

NUTRITIONAL INSECURITY AMONG COLLEGE STUDENTS ON A MIDWEST
CAMPUS

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ABSTRACT

College students experience nutritional insecurity at higher rates when compared to the general public. Compounding social, financial, community, and policy barriers limit the ability of college students to access healthy, palatable foods in adequate amounts for an active lifestyle. Recent literature, national societies, and healthcare entities have begun to highlight this concerning public health issue, yet literature has not fully explored or agreed upon the specific causes, exact prevalence, and implications of having limited food availability. Additionally, a greater understanding and awareness of this social determinant of health is required to facilitate and identify health promotion needs among this population for nurse practitioners and healthcare providers.

The purpose of this project was to examine the prevalence and associated risk factors for nutritional insecurity among the college student population. The project also aimed to provide recommendations to the university and healthcare communities for improving access to food in order to facilitate improved health outcomes for these individuals. Quantitative survey questions including demographics and a validated nutritional insecurity survey, as well as qualitative, open-ended survey questions regarding personal barriers and the pandemic were distributed to all students who took classes through the university in the Fall 2020 semester.

Six hundred forty-five students completed the survey; 539 responses were utilized for analysis following completion review. The nutritional insecurity prevalence rate among this university was 19.85%. Risk factors associated with nutritional insecurity appeared to be enrollment in an upper grade level, living off-campus, not purchasing a meal plan, low-income status, part-time employment, and being of Black or African American or Asian ethnicity. Lower grade point average and poorer physical and mental health outcomes appeared to correlate with

high nutritional insecurity scores. Multiple barriers to accessing food were identified including financial, transportation, knowledge, healthy options, storage, and preparation limitations. Pandemic effects and societal beliefs and policies also appeared to have negative consequences to accessing healthy food.

Study findings highlight the significant educational, physical and mental health implications college students face when experiencing nutritional insecurity. Campus, healthcare, and community personnel should recognize the increased risk and negative outcomes of nutritional insecurity among college students.

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To my family and friends who have stuck by my side through thick and thin of my journey, I could never thank you enough. Without the support of all of you, I could never have succeeded and grown in the capacity was I able to achieve. I love you all beyond belief.

DEDICATION

This project is dedicated to my two beautiful children who I hope always follow their dreams, no matter how difficult or challenging it may seem.

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LIST OF ABBREVIATIONS

USDA-ERS	United States Department of Agriculture’s Economic Research Division.
NI	Nutritional Insecurity.
NDSU	North Dakota State University.
NP	Nurse Practitioner.
SNAP	Supplemental Nutrition Assistance Program.
GPA	Grade Point Average.
ED	Emergency Department.
HVS	Hunger Vital Signs™.
PDSA	Plan-Do-Study-Act.
COVID-19	Coronavirus Disease 2019.
AHA	American Hospital Association.
AAFP	American Association of Family Physicians.
AAP	American Academy of Pediatrics.
PHQ	Depression Scale.
USDA AFSSM	United States Department of Agriculture Adult Food Security Survey Module.

CHAPTER 1. INTRODUCTION

Background and Significance

Achieving access to adequate amounts of appropriate food is a major population health issue (Phipps et al., 2016). For the purposes of this project, nutritional insecurity (often used interchangeably with the term food insecurity) is defined by the United States Department of Agriculture's Economic Research Service Division (USDA-ERS) (2018) as "the reduction of normal amounts and patterns of food intake necessary for an active, healthy lifestyle", due to the lack of money or other resources (para.11). Nutritional insecurity was first addressed in the United States by the passing of the National Nutrition Monitoring and Related Research Act in 1990 (Morris et al., 2016). While research has been extensively conducted across households in the US, understanding subpopulations of the overall public has only recently begun to increase; for example, research on nutritional insecurity prevalence and its overall impacts among college students has increased substantially in the last several years. After reviewing current literature, however, additional research and information is still needed to understand the severity, needs, and health implications of individuals experiencing nutritional access barriers while in college.

With accessibility to meal plans, safe housing, and institutional supports, college students are often perceived as being immune to poverty-related issues, such as nutritional insecurity, but may in fact be at greatest risk (Bruening et al., 2016). Social stigmas, lack of financial means, strict public resource guidelines, tuition and housing cost burdens, and deficient on-campus food access resources may impede students' ability to obtain healthy foods. The barriers put students at immense risk for nutritional insecurity issues.

Nutritional insecurity among students attending colleges and universities across the United States is a growing health concern due to its profound impacts on both physical and

mental health and academic success (Meza et al., 2018). In the United States, the overall rate of nutritionally insecure households is roughly 12%, however, the rates of nutritionally insecure college students have been reported as high as 60% (Bruening et al., 2017; Henry, 2017; Meza et al., 2018; Morris et al., 2016). Students living on and off campus and across all demographics are affected by nutritional insecurity. Additionally, nutritional insecurity has been observed across all forms of college settings (both 2- and 4-year colleges), all variations of student bodies, and varying geographical locations of campuses, highlighting the need to urgently address this worsening food access issue (Meza et al., 2018).

Food has long been distinguished as a basic and fundamental human need (Cady, 2014; Maslow, 1943; Meza et al, 2018). Access to healthy food is also regarded as a crucial social determinant of health, with the relationship of nutritional insecurity and chronic disease being cyclical (Patil et al., 2018). Nutritional insecurity has the potential to cause long-term detrimental effects on the health and success of students, therefore both short-term and long-term action should be taken to decrease the food burden many college students face.

Nurse Practitioners (NPs), healthcare providers, and health systems across all population care settings have a responsibility to identify food-insecure individuals and households and facilitate resources for access to healthy foods; in doing so, providers can ensure they are signifying holistic, individualized care (American Hospital Association [AHA], 2017). NPs and other primary care providers should specifically recognize and understand that college students are at high-risk for medical conditions and co-morbidities attributed to lack of healthy food. NPs are particularly well-suited to address these concerns in the student college population due to the health promotion and disease prevention focus of the discipline. NPs are more likely to receive training on how to address social determinants of health and health promotion topics as part of

their education (Kadaba, 2020). Communication, compassion, and keen patient care skills are deeply rooted within this discipline stemming from a basis within their previous nursing career. Additionally, NPs are often employed in student health and primary care settings that come into contact with patients who are college students. Treatment and care plans for this population should be optimized to ensure nutritional needs are met and education regarding healthy eating behaviors is provided. By addressing nutritional insecurity among college students, NPs can ensure a positive patient experience and improved patient outcomes.

Early research and solution efforts have increased over the past few years regarding nutritional insecurity among the college student population, and national attention is growing on this topic. Despite these efforts, access to healthy food remains a major challenge for millions of college students across America, leaving this population at greater risk for health conditions and decreased academic and employment success in the future.

Purpose

Nutritional insecurity (NI) has marked effects on both the physical and emotional health of college-age students. By understanding the related rates and risks of developing NI, steps can be taken among campuses, communities, and healthcare systems to ensure college students are receiving the food they need to prevent future physical and mental diseases and achieve scholastic success. The purpose of this project was to determine the NI rates and relating factors of students on a Midwest campus in order to provide recommendations for improving identification of at-risk NI college students and facilitate adequate access to nutritious food within university and health systems. These results were compared to existing local and national college NI data and added to the growing research efforts and understanding of this topic.

Project Objectives

Objective One

The first objective of this dissertation was to identify the NI rates among college students on the campus of North Dakota State University (NDSU) and compare these results to previous literature rates (14.1 to 58.8%) of NI among college students on NDSU's campus and across the US.

Objective Two

The second objective was to describe identified demographic risk factors and additional barriers related to NI among college students on the campus of NDSU. The results from this project may provide valuable information to understanding which students may be at greater risk for having difficulty accessing nutritious food while in college.

Objective Three

The third objective was to provide written recommendations to campus administration, healthcare personnel, and vested community members regarding improvements in nutritional access for college students on a Midwest campus. Providing valuable feedback to the universities, healthcare systems, and governing bodies provides opportunity to improve retention and graduation rates, as well as improve the health and well-being of college-age students. Developing an understanding of the NI impacts within the healthcare community is significant and necessary to address this determinant of health on the college student population.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Postsecondary Nutritional Insecurity in the United States

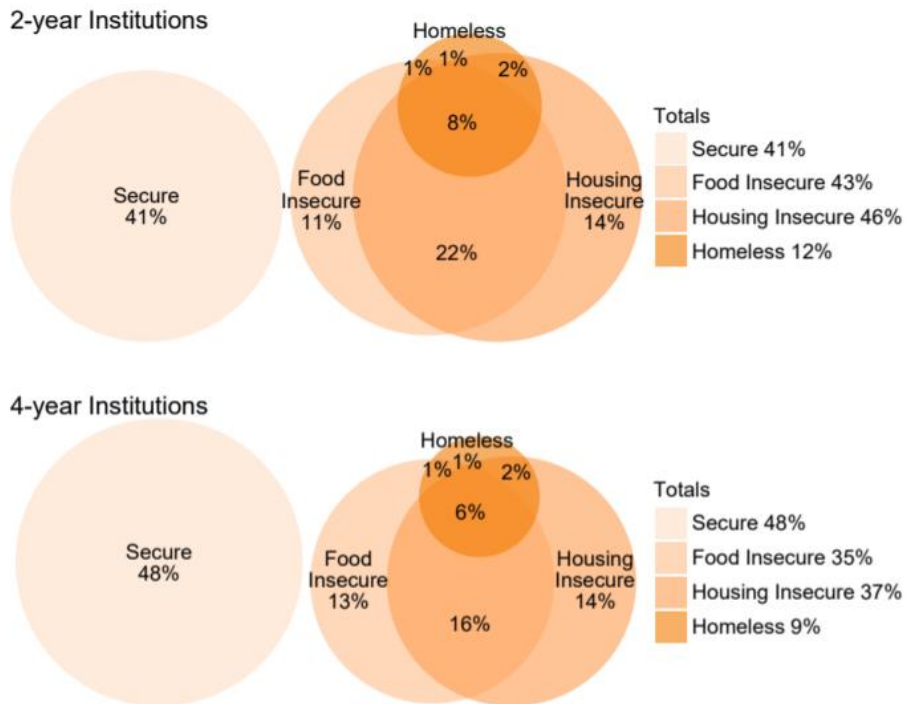
Recent studies have shown that rates of nutritional insecurity among college students may be as high as 30 to 60 percent (Bruening et al., 2016; Patton-López et al., 2014; Wood & Harris, 2018). The national average of nutritionally insecure college students has widely varied across literature, due to both inconsistency in research methods and the division of nutritional insecurity into diverse categories. In a systematic review among nine peer-reviewed United States-based postsecondary studies of NI among postsecondary students, it was estimated that 32.9% of students experienced NI, with a range of 14.1% to 58.8% overall reported rates (Bruening et al., 2017). Although the college student population NI prevalence rates have varied, it is evident that they are substantially higher than the overall national household NI average of 11.8% (Henry, 2017; Meza et al., 2018). In a joint study of four Illinois universities, the prevalence of college-aged respondents with NI was 35.0% (Morris et al., 2016). Similar to North Dakota, the state of Illinois is situated in the Midwest and is predominantly agricultural. In 2018, 66 institutions of higher learning across 20 states participated in a survey conducted by The Hope Center (formerly the Wisconsin HOPE Lab) on basic needs security of university students; this survey evaluated the NI, housing insecurity, and homelessness rates among college students at both 2- and 4-year colleges (Goldrick-Rab et al., 2018). Average rates of NI in this survey were 36% for 4-year university students and 42% for 2-year college students. The study also suggested a strong relationship between NI and housing insecurity when reported. This may suggest that students who are financially limited in ability to pay for college may be limited in other resources as well. Maroto et al. (2015) suggested that students living alone have the highest rate of food insecurity, whereas students living with their parents or spouses are likely to be more nutritionally secure.

