A. (2014). Mediterranean diet and health

     status: An updated meta-analysis and a proposal for a literature-based adherence

     score. *Public Health Nutrition, 17*(12), 2769-2782.

     https://doi.org/10.1017/S1368980013003169

TN Department of Human Services. (2019). *2Gen Annual Report.*

     https://www.tn.gov/content/dam/tn/human-

     services/documents/2GEN_ANNUAL_REPORT_WEB.pdf

TN Department of Human Services. (2020). *Financial aid available for certain families that lost employment due to COVID-19.*

https://www.tn.gov/humanservices/news/2020/3/25/financial-aid-available-for-certain-families-that-lost-employment-due-to-covid-19.html

TN Department of Labor & Workforce Development. (2021). *Tennessee's unemployment rate drops again in September.* https://www.tn.gov/workforce/general-resources/news/2021/10/21/tennessee-s-unemployment-rate-drops-again-in-september.html

United States Census Bureau. (2021). *Quick facts Davidson County, Tennessee.* https://www.census.gov/quickfacts/davidsoncountytennessee

United States Department of Agriculture Economic Research Service. (2021, September 8). *Food Insecurity in the U. S.* https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics.aspx#foodsecure

United States Zip Codes. (2021*). Zip code 37203*. https://www.unitedstateszipcodes.org/37203/

Ward, B. W., & Black, L. I. (2016). State and regional prevalence of diagnosed multiple chronic conditions among adults aged ≥ 18 years – United States. *Morbidity and Mortality Weekly Report*, 65, 735-738. https://doi.org/10.15585/mmwr.mm6529a3

Warren, M., Beck, S., & Lieberman, D. (2021). In K. Anderson, E. Sanchez, & M. Story (Eds.) *The state of obesity: Better policies for a healthier America.* Trust for America's Health. https://www.tfah.org/wp-content/uploads/2021/09/2021ObesityReport_Fnl.pdf

Wetherill, M. S., White, K. C., & Seligman, H. K. (2019). Nutrition-focused food banking in the United States: A qualitative study of healthy food distribution initiatives. *Journal of the*

Academy of Nutrition and Dietetics, *119*(10), 1653-

1665. https://doi.org/10.1016/j.jand.2019.04.023

Wolfson, J. A., & Leung, C. W. (2020). Food insecurity and COVID-19: Disparities in early

effects for US adults. *Nutrients, 12*(6), 1648. https://doi.org/10.3390/nu12061648

Wong, L. P., Alias, H., Wong, P., Lee, H. Y., & AbuBakar, S. (2020). The use of the health

belief model to assess predictors of intent to receive the COVID-19 vaccine and

willingness to pay. *Human Vaccines & Immunotherapies, 11*(9), 2204-2214.

https://doi.org/10.1080.21645515.2020.1790279

Yaribeygi, H., Panahi, Y., Sahraei, H., Johnston, T. P., & Sahebkar, A. (2017). The impact of

stress on body function: A review. *EXCLI journal*, *16*, 1057–1072.

https://doi.org/10.17179/excli2017-480

Table 1

Sociodemographic Characteristics of Survey Participants of the Family-Focused Program

Characteristic	Sample Participants		Excluded from Sample [a]		Total Family-Focused Program Survey Participants [b]	
	n	%	*n*	%	*n*	%
Gender						
Female	92	77.3	248	81.3	340	80.2
Male	27	22.7	57	18.7	84	19.8
Children in Household						
0-1[c]	30	25.2	71	23.3	101	23.8
2	32	26.9	106	34.8	138	32.5
3	21	17.6	71	23.3	92	21.7
4+	36	30.2	57	18.7	93	22.0
Adults in Household						
1	46	38.7	117	38.4	163	38.4
2-3	62	52.1	171	56.1	233	54.9
4+	11	9.2	17	5.6	28	6.6
Employment						
Unemployed	89	74.8	227	74.4	316	74.5
Employed	30	25.2	78	25.6	108	25.5
Highest Education Level						
None	3	2.5	14	4.6	17	4.0
8-11th Grade	33	27.7	83	27.2	116	27.4
High School Diploma/GED	52	43.7	133	43.6	185	43.6
Some College	17	14.3	34	11.1	51	12.0
2-year College	7	5.9	21	6.9	28	6.6
4-year College	7	5.9	13	11.5	20	4.7
Graduate School	0	0	5	1.6	5	1.2

Unknown	0	0	2	0.7	2	0.5

Race/Ethnicity

Black/African American [d]	76	63.9	164	53.8	240	56.6
Asian	2	1.7	6	2.0	8	1.9
Hispanic [e]	20	16.8	86	28.2	106	25.0
White Caucasian	19	16.0	42	13.8	61	14.4
Native American	0	0	3	1.0	3	0.7
Other	2	1.7	4	1.3	6	1.4

Note. $N = 424$, 1 participant did not provide demographic information.
[a] Reflects the individuals who were excluded due to not completing more than one survey, outlier data, and reported demographic information. $n = 305$
[b] Total sample of survey respondents enrolled in the family-focused program, $N = 424$
[c] From the total sample, 6 households had no children.
[d] Black/African American includes African American, Black Caribbean, and Black African.
[e] Pre-surveys were offered in Spanish and English. Post-surveys were only offered to English-speaking participants, as the survey had not yet been translated into Spanish.

