ASSOCIATION BETWEEN COVID-19 STRESS, FOOD INSECURITY, AND FRUIT AND VEGETABLE CONSUMPTION AMONG UNIVERSITY STUDENTS

by

Taylor M. Levy, B.S.

A thesis submitted to the Graduate Council of
Texas State University in partial fulfillment
of the requirements for the degree of
Master of Science
with a Major in Public Health Education and Promotion
May 2021

Committee Members:

Ronald D. Williams, Jr., Chair

Jeff M. Housman

Mary Odum

Jacquelyn D. McDonald

FAIR USE AND AUTHOR'S PERMISSION STATEMENT

Fair Use

Duplication Permission

ACKNOWLEDGEMENTS

A special thank you to my committee members and my family for their continuous support and help.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

I. INTRODUCTION

Food Insecurity

In the United States, millions of households are struggling to put food on the table as the rates of food insecurity have increased (Murthy, 2016). Data collected from the Food Security Supplement survey determined that approximately 89 million U.S. households were food secure while 14 million households were food insecure in 2018 (Coleman-Jensen et al., 2019). Food insecurity status is more prevalent among some groups such as households with children, households headed by single women or men, and women and men who live alone (Coleman-Jensen et al., 2019). Food insecurity often presents with poorer dietary intake which can lead to overall poorer mental and physical health among children and adults when compared to food insecure individuals (Cheung et al., 2015; Gundersen & Seligman, 2017). The U.S. Department of Agriculture (USDA, 2020a) classified food insecurity into categories to distinguish between low food security and very low food insecurity. Food security status is measured by the Household Food Security Survey Module (HFSSM) and has been tested for validity and reliability among thousands of U.S. households (Coleman-Jensen et al., 2019; Jones et al., 2013). Identifying U.S. households with food insecurity is necessary for the development of policies and reform to minimize hunger among millions of American households (Feeding America, n.d.b). Identifying needs related to food insecurity is especially important during the COVID-19 pandemic as reports indicated that one in six U.S. adults were food insecure only two months after the start of the pandemic (Waxman et al., 2020).

Pandemics

Pandemics have occurred in the past and will continue into the future (Dean et al., 2017). Pandemics are infectious disease outbreaks that spread over a wide range of geographical areas and affect the populations' health and economy (Dean et al., 2017). From the Black plague in 1347 to the 1918 Influenza Pandemic, pandemics demonstrated their negative and long-lasting impact on global communities (Dean et al., 2017). In 2014, the Ebola virus disease (EVD) outbreak in West Africa demonstrated numerous gaps in the prevention, detection, and treatment of pandemic-related infectious diseases (Dean et al., 2017). The most recent global outbreak, the COVID-19 pandemic, was started by a novel coronavirus and first identified in Wuhan, China on December 8, 2019 (Wu & McGoogan, 2020). As the highly contagious virus quickly spread to multiple countries, the World Health Organization (WHO) declared COVID-19 as a global public health emergency (Centers for Disease Control and Prevention [CDC], 2020a; Wu & McGoogan, 2020). COVID-19 is an acute respiratory virus transmitted through the respiratory tract (Baloch et al., 2020) and caused by exposure to the betacoronavirus, SARS-CoV-2 (CDC, 2020a).

The COVID-19 pandemic resulted in stay-at-home orders, decline in travel, and limited social gatherings which impacted individuals' daily lives (Dean et al., 2017). Substantial economic concerns also resulted from the pandemic as the U.S. unemployment rate drastically increased from 4% to 14% between March and April 2020 (Schanzenbach & Pitts, 2020) with an estimated peak unemployment of 16% (Kochhar, 2020). Additionally, pandemic-related unemployment in the U.S. was higher among women and racial/ethnic minorities including those who identify as Black, Hispanic, and

Asian (Kochhar, 2020). Historically, pandemics have placed an increased strain on households and individuals who already experience financial burdens (Dean et al., 2017). These hardships were related to a reduction of income leading to an increased risk of food insecurity (Temple, 2018).

COVID-19 Impact on Food Insecurity

SARS-CoV-2, which caused the condition known as COVID-19, impacted food insecurity status for millions of Americans including college students (Baloch et al., 2020; Kinsey et al., 2020; Sahu, 2020). Since April 2020, food insecurity has increased two-fold among households and tripled among households with children (Schanzenbach & Pitts, 2020). The COVID-19 pandemic had greater impacts on low-income, food-insecure households including individuals of color and people with less secure and adaptable jobs (Wolfson & Leung, 2020). Hispanic and Black households presented with greater rates of food insecurity, and the COVID-19 pandemic placed greater strains on these ethnic and racial communities throughout the U.S. (Wolfson & Leung, 2020).

Stressful events (stressors) can also lead to an increased risk of food insecurity status (Temple, 2018). Stressors are "…events, whether anticipated or not, that can have a deleterious effect on the wellbeing of individuals and their families…" (Temple, 2018, p. 2). Current evidence demonstrated stressors such as young age, being divorced or separated, lower socioeconomic status, lower education status, limited financial resources, more children, poorer health status, not owning your home, and unemployment status were correlated with experiencing food insecurity (Temple, 2018). Specifically, stressors associated with employment and health status can lead to two-fold increase in the risk of experiencing food insecurity (Temple, 2018). This is a significant public

health concern since the COVID-19 pandemic has increased health risks and decreased economic stability among the U.S. population. Exploring pandemic stressors could help further the evidence about food insecurity in the U.S.

Programs and policies were developed to help combat the negative effects on food insecurity status (Coleman-Jensen et al., 2019). Current federal assistance programs (Supplemental Nutrition Assistance Program [SNAP], Special Supplemental Nutrition Program for Women, Infants, and Children [WIC], National School Lunch Program [NSLP] and community and non-profit food assistance programs (food banks/pantries) attempted to compensate for the increased prevalence of food insecurity related to job insecurity and reduced incomes (Coleman-Jensen et al., 2019; USDA, 2020a). Under the Families First Coronavirus Response Act (FFCRA), the NSLP implemented grab-and-go meals that parents or guardians could pick up and bring home to their kids (USDA, 2020e). The FFCRA increased SNAP benefits so participants received their maximum allotment for their household (USDA, 2020d). Many programs ensured flexibility for application enrollment periods in order to increase access and availability of these services (USDA, n.d.a). WIC temporarily expanded their authorized food lists because of food shortages in grocery stores (Texas WIC, 2020). A $19 billion relief program, the Coronavirus Food Assistance Program (CFAP), was created to deliver financial aid to agriculture businesses, support the food supply chain and provide adequate food access to Americans in need (USDA, n.d.b).

Many Americans feel the repercussions of the COVID-19 pandemic including the normally economically limited group of college students (Goldrick-Rab et al., 2020). College students had already been recognized as a high-risk group with an estimated one-

third of all U.S. students reporting food insecurity (Patton-Lopez et al., 2014). A significant dietary impact of food insecurity is the lower consumption of healthy foods including fruits and vegetables (El Zeunm et al., 2019; Farahbakhsh et al., 2017). In a study of students from multiple universities, over 86% reported inadequate fruit and vegetable intake and higher perceived stress related to food insecurity (El Zeunm et al., 2019). Because increased stress and dietary behaviors of food insecure college students already indicated potential for negative health implications, it is essential to examine how the COVID-19 pandemic may impact this high-risk population.

College Students Fruit and Vegetable Consumption

College students' demographics play a role in fruit and vegetable consumption (Odum & Xu, 2018). Common barriers to healthy food access among college students include time constraints, insufficient funds, ease of access to junk food, stress and elevated costs of produce and healthy food options (Sogari et al., 2018). Social isolation impacted dietary lifestyles along with physical activity status among college students (Gallo et al., 2020). These barriers, combined with the COVID-19 pandemic, could further exacerbate the reduction of fruit and vegetable intake among college students. College students could utilize flexible enrollment periods for food assistance programs to compensate for the lack of food availability due to college closures throughout the United States (Center on Budget and Policy Priorities, 2020). The College and University Food Bank Alliance (CUFBA) promoted the development of on-campus food pantries which can be utilized by many college students during the COVID-19 pandemic (Goldrick-Rab et al., 2018). These pre-existing dietary challenges are long-term and need to be addressed to plan for the future of higher education.

The Impact of the COVID-19 Pandemic on College Students

The rapid spread and concern of COVID-19 placed numerous challenges on universities, staff, and students (Goldrick-Rab et al., 2020). The impacts from school closures and job losses is expected to increase the prevalence of food insecurity in the United States (Kinsey et al., 2020). Universities had to adjust operations to further support the health and safety of their students and staff including the use of online teaching platforms to minimize the number of students in the classroom and on campus (Sahu, 2020). Between March 6 and March 13, 2020 (the early days of the COVID-19 pandemic in the U.S.), around 300 universities shifted their classes from in-person to online to support the health and safety of their students (Goldrick-Rab et al., 2020). Closure of campuses led to the loss of jobs for university staff members which affected both students and their families (Goldrick-Rab et al., 2020). Campus closures also led to a loss of food, through dining halls and on-campus food pantries, along with housing for many college students (Goldrick-Rab et al., 2020).

The Hope Center conducted a survey from April 20 to May 15, 2020 that reached approximately 38,000 college students from 54 colleges and 26 states (Goldrick-Rab et al., 2020). Survey results indicated that food insecurity affected 44% of students attending a two-year institution and 38% of students attending a four-year institution (Goldrick-Rab et al., 2020). Around six million college students presented with barriers to obtaining their degree due to lack of adequate food and housing (Goldrick-Rab et al., 2020). Even before the COVID-19 pandemic, college students displayed inadequate intake of fruits and vegetables (Berg et al., 2014; Sharma et al., 2018), and the additional stressors from the pandemic placed further strains on students' dietary lifestyles (CDC,

2017; Goldrick-Rab et al., 2020). Food insecurity among college students can negatively impact physical and mental health, as well as academic performance and graduation rates (Goldrick-Rab et al., 2019; Payne-Sturges et al., 2017). Analyzing the effects of the pandemic on college students' fruit and vegetable intake is essential not only for student health but it is necessary for researchers and policy makers in order to make operational changes that will be meaningful for any future pandemics or similar crises.

The Integrated Behavioral Model

The Integrated Behavioral Model (IBM) is a theoretical framework that is commonly utilized in research to predict and explain health behaviors (Branscum & Lora, 2017). The IBM combines constructs from the Theory of Planned Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Glanz et al., 2015). Perceived behavioral control (PBC) and self-efficacy, both constructs from IBM, are combined to create personal agency (Glanz et al., 2015). Personal agency is defined "…as bringing one's influence to bear on one's own functioning and environmental events…" (Glanz et al., 2015, p. 106). Essentially, the construct of personal agency applied to dietary behaviors allows for a determination of two dimensions: 1) the internal belief that self-discipline influences dietary behaviors, and 2) the confidence in one's self-discipline to eat healthily (Baker et al., 2003). In this study, personal agency will be analyzed to determine its relationship with fruit and vegetable consumption among college students.

Theoretical frameworks allow researchers to identify behavioral constructs associated with certain health behaviors. TPB includes constructs that measure ability and confidence of an individual performing a behavior (Glanz et al., 2015). Self-efficacy is defined as an individual's ability and confidence in performing a behavior (Glanz et al.,

2015). Self-efficacy has been associated with the reduction of food insecurity (Kamimura et al., 2017; Martin et al., 2016; Wright et al., 2018). Higher levels of self-efficacy are associated with decreased very low food security (Martin et al., 2016).

PBC considers factors outside an individual's control that could influence intentions and behaviors (Glanz et al., 2015). Evidence demonstrated an individual's perception of control influences their dietary behaviors (Hardcastle et al., 2015; Fukuoka et al., 2014; Menozzi et al, 2015). Participants stated various triggers related to dietary intake such as family gatherings, social relationships, and emotional states, along with commercials and advertisements on television, magazine or billboards (Fukuoka et al., 2014).

The TRA,TPB, and IBM posit that behavioral intention is the greatest predictor of health behavior (Glanz et al., 2015). Various studies have shown that behavioral intention can predict fruit and vegetable consumption (Bogers et al., 2004; Canova & Manganelli, 2016). Additionally, the relationship between PBC and intention among young people has been explored (Canova & Manganelli, 2016). Other studies have indicated that fruit and vegetable intake is a behavior mediated by an individual's control and intention (Armitage & Conner, 1999; Canova & Manganelli, 2016). Furthermore, it has been suggested the construct of personal agency may play a role in increasing intention to eat fruit and vegetables among adolescents (Baker et al., 2003; Contento et al., 2007, 2010). These theoretical frameworks and constructs will guide the research questions in this study related to food insecurity status, COVID-19 stress, personal agency, intention to consume fruits and vegetables, and fruit and vegetable consumption among college students.

Research Questions

The following research questions were used to understand factors associated with fruit and vegetable consumption among college students during the COVID-19 pandemic:

1. To what degree are COVID-19 stress and personal agency to consume 5 servings of fruits and vegetables a day associated among college students?
2. To what degree are COVID-19 stress and food insecurity associated among college students?
3. To what degree are personal agency to consume 5 servings of fruits and vegetables a day and food insecurity associated among college students?
4. To what degree are personal agency to consume 5 servings of fruits and vegetables a day and behavioral intention to consume 5 servings of fruits and vegetables a day associated among college students?
5. To what degree are food insecurity and behavioral intention to consume 5 servings of fruits and vegetables associated among college students?
6. To what degree are behavioral intention to consume 5 servings of fruit and vegetables a day and 7-day fruit and vegetable consumption associated among college students?

Assumptions

The assumptions related to this study include: participants in the final sample are college students; all participants involved in the study understand their risks and will answer the survey questions to the best of their abilities; participants will answer survey items with honesty; survey items were developed to be easily understood and interpreted

by the participants; and college students could answer the survey questions based on accurate recollection of dietary behaviors at the start of the COVID-19 pandemic.

II. LITERATURE REVIEW

Pandemics

Pandemics have occurred throughout history, and the frequency has increased which is likely associated with a rise in viral diseases from animals (Dean et al., 2017). There are two combined effects which contribute to the pandemic risk: spark risk (where the pandemic arises) and spread risk (the likelihood of spread throughout the human population) (Dean et al., 2017). Dean and colleagues (2017) stated that "pandemics are large-scale outbreaks of infectious disease that can greatly increase morbidity and mortality over a wide geographic area and cause significant economic, social, and political disruption" (p. 315). Noteworthy pandemics that made a global impact include the Bubonic plague (Black Death), Fifth cholera, the 1918 Influenza Pandemic, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), severe acute respiratory syndrome (SARS), Swine flu influenza, and Zika virus (Dean et al., 2017). Due to the 2003 SARS pandemic, numerous countries developed pandemic plans to help combat the negative health and economic effects of the virus (Dean et al., 2017). Tools, such as probabilistic modeling and exceedance probability (EP), have been utilized to assess risks and potential burdens of pandemics (Dean et al., 2017). However, the West Africa Ebola outbreak of 2014 demonstrated gaps associated with "…timely detection of disease, availability of basic care, tracing of contacts, quarantine and isolation procedures, and preparedness outside of the health sector, including global coordination and response mobilization" (Dean et al., 2017, p. 315). Many of these gaps identified during the 2014 outbreak have been exposed again during the COVID-19 outbreak of 2019 and 2020.

Etiology of COVID-19

The first case of COVID-19 presented on December 8, 2019 in the city of Wuhan, China and was identified first as pneumonia with an unknown etiology (Wu & McGoogan, 2020). COVID-19 emerged from the novel coronavirus, known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) (Baloch et al., 2020; Naja & Hamadeh, 2020). COVID-19 is an acute respiratory virus that infects the respiratory tract and is commonly transmitted due to close contact (Baloch et al., 2020; Wu & McGoogan, 2020). On January 30, 2020, the World Health Organization (WHO) declared COVID-19 a global public health emergency (Naja & Hamadeh, 2020; Wu & McGoogan, 2020). By March 27, 2020, COVID-19 spread to over 177 countries while cases and deaths continued to rise (Sahu, 2020).

Ecological Impacts of Pandemics

Pandemics have a systemic effect on individual-, community-, national- and global-levels (Naja & Hamadeh, 2020). Naja and Hamadeh (2020) adapted a version of the ecological model of health behavior in order to correlate the impacts of the COVID-19 pandemic on multiple levels. On an individual-level, poor nutrition and dietary quality can result in long-term negative health effects (Naja & Hamadeh, 2020). Due to limited fresh produce, households may "…resort to cheaper and more accessible processed and prepackaged, high-sodium, and less-nutritious foods…" (Akseer et al., 2020, p. 2) The combination of poor dietary behaviors and diminished food access can lead to negative impact on individuals; however, food access transcends beyond the individual level and is directly impacted by local, national, and global policies (Naja & Hamadeh, 2020).

At the community-level, food access and availability are affected during a pandemic because of implications on transportation, distribution and delivery of foods and essential items (Naja & Hamadeh, 2020). Due to difficulties in food availability, individuals began hoarding resources such as food, water and other essential resources (Naja & Hamadeh, 2020). At risk-populations, such as the elderly, low-SES groups, and individuals with chronic diseases, can feel the repercussions of actions by individuals who have enough money to purchase many items at once (Dean et al., 2017; Naja & Hamadeh, 2020). Individual behavior change, such as avoidance and fear of workplaces and public gatherings, are associated with negative impacts on economic growth at the community, national and global levels during pandemics (Dean et al., 2017).

At the national level, countries across the globe should "…define, finance, and distribute a food basket of a least-cost diet that supports the health needs of the population, ensure the use of the local agriculture produce of the country, and minimize reliance on food imports" (Naja & Hamadeh, 2020, p. 3). The COVID-19 pandemic places a massive strain on healthcare systems, food systems, and economies (Naja & Hamadeh, 2020). Health and nutrition advocates have suggested that spikes in prices on essential items must be monitored and controlled at the national level (Akseer et al., 2020; Naja & Hamadeh, 2020). Substantial planning is necessary to enhance a nation's preparedness along with the development of policies to support the creation, delivery, and availability of food baskets throughout various communities (Naja & Hamadeh, 2020). Maintaining an open and iterative communication channel between governments and the communities is necessary to promote transparency which can help build trust, support, and compliance (Naja & Hamadeh, 2020). Pandemics require global action and

protectionist strategies to combat the negative economic and health impacts on individuals and communities (Naja & Hamadeh, 2020).

At the global-level, closures of border crossings can result in inconsistent obtainment of food and essential supplies (Naja & Hamadeh, 2020). Countries that rely on imported foods and supplies can experience an increase in the prevalence of food insecurity (Naja & Hamadeh, 2020). During recent pandemics, countries introduced travel bans and restrictions (domestic and international) in order to reduce the risk of spread (Sahu, 2020). Pandemics have a multi-level effect on communities and economies and procedures should be in place to combat the negative health and economic impacts.

Health and Economic Impacts of Pandemics

Pandemics can have a direct or indirect impact on mortality and morbidity (Dean et al., 2017). As an example, approximately 30-50% of the European population suffered due to the Black Plague pandemic of the mid-1300s. In 2013, the EVD outbreak in West Africa produced approximately 28,000 cases and 11,000 deaths (Dean et al., 2017; WHO, n.d.). Since the start of the pandemic through March 2021, an estimated 28.5 million cases and 517,224 deaths have occurred in the United States due to COVID-19 (CDC, 2020c). Dean and colleagues (2017) stated how numerous infectious diseases can have longstanding impacts, "…which can become more common and widespread in the case of a pandemic" (p. 323). Indirect impacts on population health can further exacerbate morbidity and mortality (Dean et al., 2017). Individuals seeking unnecessary care caused an increased burden on health care systems along with the reduction of resources to provide routine care (Dean et al., 2017). Accessing basic routine care can be difficult for individuals due to fear, avoidance of travel and other influences, and lack of routine care

can lead to additional deaths on top of rising pandemic numbers (Dean et al., 2017). Reduction in healthcare workers during a pandemic is attributed to contracting the disease, risk of death and fear-driven absenteeism (Dean et al., 2017). Limited healthcare workers and increasing case numbers can lead to an unfortunate number of deaths during a pandemic. Dean and colleagues (2017) stated that "pandemics can cause acute, short-term fiscal shocks as well as long-term damage to economic growth" (p. 324).

A decline in demand due to individual behavior change (avoidance of restaurants, public gatherings, avoidance of travel, and stay-at-home orders) resulted in a negative economic impact because of the increased risk of mortality and morbidity related to the disease (Dean et al., 2017). Decline in household incomes and increased financial burdens were a result of job losses related to economic and health impacts of COVID-19, which disproportionately affected low-SES and disadvantaged households (Akseer et al., 2020). Closures of schools and daycare centers also increased stress on individuals who must leave the house for work (Akseer et al., 2020).

Health Impact of COVID-19

As COVID-19 infects more of the population, researchers and healthcare workers are analyzing short- and long-term impacts of the virus. The average fatality rate among individuals who contracted COVID-19 was low and ranged from 1.4 – 2.3% (Marhl et al., 2020). The fatality rate of individuals under the age of 60 was approximately 0.2% while individuals over the age of 80 presented with a fatality rate of about 9% (Jordan et al., 2020). The elderly and male populations presented with greater negative outcomes associated with COVID-19 (Jin et al., 2020; Jordan et al., 2020). Under-recognized minorities and individuals with underlying health conditions are also at a greatest risk of

poorer health outcomes if infected by COVID-19 (Butler & Barrientos, 2020). In addition to behaviors such as employment type, inadequate masking or social distancing, individuals may be at greater risk of contracting COVID-19 due to risk factors such as metabolic syndrome, type-2 diabetes, high blood pressure, cardiovascular disease, chronic respiratory disease, cancer, overnutrition and undernutrition (Akseer et al., 2020; Jordan et al., 2020; Marhl et al., 2020; Petrakis et al., 2020). Researchers discussed a possible link between obesity and contraction of COVID-19 due to the effects of obesity on the immune system (Butler & Barrientos, 2020; Petrakis et al., 2020). Adipose tissue among obese patients interplays with the immune system which facilitates the severity and lethality of COVID-19 (Petrakis et al., 2020). Higher rates of obesity and diabetes among minority groups "…may account, at least in part, for the health disparities observed in response to COVID-19" (Butler & Barrientos, 2020, p. 54).