Students who do not have a meal plan are more likely to experience NI than students who have meal plan on campus (El Zein et al., 2020). Even students who have access to meal plans can experience NI (Nikolaus et al., 2019). Some students have indicated that they choose to overeat during the allotted meals on their meal plan to maximize food intake when they were unsure where their next meal was coming from. Dining center hours may also provide a barrier at some universities for when students are looking to access food. As for students accessing food off of campus, transportation and time factors were reported as limitations to obtaining healthy food.

Literature also suggests that NI rates tend to be higher at the end versus the beginning of the semester as resources such as money become depleted; increased stress, decreased emotional health, and decreased physical activity also become more likely at this time of the school year (Bruening et al., 2018; El Zein et al., 2018). A study at the University of California identified the end of the academic quarter, academic breaks and holidays, and the summer as times when students were at higher risk for NI (Watson et al., 2017). The figure below highlights the relationship overlap between specific social determinants of health.

Figure 1

Intersections of Food Insecurity, Housing Insecurity, and Homelessness (Goldrick-Rab et al., 2018)



Some confusion among the research community revolves around the irregular categorizing of the levels of nutritional security, specifically by the USDA, as noted in the table below. These categories are not well-defined within literature and are often difficult to distinguish. For purposes of this project, the terms “nutritionally secure” and “nutritionally insecure” will be used throughout and encompass the individuals in the correlating “food secure” and “food insecure” categories.

Table 1

Classification of Food Security

Food Security Category	Definition	Sub-Category
High Food Security	No access problems or limitations.	Food Secure
Marginal Food Security	Anxiety of sufficiency or shortage in household with little or no change of intake	
Low Food Security	Reduced food quality, variety, or desirability of diet.	Food Insecure
Very Low Food Security	Disrupted eating patterns and reduced intake.	

(USDA-ERS, 2018)

Factors and Risks Related to High Rates of NI

Causative factors of NI are not well-established. There are several possible factors that may put college students at higher risk for NI, including socioeconomic status, mental health status, and place of residence, however.

As college has become more accessible through increased financial aid opportunities, student populations have become more diverse. More first-generation students and under-represented populations are attending school, and those students and families may require more resources to aid in the transition to college life (El Zein et al., 2018; Bruening et al., 2016). The college population has changed over time to include historically underserved and low-income students (Nikolaus et al., 2019). In one study conducted among 1,138 college freshmen on an Arizona campus, it was shown that Pell grant recipients were far more likely to report food insecurity than non-Pell grant recipients (Bruening et al., 2018). Additional research has shown that Pell grant recipients may have double the rate of NI compared to non-recipients (El Zein et al., 2018, 2020). Financial aid is helpful to many students; however, it is often not enough to cover the costs of living while in college, and some low-income students have thousands of dollars of unmet needs (Choitz & Reimherr, 2013; Goldrick-Rab et al., 2018). The cost of college continues to increase, and while some universities have become more supportive of

students through increased resources and changes in policies, there remains a gap in the capacity to prevent or reduce NI (Nikolaus et al., 2019). Additionally, college is often the first experience students have with resource and financial management and are often ill-prepared for this responsibility.

In order to meet the costly demands of higher education, many students are forced to hold jobs during college. NI rates have been found to be highest (48-51%) among students who work 40 or more hours per week, or who are unemployed; rates are lower (34-38%) among students who work 6-20 hours per week (Goldrick-Rab et al., 2018). Other research has also indicated that having a job is more commonly associated with NI (El Zein et al., 2020; Hughes et al., 2011).

The financial and socioeconomic status of a student directly impacts their risk of NI (Morris et al., 2016; Phillips et al., 2018; Wood & Harris, 2018). The cost of college attendance has substantially increased over the past decade at a rate of approximately 2.2% per year beyond inflation (Ma et al., 2019). The cost of tuition, fees, and room and board has steadily been on the rise. Students who did not require student loans or other repayment-required financial support reported lower rates of NI, whereas students who received student loan support reported higher rates of NI (Morris et al., 2016). Similarly, students who were listed as dependent for financial aid purposes were at lower risk of NI, whereas students independent or older than average were at a higher risk of NI (Goldrick-Rab et al., 2018). Forty-two to 51% of older-than-average students reported NI; twenty-eight to 33% of 18-20-year-old students reported NI. Financial resources are often limited for students who are not U.S. citizens or permanent residents; they have similar challenges to financial access if their parents are not U.S. citizens or permanent residents (Goldrick-Rab et al., 2018). In studies by El Zein et al. (2018) and Watson et al. (2017),

international students had a higher prevalence of NI when compared to national students, but were less likely to be discussed in NI literature and often pay substantially higher costs of tuition. Hughes et al. (2011) identified college students as a vulnerable population that is both young and socioeconomically disadvantaged and suggested that they are at great risk for NI due to their insufficient income backing.

In order to understand the impact income has on food insecurity, it is important to analyze households that fall at or below the poverty level. NI and hunger are directly related to household resources (Cook & Frank, 2008). The 2018 poverty level for the annual income of a household of two adults and two children was \$25,100 (“Poverty Guidelines,” 2015). Poverty levels are based on historical estimates of the ability to purchase a minimally nutritious diet; poverty thresholds are calculated at three times this amount (Cook & Frank, 2008). These estimates do not take into consideration the geographical differences in the cost of housing, which can be drastically different and impact the resources individuals have in obtaining food (Cook & Frank, 2008). Even if the cost of housing is higher than average in one area, the poverty level remains the same and is not accurately reflecting the needs of that population. There are millions of households who are not poor by definition but are unable to afford healthy foods, causing many people to criticize the low value of the poverty line. The concern that this line is too low stems from the fact that the poverty level often dictates the resources people and families have access to.

One-third of the nation’s nutritionally insecure are above the poverty line, sometimes by two or more times the level (Zepeda, 2018) and often do not qualify for the necessary assistance they need. Little research has been conducted to study food insecurity among the non-poor. Zepeda (2018) described that America’s non-poor population often experiences times of episodic

nutritional insecurity, versus chronic, as a result of acutely limited assets or monetary availability. The apparent discrepancies between these situations suggest that a policy change is imperative to ensure people who do not have the income or means necessary to obtain adequate, healthy food receive access to the resources they need. Additionally, research suggests that children who grow up in poverty tend to continue to struggle with poverty into adulthood (Woolf et al., 2015). Socioeconomically disadvantaged students suffer more frequently from nutritional insecurity.

Phillips et al. (2018) determined that many subsets of students are at a greater risk of NI including veterans, graduate students, and students from a socio-economically disadvantaged background. Another study by Wood and Harris (2018) noted that students with legal concerns, disabilities, housing insecurity, or poor quality of health were at the greatest risk of having decreased nutritional security across all racial and ethnic groups. Already-underserved populations in the United States are disproportionately impacted by NI; of these groups, African American and multiethnic students were at highest risk of NI overall (Cady, 2014; Maroto et al., 2015; Morris et al., 2016; Wood & Harris, 2018). African American students are nearly twice as likely to be nutritionally insecure compared to White students (Maroto et al., 2015). White and Asian students were particularly at-risk for nutritional insecurity if they were low-income (\$30,000 or less per year) (Wood & Harris, 2018). Additionally, students who have children, especially single women with children, are at a much higher risk of NI than students who are not parents (Bruening et al., 2018; Cady 2014; Goldrick-Rab et al., 2018; Gundersen & Ziliak, 2014; Maroto et al., 2015). Moreover, students who identify as lesbian, gay, bisexual, transgender or queer tend to have a higher percentage of NI than the overall average population of college

students (Cady, 2014). Many students across all backgrounds encounter nutritional concerns, at a rate concerningly higher than the national average.

Barriers to Access

Many barriers exist for students seeking nutritious foods. Some of these barriers include insufficient resources to purchase food, negative social stigmas attached to accessing resources for food, adverse internal feelings and self-image, a lack of grocery stores on campus, a lack of transportation, limited access to kitchens or cooking facilities, and a deficiency in cooking skills and food management.

Covering the cost of tuition, housing, and food can be a challenge for many students, and students often prioritize the cost of food last (Watson et al., 2017). The high cost of food itself can be a barrier, and healthy foods come at a higher price. Pre-packaged, less-healthy options are often less expensive and a more attractive option for students on a tight budget. Additionally, a significant number of students report low confidence when budgeting, especially since financial aid disbursements come as a lump-sum at the beginning of semesters or quarters (Watson et al., 2017). Increasing credit card and student loan debt has gained national attention over the past decade (Gaines et al., 2014). Credit cards may offer both positive and negative solutions for food access; for students in crisis need of food, a credit card may offer a reasonable short-term solution, but if income does not meet statement demands, students may find themselves facing larger financial issues.

Some students may seek community or public resources to help cover the costs of food to meet basic needs and living. One notable, national public assistance program that helps individuals who are NI achieve access to food is known as the Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps). This program provides food

assistance for nearly 50 million individuals across the US (Lower-Basch & Lee, 2014).

Unfortunately, federal rules exist that limit which college students are eligible for SNAP benefits. In order to qualify you must be enrolled at least half-time at an institution of higher education and “meet one of the following criteria:

- Be under age 18 or age 50 or older
- Be a parent caring for a child under age 6 OR caring for a child 6 to 11-years-old who is unable to obtain child care to attend school and work OR caring for a child under 12 years old AND enrolled full-time
- Working for pay at least 20 hours per week
- Receiving any work-study funds
- Receiving Temporary Assistance for Needy Families (TANF) benefits
- Unable to work because of a mental or physical disability OR
- Enrolled in certain programs aimed at employment (as identified by the SNAP guidelines)” (Lower-Basch & Lee, 2014, p.1).