Table 2

Descriptive Statistics of Fruit Intake, Vegetable Intake, PSS-4 Score, and Total Visits

Variables	*n*	*M*	*Mdn*	*SD*
Fruit Intake 1st Survey	119	3.99	4.00	1.387
Fruit Intake 2nd Survey	119	4.15	4.00	1.233
Change in Fruit Intake	119	0.16	0.00	1.353
Vegetable Intake 1st Survey	119	4.24	4.00	1.249

Vegetable Intake 2nd Survey	119	4.32	4.00	1.112
Change in Vegetable Intake	119	0.08	0.00	1.250
PSS-4 Score 1st Survey[a]	114	7.51	8.00	2.873
PSS-4 Score 2nd Survey	114	7.44	8.00	2.784
Change in PSS-4 Score	114	-0.07	0.00	2.953
Total Number of Visits	119	20.16	16.00	14.683

[a] *Note.* Five participating families did not complete the PSS-4 scale and were excluded from these analyses.

Table 3

Spearman's Correlation of Change in Variables Between 1st and 2nd Surveys

Variables	n	r_s	p
1. Change in Fruit Intake & Change in PSS-4	114	-.182	.053*
2. Change in Vegetable Intake & Change in PSS-4	114	-.026	.786
3. Change in Fruit Intake & Total Visits	119	-.040	.670

4. Change in Vegetable Intake & Total Visits	119	.103	.267
5. Change in PSS-4 Score & Total Visits	114	-.114	.226

*$p < .1$.

Table 4

Descriptive Statistics of Surveys by Participants with at Least 20 Visits

Variables	n	M	Mdn	SD
Fruit Intake 1st Survey	54	3.96	4.00	1.387
Fruit Intake 2nd Survey	54	3.98	4.00	1.233

Change in Fruit Intake	54	0.02	0.00	1.325
Vegetable Intake 1st Survey	54	4.24	4.00	1.249
Vegetable Intake 2nd Survey	54	4.32	4.50	1.112
Change in Vegetable Intake	54	0.13	0.00	1.065
PSS-4 Score 1st Survey	52	8.83	9.00	2.341
PSS-4 Score 2nd Survey	52	8.33	8.00	2.778
Change in PSS-4 Score	52	-0.50	0.00	3.202
Total Number of Visits	54	33.96	35.00	9.660

Table 5

Spearman's Correlation of Change in Variables for Participants with at Least 20 Visits

Variables	n	r_s	p
1. Change in Fruit & Change in PSS-4 Score	52	-.272	.051*

2. Change in Vegetable & Change in PSS-4 Score	52	.057	.690
3. Change in Fruit & Total Visits	54	.033	.813
4. Change in Vegetable & Total Visits	54	.169	.222
5. Change in PSS-4 Score & Total Visits	52	.122	.390

*$p < .1$.

Figure 1

Visual Representation of the Health Belief Model
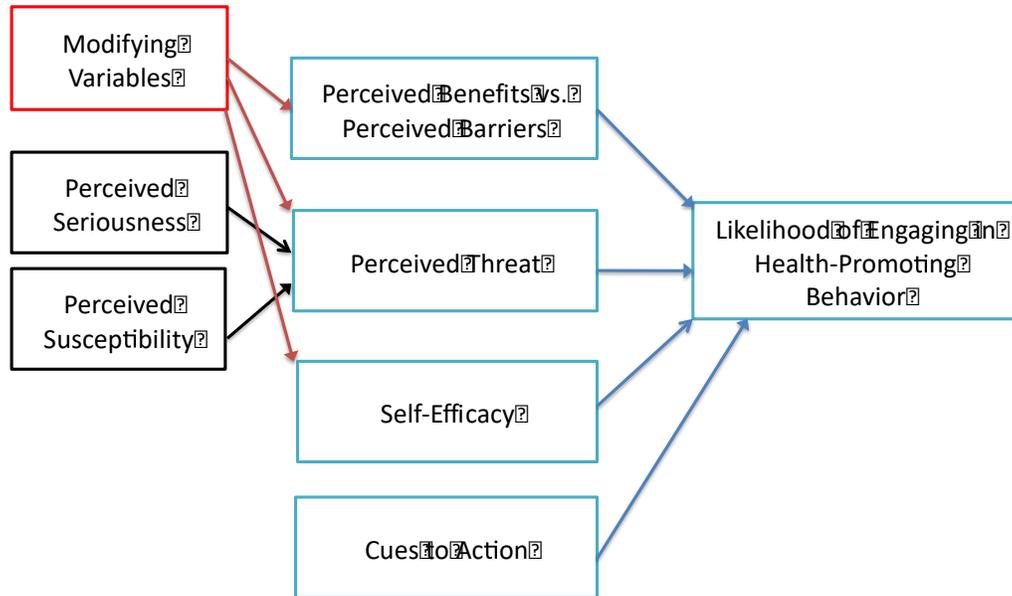
Note. From *The Health Belief Model* [Photograph], by Laurenhan, 2013, Wikimedia Commons

(https://commons.wikimedia.org/wiki/File:The_Health_Belief_Model.pdf). CC-BY-SA-3.0.

Figure 2

The Health Belief Model Applied to Fruit and Vegetable Intake