Minority populations, such as Blacks and Hispanics, face common barriers such as access to healthy food options and availability of nutrition education which further exacerbates food insecurity and increases the risk of these groups contracting the virus (Butler & Barrientos, 2020; Dharmasena et al., 2016; Gundersen & Seligman, 2017). Stay-at-home orders, self-isolation, socially distancing and lockdown measures can lead to poor management of key risk factors such as unhealthy dietary habits and physical activity which can further exacerbate associated comorbidities (Akseer et al., 2020; Butler & Barrientos, 2020; Sahu, 2020). Researchers also determined a possible link between COVID-19 and long-term consequences such as Parkinson's Disease, Dementia, neurodegenerative diseases and long-term lung damage (Butler & Barrientos, 2020; Jordan et al., 2020). Disadvantaged groups are more susceptible to morbidity and

mortality related to the negative effects of pandemics and the further strain on food security status (Dean et al., 2017). Reliable, scientific information on the long-term health impacts of COVID-19 are limited but research is currently being conducted to determine future health impacts. While the long-term impacts are yet to be determined, abundant evidence has shown that the immediate economic hardships (Akseer et al., 2020) can have significant short-term implications on health and dietary behaviors.

Impact of COVID-19 on Child and Adult Nutrition

Prior to COVID-19, approximately 7-14% of U.S. households with children were food insecure, meaning households had limited or uncertain access to adequate food for a health and active lifestyle (Coleman-Jensen et al., 2019; Kinsey et al., 2020). School closures and loss of jobs will likely result in a rise in food insecurity status (Kinsey et al., 2020). Social distancing measures affect social networks and could make it difficult for certain populations, such as the elderly who access senior centers and churches for food and other resources (Kinsey et al., 2020; Tucher & Thomas, 2020). In 2018, the senior congregate nutrition meal program served over 71.5 million meals to about 1.5 million people over the age of 60; however, food insecurity is still prevalent among older adults (Tucher & Thomas, 2020). The 2018 National Survey of Older American Act Participants collected data from a sample of approximately one million, which reported that around 18% of participants did not have adequate money or food stamps to purchase needed foods (Administration for Community Living, 2018). Congregate meal programs allow for older adults who live alone to socialize with others; however, social isolation recommendations could negatively affect these individuals (Holt-Lunstad et al., 2015; Tucher & Thomas, 2020).

Food insecurity is commonly associated with increased mental health problems, depression, type-2 diabetes, diminished sleep outcomes, and overall poor mental and physical health (Gundersen & Seligman, 2017; Martinez et al., 2018; Payne-Sturges et al., 2017). The COVID-19 pandemic may have a negative impact on mental health which could further exacerbate unhealthy dietary behaviors such as eating disorders (Shah et al., 2020). COVID-19 has been associated with increased loneliness, anxiety, depression and posttraumatic stress disorder (Carvalho et al., 2020; Torales et al., 2020). The relationship between dietary behaviors and mental health has been analyzed during the COVID-19 pandemic (Di Renzo et al., 2020). Isolation and lockdown measures influenced an individual's ability to control their food intake (Di Renzo et al., 2020). Individuals reported anxiety related to their dietary habits, greater consumption of comfort foods and greater intake of food to feel better (Di Renzo et al., 2020).

School closures present additional setbacks for low-SES households due to the interruption of school lunch programs; however, communities throughout the United States are continuing the NSLP by providing grab-and-go meals at certain pick up locations for students (Akseer et al., 2020; USDA, 2020e). School districts developed flexible guidelines to support child nutrition while being mindful of social distancing practices (USDA, 2020e). Flexible guidelines implemented by the Child Nutrition Program include: permitting parents and guardians to pick up meals for their children, waive meal time requirements, allow meals to be distributed in non-congregate settings, waive requirements regarding afterschool snacks and meals, and allow states to serve free meals to children in all areas (USDA, 2020e). Congress enacted the FFCRA on March 20, 2020 which included provisions to food assistance and nutrition programs such as

increasing SNAP allotments in order for participants to receive the maximum benefit for their households, and states can implement meal-replacement programs known as Pandemic-EBT (P-EBT) (USDA, 2020d). Pandemic-EBT was enacted in March 2020 and has been extended through fiscal year 2021 (Food Research & Action Center, 2020; USDA, 2020d). Under FFCA, states can quickly certify households who are newly applying for SNAP benefits (USDA, 2020d). P-EBT compensates families for the expenses of school meals, which averaged to around $114 a month per child (Schanzenbach & Pitts, 2020; USDA, 2020d). Both P-EBT and FFCRA aid households with children eligible for free or reduced-price school meals during school closures (USDA, 2020e).

In March 2020, a COVID-19 relief package was delivered by Congress which included $955 million to support nutrition programs, home and community services, support for family caregivers, and extended protections for individuals with disabilities (Tucher & Thomas, 2020). SNAP received $15.5 billion in March 2020 from Congress to provide additional funding to ensure food-insecure Americans obtained enough food (Tucher & Thomas, 2020). A second stimulus package passed at the end of 2020 which provided stimulus checks, aid to businesses along with funding for vaccine procurement and distribution (The New York Times, 2020). In March 2021, a $1.9 trillion COVID-19 relief bill was passed by President Joe Biden. The third bill plans to deliver financial assistance to communities, schools and businesses affected by the COVID-19 pandemic. The third relief plan could sharply cut child poverty, possibly in half (National Public Radio, 2021).

Economic Impact of COVID-19

The COVID-19 pandemic could negatively impact the U.S. economy worse than the Great Depression in the 1930s (Karpman et al., 2020). The COVID-19 pandemic affects multiple sectors of the economy: primary (agriculture and petroleum/oil), secondary (manufacturing industry) and tertiary (education and financial industry) sectors (Nicola et al., 2020). Pandemics have a systemic effect on various sectors of the world economy (Nicola et al., 2020). Between March and April 2020, approximately 26 million unemployment insurance claims were filed in the U.S. due to the COVID-19 pandemic (Karpman et al., 2020). Four relief bills were passed by policymakers to combat the crisis along with the Coronavirus Aid, Relief, and Economic Security (CARES) Act which included enhanced unemployment insurance, economic relief payments sent to U.S. households, additional aid to state and local governments and provided extra funding to safety net and housing programs (Karpman et al., 2020). In the United States, the CARES Act provided $1200 to every American with an income below $75,000, $500 for every child below 17 years old, and an increase in unemployment benefits by $600 per week (Nicola et al., 2020).

Most Americans are feeling the negative repercussions of COVID-19; however, low-income, and Hispanic families face the most difficulties (Karpman et al., 2020). Hispanic households' financial security were greatly impacted by COVID-19 compared to other racial/ethnic counterparts (Gonzalez et al., 2020). Gonzalez and colleagues (2020) concluded that "as of late March/early April 2020, nearly 6 in 10 non-elderly Hispanic adults were in families where someone lost a job, work hours, or work-related income because of the coronavirus outbreak…" (p. 1). However, 4 in 10 non-elderly

adults (41.5%) of families reported a loss of job, diminished work hours, or reduced work-related income (Karpman et al., 2020). These statistics demonstrate an economic and societal disparity between the general U.S. population and Hispanic and low-income groups. The negative consequences of COVID-19 are worsened for Hispanic adults who are non-citizens or live with family members who are non-citizens (Gonzalez et al., 2020). Approximately 38% of non-Hispanic White adults and 40% of non-Hispanic Black adults reported at least one negative impact from COVID (loss of job, decline in work hours, or decline in work-related income) compared to 68% of Hispanic adult families with non-citizens and 50% of Hispanic adults in households with citizens (Gonzalez et al., 2020). Non-citizens are discouraged from applying for federal aid due to the possible negative effects on immigration status (Gonzalez et al., 2020).

Low-income, Hispanics, and Black adults were more likely to report a reduction of spending on food (Karpman et al., 2020). More than one-quarter of households are worried about having enough food to eat the following months during the pandemic (Karpman et al., 2020). These differences demonstrate a greater susceptibility to job loss or earnings among Hispanic adults who are either citizens or noncitizens, Black adults and low-income households (Gonzalez et al., 2020; Karpman et al., 2020). The economic distress placed on these individuals will be a continuous challenge throughout and after the pandemic (Gonzalez et al., 2020).

Food Insecurity

Food insecurity is a growing public health concern and an under-recognized determinant of health in the United States (Murthy, 2016; Wolfson & Leung, 2020). The USDA defines food insecurity as “a household-level economic and social condition of

limited or uncertain access to adequate food" (USDA, 2020a, para. 3). In 2018, approximately fourteen million (11.1%) U.S. households were food insecure and two million (7.1%) households with children were food insecure (Coleman-Jensen et al., 2019). In 2018, food insecurity declined for the first time since 2007 (pre-recession levels); however, due to school closures and job losses because of the 2020 COVID-19 pandemic, food insecurity rates are expected to climb (Coleman-Jensen et al., 2019; Gundersen & Seligman, 2017; Kinsey et al., 2020). Wolfson and Leung (2020) determined that food insecurity among U.S. households increased to 38% in March 2020 compared to 11.1% in 2018. In April 2020, 35% of households with children under the age eighteen were food-insecure (Wolfson & Leung, 2020). Food insecurity is linked to overall poor short- and long-term health outcomes, and the effects of the COVID-19 pandemic could worsen food insecurity due to social distancing guidelines, quarantine and isolation procedures, and increased food hoarding (Dean et al., 2017; Naja & Hamadeh, 2020; Nicola et al., 2020; Wolfson & Leung, 2020). Food insecurity can also lead to nutrient-poor dietary lifestyles which could result in the development of obesity, cardiovascular disease, type-2-diabetes, hypertension, and other chronic diseases (Cheung et al., 2015; Morales & Berkowitz, 2016; Murthy, 2016; Pan et al., 2012).

Food-insecure households often present with hunger, however; hunger and food insecurity must be distinguished from one another (USDA, 2020a). Food insecurity can be defined as "a household-level economic and social condition of limited or uncertain access to adequate food", while hunger is a result of food insecurity and represents "…an individual-level physiological condition" (USDA, 2020a, para. 3). Food-insecure individuals can be classified into four categories: high food security (households that do

not present with concerns obtaining food); marginal food security (households presented with concerns at times about obtaining food, but the quality, variety, and amount of food consumption was not considerably reduced); low food security ("households reduced the quality, variety and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted"); and very low food security ("at times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lack money and other resources for food") (USDA, 2020a; USDA, 2020c, para. 4). The HFSSM collects data on food-insecure households in the United States to determine their needs. Advocation for policies, raising awareness and conduction of in-depth research is necessary to support people who face hunger. By identifying food insecurity status, households can determine the type of aid they can procure to feed their households such as federal nutrition assistance programs, assistance from food banks and pantries, or networks such as Feeding America (Feeding America, n.d.b).

Measurements of Food Insecurity

In the early 1980s, rates of hunger were rising in the United States, which motivated President Ronald Reagan to assemble the President's Task Force on Food Assistance. The committee reported a limited amount of data on hunger in the United States which lead to the conduction of two research studies in order to understand food insecurity and hunger among U.S. families. The qualitative measures conducted in the research studies led to the development of the HFSSM (Jones et al., 2013).

Thousands of U.S. households receive a food security survey every December that collects data on food insecurity throughout the nation. Yearly reports on food

insecurity utilize data from the HFSSM to the Current Population Survey (CPS). A nationally representative sample of approximately 50,000 households were assessed through the CPS. In 2018, approximately 37,000 households responded to the Food Security Supplement. Households without children answer the first ten questions on the Food Security Supplement, while households with children continue on to answer an additional eight questions totaling to eighteen questions. The household food security report classifies respondents as either low food security or very low food security (Coleman-Jensen et al., 2019). The HFSSM is known as a valid and strong measure of food security status and hunger among various subgroups in the United States (Jones et al., 2013). The HFSSM has been integrated into the National Health and Nutrition Examination Survey (NHANES) along with data collection tools for various research efforts (Jones et al., 2013). Several studies utilize Food Security Supplement to assess food insecurity in the United States (Broton et al., 2018; Gulliford et al., 2004). Understanding food security status is important for directing food and economic aid, evaluating nutrition assistance and health programs along with informing policies across various sectors (Jones et al., 2013).

Determinants of Food Insecurity

Food insecurity impacts various disadvantaged groups throughout the United States, and specific groups demonstrated both food insecurity and very low food insecurity rates higher than the national average of 11.1%. These groups include: households with incomes near or below 185 percent of the federal poverty line (29.1%), households with children headed by a single woman (27.8%) or a single man (15.9%), men (12.5%) and women (14.2%) who live alone, and Black (21.2%) and Hispanic

(16.2%) households (Coleman-Jensen et al., 2019). Households headed by African Americans and Hispanics, an individual who has not married, a divorced or separated individual, a renter, a younger individual, and less educated individuals presented with a greater risk of food insecurity (Gundersen & Seligman, 2017). These groups should be recognized in order to focus policy efforts to aid in the reduction of food insecurity.

A crucial risk factor for food insecurity "…is the availability of household resources such as income or SNAP (Supplemental Nutrition Assistance Program) benefits" (Gundersen & Seligman, 2017, p. 2). Wolfson and Leung (2020) determined that the impacts of the COVID-19 pandemic were already affecting low-income households with disproportionately negative impacts on low-income, food-insecure households. Food-insecure individuals were more likely to report the loss of a job and that their income would be reduced considerably (Wolfson & Leung, 2020). During the COVID-19 pandemic, individuals of color, low-SES groups, and individuals with less flexible or secure jobs were more likely to report events of food insecurity and were more susceptible to stress and struggled to meet basic needs (Wolfson & Leung, 2020). In March 2020, 44% of adults with an income 2.5 times greater than the federal poverty line reported food insecurity in the past 30 days, and Hispanics and Blacks were more likely to report food insecurity. Disparities in food access among racial and ethnic groups presented additional concerns during the COVID-19 pandemic which could greatly impact communities of color in the United States (Wolfson & Leung, 2020).

In addition to socio-economic issues, research has suggested that exposure to significant life stressors may increase the likelihood that a person experiences food insecurity (Temple, 2018). Particularly, stressors related to employment and health, both

of which are of extreme importance during the COVID-19 pandemic, may significantly increase the odds of experiencing food insecurity (Temple, 2018). A recent study on COVID-19 stress indicated that fears related to health and socio-economic consequences of COVID-19 were among the highest anxiety-inducing beliefs in the United States and Canada (Taylor et al., 2020).

Health Impacts and Economic Determinants of Food Insecurity

Food insecurity and reduced health status demonstrate a bi-directional relationship - as food insecurity increases, health status decreases (Gundersen & Seligman, 2017). Individuals that face barriers to affording a diet rich in whole grains, lean proteins, fruits, and vegetables can result in an increased risk of developing chronic diseases and management of these diseases can become even more challenging (Gundersen & Seligman, 2017). Fluctuations in food access and availability can lead to poor management of chronic diseases which can result in disease complications and increased risk for hospitalization (Gundersen & Seligman, 2017). Among individuals who are food insecure, and therefore worried about their next meal, the need for food acquisition will often supersede other health-related needs including medications and medical appointments (Gundersen & Seligman, 2017) as suggested by Maslow's hierarchy of needs (Glanz et al., 2015). Food insecurity among adults is related to a higher prevalence of mental health issues, diabetes, cardiovascular problems, reduced health status, and diminished sleep outcomes (Gundersen & Seligman, 2017). Food-insecure respondents also presented with higher body max index (BMI) compared to food-secure respondents (Cheung et al., 2015; Pan et al., 2012; Ryan-Ibarra et al., 2017). Worsening chronic diseases can increase health care costs while decreasing

employability, resulting in reduced income and elevated pressure on food budgets (Hayes & Gillian, 2020).

Children from food-insecure families can present with greater negative health risks such as "…birth defects, anemia, lower nutrient intakes, cognitive problems, and aggression and anxiety" (Gundersen & Seligman, 2017, p. 1). Food insecurity among children can lead to increased hospitalization, poorer health status, poor oral care, asthma, behavioral issues, depression, and suicidal tendencies (Gundersen & Seligman, 2017). Food-insecure children are more likely to have access to unhealthy foods in the kitchen such as microwavable and quick-frozen foods which can result in reduced consumption of essential vitamins and minerals (Fram et al., 2015). Hanson and Connor (2014) reported lower fruit intake among food-insecure children in comparison to food-secure children. Food insecurity can increase children's risk of developing obesity which can contribute to long-term health impacts (Simmonds et al., 2015).

Various studies have been conducted to determine a relationship between food insecurity and obesity (Cheung et al., 2015; Morales & Berkowitz, 2016; Pan et al., 2012). Obesity affects one in three Americans and the rates continue to rise (Cheung et al., 2015; Leyva et al., 2020; Pan et al., 2012). The CDC reported that approximately 40% of American adults were obese, and 9% of American adults were severely obese (CDC, 2020b). Individuals who are obese are at an increased risk for negative health consequences such as hypertension, type 2 diabetes, coronary heart disease, stroke, poor sleep outcomes, types of cancers, mental health issues and low quality of life (CDC, 2020b). Non-Hispanic Black adults demonstrated the highest rates of obesity and severe obesity while non-Hispanic Asians presented with the lowest rates (CDC, 2020d). An

analysis of food insecurity was conducted among twelve U.S. states and determined that food insecure adults presented with a 32% increased risk of being obese compared to food-secure adults (Pan et al., 2012).

In 2018, approximately 41% of food-insecure households received benefits from SNAP (Coleman-Jensen et al., 2019). Food and nutrition assistance programs, such as SNAP, provide benefits to qualifying households; however, the food benefits may have a possible link to obesity. Morales and Berkowitz (2016) revealed a possible relationship between long-term SNAP benefits and an increased risk of obesity and demonstrated greater risk among women compared to adult men or children. Food insecurity is associated with greater BMI which could be an unintended consequence of some nutrition assistance programs (Cheung et al., 2015). "Food insecurity may paradoxically increase BMI by creating a 'substitution effect' whereby inexpensive, energy-dense foods such as potato chips or processed meat replace healthier foods such as fresh produce and whole grains" (Cheung et al., 2015, p. 1).

SNAP benefits are modeled after the Thrifty Plan model, which assumes that participants have access to permitted foods along with a place and adequate time to prepare meals (McGuire, 2013). Currently, SNAP benefits include the following foods: fruits, vegetables, meat, poultry, fish, dairy products, breads, cereals and snack foods (USDA, n.d.b). The selection of foods demonstrates that participants can purchase a variety of choices; however, there are no nutritional standards associated with SNAP benefits (Pomeranz & Chriqui, 2015). Studies have been conducted that determined SNAP participants presented with inferior dietary quality and elevated risk of obesity (Leung et al., 2012; Nguyen et al., 2014). SNAP households had exponentially lower

Health Eating Index (HEI) scores compared to eligible and ineligible nonparticipants (Whiteman et al., 2018).

Current SNAP policies are insufficient to adequately purchase foods that follow dietary guidelines (Whiteman et al., 2018). SNAP participants stated economic barriers to healthy eating and the inadequacy of food assistance and nutrition programs, in regard to the amount of assistance provided and the types of available food (Cheung et al., 2015). Food-insecure American adults presented with decreased frequencies of dairy, fruits, and vegetables along with decreased intake of essential nutrients such as calcium, magnesium, and vitamin A (Johnson et al., 2018). An individual's immune system is boosted by essential vitamins and nutrients, such as vitamins A, C, D and E, that help fight off viruses (Galanakis, 2020); therefore, lack of nutrients and vitamins can have detrimental health effects.

Impact of the COVID-19 Pandemic on Food Insecurity

Since the COVID-19 pandemic began, new evidence has emerged from surveys that demonstrated a substantial increase in food insecurity and very low food insecurity. Food insecurity doubled among households and tripled among households with children since April 2020 (Schanzenbach & Pitts, 2020). Galanakis (2020) discussed food systems during the COVID-19 pandemic crisis which include: food security during population lockdown, sustainability, food safety, and bioactive ingredients needed to support human's health. Food assistance and nutrition programs, such as food banks and pantries, were developed to bridge the food security gap, and some individuals rely on food bank services as their sole source of food (Bazerghi et al., 2016). During COVID-19, one in five respondents experiencing food insecurity reported obtaining food and resources from

food banks; however, rates and interactions varied across states (Schanzenbach & Pitts, 2020). Non-Hispanic Blacks and Hispanics presented with higher rates of food insecurity compared to their White counterparts (Schanzenbach & Pitts, 2020).

The COVID Impact Survey was developed for the collection of "…data on economic and health outcomes of nationally and regionally representative samples of American adults" (Schanzenbach & Pitts, 2020, p. 2). In April 2020, the COVID Impact Survey reported that food insecurity was approximately 34%, which is more than three times the predicted rate for March (Schanzenbach & Pitts, 2020). The U.S. unemployment rate was approximately 4% in March 2020 and increased to around 14% by April 2020; this indicates a direct correlation between unemployment rate and food insecurity (Schanzenbach & Pitts, 2020). The economic distress placed on households during COVID-19 requires urgent and continued response efforts from the federal government (Schanzenbach & Pitts, 2020).