The guidelines provide a barrier to many students and require a large number of required work hours. Many students are unable to work at least part-time while in college, thus limiting access to public benefits such as SNAP. Moreover, SNAP benefits are only available to U.S. Citizens and do not provide assistance for international students, although it is difficult to even college students who are U.S. citizens to qualify (El Zein et al., 2018). Even if a student qualifies, most campuses where students spend the bulk of their time, do not accept SNAP benefits for payment (Goldrick-Rab et al., 2016). Oregon State University recently became one of the first institutes of higher education to accept SNAP. Federally funded food access programs such as SNAP, the National School Lunch Program, and the School Breakfast Program are readily available to

schoolchildren, but their assistance stops once these children enter college (Goldrick-Rab et al., 2016). Outside of encouraging students to apply for SNAP benefits, many universities have implemented a food pantry on campus. The College and University Food Bank Alliance supports over 200 food pantries on campuses across the U.S. These pantries have been helpful for about one-third of NI students, but barriers exist for students accessing food by this method as well (El Zein et al., 2018). Students in the noted study stated that they had received insufficient information to understand how their local food pantry works and their policies, such as who is eligible to go there, how the process works, and where it is located; additionally, the students found that the hours of operation were often unclear and inconvenient for their schedule. Some campuses have not yet implemented food pantries. A food pantry committee was formed at NDSU during the course of this project and a food pantry was opened on campus in late 2020.

Social stigmas have been reported as one of the major reasons why students who are NI do not seek public assistance for food access (El Zein et al., 2018). Social research conducted in middle America revealed that some adults did not take part in food pantries or access other resources in order to reduce their risk of social embarrassment or public shame (Zepeda, 2018). The results of the study are concerning such that the number of people seeking assistance at food pantries may not reflect the accurate number of those experiencing poor dietary quality – the number may be much higher. El Zein et al. (2018) concluded that college students felt similarly to this study and found that many students avoided public assistance options, such as food pantries and SNAP benefits, to avoid embarrassment, judgment, or feelings of shame.

Implications and Impacts of NI

A 2010 statement released by the American Dietetic Association stated that, “systematic and sustained action is needed to achieve food and nutrition security for all in the United States”

(Holben & Marshall, 2017). Nutritional insecurity can lead to significant emotional, mental, physical, and cognitive health issues (Chilton & Rose, 2009; Holben & Marshall, 2017). College students may suffer drastic, cumulative negative consequences from not having adequate amounts of healthy food; these consequences include depression, poor academic achievement, eating disorders, physical disease development, and substance abuse behaviors, which could affect their future career and health (Bruening et al., 2016).

Academic Success Implications

Similar to school-age children, college students are likely to experience academic difficulties if they are nutritionally insecure (Cady, 2014). As research on NI's impact on college student's GPA continues to grow, it builds on current K-12 research that has identified concerning negative outcomes in education (Phillips et al., 2018). Overall math and reading scores have historically suffered the most from lack of nutritionally-sound food consumption. Behavioral issues and disruption related to education are often an accompanying concern with NI, such as increased incidence of absenteeism and suspension. Some nutritionally insecure students choose to not purchase textbooks in order to have enough money for food (Phillips et al., 2018). Other students have reported dropping classes, missing a study session, class or club meeting, or choosing not to participate in an extracurricular activity due to hunger issues (Dubick et al., 2016).

College students with difficulty accessing adequate amounts of healthy foods are more likely to have lower grade point averages (GPAs) and poorer academic success than college students who do not have nutritional insecurity (Bruening et al., 2016; El Zein et al., 2018; Goldrick-Rab et al., 2018; Maroto et al., 2015; Patton-López et al., 2014; Phillips et al., 2018). In a study by Maroto et al. (2015), college students with nutritional insecurity were significantly

more likely to fall into the 2.0-2.49 GPA category and considerably less likely to reach the 3.5-4.0 GPA category. In the joint Illinois university study noted previously, a significant association of students with low GPAs (0-1.99) and a low likelihood of being nutritionally secure was displayed (Morris et al., 2016). Students' education, success, and future career are affected by nutritional insecurity and the psychosocial distress that accompanies it.

Mental Health and Psychosocial Impacts

Nutritional insecurity has been reported among college students concurrently with higher rates of stress, anxiety, and depression, often at three times higher rates than average (Bruening et al., 2016, 2018; El Zein et al., 2018; Flores & Amiri, 2019). In the 2018 study by Bruening et al., NI students who reported higher rates of depression (reported as increased feelings of little interest, feeling down, feeling tired, poor appetite, and feeling bad about oneself) also reported higher rates of unhealthy eating behaviors and worse mental health outcomes when compared with nutritionally secure students. Furthermore, students with NI who practice unhealthy eating behaviors, such as routinely missing evening meals, are more likely to experience higher levels of stress and depressed mood. One systematic qualitative review suggested that NI and depression may predict each other at subsequent time points (Bruening et al., 2017; Meza et al., 2018). Depression and anxiety often present with physical and mental manifestations including fatigue, insomnia, irritability, excessive worry, and lack of concentration which may impact students' ability to keep up with academic demands and learning, and therefore, hinder GPA and academic success outcomes. In another similar, cross-sectional study of 855 first-year freshman students, higher rates of perceived stress, disordered eating habits, and poorer sleep quality were found among NI students compared to students who were nutritionally secure (El Zein et al., 2019).

A study conducted at the University of California, Berkeley (UC Berkeley), discussed the psychosocial effects of NI from a qualitative perspective (Meza et al, 2018). In-depth interviews with students at this college have uniquely uncovered issues specific to NI which previous quantitative research was unable to address. The largest reported psychosocial effect by students in this study was stress. Students noted that the stress of not having adequate amounts and types of foods impacted their daily life and left them with feelings of anxiety and worry. Consuming high-fat and unhealthy food as a result of being unable to afford healthy food lead one student to experience poor physical health, which in turn, augmented his anxiety. Some students reported experiencing eating disorders related to NI as a result of having to save and ration food for a later time. Additionally, students reported shame, fear, and guilt regarding their NI struggles, even towards their own families. Their shame and guilt were reported to be further reinforced when other students offered to loan them money or offered to pay for their food, or if other students noticed their stomachs growling from hunger. Other common themes found in this study included resentment and jealousy of other students who did not experience NI, inability to develop meaningful social relationships, and sadness as a result of NI. Some students reported being unable to attend social gatherings and feeling left out of events that involved purchasing food. A general feeling of hopelessness was expressed by some students surrounding their difficult work-school-life balance and the long-term effects of taking out student loans to pay for their short-term needs.

Students across this study discussed mental challenges related to the physical manifestations of NI as well. Symptoms such as fatigue and lack of energy made performance in school difficult. Often, students spent more time thinking about food than concentrating on their studies; other students skipped class, contemplated changing majors, or dropping out of school to

meet their basic need of food. This study's findings and overall themes were consistent with a similar qualitative study by Henry (2017) at the University of North Texas. The relationship of NI leading to depression, decreased physical and mental health, and finally, decreased GPA and future economic success is instrumental in understanding how detrimental NI can be to the health and wellbeing of college students and universities alike.

Physical Health Consequences

Mental health outcomes related to NI have been researched extensively among college students as discussed previously, however, chronic disease associations and diet-related physical morbidities have only recently become well-established within this college-age population (El Zein et al, 2018, Bruening et al., 2015). Literature has shown that NI is a strong predictor of negative physical health outcomes (Dean et al., 2020). Of interest, two cross-sectional studies found that college students with NI were more likely to hold a negative perception of their health as well (Bruening et al., 2015, 2018) They were more likely to report their health as “fair” or “poor”, unlike their nutritionally secure peers who were more likely to report their health as “good” overall.

Research among college students has identified that decreased fruit and vegetable consumption has been closely associated with NI (Bruening et al, 2015, 2018; El Zein et al, 2018, 2020). Healthy diets rich in fruits and vegetables administered in childhood are shown to influence adult dietary patterns and reduce the likelihood of developing diabetes, obesity, cardiovascular disease, and certain cancers (DeWit et al., 2020). NI students had a higher intake of added sugars than those who were nutritionally secure (El Zein et al, 2020). If healthy food is not available or resources, such as time, are limited, individuals will rely on diets higher in saturated fats, refined grains, and added sugars. This overall lack of access to fresh fruits and

vegetables, coupled with poor dietary habits, has been identified as a common cause of obesity among young adults.

A recent study conducted by El Zein et al. (2020) indicated that NI was directly associated to poor dietary quality leading to obesity among college students. After adjusting for sociodemographic variables, these researchers found that students with NI were three to five times more likely to become obese, with the prediction being dose-dependent in relation to severity of NI. One suggestion this study made was that students experience a physiological adaptation to episodic food shortages, which increases the risk of obesity. This means that some students engage in unhealthy poverty-related eating habits by purchasing low-cost unhealthy foods or by skipping meals to stretch food dollars (El Zein et al, 2020). Some students end up overeating during times of financial stability or increased food access. These back-and-forth food choices may lead to disordered eating behaviors and a physiological energy retention cycle by storage of fat.

Individuals who are NI have reported unhealthy coping strategies to stretch their budget. Behaviors such as medication underuse or nonadherence, cancelling or postponing preventative or necessary medical care, omitting identified foods for special diets (i.e. diabetic diets), rationing infant formula, and making tradeoffs between other necessities such as utilities and transportation are observed in the NI population (Woolf et al., 2015). It is known that adults of all ages, including young adults, who experience NI have a higher potential and likelihood of developing arthritis, hyperlipidemia, coronary heart disease (CHD), stroke, asthma, diabetes, cancer, chronic obstructive pulmonary disease (COPD) and hypertension (El Zein et al., 2018; Gregory & Coleman-Jensen, 2017). Adults in NI households are 10.5% more likely to develop hypertension than adults in nutritionally secure households (Gregory & Coleman-Jensen, 2017).

Several substance abuse behaviors occur at higher rates consistently among nutritionally insecure populations. Substance abuse behaviors further add to morbidity and mortality inequities among individuals with NI (Kim & Tsoh, 2016). The odds of cigarette smoking among 18- to 30-year-old young adults, independent of other factors, is substantially increased among individuals with nutritional insecurity (Kim & Tsoh, 2016). NI significantly raises the risk of smoking among the college-age population, and may be attributed partially to psychological distress of not having access to food. Smoking is further perpetuated in the study by alcohol use, suggesting an entangled relationship between situation and behavior that serves to decrease overall health.