Food insecurity is associated with poor dietary qualities among Americans (Hanson & Connor, 2014; Johnson et al., 2018). Food insecurity leads to poor dietary intake of major food groups along with essential macro- and micronutrients (Davison et al., 2017; Johnson et al., 2018). Galanakis (2020) discussed the importance of bioactive compounds needed to support a healthy immune system during the COVID-19 pandemic. Essential nutrients, such as vitamins A, C, D and E, can strengthen the immune system which could reduce the risk of contracting the virus (Galanakis, 2020). However, food insecure adults presented with lower intake of essential vitamins and minerals (Hanson & Connor, 2014; Johnson et al., 2018). Adults who have food insecurity consumed fewer vegetables, fruit, and dairy products along with reduced "…intake of vitamins A, B-6,

calcium, magnesium, and zinc" (Hanson & Connor, 2014, p. 684). People who had food insecurity demonstrated suboptimal levels of folate and iron (Davison et al., 2017). As economic challenges and food insecurity increase during the COVID-19 pandemic, individuals are less likely to consume recommended daily nutrition. This reduced intake of vitamins and minerals among food-insecure households may increase their susceptibility of contracting the virus during the COVID-19 pandemic (Galanakis, 2020).

Food Insecurity among College Students

In 2019, approximately 19 million students enrolled in degree-granting postsecondary education of which approximately 7 million identified as White, 3 million identified as Hispanic, and 1 million identified as Black (Bustamante, 2020). Additionally, 56% of Hispanic and 46% of Black students completed a four-year degree in six years compared to 72% of their White counterparts (Bustamante, 2020). Economic challenges during college can have a significant impact on time-to-graduation (Crisp et al., 2018), so it is reasonable to expect the same economic challenges may impact food security and overall health of college students (Zein et al., 2019).

College students are a new and under-recognized population of interest affected by food insecurity (Freudenberg et al., 2019). Attaining a university degree is an important determinant in the pursuit of social capital and health; however, challenges related to food insecurity undermined attainment of post-secondary education (Zein et al., 2019). Food insecurity could impact not only the health of college students, but also school-related issues such as academic performance, retention, and graduation rates (Payne-Sturges et al., 2017). Researchers determined that food insecurity is strongly associated with depression, increased stress and poorer health outcomes among college

students (Bruening et al., 2017; Goldrick-Rab et al., 2019; Payne-Sturges et al., 2017; Zein et al., 2019).

Rates among food-insecure college students ranged from 25-50% which is vastly higher than the 11% of food-insecure U.S. households reported in 2018 (Bruening et al., 2017; Freudenberg et al., 2019). The 2018 United States Government Accountability Office (GAO) reported that around 7 million U.S. college students presented with household incomes that qualify for SNAP benefits; however, only around 2 million (31%) were enrolled in SNAP (Freudenberg et al., 2019; GAO, 2018). The 2018 GAO reported that 57% of college students who were eligible did not receive SNAP benefits (Goldrick-Rab et al., 2019). Reasons contributing to increased food insecurity rates among college students include: economic challenges that were not present in the past; cost of college has doubled between the years of 1989 to 2016 and living expenses have increased; more low-income students applying for college results in a decline in federal subsidies (Pell Grant funding cannot keep pace with rise in recipients, and Pell Grants cover less than one third of college expenses); college students' struggle with working and receiving adequate minimum wages to keep pace with rising college expenses; and public colleges and universities do not have enough funds to support college students along with providing affordable food and housing (Freudenberg et al., 2019).

Food assistance and nutrition programs are available to college students; however, the SNAP enrollment rate among college students was 85% lower than the general U.S. population (Freudenberg et al., 2019). Some full-time college students may be eligible for SNAP benefits; however, USDA and Congress present the information in a confusing manner which deterred students from applying to the program. Even if eligible college

students want to apply for SNAP, the stigmatization, confusing application, and enrollment process could deter them from applying. College students' confusion towards the application process or errors by caseworkers may result in rejection of students who may be eligible for SNAP benefits (Freudenberg et al., 2019).

Transitional years for college students, between the ages of 18 and 24, are commonly associated with weight gain and a reduction in physical activity (Karabulut et al., 2018). Adults aged 18-29 with some college education reported higher rates of obesity between 2000 to 2009 (Karabulut et al., 2018; McEligot et al., 2020). Prevalence of obese and/or overweight young adults, including college students, increased from approximately 29% to 32% from 2000 to 2009 (McEligot et al., 2020). Data from the National College Health Assessment concluded that around 30-35% of college students were overweight or obese (American College Health Association, 2008; Karabulut et al., 2018; McEligot et al., 2020). Food insecurity was directly and indirectly associated with higher BMI and poor health outcomes through three pathways: fewer days of sleep; fewer days of moderate-vigorous physical activity; and fewer daily servings of fruit and vegetable intake (Martinez et al., 2019).

College students presented with vulnerabilities related to food insecurity due to financial struggles associated with college tuition, housing, and food (Zein et al., 2019). As reported by Taylor et al. (2020), economic concerns were among the highest anxiety-inducing stressors experienced by U.S. adults. It has also been suggested that experiencing health and economic stress may increase the odds of experiencing food insecurity twofold (Temple, 2018). For college students, the combination of general financial concerns and COVID-19 stress may increase the likelihood of food insecurity.

While universities are considering the necessary measures to protect the students from COVID-19 such as shifting in-person classes to online teaching platforms (Sahu, 2020), attention must be paid to the impact stress may have on food insecurity and how this impacts college students' dietary behaviors..

Fruit and Vegetable Consumption among College Students

The 2015-2020 Dietary Guidelines for Americans stated that Americans should increase their fruit and vegetable consumption in order to lower the risk of developing dietary-induced chronic diseases such as obesity, type-2 diabetes, cardiovascular disease and some types of cancers (CDC, 2017). The 2013 Behavioral Risk Factor Surveillance System (BRFSS) data concluded that approximately 9% of adults aged 18-30 consumed the recommended intake of fruits and around 6% consumed the recommended intake of vegetables (CDC, 2017). Around 78% of adults aged 18-24 reported consuming less than five servings of fruits and vegetables daily (Karabulut et al., 2018). Fruit and vegetable consumption were low across all socioeconomic groups (CDC, 2017).

Research has been conducted to correlate health behavior models and theories with greater insight to food and vegetable consumption among college students (Jung & Bice, 2019; Odum & Xu, 2018; Thompson et al., 2020). The ecological model of health behavior was utilized to determine common barriers, enablers and contributory influences on eating habits among college students (Sogari et al., 2018). Ecological models combine multiple theories to ensure the integration of individual-, environment- and policy-level interventions (Glanz et al., 2015). It was reported that barriers associated with healthy eating included time constraints, unhealthy snacking habits, easy access to high-calorie foods, stress and higher costs of healthy foods (Sogari et al., 2018). The CDC (2017)

stated that cost, along with limited availability and access to fresh produce, was a common barrier among college students. Additionally, time constraints and insufficient money were associated with barriers to food security (Broton et al., 2018). Enabling factors to healthy eating included "…improved food knowledge and education, meal planning, involvement in food preparation, and being physically active" (Sogari et al., 2018, p. 1). Contributory factors included parental food behaviors along with social pressure which demonstrated to have a positive and negative influence on college students' dietary behaviors (Sogari et al., 2018).

Skelton and Evans (2020) conducted focus groups to understand how college students perceived their on-campus nutrition environment (Skelton & Evans, 2020). Researchers concluded themes among focus group participants which included barriers to access, money, types of food, student input along with nutrition education, resources, and classes (Skelton & Evans, 2020). Odum and Xu (2018) examined fruit and vegetable self-efficacy and consumption among first- and second-year college students. Self-efficacy is the confidence that one can effectively perform a health behavior (Glanz et al., 2015). Researchers concluded that self-efficacy explained variance in fruit and vegetable consumption (Odum & Xu, 2018). Higher rates of fruit and vegetable consumption were reported by White, Asian or Pacific Islanders, or others compared to their Hispanic, Black and American Indian counterparts. Theoretical constructs and demographic variables are necessary to evaluate fruit and vegetable consumption among college students. The CDC developed the *Guide to Strategies to Increase the Consumption of Fruits and Vegetables* and discussed methods to enhance access and availability of fresh

produce including increasing awareness of food and nutrition assistance programs such as SNAP (CDC, 2017).

Outcome evaluation and behavioral beliefs, constructs of TPB were significantly associated with nutritional behaviors among college students (Thompson et al., 2020). In addition to applying TPB constructs to observe this college population, Thompson and colleagues (2020) found that about 43% of participants did not consume the recommended amounts of fruits, vegetables, grains, proteins, and dairy. Additionally, greater nutrition knowledge was associated with a lower intake of unhealthy fats and cholesterol among college students (Yahia et al., 2016).

Limited consumption of fruit and vegetables among college students could result in the development of obesity and other co-morbidities at an earlier age (CDC, 2017; Karabulut et al., 2018; McEligot et al., 2020; Odum & Xu, 2018). Analyzing constructs from various behavioral theories and models can benefit further analysis of nutritional behaviors among college students. This may help to both identify nutrition-related health needs, as well as to develop appropriate interventions to address such needs.

COVID-19 Impact on College Students Dietary Behaviors

On March 25, 2020, schools and educational institutions in approximately 150 countries closed which impacted about 80% of student population globally (Sahu, 2020). The COVID-19 pandemic has caused much uncertainty for Americans, including college students, and many students have lost jobs that helped cover housing, food, and tuition expenses (Daughtery & Anderson, 2020). Universities attempted to mitigate the spread of the virus by advocating for travel restrictions for international students, transitioning classes to online learning, suspending classes, canceling/postponing events, sports and

conferences and providing online support services to students (Sahu, 2020). Some students were dependent on housing and meal plans, but resources were no longer available (Daughtery & Anderson, 2020). Under the CARES Act, colleges received around $14 billion in federal funding, and just under half of the aid ($6.279 billion) was to be used for food, housing, courses, health care and childcare for college students, and about 7% ($1.047 billion) of funding was provided to minority-serving institutions (American Council on Education, 2020). College students who are classified as dependent on their parents' 2018-2019 tax form may not have received the $1200 Economic Impact Payments and may not be eligible for unemployment benefits (Internal Revenue Service, n.d.). However, emergency aid was provided to higher education institutions so students could apply for grants up to $1500 to combat unexpected financial concerns (United States Department of Education, 2020). Bobcat Cares, the Texas State University COVID-19 relief grant, awarded around $6.5 million in grants to full- and part-time students to cover cost of attendance and unexpected expenses due to the pandemic (Texas State University, 2020).

The 2018 GAO reported "…insufficient food and housing undermines postsecondary educational experiences and credential attainment for many of today's college students" (Goldrick-Rab et al., 2019, p. 3). The 2018 GAO Report stated less than one third of U.S. college attendees were traditional students while 71% were non-traditional students (Feeding America, n.d.a; GAO, 2018). Traditional students are classified as being enrolled full-time while being financially dependent on their parents or guardians (Feeding America, n.d.a; GAO, 2018). Non-traditional students include the following: financially independent from parents or guardians, enrolled part-time, work

full-time while enrolled in classes, caretakers for dependents, and/or did not obtain a traditional high school degree (Feeding America, n.d.a; GAO, 2018).

Studies have concluded that food insecurity is associated with poor academic outcomes (Martinez et al., 2018; Zein et al., 2019) A national survey report called #RealCollege was conducted to assess basic needs insecurities, such as affordable food and housing, among two- and four-year colleges (Goldrick-Rab et al., 2019). The #RealCollege assessment provided necessary information to campus leaders and policymakers to better assist students. The survey determined, from the 86,000 respondents, that approximately 45% of participants were food-insecure in the past 30 days; around 56% were housing insecure in the past year; and around 17% were homeless in the past year. Students who attended a two-year college presented with higher rates of basic needs insecurities compared to students attending four-year colleges (Goldrick-Rab et al., 2019). Marginalized groups, including African Americans, LGBTQ groups, and students financially independent students, were at greater risk of basic needs insecurities (Bruening et al., 2016; Goldrick-Rab et al., 2019; Payne-Sturges et al., 2017).

Organizations like the College and University Food Bank Alliance (CUFBA) were developed "…to provide support, training, and resources to campus-based food banks/pantries and other food-insecurity initiatives that primarily serve students" (Goldrick-Rab et al., 2018, p. 1). CUFBA membership increased eight-fold from 2012 to 2018 (Daughtery & Anderson, 2020; Goldrick-Rab et al., 2018). Fifty-one percent of open campus pantries were established in less than one year (Goldrick-Rab et al., 2018). Establishing food pantries during the COVID-19 pandemic could aid in the reduction of food insecurity among college students during these unprecedented times.

COVID-19 impacts the physical and mental health of many individuals globally (Sahu, 2020; Torales et al., 2020). Social isolation strategies place an impact on physical activity and dietary intake among college students. College students surveyed in March and April 2020, the early phase of COVID-19, reported a 20% increase in high caloric intake, snacking frequency, and calorically-dense snacks among females (Gallo et al., 2020). Additionally, participation in moderate-to-vigorous physical activity decreased by 30% among both males and females. Six to eight weeks later, the follow-up survey demonstrated continued high caloric intake among females and reduced physical activity among both sexes (Gallo et al., 2020).

The increased spread of the virus caused uncertainty and anxiety about what the future may hold for college graduates (Sahu, 2020). Stress could negatively impact the learning environment and psychological wellbeing of students (Sahu, 2020), as well as potentially increase the likelihood of food insecurity (Temple, 2018). International students face additional stressors because they "…are not only worried about their health, safety, and education but they also have a huge number of concerns for the wellbeing of their families" (Sahu, 2020, p. 3). Graduate students may face difficulties in obtaining jobs and work experience after graduation because of the pandemic (Sahu, 2020).

Purpose of the Study

To uncover the impact of COVID-19 on college student health, it is important to examine whether an association exists between pandemic stress, food insecurity, and nutritional behaviors of college students so that universities and health organizations may intervene quickly. Therefore, the purpose of this study is to explore the relationship

between COVID-19 stress, food insecurity, and dietary behaviors among college students. The following research questions will be addressed:

1. To what degree are COVID-19 stress and personal agency to consume 5 servings of fruits and vegetables a day associated among college students?
2. To what degree are COVID-19 stress and food insecurity associated among college students?
3. To what degree are personal agency to consume 5 servings of fruits and vegetables a day and food insecurity associated among college students?
4. To what degree are personal agency to consume 5 servings of fruits and vegetables a day and behavioral intention to consume 5 servings of fruits and vegetables a day associated among college students?
5. To what degree are food insecurity and behavioral intention to consume 5 servings of fruits and vegetables associated among college students?
6. To what degree are behavioral intention to consume 5 servings of fruit and vegetables a day and 7-day fruit and vegetable consumption associated among college students?

Integrated Behavioral Model

The Integrated Behavioral Model (IBM) incorporates constructs from the Theory of Planned Behavior (TPB), Theory of Reasoned Action (TRA), Social Cognitive Theory (SCT), and the Health Belief Model (HBM) to explain health behavior (Simons-Morton et al., 2012). The IBM framework is shown in Figure 1. The IBM hypothesizes that behavioral intention to perform a behavior is the immediate antecedent and strongest

predictor of behavior), and that behavioral intention is a product of one's attitude, normative beliefs, and personal agency (Glanz et al., 2015).

Attitude is composed of experiential and instrumental attitude which is associated with an individual's positive or negative feelings regarding performing a behavior (Glanz et al., 2015). Perceived norms are composed of normative beliefs which is an individual's beliefs associated with important people in their life and what they think of the individual performing or not performing a behavior (Glanz et al., 2015).

Personal agency, comprised of self-efficacy and PBC, refers to an individual's internal belief in that they have the ability and confidence to perform a behavior (Glanz et al., 2015). Self-efficacy is defined one's confidence and ability related to performing a behavior (Glanz et al., 2015). PBC factors in external influences that could impact a person's ability of performing a behavior (Glanz et al, 2015). TPB hypothesizes that PBC plays a role in the performance of a behavior through perceptions of control and power (Glanz et al., 2015). The IBM constructs have been shown effective in previous research to analyze dietary behaviors among individuals (Branscum & Lora, 2017; Collado-Rivera et al., 2017; Pember, 2017; Senkowski et al., 2017).

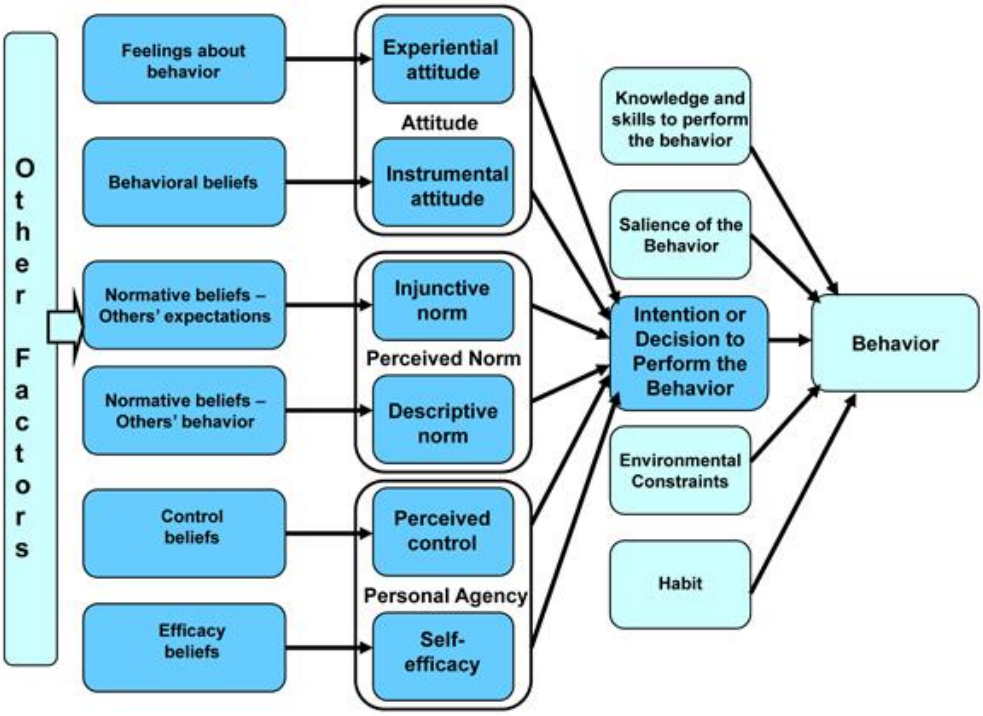


Figure 1. The Integrated Behavioral Model (Glanz et al., 2015)

Dietary Behavior as Explained by Integrated Behavioral Model

IBM has been used to examine various dietary behaviors in both adult and adolescent populations (Branscum & Lora, 2017; Collado-Rivera et al., 2017; Pember, 2017), including prediction of vegetable consumption among U.S. college students (Senkowski et al., 2017). Stressful events in life can result in an increased risk of food insecurity (Temple, 2018). Stress places demands on an individual that exceeds their ability to effectively adapt to them (Litt, 1988). The relationship between self-efficacy and stress has been analyzed in literature (Sebastian, 2013; Grenen et al., 2018; Nastaskin & Fiocco, 2015). Previous research explored the relationship between stress associated with limited access to nutrient-dense foods and its impact on dietary behaviors. Grenen et al. (2018) concluded that stress was negatively associated with fruit and vegetable intake – as stress increased, fruit and vegetable consumption decreased. Nastaskin and Fiocco

(2015) reported similar findings which suggested that as stress decreases, confidence in dietary behaviors increases, which can lead to improved dietary behaviors.

"Self-efficacy represents a way to self-control individual's emotions which can bring multiple advantages in the area of stress" (Sebastian, 2013, p. 559). If an individual is presented with a difficult task, it could trigger an increase in stress (Sebastian, 2013); however, coping mechanisms can aid in the reduction of stress (Labrague et al., 2017). Low levels of stress and high dietary self-efficacy was associated with lower intake of fat and sodium among college students (Nastaskin & Fiocco, 2015).

Limited access to nutrition resources can result in increased stress among individuals (Grenen et al., 2018). Nutrition resource stress was associated with a decrease in fruit and vegetable consumption and self-efficacy (Grenen et al., 2018). Limited research is available linking personal agency to stress. Thoits (2006) stated a possible distinction between controllable and uncontrollable stressors and its relationship with personal agency. PBC has been proposed as a mediator for stressful events (Litt, 1988). Further research should be conducted to analyze the relationship between personal agency and stress.

People with greater self-efficacy presented with a reduction in food insecurity (Kamimura et al., 2017; Martin et al., 2016; Wright et al., 2018). Gaines and colleagues (2012) collected data from college students via a questionnaire utilizing a cross-sectional research design. Findings concluded that college students impacted by an increase in food insecurity presented with a decrease in self-efficacy related to cooking healthy meals, cooking skills, enough money to purchase food along with adequate time to prepare food compared to college students not impacted by food insecurity (Gaines et al., 2012). One's

perception of control is associated with dietary behaviors (Hardcastle et al., 2015; Fukuoka et al., 2014; Menozzi et al., 2015), and current evidence suggests that personal agency may influence behavioral intention of consuming fruits and vegetables (Baker et al., 2003; Contento et al., 2007).

Behavioral intention has been identified in research as a predictor of fruit and vegetable intake (Bogers et al., 2004; Canova & Manganelli, 2016; Philippi et al., 2016). Research has indicated that fruit and vegetable intake is a behavior mediated by a person's control and intention (Armitage & Conner, 1999; Canova & Manganelli, 2016). Behavioral intention has been positively associated with dietary behaviors (Philippi et al., 2016). Therefore, previous literature has demonstrated the IBM is useful for exploring dietary behaviors.