Nutritional Insecurity Among the North Dakota Population

North Dakota (ND) has some of the lowest household NI rates in the nation, yet 1 in 12 people still face hunger and consume low-quality diets (Hornung, 2017). Nearly ninety percent of the state's land and economic output is used for agriculture and food production, but a gap continues to exist, causing some people to go without food. Even though this state is used to produce food for the world, several food deserts (neighborhoods where nutritious food is limited, low quality, expensive or simply unavailable) exist within the state itself (Weatherspoon et al., 2013). Food deserts are typically identified as populated, low-income areas that lack access to grocery stores or supermarkets, either by the distance to stores or existence of them in general (Bauer et al., 2012).

Counties with the highest rates of NI include Cass, Benson, Roulette, Sioux, and Grand Forks (Colby et al., 2010). NDSU is located in Cass County, an identified food dessert. In 2010, research involving focus groups and interviews of both food resource providers and clients in ND was conducted to identify barriers with food assistance in the state (Colby et al., 2010).

Findings revealed that only 63% of those who qualify for SNAP benefits participate in the program in ND; nearly half of the recipients of this program are children (Colby et al., 2010). Barriers to participating in SNAP included: underservice by the charitable feeding network, personal embarrassment, transportation limitations, lack of program awareness, and food amounts provided not meeting needs (Colby et al., 2010). These individuals also identified potential solutions to these barriers; they recommended that counties in ND increase their charitable feeding services to meet at least minimum needs, which would provide a 7% increase in access to food overall. Achieving a hunger-free ND would require doubling food resources, including grocery stores and food pantries, in the state (Colby et al., 2010). Not only is it crucial to increase food resources in the state, but also increase the awareness of these resources. Individuals are less likely to seek out assistance if they are not aware of what is available to them. There is an awareness and resources gap for food resource providers in ND as well. There is need for collaboration between state and federal nutritional assistance programs to team up against NI. The NI rates among adults and children in ND and across the U.S. are concerning; however, the rates among college students may be significantly higher, less studied, and responsible for far-reaching health and academic consequences.

Nutritional Insecurity Among Postsecondary Students at NDSU

A statistic of concern is that of the 13.9% of people who live under the poverty line in Fargo, ND, females ages 18-24 years old make up the highest population of that group (Data USA, 2020). Following females, males ages 18-24 years old make up the next highest group in Fargo living under the poverty line. Over 6,300 individuals of college age in Fargo, ND are estimated to be living in poverty.

Food resources for college students attending NDSU are limited. As previously noted, NDSU recently implemented a food pantry on campus for students experiencing short-term food needs. The NDSU website lists opportunities for food banks and meal baskets, however, many of these options are not available to college students, for example, the Great Plains Food Bank, which is a distribution site for its outlying food pantries across the state. Students are not able to access food through this organization, unless they present to an outlying community food pantry, which comes with additional policies and procedures to follow. Additionally, some of the resources listed are located miles away from campus and travel or transportation to these sites may pose a challenge. A study conducted in the Spring of 2016 on the campus of NDSU surveyed 1,203 students (Penn et al., 2016). The survey was administered in specific, unidentified classes and contained 84 questions. The results of the survey suggested that just over half of the students at this university (57%) had enough of the kinds of foods they want to eat; however, 11% of the students surveyed were hungry during the last 12 months but didn't eat because they couldn't afford enough food. Thirty-five percent of the students who responded also indicated that they couldn't afford to eat balanced meals. The students who endorsed that at some level they were not able to obtain the types of foods they like or enough food said that it negatively impacted their academic success. Concerningly, very few students accessed community resources to obtain healthy food, and some noted that they were able to receive food from family or friends (5% of the respondents). Some of the open-ended responses provided by the students at that time for recommendations to improve access to food included: having grocery stores closer to or on campus, offering healthier food choices at the dining centers and on-campus restaurants, healthy eating counseling and financial education, free food or food donation options on campus, less expensive meal plans, option to purchase "x" amount of meals

instead of a set number of meals per week, offering free or reduced-cost regular transportation to grocery stores, and healthier food options on the weekends. This study was instrumental in identifying that some students on campus are faced with food access barriers; it also helped to determine some of the ways access can be improved. Since several years have gone by, and the state of our economy and cost of college attendance have all changed, it is important to reevaluate the nutritional needs of students on the campus of NDSU. This project plans to conduct a similar, but not replicated, study. Further efforts are needed to improve student's access to the kinds of foods and amounts they want to eat to maintain a healthy lifestyle.

Efforts to Recognize, Ease, and Treat NI Among College Students

Several campuses, healthcare facilities, and state and local governments across the United States (US) have implemented efforts to decrease the burden of NI and reduce the harmful effects of this situation. Several organizations and universities themselves have spearheaded efforts to alleviate the NI challenges and barriers so many college students face. Moreover, some healthcare facilities have implemented strategies for evaluating and addressing the nutritional needs of patients presenting for provider visits. A number of approaches to tackle student NI were identified in literature and reviewed for this project.

Increasing Education and Awareness

One of the most common efforts used to improve college students' access to healthy food is raising public awareness and increasing education about this topic (Cady, 2016). NI is not commonly discussed among the public, and as mentioned previously, can often be a source of shame or guilt for individuals not being able to obtain food. Also, many colleges and universities have faced budget and support cuts causing some administrators and vested personnel to feel overwhelmed addressing this large complex issue. Increasing awareness and highlighting what

changes can be made with little resources will increase support for combating NI (Cady, 2016). Some universities have begun efforts by displaying posters and distributing pamphlets with educational information regarding NI in a manner relatable to college students. This has been shown to help reduce stigma and increase awareness of the issue.

Federal Assistance and Support

The United States Government Accountability Office [U.S. GAO] (2018) analyzed the United States Department of Education data on and reviewed 31 other studies related to the national prevalence of NI among college students. In this review, they found that almost 2 million students who were identified as at-risk for NI did not endorse receiving SNAP benefits. When the U.S. GAO reached out to 14 different universities, they found that 9 of them were taking initiatives to help students apply for and access SNAP benefits who may not have known that they otherwise met criteria or knew how to apply. They also found that some of the officials located at the schools who were not taking this approach did not understand the student eligibility rules themselves or stated that they were unfamiliar with it.

To combat the confusion surrounding SNAP eligibility requirements and information for college students, some universities have started centralizing their student services to include NI benefit support alongside their veteran services, financial aid, counseling, and disability support services in one location that is easily accessible to all students (U.S. GAO, 2018). This centralization of services has led to a case management approach to better serve the needs of the students. Additionally, some universities have taken the initiative of further educating their support staff regarding the federal nutritional benefit programs such as WIC and SNAP; this education has aided in the identification and facilitation of thousands more students enrolling in these benefits who may have struggled otherwise (U.S. GAO, 2018). City University of New

York (CUNY) began utilizing a nonprofit organization called Single Stop USA to aid in connecting students with social services for support such as nutritional accessibility (Laterman, 2019). Bruening et al. (2018) also recommend that public health officials focus on the needs of college students by working with universities to assist in screening students for NI. In the U.S. GAO Report to Congressional Requesters, the committee recommended that the college student eligibility information be presented in a clearer manner on the federal Food and Nutrition Service's (FNS) website to address public confusion surrounding these requirements (2018). Advocates for increased SNAP availability to college students feel that these benefits should be redeemable at university dining centers and that SNAP work requirements should be waived if a student is attending school at least part time (Laterman, 2019). They also recommended that FNS include individual state SNAP agency initiatives and continue to take additional action toward this at-risk population.

A call to expand the National School Lunch Program has grown in popularity as college costs continue to increase (Goldrick-Rab et al., 2016; Goldrick-Rab et al., 2018). The expansion of this program already implemented in public schools would allow students whose annual income or family income is 185 percent below the poverty line to receive reduced or free meals. This guideline aligns similarly with the Pell Grant awards, which are administered to students at 200% below the poverty line. Therefore, students meeting the Pell Grant criteria would be eligible for the lunch program, increasing the program recipients by 25% overall (Goldrick-Rab et al., 2016). In addition to assisting potentially eligible students in federal food assistance programs, some campuses are using local methods to combat NI.

On-campus Food Pantry

College campus food pantries are becoming more common across the nation with over 650 pantries reported so far; these pantries provide free food to students in need (U.S. GAO, 2018). These food pantries vary from site-to-site in size, location on campus, contents offered, method of running the pantry, and hours of operation. Some college campuses have given the students and student government associations the reigns for designing, developing, and managing the pantry (Cady, 2016). This method has shown improvement in the overall stigma many students feel that may keep them from accessing their college pantry. Other campuses have placed their food pantry in a very public, visual location to help normalize its use and publicize its presence (U.S. GAO, 2018). Rowland et al. (2018) recommends implementing a client-choice model so students may pick and choose foods from the shelves that meet their palate interests versus handing out pre-packaged, standard bags of food. This method creates a sense of empowerment and dignity for individuals and decreases potential waste of foods that they may not eat later that could have supported another student. It is also recommended by these authors that guidelines be implemented for the donation of food to the pantry. They suggested moving away from the “anything is better than nothing” mentality and instead focus efforts on providing the healthiest food possible to people (p. 5). They go on to explain that though this may be a difficult change for some, having conversations with all involved, including major donors, will prove beneficial to the overall health of college students in the long run. Additionally, campuses can make specific food requests to donors to help recruit ideal types of foods. Food pantries can be very impactful for college students with NI, for example, in 2013-2014, the Michigan State University food pantry served 4,000 students on their campus of 50,000 students (Cady, 2016). This article emphasizes that food pantries, though helpful, are not all-encompassing solutions to

address food access needs of students, as NI as a multi-level issue with many influencing components.

A recent initiative is underway at some campuses to redistribute leftover meals from university dining centers and catered events that would otherwise would be thrown away (Laterman, 2019). This effort is being led by the College and University Food Bank Alliance out of Temple University. Other campuses have extended the resources available at their food pantries by organizing support groups and initiating events to connect students (Laterman, 2019).

Improved On-campus Dining Centers

Many universities are re-evaluating and partnering their efforts with their dining centers to provide less expensive, healthier options for their students. Oregon State has implemented nutritious, balanced meals in their dining centers that cost students less than \$3 per meal (Cady, 2016). One community college, Bunker Hill Community College in Boston, MA, is working with their vendor to obtain a basic lunch option for students in need to purchase at wholesale prices rather than retail (Goldrick-Rab et al., 2016). Other campuses are utilizing meal plans that have a designated number of meals per semester versus a set number of meals per week. This has allowed students to obtain meals during challenging or irregular times and not lose meals that would have otherwise been unused.

Additional Efforts and Influence Reduction

Oregon state addressed one layer of the multifactorial components of NI by placing low-income and at-risk students into the most affordable housing first (Cady, 2016). Other colleges have implemented fundraisers amongst the staff and students to raise money for students in need; the money raised is applied to these students' accounts and can be accessed when swiping their college identification card in the cafeteria, eliminating embarrassment or stigma to physical

vouchers (Goldrick-Rab et al., 2016). There are several organizations and programs that now assist students in donating their extra meal swipes to students who are in need; Swipe out Hunger and Share Meals are just a couple of the options universities have to use a meal share program amongst their students (Laterman, 2019).

Some colleges, such as the University of California (UC), have created both community and academic programs to teach students food literacy and preparation of healthy meals along with financial and budgeting classes (Watson et al., 2017). They suggest that implementing such programs may prevent overall NI and help students understand how to afford and prepare healthy foods. Even though multiple efforts such as those discussed are increasing at the campus, city, state, and federal level, the concerning NI disparity among college students is continuing to grow as well.

Nutritional Insecurity in Healthcare

Addressing NI and its related health confounds have become a pressing issue in today's healthcare systems. A growing body of evidence as discussed below has suggested that NI is associated with significantly increased healthcare costs, healthcare utilization, emergency department (ED) visits, and hospitalizations.

As the concern for increasing healthcare costs has become a national focus, several research studies looked at the association between NI and health care expenses. A 2018 study entitled *Map the Meal Gap* conducted by Feeding America outlined key findings among healthcare costs in the US related to the effects of NI (2020). The findings indicated that NI patients each have an average of \$1,863 in extra healthcare costs per year, totaling over \$77.5 billion dollars in additional costs directly associated with NI. North Dakota incurs approximately \$57.6 million in annual additional healthcare expenditures related to NI. These costs are

substantial and harmful to an already pressured healthcare system focused on reducing expenditures. The additional costs may come partially as a result of chronic health conditions (hypertension, heart disease, stroke, asthma, depression, diabetes, etc.) strongly associated with NI (Dean et al., 2020). Individuals who experience NI tend to have an overall increased healthcare utilization rate and obtain substantially higher levels of healthcare costs than their nutritionally secure counterparts. Dean et al. (2020) discussed that NI individuals are more likely to exhibit chronic conditions which are positively associated with increased healthcare usage and spending. The harmful relationship of the increased financial burden individuals experience with chronic disease causes constraints to their further ability to purchase healthy foods. Other social determinants of healthcare are also affected by the increased medical costs, such as rent or mortgage payments, utility bills, and transportation expenses, increasing already known and established barriers to accessing food.

A 2018 retrospective analysis conducted by Berkowitz et al. looked at over 11,781 participants from a nationally-representative cohort and found that NI was associated with markedly higher levels of ED visits and department services and inpatient hospitalization admissions. They also noted that there was an increased length of stay for hospitalizations among this group. The researchers in this study accounted for demographics as well as education, income, health insurance, region, and residence to account for socioeconomic factors (Berkowitz et al., 2018). The overall prominent outcome from the study was the determination that patients who experience NI are in the top percentiles of total healthcare expenditures.

The increased healthcare costs and physical disease implications, as discussed previously, have pushed health systems and national health societies to seek out solutions to identifying NI and promoting healthy food access and intake. For example, the American Academy of Family

Physicians (AAFP) announced a new initiative entitled the EveryOne Project to encourage all family providers to screen for comorbid social risk factors, including NI, by using a specific screener (De Marchis et al., 2019). The screening tool organized by the AAFP incorporates the 2-question USDA NI screener within its list of multiple social-based questions, making the tool quick to use in clinic. The American Academy of Pediatrics (AAP) called on pediatric providers in 2015 to screen all children for NI using the Hunger Vital Sign™ (HVS) tool developed by the Children's HealthWatch team (Black & Debrunner, 2019). Since then, this 2-question screener based off of the USDA's FSSM survey has been validated for use amongst the youth and adolescent population (Black & Debrunner, 2019; Hager et al., 2010). The screener has been tested in primary care pediatric offices and busy specialty clinics as well, such as pediatric cardiology, with demonstrated effectiveness for identifying NI among these patients. The nursing and healthcare community has embraced this screener and validated its use among various populations with effective outcomes among all ages (Flores & Amiri, 2019; Rottapel & Sheward, 2016). Specifically, Flores et al. (2019) indicate the effectiveness of this tool among vulnerable populations, such as college students. Furthermore, the HVS screener has been incorporated into the Centers for Medicare & Medicaid Services Accountable Health Communities Screening Tool (Joyce, 2018). Individual institutions are beginning to incorporate the HVS screener into their EHRs as new research continues to contribute to the validation of this screener. A positive screen is indicated by a response of: "often true" or "sometimes true" to either or both of the listed statements.

- "Within the past 12 months we worried whether our food would run out before we got money to buy more."

- "Within the past 12 months the food we bought just didn't last and we didn't have money to get more." (Joyce, 2018).

Coding opportunities for food security screenings and diagnosis have been somewhat challenging in healthcare. In 2015, the switch from ICD-9 to ICD-10 codes brought forth vague, yet applicable, options for food screening practices (Joyce, 2018). The billable ICD-10 code that was created for the diagnosis of NI was: (Z59.4) Lack of adequate food and safe drinking water (United Healthcare Services, 2019). This code has been met with some resistance as it is not specific to food alone. The Academy of Nutrition and Dietetics (2019) released a statement in support of further improvements in the addition of specific coding language related to food access. They feel that the change will allow for improved diagnostic tracking in support of quality-related and epidemiologic projects; the tracking will also assist in a greater understanding of the related morbidity and mortality associations, as well as incidence and treatment knowledge related to NI. Arons et al. (2018) developed a coding resource and database for providers to access through the Social Interventions Research and Evaluation Network (Siren) website. They also recommend adding the ICD-10 code as applicable to the patient's problem list to ensure it is addressed over time.

As the body of research and understanding grows for NI, more healthcare facilities than ever are incorporating processes and policies for screening, assessing, diagnosing, and treating NI. Incorporating these processes into practice requires some ingenuity and development of partnerships between healthcare systems and community programs. A systematic review of NI healthcare interventions showed that Geisinger and ProMedica health systems have developed the most robust practices for screening and providing healthy food to patients (De Marchis et al.,

2019). Neither program has published peer-reviewed studies or disseminated information related to their practices, making replication of the practice change difficult in other facilities.

Some facilities have begun providing food prescriptions to certain patients; these “prescriptions” are essentially vouchers provided for free fruits and vegetables at local food markets. The Wholesome Rx program, headed by the Community Health and Wellness Partners (CHWP) in Logan County, Ohio, works with local healthcare facilities as a referral program to provide fruit and vegetable vouchers for patients with a diagnosis of diabetes or prediabetes (Traynor, 2019). Each member of the household receives a \$30 voucher for fruits and vegetables to be purchased at a local market. The monetary amount per person, or \$30 each, represents 20% of a family’s survival food budget. The program typically runs four to five months per patient and is federally funded by a state health department grant. Traynor (2019) noted that the outcomes of this program have been very promising, as initial reports have shown increased patient weight loss and reduced A1c values within three-months time. Programs such as these are short-term solutions, but may offer a window to which healthy changes can be made. Some facilities have found barriers to the success of a food prescription program, highlighting areas of careful consideration including the affordability of the produce, transportation or accessibility ease of the market, and palatable desirability of the foods (DeWit et al., 2020). This facility found that if the market wasn’t part of the patient’s normal routine or route, or if they had limitations to transportation or time, the food prescription was not effective. They also noted that some patients had hesitation towards buying produce if they knew they didn’t particularly enjoy the flavor to avoid throwing away food someone else may need. Children in the households also played a factor in the desirability factor, as parents were not as willing to purchase the food their children did not like. Lastly, the food market where the vouchers are

eligible for need to offer low priced produce or the vouchers will not extend far enough to influence health outcomes.

Theoretical Framework

The Social Ecological Model was evaluated and selected for implementation of and use in this project. This model is a theory-based framework that assists the development of programs in social environments and situations (Office of Behavioral & Social Sciences Research, 2020). This model implies that there are multiple levels of influencers on health behaviors and outcomes. Literature has identified multiple layers of influence that align with this model.

The Social Ecological Model provided a framework to developing the survey format and questions and helped indicate appropriate variables to assess for the study. It also helped uncover barriers to accessing healthy food in this population through a visual chain of influence noted in the figure. The model also assisted in developing an understanding of the overall multiple layers that influence NI and NI outcomes.

Public Policy Influence

The policies surrounding the eligibility requirements of the SNAP program are a component of the public policy category harbored within the outer-ring, suggesting overall overhead influence of the individual's health and academic success. Additional components of the public policy category include federal definitions of, and constraints related to, poverty guidelines and rates. Policies related to financial aid, including student loans, grants, and scholarships, influence the NI outcomes students experience. Taxation that influences positive behaviors, such as increased tobacco and alcohol taxes, are included within the model; resource allocation and inflation policies and practices additionally affect the underlying categories (Office of Behavioral & Social Sciences Research, 2020).

Community Influence

Community structure impacts individuals through the location of the campus within the community, vested community personnel, on- and off-campus housing, parking opportunities, and walkability and public transportation options to food retail outlets (grocery stores, gas stations, on-campus dining). Food pantry locations, hours of operation, and accessibility are factors related to community influence of NI among students (Office of Behavioral & Social Sciences Research, 2020).

Organizational

NDSU campus cafeteria dining options and locations, financial policies, support/attitude/availability for student food access relief, class schedules, and organizational culture affect NI outcomes for students (Office of Behavioral & Social Sciences Research, 2020).