III: METHODOLOGY

IRB Approval

This project was approved by the Texas State University IRB (protocol # 7640) on October 13, 2020.

Research Design

This project utilized a non-experimental, cross-sectional research design by using survey questionnaires to assess rates of food insecurity, stress, and dietary behaviors among college students.

Theoretical Framework

The IBM has been shown effective for examining influences of dietary behaviors of college students. The proposed theoretical framework for this study hypothesized a relationship between COVID-19 stress, personal agency, food insecurity, behavioral intention to consume fruits and vegetables, and 7-day intake of fruits and vegetables among college students.

The proposed theoretical framework and constructs were utilized to determine the associations between pandemic stress, food insecurity, and constructs related to dietary behaviors among college students (Figure 2). The proposed framework hypothesizes an association between COVID-19 stress and personal agency as well as an association between COVID-19 stress and food insecurity. Personal agency and food insecurity present a bi-directional relationship with each influencing the other. Personal agency and food insecurity are both indirect influences on 7-day fruit and vegetable consumption. Behavioral intention to consume fruits and vegetables is a direct influence on 7-day fruit

and vegetable consumption. The scales that follow reflect the IBM framework. The research questions for this study were informed by the IBM.

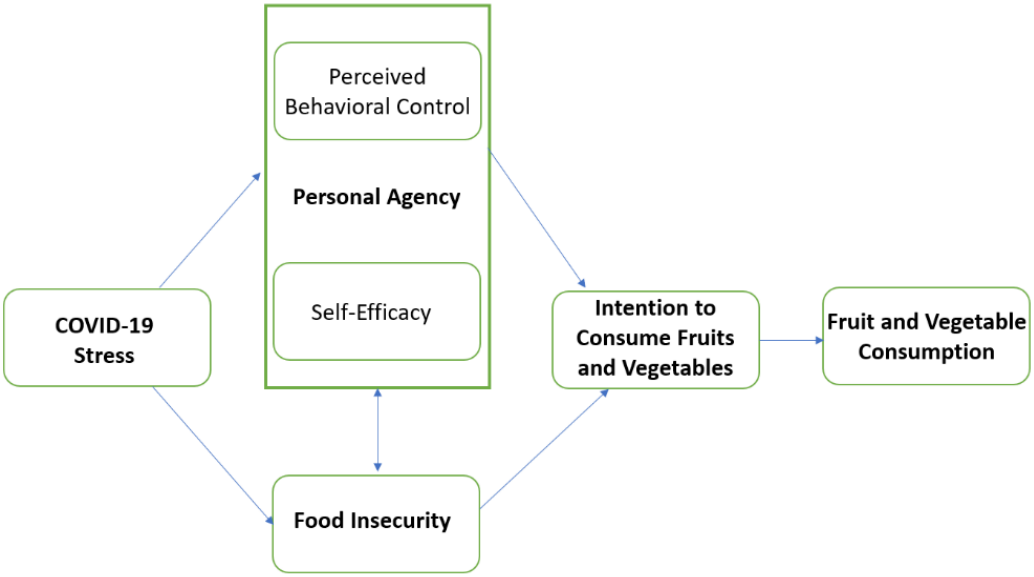


Figure 2. Proposed Model to Explain Relationships between COVID-19 Stress, Food Insecurity, and Fruit and Vegetable Consumption among College Students

Instrument Development

A survey instrument consisting of 36 items was originally developed to measure the relationship between food insecurity, stress related to the COVID-19 pandemic, dietary intentions, and dietary intake among the participating college population. In addition to basic demographic questions (age, sex, race and ethnicity, academic classification, current living arrangement, grade point average (GPA) range, BMI, participant's monthly income, and international student status), individual items on the survey were drawn from five existing questionnaires: 6-item Short Form Food Security Scale, Coronavirus Stress Measure, Food Attitudes and Behavior Survey, the Fruit and

Vegetables Intention Scale, and the Family Life, Activity, Sun, Health, and Eating (FLASHE) Survey (fruit and vegetable consumption items).

Independent Variables

In addition to the demographic variables, the independent variables utilized in this study included food insecurity status, coronavirus stress, personal agency for fruit and vegetable consumption, and intention to consume fruits and vegetables. Scores for all five scales were determined by calculating the sum of each scale item.

Dependent Variable

Three dependent variables were measured for this study: 1) past 7-day fruit consumption, 2) past 7-day vegetable consumption, and 3) past 7-day fruit and vegetable consumption.

Measures

Demographic Items. Demographics questions assessed participant age, sex, race and ethnicity, academic classification, current living arrangement, grade point average (GPA) range, BMI, monthly income, and international student status. BMI was calculated from participant self-reported weight in pounds and height in inches using the English System formula: $\{[\text{weight (lb)} / \text{height (in)}]^2 \times 703\}$ (CDC, 2014). Demographics items were ordinal, interval, or ratio variables depending on the type of question addressed.

From the aforementioned five instruments, a total of five unique measures were used in this study (Appendix A). Those measures and the instruments from which they were derived are:

- Food Insecurity Scale – 6-item Short Food Security Scale
- Coronavirus Stress Scale – Coronavirus Stress Measure

- Personal Agency Scale – Food Attitudes and Behaviors Survey
- Intention Scale – Fruit and Vegetables Intention Scale
- Past 7-day Fruit and Vegetables Consumption – FLASHE Survey

An overview of each measure follows.

Food Security Scale: 6-Item Short Form. The Food Security Scale was developed in 1995 by researchers at the National Center for Health Statistics in an effort to develop an assessment to for food security levels (Blumberg et al., 1999). Originally an 18-item scale, the 6-item short form developed in 1999 was shown to have high specificity and sensitivity to food security measurement (Blumberg et al., 1999).

The short form scale (USDA, 2012) was used in this study to measure food insecurity status among the participating sample; however, the survey items were revised to reflect the nature of this study. Because this study explored food insecurity as it relates to the COVID-19 pandemic, wording on survey items were revised from *in the last 12 months* to *since the start of the COVID-19 pandemic.* Using this ordinal scale, food security status was coded into three categories: high or marginal food security (raw score 0-1); low food security (raw score 2-4); and very low food security (raw score 5-6). Scale scores were determined by summing affirmative responses to each of the survey items and calculating the mean scale score. The scale score was the sum of these items ranging from 5 – 12.

Coronavirus Stress Measure. The Coronavirus Stress Measure was developed in 2020 to measure psychological health among Turkish adults dealing with the COVID-19 pandemic (Arslan et al., 2020). The eight items were derived from the widely used Perceived Stress Scale developed by Cohen et al. (1983). Because the novel coronavirus

and subsequent COVID-19 pandemic are new to science, very few existing instruments are available to specifically measure stress related to the pandemic. However, the Coronavirus Stress Measure was tested on a sample of 451 young adults with a mean age of 23.3 years and produced data with high international consistency (Cronbach's .83) (Arslan et al., 2020).

The 8-item Coronavirus Stress Measure assesses stress related to the COVID-19 pandemic using items which asked about the frequency of experiences specific to pandemic stress. Responses were recorded on a 5-point, ordinal Likert scale ranging from "never" scored as 1 to "very often" scored as 5. The scale score was the sum of these items ranging from 5 – 25 (Arslan et al., 2020).

Food Attitudes and Behavior Survey (Personal Agency Scale). The National Cancer Institute (NCI) Food Attitudes and Behavior Survey was first administered in 2007 to a sample of U.S. adults in an effort to determine the strongest correlates of fruit and vegetable consumption (Erinosho et al., 2015; NCI, 2013). The complete survey consisted of 65 total items, but this study used only a 7-item scale which contained measures of self-efficacy and PBC related to fruit and vegetable intake (Emanual et al., 2012; Erinosho et al., 2015). Self-efficacy and PBC are the two components of the Integrated Behavior Model construct of personal agency (Glanz et al., 2015), so this scale was referred to as the Personal Agency Scale in this study.

The Personal Agency Scale includes ordinal, Likert scale items which measures confidence related to fruit and vegetable consumption. Item responses include: 1 = not at all confident, 2 = slightly confident, 3 = somewhat confident, 4 = fairly confident, and 5 = very confident. Scores from each item were summed to determine level of personal

agency to consume fruits and vegetables with high scores indicating high personal agency and low scores indicating low personal agency. Data collected during prior research utilizing this scale indicated a high internal consistency with a Cronbach's alpha of .92 (Emanual et al., 2012; Erinosho et al., 2015). The scale score was the sum of these items ranging from 5 – 25.

Fruit and Vegetables Intention Scale. The Fruit and Vegetables Intention Scale was developed in 2015 as a method to measure behavioral intentions related to dietary intake (Carfora et al., 2015). The scale was a modified version which was originally developed by Armitage and Conner (1999) to measure behavioral intention of consuming a low-fat diet (Carfora et al., 2015). The original low-fat diet intention scale yielded data with a Cronbach's alpha of 0.86, while data collected with the modified Fruit and Vegetable Intention scale also indicated high internal consistency with a Cronbach's alpha of .79. The scale utilizes a 7-point ordinal scale with responses ranging from "definitely do not: to "definitely do." Responses were summed with higher scores indicating high intention to eat fruits and vegetables and lower scores indicating low intention. The scale score was the sum of these items ranging from 3 – 21.

FLASHE Survey - Fruit and Vegetable Consumption Items. The FLASHE survey was developed and initially administered to a sample of U.S. families in 2014 by the NCI to measure multiple cancer-related behaviors of adults and children (Nebeling et al. 2017). Concerning the present study, only FLASHE items measuring consumption of fruits and vegetables among adults were of interest. This included four items taken from the FLASHE parent survey which asked about past 7-day consumption of 100% pure fruit juice, fruit, green salad, and non-fried vegetables (NCI, 2017). Ordinal item

responses included: 1 = “I did not perform the behavior”, 2 = “perform behavior 1-3 times in the past 7 days”, 3 = “perform behavior 4 – 6 times in the past 7 days”, 4 = “perform behavior 1 time per day”, 5 = “perform behavior 2 times per day”, and 6 = “perform behavior 3 or more times per day”. The scale score was determined by calculating the sum of the scale items with scores ranging from 4 – 24 (NCI, 2017).

Pilot Testing Procedures

A pilot test was conducted to analyze the validity and reliability of questions obtained from the U.S. Household Food Security Survey Module: Six-item Short Form, Coronavirus Stress Measure (CSM), Intention Scale, Food Attitude and Behavioral Survey, and FLASHE Survey. In October-November 2020, a sample of students (n=101) enrolled in courses in the Department of Health and Human Performance were recruited via email invitation to participate in the pilot test. Instructors of the selected courses provided approval and a course email list prior to sending the invitation. Pilot test participants were sent an email which explained the study and provided the IRB-approved consent form. Participants were asked to complete the online Qualtrics survey and provide feedback to the researcher on the ease of procedures, survey readability, and any other pertinent information related to the instrument. Data generated from the pilot test were used to revise the survey instrument prior to the full study.

Cronbach’s alpha reliability analyses were conducted to determine data reliability for each scale on the survey (Table 1). The initial Cronbach’s alpha scores for data collected using the Coronavirus Stress Scale, Personal Agency Scale, and Intention Scale indicated acceptable internal consistency (Cronbach’s alpha >.70); however, the initial Cronbach’s alpha score for data collected using the Food Insecurity Scale and Past 7-Day

Fruit and Vegetable Consumption Scale were below .70 (Cronbach's alpha = .525). The Food Insecurity Scale alpha score was originally .525. This scale included one skip-logic question that was only answered by 30.6% (n=31) of the sample. Removal of this item increased the scale reliability score to .778. The question "*If you answered yes to the previous question, how often did this happen?"* was deleted from this scale. The initial alpha score for data collected using the Past 7-Day Fruit and Vegetable Consumption Scale was .659 but removing the question *"During the past 7 days, how many times did you drink 100% pure fruit juice like orange, apple, grape, etc.?* increased the reliability score to .766. It is possible that this question did not align with the other 3 consumption questions because it asked about beverage consumption compared to consumption of whole fruits and vegetables. Removal of these two items yielded a highly reliable final survey instrument of 34 items (Appendix B).

Table 1. Cronbach's Alpha Reliability Score for Instrument Scales

Survey Scales	Initial Alpha	Final Alpha
Food Insecurity	.525	.778
Coronavirus Stress	.854	.854
Personal Agency	.900	.900
Intention	.824	.824
Past 7-day Fruit and Vegetable Consumption	.659	.766

As part of the pilot study, participants were asked to provide written feedback on any parts of the survey that may have been difficult to understand or complete; however, very few comments were provided. Three participants expressed minor confusion on the Intention Scale items which asked if they "plan to", "intend to", and "want to" eat fruits and vegetables. Because these comments were only mentioned by <3% of the pilot

sample and the scale maintained high internal consistency (.824), no changes were made to the scale.

Data Collection

Sampling. To participate in this research study, an individual must have been a student of Texas State University during the study period (fall 2020 or spring 2021) and been at least 18 years of age or older. An estimated sample size was determined using the Qualtrics sample size calculator (Qualtrics, 2020). Using a 95% confidence level, a confidence interval of 5%, and a population estimate of 38,000 students at the sampled campus, the anticipated sample size for this study was 381 college students.

All Texas State University students enrolled at the time of this study were eligible and were invited to participate in the online survey including undergraduate and graduate students, those who live on- and off-campus, and part-time and full-time students. The survey started with a question asking the participant if they are 18 years of age or older, and if they responded no to the question then the survey terminated. A list of active student email addresses (N = 37,812) was downloaded by the thesis committee chair from the university's email list management tool. Students were invited to participate in this study via an email invitation which included the IRB-approved informed consent and a link to the web-based survey. The email was sent by the thesis committee chair directly from the email list management tool to all 37,812 student email addresses. Students who agreed to participate were provided passive consent by clicking on the link enclosed in the invitation where they were redirected to the Qualtrics survey instrument. Once redirected to the survey, participants could complete the 34-item survey which was estimated to take 10-15 minutes.

Incentives. Funding was granted from the Graduate College's Thesis Research Support Fellowship to offer incentives to selected survey participants. A total of thirty $15 Amazon gift cards were made available to participants through a randomized drawing. Once completed, participants submitted the survey and were redirected to a second link which included the opportunity to enter their name and email address for the incentive drawing. If students wanted to enter the drawing, they could click on the second link and enter their information. To maintain confidentiality of study participants, data entered for the survey and for the incentive drawing were stored in two separate spreadsheets which were not linked to one another in any way. At the completion of data collection, the researcher and thesis committee members randomly selected 30 participants to receive the incentive. Each winner was notified in a private email and the gift card was provided to them electronically.

Survey Availability. The survey was available for participants to complete for a four-week period. Using the university's email list management tool, a reminder email was sent to all students at the beginning of week two. After the four-week survey availability period was completed, data were downloaded from Qualtrics into an SPSS version 26 file. The file was stored on a password protected document on the secure Texas State University U-drive. Only the student researcher and thesis committee members had access to the file. Data were analyzed using SPSS version 26.

Confidentiality. Participants did not include their names or any other personal identification number (e.g., student i.d. number, social security number, etc.) on the survey. Participants were informed that their collected survey responses would remain anonymous and would be shared only in aggregate form through research publications or

presentations. Because participants did not share any identifiers as part of the survey, at no time were the researchers able to link any responses with any specific participant.

Data Analysis

SPSS version 26.0 was used for all statistical analyses. Descriptive statistics were used to identify participant characteristics as they relate to demographics and study constructs. The variable relationships that were analyzed in the study included: COVID-19 stress, food insecurity status, personal agency, intention to consume fruits and vegetables, and overall fruit and vegetable consumption. Figure 1 shows the proposed model which guides this study. Bivariate correlations and linear regression analyses were used to test the relationships of the variables identified in the model. Additionally, partial eta^2 was used to determine the variance explained for each relationship. One-way ANOVAs were used to determine if there was a difference in scale scores based on demographic variables. Because of the exploratory nature of the study, an *a priori* p-value of <0.05 was utilized for all statistical analyses. Missing data were excluded with pairwise deletions.

IV. RESULTS

Participants

A total of 1,001 individuals responded to the survey request; however, not all surveys were completed. Participants who completed only a portion (<50%) of the survey items were excluded from the analysis. This yielded a final sample of 876 respondents. Missing data for the 876 participants in the sample were coded as -9 in SPSS.

Most participants were female (76.0%), White, Non-Hispanic (79.1%), between the ages of 18 – 25 (68.5%), Seniors (30.7%) or Graduate Students (28.4%), had high grade point averages (GPA) (3.1-4.0; 71.4%), lived off campus but not with parents/guardians (72.6%), had monthly income at or below the U.S. federal poverty rate (39.1%) and were not international students (97.5%). Mean (standard deviation) age of the participants was 24.96 (8.118). Among males, mean height and weight was 70.2053 inches and 185.02 pounds, while females reported 64.3439 inches and 154.57 pounds. Mean BMI for males was 26.33 and females was 26.17, which places both sexes in the overweight category; however, there was no statistically significant relationship between BMI and any of the 5 scales examined in this study. Table 2 provides further descriptive data on the sample.

Table 2. Descriptive Statistics of Participants

	N= 876*	%
Sex		
Male	190	21.7
Female	666	76.0
Race		
White	686	79.1
Black or African American	48	5.5
American Indian or Alaska Native	13	1.5

Asian	34	3.9
Native Hawaiian or Pacific Islander	4	0.5
Some other race or more than one race	82	9.5
Ethnicity		
Hispanic/LatinX/Spanish	301	34.4
Not Hispanic/LatinX/Spanish	574	65.6
Academic Classification		
Freshman	89	10.2
Sophomore	103	11.8
Junior	166	18.9
Senior	269	30.7
Graduate Student (Masters or Doctoral Student)	249	28.4
Current Living Arrangement		
I live on campus	92	10.5
I live off campus with my parents/guardians	147	16.8
I live off campus, but not with my parents/guardians	634	72.6
Current Grade Point Average (GPA)		
I am new to college and do not have a GPA yet	79	9.0
1.1 – 2.0	6	0.7
2.1 – 3.0	165	18.9
3.1 – 4.0	625	71.4
Average Monthly Income (In Dollars)		
At or below the poverty line	252	28.8
Up to 150% above the poverty line	342	39.1
150-185% above the poverty line	129	14.7
Greater than 185% above the poverty line	152	17.4
International Student		
Yes	22	2.5
No	855	97.5

Note.
*Category N different due missing data

Scale Analyses

Descriptive analyses were conducted on the following research variables: COVID-19 stress, food insecurity, personal agency, behavioral intention to consume fruits and vegetables, and past 7-day fruit and vegetable consumption. Additionally, Cronbach's alpha reliability coefficient was used to determine internal consistency of data collected using each of the variable scales (Table 3).

Student respondents reported experiencing moderately high levels of COVID-19 stress (M=17.59 scale score) based on the scale items which ranged from 5-25 with 5 total items. Participants reported relatively low levels of food insecurity (M=6.67) based on the scale items ranging from 5-12 with a total of 5 items. Personal agency was high (M=21.34) among respondents when measured on a scale ranging from 5-25 for 7 total items. Behavioral intention to consume fruits and vegetables was considered moderate (M=13.1957) based on the 3 scale items ranging from 3-21. Participants reported low past 7-day fruit and vegetable consumption (M=7.14) on a scale ranging from 4-24 with 3 items.

Reliability analyses indicated high internal consistency among data for all scales: COVID-19 stress (Cronbach's α = .891), food insecurity (.813), personal agency (.904), intention to consume fruit and vegetables (.857), and past 7-day fruit and vegetable consumption (.655).

Table 3. Means, Standard Deviations, and Cronbach's Alpha for Survey Scales

Variable	M	SD	Cronbach's Alpha
COVID-19 Stress (range; 5-25)	17.59	4.508	.891
Food Insecurity (range; 5-12)	6.67	1.779	.813

Personal Agency (range; 5-25)	21.34	7.314	.904
Behavioral Intention (range; 3-21)	13.1957	4.22572	.857
Fruit and Vegetable Consumption (range; 4-24)	7.14	2.636	.655

Bivariate Correlation Analyses

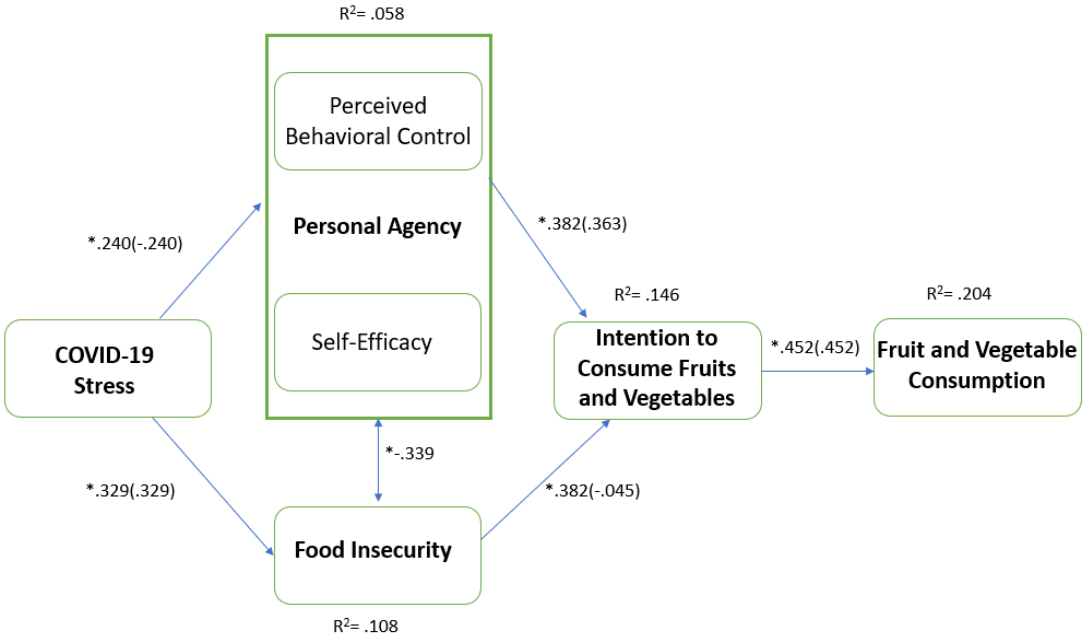
Bivariate correlation analyses were conducted on each survey scale: COVID-19 stress, food insecurity, personal agency, behavioral intention, and fruit and vegetable consumption (Table 4 and Figure 3). Pearson r statistics indicated a weak, inverse relationship between COVID-19 stress and personal agency (r=-.240) demonstrating that as respondents' stress increases, personal agency decreases. A moderate, positive relationship (r=.329) was found between COVID-19 stress and food insecurity indicating that as stress levels increase, food insecurity increases. COVID-19 stress was negatively associated with behavioral intention (r=-.029) and consumption of fruits and vegetables, indicating that as stress increases, behavioral intention to consume fruits and vegetables decreases.