Interpersonal

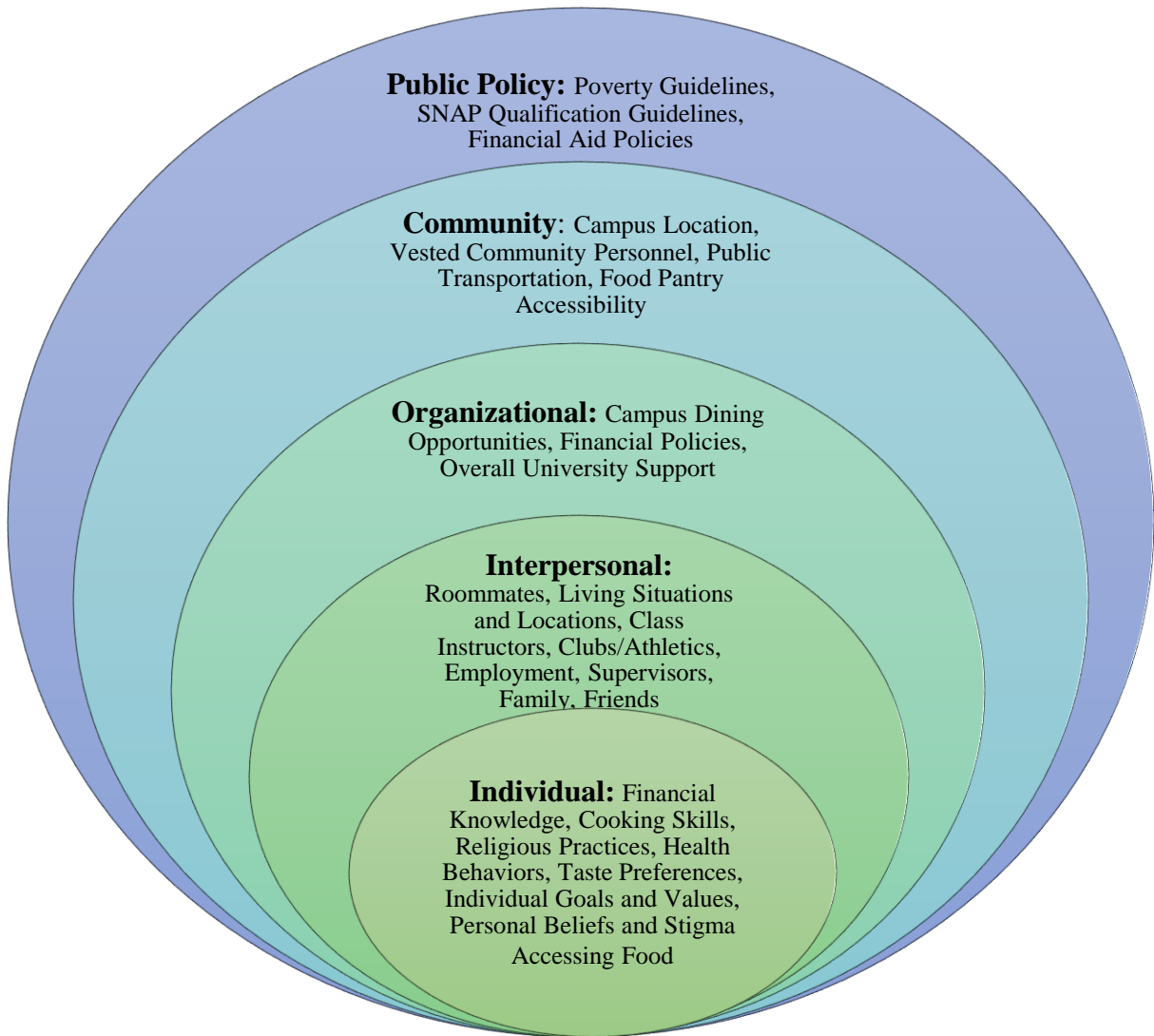
This level highlights the social and organizational networks that comprise availability of individual students to access food. Roommates, living situations and locations, employment, supervisors, customs and traditions, class instructors/professors, diversity, university athletics/club involvement, family dynamics, and friendships are relevant health and education determinants related to NI. The attitudes and beliefs of people involved in individuals' lives influences their perception and attitudes towards food access, as noted in the level below it (Office of Behavioral & Social Sciences Research, 2020).

Individual

Multiple factors encompass the individual factors that influence NI among students. Financial knowledge and resources (including budgeting and spending habits), cooking and meal

preparation skills, religious practices, health behaviors, taste preferences, individual goals and values, and stigma and beliefs about utilizing food access resources are important factors when considering NI barriers and individualized strengths (Office of Behavioral & Social Sciences Research, 2020).

Figure 2
Social Ecological Model (Office of Behavioral & Social Sciences Research, 2020).



CHAPTER 3. METHODS

Overall Project Design

This proposed study used a cross-sectional, observational, quantitative approach with electronic surveys distributed to all undergraduate and graduate students attending North Dakota State University in the Fall 2020 semester. Administering the surveys prior to class breaks and holidays, or one month thereafter, helped prevent biased data from a time when students may have increased access to foods.

Implementation Plan

Students from NDSU, including both undergraduate and graduate students, and from all programs and colleges of study, were invited to participate in this study. This is a public four-year university situated in Fargo, ND, in Cass County on the eastern edge of North Dakota. Total enrollment of students at NDSU in Fall 2020 was 12,846 students.

Inclusion criteria for this project included English-speaking-and-reading students 18 years of age and older, who were enrolled in at least one course through NDSU in Fall 2020 semester, either online or in-person. Students were either undergraduate or graduate students.

Email invitations were sent out once via the university ListServ mass email service, which included a link to the surveying software Qualtrics©. Multiple ListServ routes were utilized, including the NDSU Research Participant ListServ, the NDSU School of Nursing ListServ, and the Office of Student Success ListServ. Qualtrics is a web-based internet surveying tool that is available and free to use for students of the university (See Appendix B for complete survey) (North Dakota State University, 2020). The survey was able to be completed by mobile phone or by computer. The majority of programs on campus require the use of a personal

computer with internet access. Computers with internet access are also located on campus and available for use for all students, ensuring students have opportunity to complete this survey.

As an incentive, participants were entered into a drawing for one of two \$50.00 gift cards. The gift cards were administered to the two random winners at the completion of the survey. The monetary incentive offered is not of high value therefore prevents coercion of responses and did not bias willingness to participate in the survey.

All college students hold, at a minimum, a GED or high school diploma and are, therefore, of the mental capacity to understand the risks associated with participation in the project. Subjects may find the survey questions upsetting or embarrassing and were therefore allowed to withhold information of their choosing. The survey was set up to protect the confidentiality of the subjects and keep their responses anonymous. The surveying software was able to assign random identification numbers to surveys, so the investigators were unable to identify individual responses. The survey was kept filed under a password-protected electronic file. This survey was completely voluntary, and participants were allowed to withdraw from the survey at any time without penalty. An explanation of the study was provided in the email, and participants who wished to participate granted consent to the study by pressing the link to begin the survey. Name and email information from students was kept in a separate Qualtrics© database in order to enter them into the drawing for the gift cards. This kept personally identifiable information separate from data. A separate link was added to the end of the survey to enter this information. The personal information file was deleted upon administration of the gift cards to the chosen winners.

IRB approval was applied for and obtained from the NDSU IRB committee, following approval of this project from the advisory committee. The approval was obtained prior to the commencement of this study.

Evidence Based Practice Model

The Plan-Do-Study-Act (PDSA) model is a long-used methodology for identifying areas of change needed within healthcare and is also one of the most frequently used tools in quality improvement (Christoff, 2018). The model utilizes a four-step process to develop the areas of change. This project used the PDSA model to guide the needs assessment for obtaining and identifying specific characteristics surrounding the nutritional access barriers and risks found on the campus of NDSU. The steps of the model within this project are identified below.

Plan

Developed a useful, validated method (survey) of obtaining the risk factors, prevalence, and barriers NDSU students have to acquiring adequate amounts of nutritious, palatable foods. Results were predicted to be reflective of national prevalence rates and identified barriers. It is also predicted that this survey resulted in essential information needed to guide the NDSU campus community towards providing relief for students who require additional access to healthy foods.

Do

Surveys were administered to all students on the NDSU campus via email as a Qualtrics survey developed in the above referenced step; results and observations were obtained and recorded.

Study

Data was analyzed and reviewed per the analysis method noted below. Results were compared to predictions. A summary of what was learned was formulated.

Act

Recommendations for change were be made to the university and vested community personnel; need for further information and data were identified. Because this model is a cycle, once the final step, act, is completed, the cycle will be continued with further plans to continue to implement change within the relm of the project.

Evaluation and Data Analysis

Instrumentation

The 10-question United States Department of Agriculture (USDA) Adult Food Security Survey Module (AFSSM) is the most accurate and validated tool for identifying college students with NI at this time and has been used extensively in college NI studies (Knol et al., 2019; Nikolaus et al., 2019; Wooten et al., 2018). The AFSSM looks at varying dimensions of NI including quantity and quality of food obtained, anxiety related to food supply, preserved feelings of deprivation, and behaviors such as skipping meals due to lack of resources to purchase food (Knol et al., 2019). This survey is free to use and permission is not required, as it is available in the public domain. This study utilized the USDA AFSSM survey and includes an additional section of demographic inquiries along with two open-ended questions regarding student-perceived barriers to food access and the effects COVID-19 has had on food access (see Appendix B). The demographic questions stemmed from emerging trends found in literature and previous studies regarding risk factors and considerations among this population. Information including age, sex, ethnicity, marital status, number (if any) of dependents, employment status

and average weekly hours, annual household income, financial aid status, amount of credit card and college debt, year of study in school, currently receiving food assistance, current living situation (place of residence, roommates), and current average GPA were included in the demographic section. Total time to complete the survey was estimated at under ten minutes. The setup of this survey aimed to address the multidimensional continuum that nutritional insecurity is known to be; there is not a solitary explanation for why one may experience this situation, but rather many influences that lead to it.

Analysis

The data that were collected via electronic surveys were evaluated and analyzed using descriptive statistics, two-way tables, and chi-square test analyses to assess the prevalence and associated risk factors for NI among college students at NDSU. Correlations between demographic characteristics and resulting levels of nutritional insecurity were compared to help us understand possible common trends and situations that may lead to or increase risk for NI. Levels of NI were calculated and analyzed based on the results of the AFSSM per the USDA Guide instructions to decipher severity. The open-ended questions were reviewed and included word-for-word in feedback as deemed appropriate by this researcher.

CHAPTER 4. RESULTS

The response rate for this study was estimated at 5.02%. Total enrollment for the fall 2020 semester was 12,846, which is the estimated number of eligible students the survey was sent to via ListServ. Total enrollment was slightly down for the semester of survey administration in comparison to the Spring 2019 semester when this project was first initiated. Six hundred forty-five responses were received for the survey in total; after reviewing the data for completeness amongst the responses, a final sample of 539 students was achieved for analysis use.

Each participant was scored first in the USDA's ASSF block of the survey and placed in correlating categories of NI. Responses of "yes," "often," "sometimes," "almost every month," and "some months but not every month" were coded as affirmative, or given 1 point per the USDA guidelines. A score of 0 indicates high nutritional security, 1-2 indicates marginal nutritional security, 3-5 indicates low nutritional security, and 6-10 correlates with very low nutritional security. High nutritional security and marginal nutritional security correlate with overall nutritional security. Low and very low nutritional security are indicative of NI. Of the responses received, 52.5% of the students were found to be highly nutritionally secure and 27.64% were found to be marginally nutritionally secure. The low nutritional security rate was 10.76% and the very low nutritional security rate was 9.09%, making the total percentage of NI students at NDSU who responded to this survey 19.85%. A statistical significance value of $p < 0.05$ was used for the analysis of this study; chi-square tests and descriptive statistics were used to analyze the data.

Demographics

Participants were predominately female with 352 responses compared to 152 male responses. Gender association data, when compared with NI, was not statistically significant. A larger percentage of females were found to be NI at 14.28%, while the percentage of males was 5.36%. Marriage status was not found to be associated with levels of nutritional security. Mean age of participants was 21.68 years; minimum age was 18-years-old, and maximum age was 47-years-old.

Twenty-seven international students, 18 immigrant students, and one refugee student were included in this study. Forty-seven percent of the respondents grew up in Minnesota, followed by 33.96% from North Dakota, 13.77% from a state other than ND or MN within the US, and 5.28% grew up outside of the US. Nine of the 27 international students (30%) who responded to the survey were found to have low or very low nutritional security. Four out of 539 participants indicated that they receive federal supplemental assistance.

Several subcategories within the ethnicity category had fewer than 5 responses, making analysis with the chi-square test invalid; therefore, the relationship was not analyzed. Of those who responded, 90.53% were of White ethnicity. Asian and Black or African American students appeared to have a larger amount of NI amongst their ethnically homogenous category when compared to other ethnic groups. Two out of seven Black or African American students reported NI. Of the Asian students who responded, seven out of 22 reported experiencing NI. A total of 19.04% of White students, zero out of two American Indian or Alaska Native students, and two out of eight Hispanic, Latino/a, or Spanish origin students fell into the NI category as well.

Breakdown of the frequency of ethnicity response rates are as follows:

Table 2*Table of Ethnicity Responses*

Ethnicity	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Black or African American	7	1.33	7	1.33
American Indian or Alaska Native	2	0.38	9	1.70
Asian	22	4.17	31	5.87
Hispanic, Latino/a, or Spanish Origin	8	1.52	39	7.39
White	478	90.53	517	97.92
Other Race	11	2.08	528	100.00

Class and Year of Study Significance

Each year of study was relatively even in representation, given that Freshman through Graduate categories each had roughly 100 students respond. Year of study was statistically significant ($p = 0.0005$) in regards to NI. Among the students who responded, Junior year individuals had the highest percentage of NI among their peers (5.36% of the total sample). Freshman had the lowest rate of NI at 2.68% as well as the highest rate of nutritional security. Sophomores, Seniors, and Graduate students also reported overall higher rates of NI than their Freshman counterparts at 3.83, 4.22, and 3.84% respectively.

The majority of students in this study attend classes on-campus in Fargo ($n = 281$); a slightly smaller number of respondents attend classes online but live in the Fargo-Moorhead (FM) area ($n = 214$), followed by students who attend classes online but live outside of the FM area ($n = 34$).

The living situation of which a student resides was found to be statistically significant in its association with NI ($p = 0.0036$). Of the total students who took the survey, 47.64% lived off campus, 45.75% lived on-campus, and 6.62% lived with parents or guardians. Students who lived with parents or guardians had the lowest NI rates at 1.13% low nutritional security and 0%

very low nutritional security. Students who lived off campus and rented their apartment or home had the highest rates of NI at 9.45%, but in comparison, students who lived off campus but owned their own home had very low rates of NI at 1.14% of the total sample. All students living on campus (in a dorm or apartment setting) had lower rate of NI in total at 8.51%, whereas all students living off campus (excluding those that live with parents or guardians) have a rate of 10.59% of the sample.

Meal Plan

Meal plan status was assessed in this survey. One hundred eighty-nine out of 539 students in this study have a meal plan on campus. Of the 189 students, 28% felt that the days included in their meal plan did not meet their nutritional and food access needs. For the individuals whose food needs were not met by their meal plan, 18%, or 21 students, indicated that they do not have enough food at home to meet their needs without having to skip a meal. Additionally, the distribution analysis indicates that graduate students experience a proportionately higher incidence of having unmet food needs at home if their meal plan did cover all of their meals and nutritional needs.

Employment and Income

Employment was found to be statistically significant to NI in this study ($p = 0.0049$). Total frequencies for employment categories are listed below.

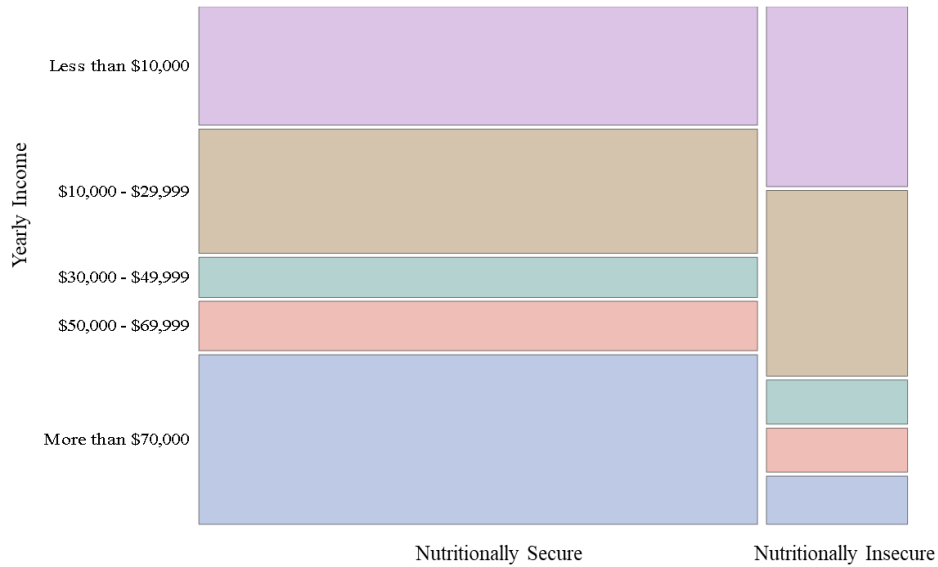
Table 3
Frequency of Employment

Employment	Frequency	Percent
Employed Full Time	47	8.88
Employed Part Time	313	59.17
Unemployed-Looking for Work	53	10.02
Unemployed-Not Looking for Work	115	21.74
Disabled	1	0.19

The highest reported incidence of NI was found amongst students who are employed part-time (1-20 hours per week). These students make up 60% of the individuals who experienced NI. Students who indicated they were unemployed but looking for work made up the next largest group of NI students at 18.8%. The lowest level of NI response came from both students who are unemployed and not currently looking for work as well as students who are employed full-time (20-40 hours per week), both at 10.4% of the NI responses overall. Due to low response in the disability category ($n = 1$), this was removed from the data and analyzed without this category. Mean hours worked per week was 19.68; maximum number of hours worked per week was 60.

Income was statistically significant when analyzing for NI ($p = <0.0001$). Distribution of results are noted in the table below.

Figure 3
Distribution of Income and Nutritional Security Level



Grocery Cost Sharing and Supplemental Assistance

When looking at supportive measures for covering the cost of groceries, four students in total were found to receive some form of supplemental assistance (WIC or SNAP), 517 students do not receive supplemental assistance, and seven students preferred not to disclose. Of these four students, two fell within the marginal nutritional security level, one scored in the low nutritional security level, and one scored in the very low nutritional security level. None of the students who receive supplemental assistance had high nutritional security.

Of the total respondents, 145 students share the cost of groceries with someone else in their home, while 381 students indicated that they do not share the cost of groceries with anyone in their home. Neither supplemental assistance nor sharing the cost of groceries was statistically significant with NI.

GPA

GPA level was strongly associated with severity of NI ($p = 0.0003$). Overall GPA was directly correlated with the level of nutritional security some students faced. Students with lower

GPA (3.49 or less) had the highest levels of NI; over one-third of students in this GPA category experience NI (33.47%). Students with a 4.0 GPA or higher had the lowest rates of NI, with a 3.23% NI rate of all students who responded.

Associated Medical Conditions

Medical conditions, when compared to NI outcome levels, were statistically significant. One hundred thirty-eight out of 539 (26%) students in this survey have a mental or physical condition, or both. Mental health conditions and related conditions that were identified by students include depression, anxiety, post-traumatic stress disorder (PTSD), panic disorder, anorexia nervosa, obsessive compulsive disorder (OCD), attention deficit disorder (ADHD), post-concussion syndrome (PCS), premenstrual dysphoric disorder (PMDD), schizophreniform, insomnia, substance use disorder, and bipolar disorder. Anxiety and depression were the most predominant responses. Physical health disorders and related issues within this surveyed population included nephrolithiasis, hypothyroidism, asthma, polycystic ovarian syndrome (PCOS), ulcerative colitis, pulmonary hypertension, atrial fibrillation, eczema, sleep apnea, gastroesophageal reflux disease (GERD), Crohn's disease, irritable bowel syndrome (IBS), endometriosis, infertility, Hashimoto's disease, Graves' disease, Arnold-Chiari malformation, diabetes mellitus type 1 and 2, restless leg syndrome (RLS), supraventricular tachycardia (SVT), Celiac disease, carpal tunnel syndrome, anemia, arthritis, hypertension. Listed below is a table that compares students who have a medical condition, or conditions, to their nutritional security level.

Table 4*Medical Conditions Associated with NI*

Medical Condition	% Nutritionally Secure	% Nutritionally Insecure
Mental	18.84	15.22
Physical	36.24	10.15
Mental and Physical	13.77	5.79

COVID-19

Quantitative and qualitative data were reviewed and analyzed for the effects of the pandemic related to the novel virus, coronavirus disease 2019 (COVID-19) on the overall nutritional security status of college-age students. Over thirty percent (31.71%) of students who responded to the survey felt that COVID-19 has negatively impacted their ability to access healthy food. 62.87% felt that it had no impact on their food access. 5.42% of those who responded felt that COVID-19 positively impacted their food access abilities. One hundred seventy students did not respond to this question.

Table 5*COVID-19 Effects on Food Access*

COVID-19 Impact	Frequency	Percent
Negative	117	31.71
Positive	20	5.42
No Impact	232	62.87
Total	369	100

Some college students who felt that COVID-19 negatively impacted their access abilities to healthy food noted that they were unable to work or their work hours were substantially decreased due to business reduction or shutdown, and therefore had less money to purchase healthy food or food in any capacity. One individual noted that they ate less food as they were not as able to afford groceries as they were previous to the pandemic. Others noted a decrease in the amount and quality of produce available at food markets when they were able to purchase

them. Limited trips to grocery stores were taken to avoid exposure, and some attempted to stock up on canned goods or frozen processed foods when available to decrease the number of trips there. The university dining centers also altered their dining center hours, causing some students who were still on campus to have increased difficulty accessing food during the available hours. Increased snacking and reliance on processed foods were reported with a decreased motivation to cook. One student noted that, “(...) finding jobs at places that are COVID safe are pretty hard, and there are less options through the school, so I spend less [money], and often that means cutting costs at the grocery stores since I can’t cut rent, or utilities, or health insurance”.