Pearson r statistics indicated a moderate, positive relationship (r=.387) between personal agency and behavioral intention to consume 5 servings of fruits and vegetables indicating that as respondents' personal agency increases, behavioral intention to consume fruits and vegetables increases. Personal agency and fruit and vegetable consumption (r=.474) demonstrating a moderate, positive relationship indicating that was personal agency increases, fruit and vegetable consumption increases among student respondents.

Pearson r statistics indicated a weak, inverse relationship (r=-.174) between food insecurity and behavioral intention to consume fruits and vegetables demonstrating that as food insecurity increases, intention to consume fruits and vegetables decreases. Food insecurity and fruit and vegetable consumption demonstrated a weak, inverse relationship (r=-.214) indicating that as food insecurity increases, fruit and vegetable consumption decreases among respondents. Pearson R statistics indicated a moderate, positive relationship (.452) between behavioral intention to consume fruits and vegetables and respondents past 7-day consumption of fruits and vegetables.

Table 4. Bivariate Correlations of Survey Scales (Pearson Correlation Coefficient)

Variables	COVID-19 Stress	Personal Agency	Food Insecurity	Behavioral Intention	Fruit and Vegetable Consumption
COVID-19 Stress	1	-.240*	.329*	-.029	-.150*
Personal Agency	-.240*	1	-.339*	.387*	.474*
Food Insecurity	.329*	-.339*	1	-.174*	-.214*
Behavioral Intention	-.029	.387*	-.174*	1	.452*
Fruit and Vegetable Consumption	-.150*	.474*	-.214*	.452*	1



Note.
*Pearson r (beta weight)
R^2 % of explained variance

Figure 3. Bivariate Analysis and Correlation Between Scales

COVID-19 Stress, Personal Agency, and Fruit and Vegetable Consumption

The first research question of this study was: *To what degree are COVID-19 stress and personal agency to consume 5 servings of fruits and vegetables a day associated among college students?* Bivariate regression analyses were conducted to determine the relationship between COVID-19 stress and personal agency as it relates to fruit and vegetable consumption among student respondents. COVID-19 stress (ß=.-240) explained 5.8% of variance in personal agency to consume 5 servings of fruits and vegetables a day suggesting that COVID-19 stress was a weak predictor of personal agency to consume fruits and vegetables.

COVID-19 Stress and Food Insecurity

The second research question of this study was: *To what degree are COVID-19 stress and food insecurity associated among college students?* Bivariate regression analyses were conducted to determine the impact of COVID-19 stress on food insecurity. COVID-19 stress (ß=.329) explained 10.8% of variance in food insecurity indicating that COVID-19 stress was a weak predictor of food insecurity status among respondents.

Personal Agency and Fruit and Vegetable Consumption

The third research question of this study was: *To what degree are personal agency to consume 5 servings of fruits and vegetables a day and food insecurity associated among college students?* A bivariate correlation analysis was conducted to determine the reciprocal relationship between personal agency and food insecurity. Personal agency and food insecurity had an inverse relationship because the variables influence each other. The relationship between personal agency and food insecurity (r=-.339) indicated that as personal agency decreases, food insecurity increases.

Behavioral Intention, Personal Agency, and Food Insecurity

As indicated in Figure 3, the original model proposed for this study indicated that both personal agency and food insecurity directly impacted behavioral intention to consume fruit and vegetables. The two research questions exploring these variables were: *To what degree are personal agency to consume 5 servings of fruits and vegetables a day and behavioral intention to consume 5 servings of fruits and vegetables a day associated among college students?*, and: *To what degree are food insecurity and behavioral intention to consume 5 servings of fruits and vegetables associated among college students?* Linear regression analyses were conducted to determine the relationship

between personal agency and food insecurity and its impact on behavioral intention to consume 5 servings fruits and vegetables. Personal agency and food insecurity explained 14.6% of variance in behavioral intention to consume fruit and vegetable among respondents. Personal agency (ß=.363) was a moderate predictor of fruit and vegetable consumption, while food insecurity was a weak predictor (ß=-.045) of fruit and vegetable consumption.

Behavioral Intention and Past 7-Day Consumption of Fruit and Vegetables

The final research question of this study was: *To what degree are behavioral intention to consume 5 servings of fruit and vegetables a day and 7-day fruit and vegetable consumption associated among college students?* Bivariate regression analyses analyzed the relationship between behavioral intention to consume fruits and vegetables and fruit and vegetable consumption. Behavioral intention to consume fruits and vegetables (ß=.452) explained 20.4% of variance in fruit and vegetable consumption suggesting that behavioral intention was a moderate predictor of students consuming fruits and vegetables.

Demographic Differences among Scale Scores

In addition to the research questions explored above, a series of one-way ANOVA analyses were conducted to examine demographic differences among the participants as it related to the five survey scale variables.

COVID-19 Stress

Gender. Males (n=190; M=15.7526) reported the lowest COVID-19 stress scores compared to females (n=662; M=18.0529) and individuals who identified as other (n=14;

M=20.000) (F=14.914; p≤.001). Gender identity explained 4.9% of variance in COVID-19 stress among respondents.

Ethnicity. Individuals who identified as Hispanic/LatinX/Spanish (n=300; M=18.0267) reported greater COVID-19 stress scores compared to individuals who did not identify as Hispanic/LatinX/Spanish (n=570; M=17.3175) Ethnicity explained 0.6% of variance in COVID-19 stress (F=4.858; p=.028).

Race. Native Hawaiian or Pacific Islander (n=4; M=19.2500) reported greater COVID-19 stress scores followed by American Indian or Alaska Native (n=12; M=18.417), individuals identifying as other race or more than one race (n=81; M=18.2963), Asian (n =34, M=17.7941), Black or African American (n=47; M=17.5532), and White (n=684; M=17.4386). Race explained 0.4% of variance in COVID-19 stress and was not statistically significant (F=.741; p=.593).

Current Living Arrangement. Individuals living off campus with a parent or guardian (n=145; M=17.1724) reported lower COVID-19 stress scores compared to individuals living on campus (n=91; M=17.5055). Individuals living off campus, but not with their parents or/guardians reported the greatest COVID-19 (n=633; M=17.6714). Respondents living arrangement explained 0.2% of variance in COVID-19 stress and was not statistically significant (F=.726; p=.484).

Monthly Income. COVID-19 stress scores (n=341; M=18.3959) were greatest among individuals whose income was up to 150 percent above the federal poverty line. This was followed by individuals at or below the federal poverty line (n=250; M=17.9160) and individuals whose income was 150 – 185 percent above the federal poverty line (n=128; M=17.3594). Individuals whose income was greater than 185

percent above the federal poverty line reported lowest COVID-19 stress scores (n=151; M = 15.2517). Average monthly income explained 6.1% of variance in COVID-19 stress (F=18.698; p≤.001).

Behavioral Intention

Gender. Behavioral intention to consume fruits and vegetables was greatest among females (n=595; M=13.3748) compared to males (n=170; M=12.6824) and individuals identifying as other (n=13; M=12.2308). Gender identity explained 0.5% of variance in behavioral intention to consume fruits and vegetables but was not statistically significant (F=1.418; p=.236).

Ethnicity. The behavioral intention score (n=268; M=13.3545) for individuals who identified as Hispanic/LatinX/Spanish was greater than individuals who did not identify as Hispanic/LatinX/Spanish (n=513; M=13.1306). Ethnicity explained 0.1% of variance in behavioral intention to consume fruits and vegetables but was not statistically significant (F=.492; p=.483).

Race. Native Hawaiian or Pacific Islander reported greatest behavioral intention to consume fruits and vegetables (n=4; M=14.7500), followed by Asian (n=33; M=14.3636), Black or African American (n=37; M=13.7568), individuals identifying as other race or more than one race (n=76; M=13.6447), White (n=615; M=13.0829), and American Indian or Alaska Native (n=11; M=12.1818). Race explained 0.7% of variance in behavioral intention to consume fruits and vegetables but was not statistically significant (F=1.114; p=.351).

Current Living Arrangement. Individuals living off campus, but not with parents/guardians reported greatest behavioral intention to consume fruits and vegetables

(n=570; M=13.4368) compared to individuals living off campus with their parents/guardians (n=132; M=13.0076) and individuals living on campus (n=78; M=11.7692). Living arrangement explained 1.4% of variance in behavioral intention to consume fruits and vegetables (F=5.548; p=.004).

Monthly Income. Behavioral intention to consume fruits and vegetables was greatest among individuals whose income was greater than 185 percent above the federal poverty line (n=140; M=14.1857) followed by individuals whose income was 150 – 185 percent above the federal poverty line (n=121; M=13.6777) and individuals whose income was up to 150 percent above the federal poverty line (n=303; M=12.8515). Individuals at or below the federal poverty line (n=217; M=12.8341) reported lowest behavioral intention to consume fruits and vegetables. Average monthly income explained 1.7% of variance in behavioral intention to consume fruits and vegetables (F=4.354; p=.005).

Personal Agency

Gender. Personal agency was greatest among males (n=189; M=22.3386) compared to females (n=659; M=21.0804) and individuals identifying as other (n=14; M=16.9286). Gender identity explained 1.2% of variance in personal agency among respondents (F=3.542; p=.014).

Ethnicity. Personal agency was lower (n=298; M=20.4463) among individuals who identified as Hispanic/LatinX/Spanish compared to individuals who did not identify as Hispanic/LatinX/Spanish (n=567; M=21.7778). Ethnicity explained 0.7% of variance in personal agency (F=6.380; p=.012).

Race. Personal agency was greatest among Native Hawaiian or Pacific Islander (n=4; M=23.7500) followed by Asian (n=34; M=21.6765), White (n=680; M=21.4515), Black or African American (n=48; M=21.1458), individuals identifying as some other race or more than one race (n=79; M=20.7215), and American Indian or Alaska Native (n=12; M=20.0833). Race explained 0.2% of variance in personal agency but was not statistically significant (F=.313; p=.905).

Current Living Arrangement. Individuals living off campus, but not with parents/guardians had greatest personal agency (n=627; M=21.6619) followed by individuals living off campus with parents/guardians (n=145; M=21.4483) and individuals living on campus (n=92; M=18.5217). Current living arrangement explained 1.7% of variance in personal agency (F=7.415; p≤.001).

Monthly Income. Individuals whose income was greater than 185 percent above the federal poverty line (n=148; M=24.3243) reported greatest personal agency followed by individuals whose income was 150 – 185 percent above the federal poverty line (n=126; M=22.4444) and individuals at or below the federal poverty line (n=251; M=20.6853). Individuals whose income was up to 150 percent above the federal poverty reported lowest personal agency (n=340; M=20.0676). Average monthly income explained 4.5% of variance in personal agency (F=13.573; p≤.001).

Food Insecurity

Gender. Food insecurity was greatest among individuals identifying as other (n=13; M=7.5385) compared to females (n=641; M=6.6708) and males (n=181; M=6.5304). Gender identity explained 0.5% of variance in food insecurity but was not statistically significant (F=1.393; p=.243).

Ethnicity. Food insecurity was greatest among individuals who identified as Hispanic/LatinX/Spanish (n=286; M=7.0070) compared to individuals who did not identify as Hispanic/LatinX/Spanish (n=553; M=6.4738). Ethnicity explained 2% of variance in food insecurity (F=17.228; p≤.001).

Race. Food insecurity was greatest among Native Hawaiian or Pacific Islander (n=4; M=7.7500) followed by American Indian or Alaska Native (n=12; M=7.3333), individuals identifying as some other race or more than one race (n=79; M=7.2152), Black or African American (n=45; M=6.7556), White (n=658; M=6.5669), and Asian (n=34; M=6.4118). Race explained 1.6% of variance in food insecurity (F=2.735; p=.018).

Current Living Arrangement. Individuals living on campus reported greater food insecurity (n=85; M=6.7765) compared to individuals living off campus but not with their parents/guardians (n=615; M=6.7171) and individuals living off campus with their parents/guardians (n=138; M=6.3043). Current living arrangement explained 0.8% of variance in food insecurity (F=3.265; p=.039).

Monthly Income. Individuals whose income was up to 150 percent above the federal poverty line (n=329; M=7.1094) reported greatest food insecurity followed by individuals at or below the federal poverty line (n=238; M=6.6975) and individuals whose income was 150 – 185 percent above the federal poverty line (n=126 M=6.4921). Individuals whose income was greater than 185 percent above the federal poverty line reported lowest food insecurity (n=148; M=5.7365). Average monthly income explained 7.4% of variance in food insecurity (F=22.181; p≤.001).

Fruit and Vegetable Consumption

Gender. Females reported greater fruits and vegetable consumption (n=665; M=7.1489) compared to males (n=190; M=7.1316) and individuals identifying as other (n=14; M=6.6429). Gender identity explained 0.1% of variance in consuming 5 servings of fruits and vegetables daily but was not statistically significant (F=.271; p=.846).

Ethnicity. Individuals who did not identify as Hispanic/LatinX/Spanish reported higher consumption of 5 servings of fruits and vegetables (n=572; M=7.2675) compared to individuals who identified as Hispanic/LatinX/Spanish (n=301; M=6.8937). Ethnicity explained 0.5% of variance in consuming 5 servings of fruits and vegetables daily among respondents (F=3.947; p=.047).

Race. Five servings of fruit and vegetable intake was greatest among individuals identifying as some other race or more than one race (n=82; M=7.6707) followed by Native Hawaiian or Pacific Islander (n=4; M=7.5000), White (n=685; M=7.1460), Asian (n=34; M=7.1176), Black or African American (n=48; M=6.8750), and American Indian or Alaska Native (n=12; M=5.4167). Race explained 1% of variance in respondents consuming 5 servings of fruits and vegetables daily but was not statistically significant (F=1.780; p=.114).

Current Living Arrangement. Individuals living off campus with a parent/guardian (n=146; M=7.2671) reported greatest consumption of 5 daily servings of fruits and vegetables compared to individuals living off campus but not with a parent/guardian (n=634; M=7.2271) and individuals living on campus (n=92; M=6.3043). Current living arrangement explained 1.2% of variance in respondents consuming 5 servings of fruits and vegetables daily (F=5.148; p=.006).

Monthly Income. Individuals whose income was greater than 185 percent above the federal poverty line reported greatest consumption of 5 servings of fruits and vegetables daily (n=151; M=8.2848) followed by individuals whose income was 150 – 185 percent above the federal poverty line (n=129; M=7.9147) and individuals at or below the federal poverty line (n=252; M=6.6984). Individuals whose income was up to 150 percent above the federal poverty line reported lowest consumption of 5 servings of fruits and vegetables daily (n=341; M=6.6745). Average monthly income explained 6.5% of variance in respondents consuming 5 servings of fruits and vegetables daily ($F=20.177$; $p \leq .001$).

V. DISCUSSION

The COVID-19 pandemic has influenced the lives of millions and is continuing to surge throughout the globe (Yang et al., 2021). Research during this time is necessary to provide evidence-based findings on how to best respond to the effects of the COVID-19 pandemic on mental and physical health (Holmes et al., 2020). Early research has suggested that the pandemic has impacted food access and dietary behaviors among affected populations (Niles et al., 2020; Wolfson & Leung, 2020) and the International Food Policy and Research Institute has called for increased research on the COVID-19 impact on food insecurity (Laborde, et al., 2020). Because college students can face unique issues related to food access (Cady, 2014), urgency is needed from academia and science to identify the behavioral impacts of the COVID-19 pandemic on college students' stress, food insecurity, and dietary behaviors.

Research Variables & Theoretical Framework

The present study informed and supported literature on the impact of the COVID-19 pandemic on population behaviors among college students. Previous literature analyzed food insecurity (Ebadi & Ahmadi, 2019), self-efficacy (Odum & Xu, 2018), PBC (Canova & Manganelli, 2016), and behavioral intention (Bogers et al., 2004; Canova & Manganelli, 2016; Lien et al., 2002) on fruit and vegetable consumption. The present study further explored college students' fruit and vegetable consumption by incorporating personal agency and stress associated with the COVID-19 pandemic to analyze the relationship with college student dietary behaviors.

The Integrated Behavioral Model served as the theoretical framework for the present study to analyze the relationship between food insecurity, COVID-19 stress,

personal agency, dietary intentions to eat fruit and vegetables, and fruit and vegetable consumption among college students. Additionally, various demographic variables were examined including gender, ethnicity, race, current living arrangement and monthly income. The key findings of this study are: a) COVID-19 stress was a weak predictor of personal agency to consume fruits and vegetable and food insecurity, b) personal agency and food insecurity indicated a bi-directional relationship – as personal agency increases, food insecurity decreases, c) personal agency was a moderate predictor of fruit and vegetable consumption while food insecurity was a weak predictor of fruit and vegetable consumption, d) behavioral intention was the greatest predictor of, and explained the most variance in, fruit and vegetable consumption. A discussion of each of these key findings follows.

COVID-19 Stress

Previous literature indicated that college students experienced negative psychological impact from the COVID-19 pandemic (Cao et al., 2020; Rudenstine et al., 2020; Son et al., 2020; Yang et al., 2021). The present study found that females (M=18.0529) and individuals who identified as Hispanic/LatinX/Spanish (M=18.0267) reported greatest COVID-19 stress compared to their peers. These findings are similarly found in non-COVID related literature which states that Hispanics, particularly women, were more likely to experience stress associated with health, work, and money compared to the general population (Alcántara et al., 2017; American Psychological Association, 2006).

The present study also found that individuals whose income was up to 150 percent above the federal poverty line experienced more COVID-19 stress (M=18.3959)

than individuals with higher incomes (M=15.2517) and individuals at or below the poverty line (M=17.9160). Around 33% of American adults and 50% of American children live "near poverty" or just above the federal poverty line (Columbia University, 2018). In the present study, individuals living near poverty (up to 150 percent above the federal poverty line) reported the greatest COVID-19 stress. Further study is needed to explore the relationship between health and financial risks experienced by this population.

Financial strain and limited income during the COVID-19 pandemic were associated with mental health issues (Hertz-Palmor et al., 2020), and could lead to increased stress among individuals. Increased stress has been linked to lowered fruit and vegetable consumption (Gardiner et al., 2019). The theoretical model in the present study indicated that as COVID-19 stress increased personal agency to consume fruits and vegetables decreased; however, results concluded that COVID-19 stress was a weak predictor of personal agency to consume fruits and vegetables. Public health and nutrition practitioners should recognize that stressful events, such as community-wide outbreaks, may increase the need for health education related to dietary behaviors. Identifying pandemic stress as an indicator for personal agency to consume fruits and vegetables could be evaluated in future research to mitigate additional stressors placed on individuals during a pandemic.

Living near poverty presents unique stresses on individuals as they may not qualify for governmental assistance programs such as the Supplemental Nutrition Assistance Program (SNAP), yet they may not make an income sufficient for basic sustainability. For example, while over half of individuals living in poverty qualified for

SNAP, less than one-third of individuals in near poverty qualified for the program (Hokeyem & Heggeness, 2014). Public health and nutrition practitioners should seek to identify stressors which act as key behavioral determinants related to fruit and vegetable access. Identifying these specific determinants can help develop interventions to mitigate the effects of stress on fruit and vegetable consumption.

Personal Agency and Food Insecurity

The present study suggested that individuals with greater personal agency are more likely to be food secure and have greater intention to consume fruits and vegetables. The relationship between food insecurity and personal agency has been previously reported in literature. College students experiencing health or financial stress could increase their odds of experiencing food insecurity twofold (Temple, 2018). Improvement in self-efficacy has been linked to a decrease in food insecurity status (Kamimura et al., 2017; Martin et al., 2016; Wright et al., 2018); however, the present study indicated that the personal agency was not a strong indicator of food insecurity status (r=-.339) among the current sample.

In the present study, males (M=22.3386), individuals living off campus but not with parents/guardians (M=21.6619), and individuals whose income was greater than 185 percent above the federal poverty line (M=24.3243) demonstrated the greatest personal agency to consume fruits and vegetables. Conversely, personal agency to consume fruits and vegetables was lowest among individuals who identified as Hispanic/LatinX/Spanish (M=20.4463). Ethnicity (2%) and average monthly income (7.4%) explained the highest degree of variance in food insecurity among the variables explored. The current study indicated that individuals living on campus (M=6.7765), individuals who identified as

Hispanic/LatinX/Spanish (M=7.0070), Native Hawaiian or Pacific Islander (M=7.7500), and individuals whose income was up to 150 percent above the federal poverty line (M=7.1094) reported greater food insecurity compared to their counterparts.

Previous literature indicated that minority populations were at greater risk of food insecurity, and college students presented with a higher risk of food insecurity during the COVID-19 pandemic (Owens et al., 2020; Wolfson & Leung, 2020). Owens and colleagues (2020) indicated that one of the strongest predictors of food insecurity was current living arrangements among respondents which highlights the findings in this study. The present study provided an additional perspective by assessing current living arrangements as it relates to college students (living on campus and living off campus with or without parents/guardians). The COVID-19 pandemic exacerbated food security and dietary quality among individuals at the domestic and global level (Kansiime et al., 2020). Food insecurity and fruit and vegetable consumption demonstrated an inverse relationship (r=-.214) in the current study – as food insecurity increased, fruit and vegetable consumption decreased. The supports previous literature stating that food-insecure individuals reported lower intake of nutritious foods (Hanson & Connor, 2014). The present study emphasized the need to focus on food insecurity among college students to mitigate the negative effects of the ongoing, and future, pandemics on dietary behaviors. Evaluating an individual's monthly income and current living situation could improve understanding of influences on food insecurity in the U.S. Public health and nutrition practitioners should focus on developing interventions that address personal agency to consume fruits and vegetables which is particularly important as it relates to food insecurity.

Personal Agency and Intention

Previous literature suggested that personal agency, comprised of PBC and self-efficacy, could play a role in increasing intention to eat fruits and vegetables (Baker et al., 2003; Contento et al., 2007, 2010). The present study contributes to literature by exploring this theoretical construct. Previous literature also analyzed self-efficacy and PBC as separate constructs (Blanchard et al., 2009; Canova & Maganelli, 2016), and suggested that PBC was significantly related to (Canova & Maganelli, 2016), and a strong predictor of (Blanchard et al., 2009) behavioral intention to consume fruits and vegetables. However, in the present study, personal agency presented with a moderate relationship with intention to consume fruits and vegetables (r=.387) and fruit and vegetable consumption (r=.474). Future research should analyze the various dimensions and effects of personal agency on intention to consume fruits and vegetables. Public health and nutrition practitioners should develop strategies addressing personal agency to consume fruits and vegetables which may positively impact fruit and vegetable intake among college students. Future research should also address additional constructs of IBM, including social norms and attitudes along with personal agency, to further understanding of fruit and vegetable consumption among college students.

Behavioral Intention and Fruit and Vegetable Consumption

The present study revealed that behavioral intention was a moderate predictor of college students consuming 5 servings of fruits and vegetables per day (r=.452) and demonstrated the greatest variance (20.4%) in explaining fruit and vegetable consumption among college students. Monthly income (1.7%) and current living arrangement (1.4%) explained the majority of variance in behavioral intention to

consume fruits and vegetables. The study also suggested that females (M=13.3748) qualitatively had greater behavioral intention to consume fruits and vegetables compared to males (M=12.6824); however, the difference failed to achieve statistical significance. Similarly, previous literature concluded that females had greater behavioral intention to consume fruits and vegetables than males (Fila & Smith, 2006). The present study adds to the previous literature by similarly demonstrating the impact of intention on fruit and vegetable consumption (Bogers et al., 2004; Canova & Manganelli, 2016; Lien et al., 2002). University health professionals should utilize research findings to inform program strategies that focus on improving intention as it relates to fruit and vegetable consumption. Future research should continue to identify additional predictors of behavioral intention and the impact on fruit and vegetable consumption among college students.

Fruit and Vegetable Consumption

In the present study, individuals who identified as Hispanic/LatinX/Spanish (M=6.8937) and individuals identifying as Black or African American (M=6.8750) and American Indian/Alaskan Native (M=5.4167) reported lower intake of fruits and vegetables than their counterparts. This is a similar result as indicated in prior literature which suggested that racial and ethnic minorities, particularly Black and Hispanic populations, were more likely to experience disparities related to fruit and vegetable consumption (Di Noia et al., 2016; Nepal et al., 2011). Previous literature concluded that females consumed more fruits and vegetables than males (Emanual et al., 2012; Prättälä et al., 2007); however, the present study failed to find a difference in fruit and vegetable consumption based on gender (p=.846).

Individuals living off campus with a parent/guardian reported the greatest fruit and vegetable consumption (M=7.2671) in the current study. The relationship of living arrangement and dietary intake among college students has not been studied extensively to date; however, the findings of the current study align with prior research. El Ansari and colleagues (2012) found that fruit and vegetable consumption was higher among European college students living at home with parents. Papadaki et al. (2007) found that college students in Greece living away from home had decreased weekly consumption of fruits and vegetables. Irrespective of living with parents, the University Life Study found that U.S. college students who lived off-campus were less likely to consume fruits and vegetables compared to individuals living on campus (Small et al., 2013). The impact of college student living arrangement on dietary intake, particularly fruit and vegetable consumption, should be explored in future research. The present study suggested that individuals living on campus reported the lowest fruit and vegetable intake, which can inform Universities on how to better prepare for the impact of pandemic-related stressors on college students. Individuals living off campus, but not with parents/guardians demonstrated personal agency (M=21.6619) and behavioral intention (M=13.4368) to consume fruits and vegetables.

Among participants in the present study, individuals whose income was greater than 185 percent above the federal poverty line reported greatest consumption of fruits and vegetables (M=8.2848) than those reporting lower monthly income levels (M=6.6745). This result provides support for prior evidence which suggests that there are significant income disparities in fruit and vegetable consumption (Grimm et al., 2012; Mook et al., 2016). Middaugh and colleagues (2012) suggested that there is little

difference in fruit and vegetable consumption among lower income levels, but that consumption increases as income rises. Cost is cited as a major factor for lack of fruit and vegetable consumption (Mook et al., 2016). Monthly income mostly explained variance (6.5%) in fruit and vegetable consumption.

Overall, behavioral intention explained the majority of variance in (20.4%) and was the greatest predictor of (r=.452), fruit and vegetable consumption among college students during the COVID-19 pandemic. Prior research has effectively demonstrated the relationship of intentions and fruit and vegetable consumption (Bogers et al., 2004; Canova & Manganelli, 2016; Lien et al., 2002). This study has added to the current literature by exploring this relationship in light of the current global COVID-19 pandemic and its related stressors on the college student population. Public health and nutrition practitioners who work with low-income and racial/ethnic minority populations should recognize the need for additional nutrition programming to improve overall dietary behaviors. Future research can evaluate behavioral intention and its impact on fruit and vegetable consumption to improve dietary behaviors among college students.

Limitations

Several limitations should be noted when considering study findings. First, the electronic survey data collection method could limit those potential participants who lacked internet access or had limited time to complete the questionnaire. However, because data were collected during the COVID-19 pandemic during a period of time when many students were inaccessible on campus, the electronic survey method allowed for each enrolled student to be invited to participate. Survey biases can present due to low response rate and selective participation while using online surveys; however, faster and

lower cost of data collection, quality of data, ability to gather large amounts of information from many individuals are advantages of electronic surveys (DeCarlo, n.d.; Heiervang & Goodman, 2011). Versatility, reliability, and generalizability are advantages of survey research (DeCarlo, n.d.).

This research study utilized a cross-sectional design making it impossible to monitor changes in the population of interest over time (London School of Hygiene and Tropical Medicine, 2009); however, this research design was appropriate to address the research questions in this study. The majority of respondents were females causing unequal cell sizes which can affect statistical outcomes; however, literature suggests that females are more likely than males to participate in online surveys (Curtin et al., 2000; Saleh & Bista, 2017).

The sample size of the research study (n=876) was relatively large which could compromise the findings through amplification of differences and accentuate statistical differences that are not meaningful (Faber & Fonseca, 2014). However, the response rate was relatively small (approximately 2.3%) which may limit generalizability of research findings to the sample population (n= 38,000); however, every member of the population was invited to participate in the online survey. The sample included a diverse representation of gender, race, ethnicity and living arrangement.

Survey research tends to be reliable due to the standardization of questions; however, the present study utilized multiple scales to develop one inclusive survey that focused on stress, theoretical constructs, food insecurity status and fruit and vegetable consumption. Scales used in the study were edited to improve internal consistency, which can affect the standardized survey questions, possibly affecting research outcomes.

Cronbach's alpha scores for most scales indicated acceptable internal consistency (>.70); however, Cronbach's alpha score for the fruit and vegetable consumption scale was marginal (.655).

Fruit and vegetable consumption was analyzed by measuring fruits and vegetables (green salad and non-fried vegetables) as two different categories. USDA food intake surveys concluded that Americans consume lower than the recommended value of fruits (2 cups) and vegetables (2.5 cups) per day. The surveys determined that vegetable consumption was higher (1.4 cups) among individuals compared to fruit consumption (0.9 cups) (Stewart & Hyman, 2019). The differing intakes could shift the distribution of data affecting research outcomes. To compensate for this potential issue, scores were summed which represented cumulative fruit and vegetable consumption. This aligns with the USDA dietary guidelines which states that individuals should consume a cumulative total of at least 5 servings of fruits and vegetables a day (USDA, 2020b).

Conclusion

Various factors, including the COVID-19 pandemic, can affect fruit and vegetable consumption among college students. College students are an underrecognized population who have been impacted by the financial, mental, and physical stressors of the pandemic. Stress, personal agency, and food insecurity can affect fruit and vegetable consumption; however, behavioral intention was identified as the strongest predictor in fruit and vegetable consumption among the current sample. Future studies should focus on behavioral intention for improving fruit and vegetable consumption among college students because understanding the influences of fruit and vegetable consumption can further inform dietary behavior interventions. Future research should also explore social

norms and attitudes as behavioral intention predictor constructs of IBM. Universities can utilize the results from this study to understand the health behaviors of their student population, and how they can better assist students during situations of high environmental-initiated stress such as the current COVID-19 pandemic.

APPENDIX SECTION

APPENDIX A: First Draft of Survey Instrument

What is your age range?

a. Under 18 years of age (Redirected out of the survey, if selected)
b. 18 years of age or older (Survey continues if selected)

The next five questions will ask you about your feelings and thoughts related to the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

1. How often have you been upset because of the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

2. How often have you felt that you were unable to control the important things in your life due to the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

3. How often have you felt nervous and stressed because of the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

4. How often have you found that you could not cope with all the things that you had to do due to the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

5. How often have you felt difficulties were piling up so high that you could not overcome them due to the COVID19 pandemic?

a. Never
b. Almost Never
c. Sometimes
d. Fairly Often
e. Very Often

The next six questions will ask you about your ability to get food during the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

1. *"The food that I bought just didn't last, and I didn't have money to get more."* Was that often, sometimes, or never true for you since the start of the COVID-19 pandemic?
    a. Often true
    b. Sometimes true
    c. Never true
    d. Don't know

2. *"I couldn't afford to eat balanced meals."* Was that often, sometimes, or never true for you since the start of the COVID-19 pandemic? A balanced meal includes fruits and vegetables (½ your plate), whole grains (¼ of your plate), and protein (¼ of your plate).
    a. Often true
    b. Sometimes true
    c. Never true
    d. Don't know

3. Since the start of the COVID-19 pandemic, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?
    a. Yes
    b. No
    c. Don't know

4. If you answered yes to the previous question, how often did this happen?
    a. Almost every month
    b. Some months but not every month
    c. Only 1 or 2 months
    d. Don't know
    e. I answered no or don't know to the previous question.

5. Since the start of the COVID-19 pandemic, did you ever eat less than you felt you should because there wasn't enough money for food?
    a. Yes
    b. No

c. Don't know

6. Since the start of the COVID-19 pandemic, were you ever hungry but didn't eat because there wasn't enough money for food?
    a. Yes
    b. No
    c. Don't know

The next seven questions will ask you about your confidence to eat certain foods during the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

Assuming that you want to, how confident are you that you could do each of the following starting this week and continuing through the remainder of the pandemic?

1. Eat a healthy snack, like a fruit or a vegetable, when you're really hungry?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

2. Eat healthy foods, like fruits or vegetables, when you are tired?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

3. Eat healthy foods, like fruits or vegetables, when there are junk foods in your house like chips, cookies, or candy?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

4. Eat fruit instead of cake, cookies, candy, ice cream, or other sweets for dessert?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

5. Eat fruits and vegetables when your family and friends are eating junk foods like chips, cookies, or candy?

a. Not at all confident
b. Slightly confident
c. Somewhat confident
d. Fairly confident
e. Very confident

6. Buy or bring fruits and vegetables to eat at work or school?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

7. Snack on fruits and vegetables rather than on junk foods while watching TV?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

The next three questions will ask you about your intentions to eat certain foods over the next month. Please select the most appropriate responses on the scale provided.

1. I intend to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

2. I plan to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

3. I want to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

The next four questions will ask you about your actual fruit and vegetable consumption during the past 7 days. Please select the most appropriate response for each item.

1. DURING THE PAST 7 DAYS, how many times did you drink 100% PURE FRUIT JUICE like orange, apple, grape, etc.? DON'T COUNT fruit-flavored drinks with added sugar like Capri Sun, etc.
    a. I did not drink 100% pure fruit juice during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

2. DURING THE PAST 7 DAYS, how many times did you eat FRUIT like apples, bananas, melon, etc.? COUNT fresh, frozen, canned and dried fruit. DON'T COUNT fruit juices.
    a. I did not eat fruit during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

3. DURING THE PAST 7 DAYS, how many times did you eat a GREEN SALAD, with or without other vegetables?
    a. I did not eat green salad during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

4. DURING THE PAST 7 DAYS, how many times did you eat other NON-FRIED VEGETABLES like carrots, broccoli, collards, green beans, corn, etc.? DON'T COUNT green salad or potatoes.
    a. I did not eat non-fried vegetables during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

The last few questions will ask a little about you. Please select the most appropriate response for each item.

1. What is your current age? _____

2. Which of the following best describes you?
    a. Female
    b. Male
    c. Other
    d. Prefer not to say

3. Are you Hispanic/LatinX/Spanish origin?
    a. Yes
    b. No

4. Which of the following best describes your race?
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian
    e. Native Hawaiian or Pacific Islander
    f. Some other race or more than one race

5. Which of the following best describes your academic classification?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
    e. Graduate Student (Masters or Doctoral Student)

6. What is your current living arrangement?
    a. I live on campus.
    b. I live off campus with my parents/guardians.
    c. I live off campus, but not with my parents/guardians.

7. What is your current GPA?
    a. I am new to college and do not have a GPA yet.
    b. 0.0 – 1.0
    c. 1.1 – 2.0
    d. 2.1 – 3.0
    e. 3.1 – 4.0

8. Which of these describes your average monthly income (in dollars)?

a. $0; I do not have an income
b. $1 – $1063 per month
c. $1064 – $1967 per month
d. Above $1967 per month

9. Are you an international student?
    a. Yes
    b. No

10. What is your current height?
    Drop down menu (4’0 through 7’3)

11. What is your current weight?
    _____

Thank you for participating in this study. If you would like to enter your name and email address into the drawing to win a $15 Amazon gift card please click on the link below.

Incentive Drawing Linked Here

If you are struggling to get adequate food, please seek services at Bobcat Bounty, the university food bank**.**

If you are struggling with stress, please seek services at the University Counseling Center **or** Student Health Center**.**

APPENDIX B: Final Draft of Survey Instrument

What is your age range?

a. Under 18 years of age (Redirected out of the survey, if selected)
b. 18 years of age or older (Survey continues if selected)

The next five questions will ask you about your feelings and thoughts related to the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

1. How often have you been upset because of the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

2. How often have you felt that you were unable to control the important things in your life due to the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

3. How often have you felt nervous and stressed because of the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

4. How often have you found that you could not cope with all the things that you had to do due to the COVID19 pandemic?
    a. Never
    b. Almost Never
    c. Sometimes
    d. Fairly Often
    e. Very Often

5. How often have you felt difficulties were piling up so high that you could not overcome them due to the COVID19 pandemic?
    a. Never
    b. Almost Never

c. Sometimes
d. Fairly Often
e. Very Often

The next five questions will ask you about your ability to get food during the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

1. *"The food that I bought just didn't last, and I didn't have money to get more."* Was that often, sometimes, or never true for you since the start of the COVID-19 pandemic?
    a. Often true
    b. Sometimes true
    c. Never true
    d. Don't know

2. *"I couldn't afford to eat balanced meals."* Was that often, sometimes, or never true for you since the start of the COVID-19 pandemic? A balanced meal includes fruits and vegetables (½ your plate), whole grains (¼ of your plate), and protein (¼ of your plate).
    a. Often true
    b. Sometimes true
    c. Never true
    d. Don't know

3. Since the start of the COVID-19 pandemic, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?
    a. Yes
    b. No
    c. Don't know

4. Since the start of the COVID-19 pandemic, did you ever eat less than you felt you should because there wasn't enough money for food?
    a. Yes
    b. No
    c. Don't know

5. Since the start of the COVID-19 pandemic, were you ever hungry but didn't eat because there wasn't enough money for food?
    a. Yes
    b. No
    c. Don't know

The next seven questions will ask you about your confidence to eat certain foods during the coronavirus (COVID-19) pandemic. Please select the most appropriate response for each item.

Assuming that you want to, how confident are you that you could do each of the following starting this week and continuing through the remainder of the pandemic?

1. Eat a healthy snack, like a fruit or a vegetable, when you're really hungry?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

2. Eat healthy foods, like fruits or vegetables, when you are tired?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

3. Eat healthy foods, like fruits or vegetables, when there are junk foods in your house like chips, cookies, or candy?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

4. Eat fruit instead of cake, cookies, candy, ice cream, or other sweets for dessert?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

5. Eat fruits and vegetables when your family and friends are eating junk foods like chips, cookies, or candy?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

6. Buy or bring fruits and vegetables to eat at work or school?
    a. Not at all confident

b. Slightly confident
c. Somewhat confident
d. Fairly confident
e. Very confident

7. Snack on fruits and vegetables rather than on junk foods while watching TV?
    a. Not at all confident
    b. Slightly confident
    c. Somewhat confident
    d. Fairly confident
    e. Very confident

The next three questions will ask you about your intentions to eat certain foods over the next month. Please select the most appropriate responses on the scale provided.

1. I intend to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

2. I plan to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

3. I want to eat a diet based on the consumption of at least five portions of fruit and vegetables per day over the next month.

    Definitely do not Definitely do
    1…….….2……...3…..….4…..…5…….6……....7

The next three questions will ask you about your actual fruit and vegetable consumption during the past 7 days. Please select the most appropriate response for each item.

1. DURING THE PAST 7 DAYS, how many times did you eat FRUIT like apples, bananas, melon, etc.? COUNT fresh, frozen, canned and dried fruit. DON'T COUNT fruit juices.
    a. I did not eat fruit during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day

e. 2 times per day
f. 3 or more times per day

2. DURING THE PAST 7 DAYS, how many times did you eat a GREEN SALAD, with or without other vegetables?
    a. I did not eat green salad during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

3. DURING THE PAST 7 DAYS, how many times did you eat other NON-FRIED VEGETABLES like carrots, broccoli, collards, green beans, corn, etc.? DON'T COUNT green salad or potatoes.
    a. I did not eat non-fried vegetables during the past 7 days
    b. 1 – 3 times in the past 7 days
    c. 4 – 6 times in the past 7 days
    d. 1 time per day
    e. 2 times per day
    f. 3 or more times per day

The last few questions will ask a little about you. Please select the most appropriate response for each item.

1. What is your current age? _____

2. Which of the following best describes you?
    a. Female
    b. Male
    c. Other
    d. Prefer not to say

3. Are you Hispanic/LatinX/Spanish origin?
    a. Yes
    b. No

4. Which of the following best describes your race?
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian
    e. Native Hawaiian or Pacific Islander
    f. Some other race or more than one race

5. Which of the following best describes your academic classification?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior
    e. Graduate Student (Masters or Doctoral Student)

6. What is your current living arrangement?
    a. I live on campus.
    b. I live off campus with my parents/guardians.
    c. I live off campus, but not with my parents/guardians.

7. What is your current GPA?
    a. I am new to college and do not have a GPA yet.
    b. 0.0 – 1.0
    c. 1.1 – 2.0
    d. 2.1 – 3.0
    e. 3.1 – 4.0

8. Which of these describes your average monthly income (in dollars)?
    a. $0; I do not have an income
    b. $1 – $1063 per month
    c. $1064 – $1967 per month
    d. Above $1967 per month

9. Are you an international student?
    a. Yes
    b. No

10. What is your current height?
    Drop down menu (4’0 through 7’3)

11. What is your current weight?
    _____

Thank you for participating in this study. If you would like to enter your name and email address into the drawing to win a $15 Amazon gift card please click on the link below.

Incentive Drawing Linked Here

If you are struggling to get adequate food, please seek services at Bobcat Bounty, the university food bank**.**

If you are struggling with stress, please seek services at the University Counseling Center **or** Student Health Center**.**

REFERENCES

Administration for Community Living. (2018). *2018 congregate meals.* https://agid.acl.gov/DataFiles/NPS/Files.aspx?year=2018&serviceid=5

Akseer, N., Kandru, G., Keats, E. C., & Bhutta, Z. A. (2020). COVID-19 pandemic and mitigation strategies: Implications for maternal and child health and nutrition. *The American Journal of Clinical Nutrition, 112*(2), 251-256. https://doi.org/10.1093/ajcn/nqaa171

Alcántara, C., Patel, S. R., Carnethon, M., Castañeda, S. F., Isasi, C. R., Davis, S., Ramos, A. R., Arredondo, E., Redline, S., Zee, P. C., & Gallo, L. C. (2017). Stress and sleep: Results from the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. *SSM - Population Health, 3*, 713–721. https://doi-org.libproxy.txstate.edu/10.1016/j.ssmph.2017.08.004

American College Health Association. (2008). American College Health Association-National College Health Assessment spring 2007 reference group data report (abridged). *Journal of American College Health, 56*(5), 469-480. https://doi.org/10.3200/jach.56.5.469-480

American Council on Education. (2020). *Summary of higher education provisions in H.R. 748, the Coronavirus Aid, Relief, and Economic Security (CARES) Act.* https://www.acenet.edu/Documents/Summary-CARES-Act-HigherEd-Provisions-032620.pdf

American Psychological Association. (2006). National survey reveals Hispanics engage in healthy behaviors to manage stress more than general population. *https://www.apa.org/news/press/releases/2006/10/hispanic-health#:~:text=Hispanics%20report%20being%20concerned%20about,report%20it%20comes%20from%20home).*

Armitage, C. J., & Conner, M. (1999). Distinguishing perceptions of control from self-efficacy: Predicting consumptions of a low-fat diet using the theory of planned behavior. *Journal of Applied Social Psychology, 29*(1), 72-90. https://doi.org/10.1111/j.1559-1816.1999.tb01375.x

Arslan, G., Yildirium, M., Tanhan, A., Bulus, M., & Allen, K. A. (2020). Coronavirus stress, optimism-pessimism, psychological inflexibility, and psychological health: Psychometric properties of the Coronavirus Stress Measure. *International Journal of Mental Health and Addiction.* Advance online publication. https://doi.org/10.1007/s11469-020-00337-6

Baker, C. W., Little, T. D., & Brownell, K. D. (2003). Predicting adolescent eating and activity behaviors: The role of social norms and personal agency. *Health Psychology, 22*(2), 189-198. https://doi.org/10.1037/0278-6133.22.2.189

Baker, F. (2009). Do ethnicity and gender matter when using the theory of planned behavior to understand fruit and vegetable consumption? *Appetite, 52*(1), 15–20. https://doi-org.libproxy.txstate.edu/10.1016/j.appet.2008.07.001

Baloch, S., Baloch, M. A., Zheng, T., & Pei, X. (2020). The Coronavirus Disease 2019 (COVID-19) pandemic. *The Tohoku Journal of Experimental Medicine, 250*(4), 271–278. https://doi.org/10.1620/tjem.250.271

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.libproxy.txstate.edu/10.1007/s10900-015-0147-5

Berg, C. J., Goodwin, S. B., Stratton, E., Lowe, K., Grimsley, L., Rodd, J., Williams, C., Mattox, C., & Foster, B. (2014). Physical activity and fruit and vegetable intake among black and white female college students at two- and four-year colleges and universities. *Open Journal of Preventive Medicine, 4*(4), 229-239. https://doi.org/10.4236/ojpm.2014.44029

Blanchard, C. M., Kupperman, J., Sparling, P. B., Nehl, E., Rhodes, R. E., Courneya, K. S., & Baker, F. (2009). Do ethnicity and gender matter when using the theory of planned behavior to understand fruit and vegetable consumption? *Appetite*, *52*(1), 15–20. https://doi-org.libproxy.txstate.edu/10.1016/j.appet.2008.07.001

Blumberg, S. J., Bialostosky, K., Hamilton, W. L., & Briefel, R. R. (1999). The effectiveness of a short form of the household food security scale. *American Journal of Public Health*, *89*(8), 1231–1234.

Bogers, R., Brug, J., Assema, P. V., & Dagnelie, P. (2004). Explaining fruit and vegetable consumption: The theory of planned behaviour and misconception of personal intake levels. *Appetite, 42*(2), 157-166. https://doi.org/10.1016/j.appet.2003.08.015

Branscum, P., & Lora, K. (2017). Using the integrated behavioral model of prediction to predict maternal monitoring of fruit and vegetable consumption among Hispanic mothers. *Family and Community Health, 40*(1), 32-38. https://doi.org/10.1097/FCH.0000000000000130

Broton, K., Weaver, K., & Mai, M. (2018). Hunger in higher education: Experiences and correlates of food insecurity among Wisconsin undergraduates from low-income families. *Social Sciences, 7*(10). https://doi.org/10.3390/socsci7100179

Bruening, M., Brennhofer, S., Woerden, I. V., Todd, M., & Laska, M. (2016). Factors related to the high rates of food insecurity among diverse, urban college freshmen. *Journal of the Academy of Nutrition and Dietetics, 116*(9), 1450-1457. https://doi.org/10.1016/j.jand.2016.04.004

Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: A systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics, 117*(11), 1767-1791. https://doi.org/10.1016/j.jand.2017.05.022

Bustamante, J. (2020). *College Enrollment Statistics [2020]: Total + by demographic.* https://educationdata.org/college-enrollment-statistics/

Butler, M. J., & Barrientos, R. M. (2020). The impact of nutrition on COVID-19 susceptibility and long-term consequences. *Brain, Behavior, and Immunity, 87,* 53-54. https://doi.org/10.1016/j.bbi.2020.04.040

Cady, C. L. (2014). Food insecurity as a student issue. *Journal of College and Character, 15*(4), 265-272.

Canova, L., & Manganelli, A. M. (2016). Fruit and vegetables consumption as snacks among young people. the role of descriptive norm and habit in the theory of planned behavior. *TPM – Testing, Psychometrics, Methodology in Applied Psychology, 23*(1), 83-97.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research, 287,* 112934. https://doi.org/10.1016/j.psychres.2020.112934

Carfora, V., Caso, D., & Conner, M. (2015). The role of self-identity in predicting fruit and vegetable intake. *Appetite, 106,* 23-29.

Carvalho, P., Moreira, M. M., de Oliveira, M., Landim, J., & Neto, M. (2020). The psychiatric impact of the novel coronavirus outbreak. *Psychiatry Research, 286,* Article 112902. https://doi.org/10.1016/j.psychres.2020.112902

Center on Budget and Policy Priorities. (2020). *States are using much-needed temporary flexibility in SNAP to respond to COVID-19 challenges.* https://www.cbpp.org/research/food-assistance/states-are-using-much-needed-temporary-flexibility-in-snap-to-respond-to

Centers for Disease Control and Prevention. (2014). *Calculating BMI using the English system.* https://www.cdc.gov/nccdphp/dnpao/growthcharts/training/bmiage/page5_2.html

Centers for Disease Control and Prevention. (2017). *Disparities in state-specific adult fruit and vegetable consumption – United States, 2015.* https://www.cdc.gov/mmwr/volumes/66/wr/mm6645a1.htm?s_cid=mm6645a1_w

Centers for Disease Control and Prevention. (2020a). *About COVID-19.* https://www.cdc.gov/coronavirus/2019-ncov/cdcresponse/about-COVID-19.html

Centers for Disease Control and Prevention. (2020b). *Adult obesity causes & consequences.* https://www.cdc.gov/obesity/adult/causes.html

Centers for Disease Control and Prevention. (2020c). *Cases in the U.S.* https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html

Centers for Disease Control and Prevention. (2020d). *Products - Data Briefs - Number 360 - February 2020.* https://www.cdc.gov/nchs/products/databriefs/db360.htm

Cheung, H. C., Shen, A., Oo, S., Tilahun, H., Cohen, M. J., & Berkowitz, S. A. (2015). Food insecurity and body mass index: A longitudinal mixed methods study, Chelsea, Massachusetts, 2009–2013. *Preventing Chronic Disease, 12*. https://doi.org10.5888/pcd12.150001

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 386-396.

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2019). *Household food security in the United States in 2018* (Economic Research Report No. 270). United States Department of Agriculture. https://www.ers.usda.gov/webdocs/publications/94849/err-270.pdf?v=963.1

Collado-Rivera, M., Branscum, P., Larson, D., & Gao, H. (2017). Evaluating the determinants of sugary beverage consumption among overweight and obese adults: An application of the integrative model of behavioural prediction. *Health Education Journal, 77*(1), 109-125. https://doi.org/10.1177/0017896917739330

Columbia University Mailman School of Public Health. (2016). Nearly half of American children living near poverty line. *Science Daily*. https://www.sciencedaily.com/releases/2016/03/160302132533.htm

Contento, I. R., Koch, P. A., Lee, H., & Calabrese-Barton, A. (2010). Adolescents demonstrate improvement in obesity risk behaviors after completion of Choice, Control & Change, a curriculum addressing personal agency and autonomous motivation. *Journal of the American Dietetic Association, 110*(12), 1830-1839.

Contento, I. R., Koch, P. A., Lee, H., Sauberli, W., & Calabrese-Barton, A. (2007). Enhancing personal agency and competence in eating and moving: Formative evaluation of a middle-school curriculum – Choice, Control, and Change. *Journal of Nutrition Education and Behavior, 39*(5S), S179-S186.

Crisp, G., Doran, E., & Salis-Reyes, N. A. (2018). Predicting graduation rates at 4-year broad access institutions using a Bayesian Modeling approach. *Research in Higher Education, 59,* 133-155. https://doi.org/1007/s111-62-017-9459-x

Curtin, R., Presser, S., & Singer, E. (2000). The effects of response rate changes on the index of consumer sentiment. *Public Opinion Quarterly 64,* 413–428.

Daughtery, L., & Anderson, D. M. (2020). *Emergency COVID-19 aid helps college students with food and housing: Four ways colleges can maintain that support.* RAND Corporation. https://www.rand.org/blog/2020/05/emergency-covid-19-aid-helps-college-students-with.html

Davison, K. M., Gondara, L., & Kaplan, B. J. (2017). Food insecurity, poor diet quality, and suboptimal intakes of folate and iron are independently associated with perceived mental health in Canadian adults. *Nutrients, 9*(3), 274. https://doi.org/10.3390/nu9030274

Dean T., J., Hellen, G., Susan, H., Prabhat, J., Ramanan, L., Charles N., M., & Rachel, N. (2017). *Disease Control Priorities, Third Edition (Volume 9): Improving Health and Reducing Poverty*. The World Bank. https://doi-org.libproxy.txstate.edu/10.1596/978-1-4648-0527-1

DeCarlo, M. (n.d.). *11.2 strengths and weaknesses of survey research.* https://scientificinquiryinsocialwork.pressbooks.com/chapter/11-2-strengths-and-weaknesses-of-survey-research/

Dharmasena, S., Bessler, D. A., & Capps, O. (2016). Food environment in the United States as a complex economic system. *Food Policy, 61*, 163-175. https://doi.org/10.1016/j.foodpol.2016.03.003

Di Noia, J., Monica, D., Cullen, K. W., Perez-Escalilla, R., Gray, H. L., & Sikorskii, A. (2016). Differences in fruit and vegetable intake by race/ethnicity and by Hispanic origin and nativity among women in special supplemental nutrition program for women, infants, and children, 2015. *Preventing Chronic Disease*, *13*, e115.

Di Renzo, L., Gualtieri, P., Cinelli, G., Bigioni, G., Soldati, L., Attinà, A., Bianco, F. F., Caparello, G., Camodeca, V., Carrano, E., Ferraro, S., Giannattasio, S., Leggeri, C., Rampello, T., Lo Presti, L., Tarsitano, M. G., & De Lorenzo, A. (2020). Psychological aspects and eating habits during COVID-19 home confinement: Results of EHLC-COVID-19 Italian online survey. *Nutrients*, *12*(7), 2152. https://doi.org/10.3390/nu12072152

Ebadi, N., & Ahmadi, D. (2019). Association between food insecurity and low fruit and vegetable intake in the UK in 2016: A cross-sectional study. *The Lancet*, *394*(Supplement 2), S36. https://doi-org.libproxy.txstate.edu/10.1016/S0140-6736(19)32833-8

El Ansari, W., Stock, C., & Mikolajczjk, R. T. (2012). Relationships between food consumption and living arrangements among university students in four European countries - A cross-sectional study. *Nutrition Journal, 11*, 28. https://doi.org/10.1186/1475-2891-11-28

El Zeunm A., Shelnutt, K. P., Colby, S., Vilaro, M. J., Zhou, W., Greene, G., Ofert, M. D., Riggsbee, K., Morrell, J. S., & Mathews, A. E. (2019). Prevalence and correlates of food insecurity among U.S. college students: A multi-institutional study. *BMC Public Health, 660,* https://doi.org/10.1186/s12889-019-6943-6

Emanual, A. S., McCully, S. N., Gallagher, K. M., & Updegraff, J. A. (2012). Theory of planned behavior explains gender difference in fruit and vegetable consumption. *Appetite*, *59*(3), 693-697.

Erinosho, T. O., Pinard, C. A., Nebeling, L., C., Moser, R. P., Shaikh, A. R., Resnicow, K., Oh, A. Y., & Yaroch, A. L. (2015). Development and implementation of the National Cancer Institute's food attitudes and behaviors survey to assess correlated of fruit and vegetable intake in adults. *PlosOne*, *10*(2), Article e0115017.

Faber, J., & Fonseca, L. M. (2014). How sample size influences research outcomes. *Dental Press Journal of Orthodontics*, *19*(4), 27–29. https://doi.org/10.1590/2176-9451.19.4.027-029.ebo

Farahbakhsh, J., Hanbazaza, M., Ball, G. D. C., Farmer, A. P., Maximova, K., & Willows, N. D. (2017). Food insecure student clients of a university-based food bank have compromised health, dietary intake, and academic quality. *Nutrition & Dietetics, 74*(1), 67-73.

Feeding America. (n.d.a). *College student hunger statistics and research.* https://www.feedingamerica.org/research/college-hunger-research

Feeding America. (n.d.b). *Hunger in America.* https://www.feedingamerica.org/hunger-in-america/food-insecurity

Fila, S. A., & Smith, C. (2006). Applying the theory of planned behavior to healthy eating behaviors in urban Native American youth. *International Journal of Behavioral Nutrition and Physical Activity, 3*(11). https://doi-org.libproxy.txstate.edu/http://www.ijbnpa.org/content/pdf/1479-5868-3-11.pdf

Food Research & Action Center. (2020). *COVID-19 updates.* https://frac.org/covid19

Fram, M. S., Ritchie, L. D., Rosen, N., & Frongillo, E. A. (2015). Child experience of food insecurity is associated with child diet and physical activity. *The Journal of Nutrition, 145*(3), 499-504. https://doi.org/10.3945/jn.114.194365

Freudenberg, N., Goldrick-Rab, S., & Poppendieck, J. (2019). College students and SNAP: The new face of food insecurity in the United States. *American Journal of Public Health, 109*(12), 1652-1658. https://doi.org/10.2105/ajph.2019.305332

Fukuoka, Y., Lindgren, T. G., Bonnet, K., & Kamitani, E. (2014). Perception and sense of control over eating behaviors among a diverse sample of adults at risk for type 2 diabetes. *The Diabetes Educator, 40*(3), 308-318. https://doi.org/10.1177/0145721714522717

Gaines, A., Knol, L. L., Robb, C. A., & Sickler, S. M. (2012). Food insecurity is related to cooking self-efficacy and perceived food preparation resources among college students. *Journal of the Academy of Nutrition and Dietetics, 112*(9), A11. https://doi.org/10.1016/j.jand.2012.06.032

Galanakis, C. M. (2020). The food systems in the era of the Coronavirus (COVID-19) pandemic crisis. *Foods, 9*(4), 523. https://doi.org/10.3390/foods9040523

Gallo, L. A., Gallo, T. F., Young, S. L., Moritz, K. M., & Akison, L. K. (2020). The impact of isolation measures due to COVID-19 on energy intake and physical activity levels in Australian university students. *Nutrients, 12*(6). https://doi-org.libproxy.txstate.edu/10.3390/nu12061865

Gardiner, C. K., Hagerty, S. L., & Bryan, A. D. (2019). Stress and number of servings of fruit and vegetables consumed: Buffering effects of monetary incentives. *Journal of Health Psychology.* https://doi.org/10.1177/1359105319884620.

Glanz, K., Rimer, B. K., & Viswanath, K. (2015). *Health behavior: Theory, research, and practice (5 ed.).* San Francisco, CA: Jossey-Bass.

Goldrick-Rab, S., Coca, V., Kienzl, G., Welton, C.R., Dahl, S., & Magnelia, S. (2020). *#Realcollege during the pandemic.* The Hope Center for College, Community and Justice, Temple University. https://hope4college.com/wp-content/uploads/2020/06/Hopecenter_RealCollegeDuringthePandemic.pdf

Goldrick-Rab, S., Cady, C. & Coca, V. (2018). *Campus food pantries: Insights from a national survey.* The Hope Center for College, Community and Justice, Temple University. https://hope4college.com/wp-content/uploads/2018/09/2018-CUFBA-Report-web-2.pdf

Goldrick-Rab, S., Baker-Smith, C., Coca, V., Looker, E., & Williams, T. (2019). *College and university basic needs insecurity: A national #Realcollege survey report.* The Hope Center for College, Community and Justice, Temple University. https://hope4college.com/wp-content/uploads/2019/04/HOPE_realcollege_National_report_digital.pdf

Gonzales D., Karpman M., Kenney, G. M., & Zuckerman, S. (2020). *Hispanic adults in families with noncitizens disproportionately feel the economic fallout from COVID-19.* The Urban Institute. https://www.urban.org/sites/default/files/publication/102170/hispanic-adults-in-families-with-noncitizens-disproportionately-feel-the-economic-fallout-from-covid-19_2.pdf

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 U.S. nationally representative survey. *Health Education & Behavior*, *45*(4), 524–531. http://dx.doi.org.libproxy.txstate.edu/10.1177/1090198117741940

Grimm, K. A., Foltz, J. L., Blanck, H. M., & Scanlon, K. S. (2012). Household income disparities in fruit and vegetable consumption by state and territory: Results of the 2009 Behavioral Risk Factor Surveillance System. *Journal of the Academy of Nutrition and Dietetics, 112*(12), 2014-2021.

Gulliford, M. C., Mahabir, D., & Rocke, B. (2004). Reliability and validity of a short form household food security scale in a Caribbean community. *BMC Public Health, 4*(1). https://doi.org/10.1186/1471-2458-4-22

Gundersen, C., & Seligman, H. K. (2017). Food insecurity and health outcomes. *The Economists' Voice, 14*(1). https://doi.org/10.1515/ev-2017-0004

Hanson, K. L., & Connor, L. M. (2014). Food insecurity and dietary quality in U.S. adults and children: A systematic review. *The American Journal of Clinical Nutrition, 100*(2), 684-692. https://doi.org/10.3945/ajcn.114.084525

Hardcastle, S., Thøgersen-Ntoumani, C., & Chatzisarantis, N. (2015). Food choice and nutrition: A social psychological perspective. *Nutrients, 7*(10), 8712-8715. https://doi.org/10.3390/nu7105424

Hayes, T. O, & Gillian, S. (2020). *Chronic disease in the United States: A worsening health and economic crisis.* https://www.americanactionforum.org/research/chronic-disease-in-the-united-states-a-worsening-health-and-economic-crisis/

Heiervang, E., & Goodman, R. (2011). Advantages and limitations of web-based surveys: Evidence from a child mental health survey. *Social Psychiatry and Psychiatric Epidemiology (Print), 46*(1), 69–76.

Hertz-Palmor, N., Moore, T. M., Gothelf, D., DiDomenico, G. E., Dekel, I., Greenberg, D. M., Brown, L. A., Matalon, N., Visoki, E., White, L. K., Himes, M. H., Lifshitz-Schwartz, M., Gross, R., Gur, R. C., Gur, R. E., Pessach, I. M., & Barzilay, R. (2020). Association among income loss, financial strain and depressive symptoms during COVID-19: Evidence from two longitudinal studies. *MedRxiv : The Preprint Server for Health Sciences*, 2020.09.15.20195339. https://doi.org/10.1101/2020.09.15.20195339

Hokeyem, C. & Heggeness, M. L. (2014). Living in near poverty in the United States: 1966-2012. *Current Population Reports.* https://www.census.gov/prod/2014pubs/p60-248.pdf

Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A. K., Shafran, R., Sweeney, A., … Bullmore, E. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry, 7*(6), 547–560. https://doi-org.libproxy.txstate.edu/10.1016/S2215-0366(20)30168-1

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality. *Perspectives on Psychological Science, 10*(2), 227-237. https://doi.org/10.1177/1745691614568352

Internal Revenue Service. (n.d.). *Economic impact payment information center.* https://www.irs.gov/coronavirus/economic-impact-payment-information-center

Jin, J., Bai, P., He, W., Wu, F., Liu, X., Han, D., Liu, S., & Yang, J. (2020). Gender differences in patients with COVID-19: Focus on severity and mortality. *Frontiers in Public Health.* Advance online publication. https://doi.org/10.3389/fpubh.2020.00152

Johnson, C. M., Sharkey, J. R., Lackey, M. J., Adair, L. S., Aiello, A. E., Bowen, S. K., Fang, W., Flax, V. L., & Ammerman, A. S. (2018). Relationship of food insecurity to women's dietary outcomes: A systematic review. *Nutrition Reviews, 76(*12), 910-928. https://doi.org/10.1093/nutrit/nuy042

Jones, A. D., Ngure, F. M., Pelto, G., & Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition, 4*(5), 481-505. https://doi.org/10.3945/an.113.004119

Jordan, R. E., Adab, P., & Cheng, K. K. (2020). COVID-19: Risk factors for severe disease and death. *British Medical Journal*, *368.* https://doi.org/10.1136/bmj.m1198

Jung, S. E., & Bice, C. (2019). The Role of self-identity in predicting college students' intention to consume fruits and vegetables. *Journal of Nutrition Education and Behavior*, *51*(2), 173-181. https://doi.org/10.1016/j.jneb.2018.07.015

Kamimura, A., Jess, A., Trinh, H. N., Aguilera, G., Nourian, M. M., Assasnik, N., & Ashby, J. (2017). Food insecurity associated with self-efficacy and acculturation. *Population Health Management*, *20*(1), 66-73. https://doi.org/10.1089/pop.2015.0179

Kansiime, M. K., Tambo, J. A., Mugambi, I., Bundi, M., Kara, A., & Owuor, C. (2021). COVID-19 implications on household income and food security in Kenya and Uganda: Findings from a rapid assessment. *World development, 137*, 105199. https://doi.org/10.1016/j.worlddev.2020.105199

Karabulut, U. S., Romero, Z., Conatser, P., & Karabulut, M. (2018). Assessing overweight/obesity, dietary habits, and physical activity in Hispanic college students. *Exercise Medicine, 2*. https://doi.org/10.26644/em.2018.005

Karpman, M., Zuckerman, S., Gonzalez, D., & Kenney, G. M. (2020). *The COVID-19 pandemic is straining families' abilities to afford basic needs: Low-income and Hispanic families the hardest hit.* The Urban Institute. https://www.urban.org/sites/default/files/publication/102124/the-covid-19-pandemic-is-straining-families-abilities-to-afford-basic-needs_2.pdf

Kinsey, E. W., Kinsey, D., & Rundle, A. G. (2020). COVID-19 and food insecurity: An uneven patchwork of responses. *Journal of Urban Health, 97*(3), 332-335. https://doi.org/10.1007/s11524-020-00455-5

Kochhar, R. (2020). *Unemployment rose higher in three months of COVID-19 than it did in two years of the Great Recession.* Pew Research Center. https://www.pewresearch.org/fact-tank/2020/06/11/unemployment-rose-higher-in-three-months-of-covid-19-than-it-did-in-two-years-of-the-great-recession/

Laborde, D., Martin, W., & Vos, R. (2020). Poverty and food insecurity could grow dramatically as COVID-19 spreads. https://www.ifpri.org/blog/poverty-and-food-insecurity-could-grow-dramatically-covid-19-spreads.

Labrague, L. J., McEnroe-Petitte, D. M., Gloe, D., Thomas, L., Papathanasiou, I. V., & Tsaras, K. (2017). A literature review on stress and coping strategies in nursing students. *Journal of Mental Health, 26*(5), 471–480. https://doi-org.libproxy.txstate.edu/10.1080/09638237.2016.1244721

Leyva, R. P., Mengelkoch, S., Gassen, J., Ellis, B. J., Russell, E. M., & Hill, S. E. (2020). Low socioeconomic status and eating in the absence of hunger in children aged 3–14. *Appetite, 154*. https://doi.org/10.1016/j.appet.2020.104755

Leung, C. W., Ding, E. L., Catalano, P. J., Villamor, E., Rimm, E. B., & Willett, W. C. (2012). Dietary intake and dietary quality of low-income adults in the Supplemental Nutrition Assistance Program. *The American Journal of Clinical Nutrition*, *96*(5), 977–988. https://doi.org/10.3945/ajcn.112.040014

Lien, N., Lytle, L. A., & Komro, K. A. (2002). Applying theory of planned behavior to fruit and vegetable consumption of young adolescents. *American Journal of Health Promotion*, *16*(4), 189–197. https://doi-org.libproxy.txstate.edu/10.4278/0890-1171-16.4.189

Litt, M. D. (1988). Cognitive mediators of stressful experience: Self-efficacy and perceived control. *Cognitive Therapy and Research*, *12*(3), 241–260.

London School of Hygiene and Tropical Medicine. (2009). *Limitations of surveys.* http://conflict.lshtm.ac.uk/page_26.htm#:~:text=Other%20constraints%20to%20using%20surveys,because%20of%20competing%20urgent%20tasks

Marhl, M., Grubelnik, V., Magdič, M., & Markovič, R. (2020). Diabetes and metabolic syndrome as risk factors for COVID-19. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14*(4), 671-677. https://doi.org/10.1016/j.dsx.2020.05.013

Martin, K. S., Colantonio, A. G., Picho, K., & Boyle, K. E. (2016). Self-efficacy is associated with increased food security in novel food pantry program. *Social Science & Medicine - Population Health*, *2*, 62–67. https://doi.org/10.1016/j.ssmph.2016.01.005

Martinez, S. M., Frongillo, E. A., Leung, C., & Ritchie, L. (2018). No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *Journal of Health Psychology*, *25*(12), 1930-1939. https://doi.org/10.1177/1359105318783028

Martinez, S. M., Grandner, M. A., Nazmi, A., Canedo, E. R., & Ritchie, L. D. (2019). Pathways from food insecurity to health outcomes among California university students. *Nutrients, 11*(6). https://doi.org/10.3390/nu11061419

McEligot, A. J., Mitra, S., & Beam, W. (2020). The association between fitness and obesity in diverse multi-ethnic college students. *Journal of American College Health,* Advance online publication. https://doi.org/10.1080/07448481.2019.1665054

McGuire, S. (2013). IOM (Institute of Medicine) and NRC (National Research Council). 2013. Supplemental Nutrition Assistance Program: Examining the evidence to define benefit adequacy. Washington, DC: The National Academies Press, 2013. *Advances in Nutrition*, *4*(4), 477-478. https://doi.org/10.3945/an.113.003822

Menozzi, D., Sogari, G., & Mora, C. (2015). Explaining vegetable consumption among young adults: An application of the theory of planned behaviour. *Nutrients, 7*(9), 7633-7650. https://doi.org/10.3390/nu7095357

Middaugh, A. L., Fisk, P. S., Brunt, A., & Rhee, Y. S. (2012). Few associations between income and fruit and vegetable consumption. *Journal of Nutrition Education & Behavior, 44*(3), 196-203.

Mook, K., Laraia, B. A., Oddo, V. M., & Jones-Smith, J. C. (2016). Food security status and barriers to fruit and vegetable consumption in two economically deprived communities of Oakland, California, 2013-2014. *Preventing Chronic Disease, 13. https://www.cdc.gov/pcd/issues/2016/15_0402.htm*

Morales, M. E., & Berkowitz, S. A. (2016). The relationship between food insecurity, dietary patterns, and obesity. *Current Nutrition Reports, 5*(1), 54-60. https://doi.org/10.1007/s13668-016-0153-y

Murthy, V. H. (2016). Food insecurity: A public health issue. *Public Health Reports, 131*(5), 655-657. https://doi.org/10.1177/0033354916664154

Nastaskin, R. S., & Fiocco, A. J. (2015). A survey of diet self-efficacy and food intake in students with high and low perceived stress. *Nutrition Journal, 14*, 1–8. https://doi-org.libproxy.txstate.edu/10.1186/s12937-015-0026-z

Naja, F., & Hamadeh, R. (2020). Nutrition amid the COVID-19 pandemic: A multi-level framework for action. *European Journal of Clinical Nutrition, 74*(8), 1117–1121. https://doi-org.libproxy.txstate.edu/10.1038/s41430-020-0634-3

National Cancer Institute. (2013). *Food attitudes and behaviors.* https://cancercontrol.cancer.gov/brp/hbrb/fab/.

National Cancer Institute. (2017). *Family Life, Activity, Sun, Health, and Eating (FLASHE) study.* https://cancercontrol.cancer.gov/brp/hbrb/flashe.html

National Public Radio. (2021). *Biden praises senate passage of desperately needed' COVID-19 relief bill.* https://www.npr.org/sections/coronavirus-live-updates/2021/03/06/974409402/biden-praises-senate-passage-of-desperately-needed-covid-19-relief-bill

Nebeling, L. C., Hennessy, E., Oh, A. Y., Dwyer, L. A., Patrick, H., Blanck, H. M., Perna, F. M., Ferrer, R. A., & Yaroch, A. L. (2017). The FLASHE Study: Survey development, dyadic perspectives, and participant characteristics. *American Journal of Preventive Medicine, 52*(2), 839-848.

Nepal, V. P., Mgbere, O., Banerjee, D., & Arafat, R. R. (2011). Disparities in fruits and vegetables consumption in Houston, Texas: Implications for health promotion. *Journal of Primary Care and Community Health, 2*(3), 142-147.

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery (London, England), 78*, 185–193. https://doi.org/10.1016/j.ijsu.2020.04.018

Niles, M. T., Bertmann, R., Belarmino, E. H., Wentworth, T., Biehl, E., & Neff, R. (2020). The early food insecurity impacts of COVID-19. *Nutrients, 12*, 2096. https://doi.org/10.3390/nu12072096.

Nguyen, B. T., Shuval, K., Njike, V. Y., & Katz, D. L. (2014). The Supplemental Nutrition Assistance Program and dietary quality among U.S. adults: Findings from a nationally representative survey. *Mayo Clinic Proceedings, 89*(9), 1211–1219. https://doi.org/10.1016/j.mayocp.2014.05.010

Odum, M., & Xu, L. (2018). Racial and sex differences of fruit and vegetable self-efficacy and intake among college students in a rural, southern location. *Journal of American College Health, 67*(8), 825–834. https://doi.org/10.1080/07448481.2018.1515752

Owens, M. R., Brito-Silva, F., Kirkland, T., Moore, C. E., Davis, K. E., Patterson, M. A., Miketinas, D. C., & Tucker, W. J. (2020). Prevalence and Social Determinants of Food Insecurity among College Students during the COVID-19 Pandemic. *Nutrients*, *12*(9), 2515. https://doi.org/10.3390/nu12092515

Pan, L., Sherry, B., Njai, R., & Blanck, H. M. (2012). Food insecurity is associated with obesity among U.S. adults in 12 states. *Journal of the Academy of Nutrition and Dietetics, 112*(9), 1-14. https://doi.org/0.1016/j.jand.2012.06.011

Papadaki, A., Hondros, G., Scott, J. A., & Kapsokefalou, M. (2007). Eating habits of university students living at, or away from home in Greece. *Appetite, 49*(1). doi: 10.1016/j.appet.2007.01.008

Patton-Lopez M. M., Lopez-Cevallos D. F., Cancel-Tirado D. I., & Vazquez L. (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of Nutrition Education and Behavior, 46*(3), 209–214. https://doi.org/10.1016/j.jneb.2013.10.007

Payne-Sturges, D. C., Tjaden, A., Caldeira, K. M., Vincent, K. B., & Arria, A. M. (2017). Student hunger on campus: Food insecurity among college students and implications for academic institutions. *American Journal of Health Promotion, 32*(2), 349-354. https://doi.org/10.1177/0890117117719620

Pember, S. E. (2017). *A qualitative application of the Integrated Model of Behavioral prediction to graduate student eating behaviors*. [Doctoral dissertation, University of Alabama]. University of Alabama Institutional Repository. http://ir.ua.edu/handle/123456789/3360

Petrakis, D., Margină, D., Tsarouhas, K., Tekos, F., Stan, M., Nikitovic, D., Kouretas, D., Spandidos D. A., & Tsatsakis, A. (2020). Obesity - a risk factor for increased COVID-19 prevalence, severity and lethality (Review). *Molecular Medicine Reports, 22*(1), 9-19. https://doi.org/10.3892/mmr.2020.11127

Philippi, S. T., Guerra, P. H., & Leme, A. C. B. (2016). Health behavioral theories used to explain dietary behaviors in adolescents: A systematic review. *Nutrire, 41*(22).

Pomeranz, J. L., & Chriqui, J. F. (2015). The Supplemental Nutrition Assistance Program: Analysis of program administration and food law definitions. *American Journal of Preventive Medicine, 49*(3), 428–436. https://doi.org/10.1016/j.amepre.2015.02.027

Prättälä R, Paalanen L, Grinberga D, Helasoja V, Kasmel A, & Petkeviciene J. (2007). Gender differences in the consumption of meat, fruit and vegetables are similar in Finland and the Baltic countries. *European Journal of Public Health, 17*(5), 520–525. https://doi-org.libproxy.txstate.edu/10.1093/eurpub/ckl265

Qualtrics (2020). *Sample size calculator*. https://www.qualtrics.com/blog/calculating-sample-size/

Ryan-Ibarra, S., Sanchez-Vaznaugh, E. V., Leung, C., & Induni, M. (2017). The relationship between food insecurity and overweight/obesity differs by birthplace and length of U.S. residence. *Public Health Nutrition*, *20*(4), 671–677. https://doi.org/10.1017/S1368980016002858

Rudenstine, S., McNeal, K., Schulder, T., Ettman, C. K., Hernandez, M., Gvozdieva, K., & Galea, S. (2020). Depression and anxiety during the COVID-19 pandemic in an urban, low-income public university sample. *Journal of Traumatic Stress*. https://doi-org.libproxy.txstate.edu/10.1002/jts.22600

Sahu P. (2020). Closure of universities due to Coronavirus Disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus*, *12*(4), e7541. https://doi.org/10.7759/cureus.7541

Saleh, A., & Bista, K. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Journal of Multidisciplinary Evaluation, 13*(29), 63-74.

Schanzenbach, D. W. & Pitts, A. (2020). *Estimates of food insecurity during the COVID-19 crisis: Results from the COVID impact survey, week 1 (April 20-26, 2020).* Institute for Policy Research Rapid Research Report. https://www.ipr.northwestern.edu/documents/reports/food-insecurity-covid_week1_report-13-may-2020.pdf

Sebastian, V. (2013). A theoretical approach to stress and self-efficacy. *Procedia - Social and Behavioral Sciences, 78,* 556–561. https://doi-org.libproxy.txstate.edu/10.1016/j.sbspro.2013.04.350

Senkowski, V., Branscum, P., Maness, S., & Larson, D. (2017). Using the integrative model of behavioral prediction to predict vegetable subgroup consumption among college students. *American Journal of Health Education, 48*(4), 240-247. http://dx.doi.org/10.1080/19325037.2017.131669

Shah, M., Sachdeva, M., & Johnston, H. (2020). Eating disorders in the age of COVID-19. *Psychiatry Research, 290*. https://doi.org/10.1016/j.psychres.2020.113122

Sharma, M., Stephens, P. M., Nahar, V. K., Catalano, H. P., Lingam, V. C., & Ford, M. A. (2018). Using a multitheory model to predict initiation and sustenance of fruit and vegetable consumption among college students. *Journal of the American Osteopathic Association, 118*(8), 507-517.

Simmonds, M., Burch, J., Llewellyn, A., Griffiths, C., Yang, H., Owen, C., Duffy, S., Woolacott, N. (2015). The use of measures of obesity in childhood for predicting obesity and the development of obesity-related diseases in adulthood: A systematic review and meta-analysis. *Health Technology Assessment, 19*(43), 1-336. https://doi.org/10.3310/hta19430

Simons-Morton, B., McLeroy, K. R., & Wendel, M. L. (2012). *Behavior theory in health promotion practice and research.* Burlington, MA: Jones & Bartlett Learning.

Skelton, K. R., & Evans, R. R. (2020). A qualitative investigation of college student perceptions of their nutrition environment: Recommendations for improvement. *American Journal of Health Education, 51*(1), 50–58. https://doi-org.libproxy.txstate.edu/10.1080/19325037.2019.1687367

Small, M., Bailey-Davis, L., Morgan, N., & Maggs, J. (2013). Changes in eating and physical activity behaviors across seven semesters of college: Living on or off campus matters. *Health Education & Behavior, 40*(4), 435-441.

Sogari, G., Velez-Argumedo, C., Gómez, M., & Mora, C. (2018). College students and eating habits: A study using an ecological model for healthy behavior. *Nutrients, 10*(12). https://doi.org/10.3390/nu10121823

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research*, *22*(9), e21279. https://doi-org.libproxy.txstate.edu/10.2196/21279

Stewart, H. & Hyman, J. (2019). *Americans can still meet fruit and vegetable dietary guidelines for $2.10-$2.60 per day.* https://www.ers.usda.gov/amber-waves/2019/june/americans-still-can-meet-fruit-and-vegetable-dietary-guidelines-for-210-260-per-day/

Taylor, S., Landry, C. A., Paluszek, M. M., Fergus, T. A., McKay, D., & Asmundson, G. J. G. (2020). COVID stress syndrome: Concept, structure, and correlates. *Depression and Anxiety, 37*, 706-714.

Temple, J. B. (2018). The association between stressful events and food insecurity: Cross-sectional evidence from Australia. *International Journal of Environmental Research and Public Health, 15*(11).

Texas WIC. (2020). *Changes to WIC foods.* https://texaswic.org/about-wic/special-wic-food-updates

Texas State University. (2020). *Funding assistance for students impacted by COVID-19.* https://www.txstate.edu/cares

The New York Times. (2020). *The second stimulus package: Here's what's included.* https://www.nytimes.com/2020/12/22/us/politics/second-stimulus-whats-included.html

Thoits, P. A. (2006). Personal agency in the stress process. *Journal of Health and Social Behavior*, *47*(4).

Thompson, N. R., Asare, M., Millan, C., & Meyer, M. R. (2020). Theory of planned behavior and perceived role model as predictors of nutrition and physical activity behaviors among college students in health-related disciplines. *Journal of Community Health*. https://doi.org/10.1007/s10900-020-00814-y

Torales, J., O'Higgins, M., Castaldelli-Maia, J. M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *The International Journal of Social Psychiatry*, *66*(4), 317–320. https://doi.org/10.1177/0020764020915212

Tucher, E., & Thomas, K. S. (2020). *The impact of COVID-19's closure of meal sites on older adults.* Milbank Memorial Fund. https://www.milbank.org/2020/03/the-impact-of-covid-19s-closure-of-meal-sites-on-older-adults/

United States Department of Agriculture. (n.d.a) *Food assistance.* https://www.usda.gov/coronavirus/food-assistance#cfap

United States Department of Agriculture (n.d.b). B *What can SNAP buy?* https://www.fns.usda.gov/snap/eligible-food-items

United States Department of Agriculture. (2012). *U.S. household food security survey module: Six-item short form.* Economic Research Service. https://www.ers.usda.gov/media/8282/short2012.pdf

United States Department of Agriculture. (2020a). *Definitions of food security.* https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx

United States Department of Agriculture. (2020b). *Dietary Guidelines for Americans, 2020-2025. https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf*

United States Department of Agriculture. (2020c). *Measurement.* https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/measurement/

United States Department of Agriculture. (2020d). *States must act swiftly to deliver food assistance allowed by families first act.* https://www.cbpp.org/research/food-assistance/usda-states-must-act-swiftly-to-deliver-food-assistance-allowed-by-families

United States Department of Agriculture. (2020e). *USDA approves program to feed kids in Texas and New Jersey.* https://www.usda.gov/media/press-releases/2020/05/11/usda-approves-program-feed-kids-texas-and-new-jersey

United States Department of Education. (2020). *CARES Act: Higher education emergency relief fund.* https://www2.ed.gov/about/offices/list/ope/caresact.html

United States Government Accountability Office (GAO). (2018). *Food insecurity: Better information could help eligible college students access federal food assistance benefits.* https://www.gao.gov/assets/700/696254.pdf

Waxman, E., Gupta, P., & Karpman, M. (2020). *More than one in six adults were food insecure two months into the COVID-1-9 recession.* Urban Institute. https://www.urban.org/sites/default/files/publication/102579/more-than-one-in-six-adults-were-food-insecure-two-months-into-the-covid-19-recession_0.pdf

Whiteman, E. D., Chrisinger, B. W., & Hillier, A. (2018). Diet quality over the monthly supplemental nutrition assistance program cycle. *American Journal of Preventive Medicine, 55*(2), 205-212. https://doi.org/10.1016/j.amepre.2018.04.027

World Health Organization [WHO]. *Ebola virus disease.* https://www.who.int/health-topics/ebola#tab=tab_1

Wolfson, J. A., & Leung, C. W. (2020). Food insecurity and COVID-19: Disparities in early effects for U.S. adults. *Nutrients, 12*(6), 1-13. https://doi.org/10.3390/nu12061648

Wright, L., Arce, K. S., Himmelgreen, D., & Epps, J. B. (2018). Farm2Fork: Use of the health belief model to increase fresh fruit and vegetable intake among food pantry participants. *Journal of Hunger & Environmental Nutrition, 14*(1-2), 252-261. https://doi.org/10.1080/19320248.2018.1538920

Wu, Z., & McGoogan, J. M. (2020). Characteristics of and important lessons from the Coronavirus Disease 2019 (COVID-19) outbreak in China. *Journal of American Medical Association, 323*(13), 1239-1242. https://doi.org/10.1001/jama.2020.2648

Yahia, N., Brown, C. A., Rapley, M., & Chung, M. (2016). Level of nutrition knowledge and its association with fat consumption among college students. *BMC Public Health, 16*(1). https://doi.org/10.1186/s12889-016-3728-z

Yang, C., Chen, A., & Chen, Y. (2021). College students' stress and health in the COVID-19 pandemic: The role of academic workload, separation from school, and fears of contagion. *PLoS ONE*, *17*(2), 1–16. https://doi-org.libproxy.txstate.edu/10.1371/journal.pone.0246676

Zein, A. E., Shelnutt, K. P., Colby, S., Vilaro, M. J., Zhou, W., Greene, G., Horacek, T. M., Olfert, M. D., & Mathews, A. E. (2019). Prevalence and correlates of food insecurity among U.S. college students: A multi-institutional study. *BMC Public Health, 19*(1). https://doi.org/10.1186/s12889-019-6943-6