Some students who felt they were positively impacted by COVID-19 commented that they were able to increase work hours when classes for school went to an online method of learning and were therefore able to more easily afford the cost of groceries. Others who were positively impacted stated that they were able to eat more nutritious foods from home and had more time to plan and prepare their meals. One student noted that they were able to seek treatment for an eating disorder during the downtime, and increased their “ability to eat enough food for [their] activity level”.

Barriers to Accessing Healthy Foods

The qualitative barriers described by participants in this project for accessing healthy foods fell within the various levels of the *Social Ecological Model* and followed the comparable national trend of multi-factorial influences on food access and other social determinants of health.

Major themes for barriers to accessing food as reported by students included:

1. *Cost*: overall high cost of healthy food and comparable low cost of unhealthy food, the high cost of tuition, increasing student loan debt to cover the cost of

tuition and living, high meal plan prices (stated by participants frequently), lack of funds, expensive meal options through dining services and on-campus food courts when without a meal plan, and difficulties choosing how and where to budget and ration money (i.e., paying for rent versus purchasing food).

2. *Income*: balancing employment hours with school requirements to obtain enough money for food, limited hours able to work on campus, and the relatively low graduate teaching assistant (GTA) stipend. Money was a clear concern and common barrier students listed in the survey results.

“[The] primary issue is money. The workload for a full-time student who wants to perform in the top percentile [of their program] isn’t conducive to employment greater than 10 hours a week which isn’t enough to support rent, a balanced diet, and loan payments or any sort of medical necessities that might occur”.

3. *Preparation*: increased time it takes to prepare, plan, and/or pack healthy foods for the day, difficulty obtaining storage space and/or refrigeration if packing a meal, inadequate storage in dorm rooms, limited shelf life of fresh foods, not enough time to grocery shop routinely for fresh foods, decreased time to prepare based on busy schedules and stress, ease of cooking pre-packaged and processed foods, and lack of cooking supplies.
4. *Healthy food options*: choosing to eat less healthy foods based on cost, as well as availability of healthy food options (i.e., fruit) in the university cafeteria, specific allergy modification options unavailable (i.e., gluten-free) or cross-contamination, and limited healthy choices within on-campus vending machines and convenience stores.

5. *Location and transportation:* lengthy distance of grocery stores from campus, limited hours of university dining centers especially on weekends, lack of access to a personal vehicle, money for gas, or ease and convenience of transportation options from residence halls
6. *Palatable choices:* lack of food choices with favorable or preferred taste, low visual appeal of nutritious foods, lack of culturally favorable foods outside of American food.
7. *Knowledge:* lack of understanding what constitutes a healthy diet and overall nutrition, lack of cooking and budgeting skills, lack of awareness of assistance programs, and unsure how to access food pantries and emergency food sources.
8. *Societal beliefs and policies:* indicated that society feels college students are supposed to experience hunger ("I'm a college student, I'm supposed to be hungry at times"), stigma associated with accessing food pantries, and listed as a dependent on federal aid applications when independent financially without aid from parents.
9. *Pandemic (COVID-19) effects:* ease of eating unhealthy foods that are pre-packaged safely or plated by dining center personnel, decreased choices with increased limitations and restrictions for safety, hesitancy to go to the dining halls to abide by social distancing measures, and loss of employment and income during pandemic.

These overall themes from the findings were somewhat tied together within the feedback from one student, "I (...) live close by [campus] with no car. The nearest restaurants are more fast-food oriented, and the nearest grocery store, which has healthy food, is a little more

expensive than others. I'd say the biggest barrier is that I used to buy fast-food the most when I didn't feel like I had enough time to prepare food at home.”

Several suggestions and recommendations were posed by respondents. One student wrote, “would it be possible to have a (...) class/demo for cooking - it could be done via Zoom or BB [Black Board] collaborate. Sometimes it's hard to know what to make and after a while hunger and the easiness of ramen wins”. Another student noted, “(...) I'm a graduate student here and my previous university offered free money management sessions with a financial adviser”. Many students also noted that incorporating more healthy options in the dining centers would improve their nutritional access.

CHAPTER 5. DISCUSSION AND RECOMMENDATIONS

Discussion

This study, which used primarily quantitative methods, sought to understand the nutritional insecurity prevalence and risk factors associated with an increased incidence of NI among college students. This research was completed in order to provide healthcare providers, communities, and universities with the knowledge and understanding needed to care for and support individuals in this demographic.

Outcome One

Outcome one was met by examining the prevalence of NI among students on NDSU campus (found to be nearly 20%). As mentioned previously, average national rates of NI among college students are variable (14.1 to 58.8%), but consistently shown in literature to be higher than household average NI rates (12%) (Bruening et al., 2017; Henry, 2017; Meza et al., 2018; Morris et al., 2016). The findings of this project were consistent with previous studies. Results from this study contribute to the body of knowledge that NI rates among students within university systems across many geographical locations, including the Midwest, continue to remain at higher rates than household averages. The results of this study therefore suggest that college students are at high risk for developing this critical social determinate of health and there is justification for mitigating its burden.

Outcome Two

When examining demographic and individual risk factors for NI among this population, multiple relationships and correlations were found to exist. Outcome two examined the association between NI and associated risk factors, barriers, and correlations. This study suggests that students further along in their years of study may be at greater risk for limited access to

healthy foods. Freshman students, who are typically required to live on campus and purchase meal plan options, have the lowest overall rates of NI (2.68%), however, upper classmen and graduate students have higher rates of NI with less ability to meet nutritional needs. Students who live with parent(s) or guardian(s) scored very low-risk for NI, but students who live off-campus and who also rent their place of residence scored highest for NI. This is an expected finding as residency and NI are closely-related and overlap in basic needs and determinants of health. Additionally, income is a strongly correlated risk factor for college students. Students who fell into the under \$10,000 and \$10,000 to \$29,999 total income per year categories had the highest incidence of NI. This study found that students on this campus who are unemployed but looking for work were at highest risk for NI, while students who work part-time are also at high risk for NI. These results were slightly different than the results of a separate research project by Goldrick-Rab et al. (2018), who indicated students who worked 40 or more hours per week were at highest risk, and students who worked part time (6-20 hours) per week were at lowest risk. Further investigation via future research exploration into this variable may be warranted to understand how to identify and better serve these students' needs.

As previously discussed, individuals in minority and underserved populations experience higher rates of NI. This study was limited by the low number of non-White respondents, however, it does support prior data by noting that both Black and African American students, as well as Asian students, experience NI at higher rates compared to students of other ethnicities. Further research is also warranted to study the affects and implications of NI related to the minority/underserved and international students.

Future success of students may be impacted as evidenced in the results by the association of low GPA levels with NI students found in this study. The NI level of severity was positively

correlated with GPA scores. This is concerning in that students who are struggling to do well in school are most likely suffering from hunger and/or settling for an unhealthy diet. This can lead to reduced concentration, feelings of resentment or shame, and increased frequency of absences from classes or groups (Meza et al, 2018).

COVID-19 was shown to have potential to further aggravate the already difficult challenge of obtaining healthy foods for college students. Decreased frequency of food market visits, complications with social distancing, reduced work hours and income reduction, lower food quality, and increased mental health influences have been reported as barriers to healthy eating in this population. This study identified the need for further research related to COVID-19 effects on healthy food access and how college students are impacted emotionally and physically by the pandemic.

Outcome Three

Outcome three aimed to provide written recommendations for healthcare personnel and health systems, vested community members, and campus administration. This outcome was achieved as this project identified overall prevalence, risk factors, intervention and mitigation suggestions discussed later, and valuable feedback provided by affected individuals. This survey included questions aimed at collecting a history of medical conditions to support feedback to healthcare systems and personnel. NI was found to be closely associated with health conditions among this population. Depression and anxiety were notably reported most frequently, which relates to the most common health conditions found in literature related to NI. This study suggests that students who experience NI are at higher risk of mental and physical disease co-morbidity or development, and healthcare systems, providers, and national societies should take note of the preventative health opportunities necessary for this population.

The key findings of this study support the need to quickly address the highly important food access needs of college students through university, community, and healthcare interventions. NI has more implications on health and success than previously thought, and understanding the barriers and correlates of this issue is ever-increasing in recent research.

Comparison of NI Studies at NDSU

The results of this study were compared to the 2016 NDSU food security study results completed by Penn, et al. Some differences among the studies existed and were primarily related to the obtaining of the data and analyzation of the results. First, the surveys were administered in-person within specific classes on the campus of NDSU with the 2016 study, whereas this study administered the surveys electronically to a much larger population; the 2016 study, however, had almost double the number of responses. Differences in analyzation also occurred, given that the breakdown of responses into severity categories was not completed with the 2016 study. This 2020 project placed the responses into the USDA-recommended NI categories to gauge overall severity among the campus. Even with these differences, similar themes were present. Students in both studies recommended lower-cost meal plan and dining center single-meal prices, the addition of an on-campus grocery store, incorporating an on-campus food pantry, and improving food options on campus to make healthier choices with a larger variety of foods. Other barriers to food access were also similar including limited income and lack of personal and community transportation options. This current study demonstrates that the food access problem on campus has continued to perpetuate and students continue to have difficulty accessing healthy foods for multiple reasons. This also shows that the issue of NI on the campus of NDSU is a major concern; interventions should be identified and established quickly to offset and alleviate the negative implications this has on the students on this campus.

Recommendations

The findings of this study open opportunity options and considerations for the implementation of practice change among primary care clinics and student health clinics that care for college-age patients. College students are at high risk for developing NI and NI-related health conditions. Addressing the nutritional access needs of this population is a major public health concern across the nation. Food access improvements among communities and university systems should be considered based on the outcomes of this project.

For the administration of the survey, multiple ListServ email addresses were used to ensure that all students who were enrolled at NDSU were reached and had the opportunity to participate in the survey if they wished. Accessing the most students through NDSU occurred with the use of the Office of Student Success ListServ, which reached every student on campus. Access to a ListServ database with student numbers was unavailable, so discovering the appropriate ListServ was accomplished with assistance from the Office of Student Success at NDSU. These options would be utilized for future research if needed.

Recommendations for Student Health and Healthcare Systems

Several interventions may be considered in student health and primary care clinic settings. Similar to the nation-wide efforts among pediatric clinics to implement the practice of screening patients for NI using the Hunger Vital Sign™ (HVS) survey, comparable efforts may benefit college-age patients when they present to the clinic. Further local and national research should be conducted to formalize an effective and accurate system of clinic flow for in-clinic screening and development of protocols for referral and resources within this at-risk college student population. Much like the Patient Health Questionnaire (PHQ) screening for depression, the food access screener should be implemented as a routine screening for this population with

each visit. Student health clinics, especially at NDSU, are already completing multiple short screeners for a number of conditions, and adding the HVS two-question survey would not contribute additional burden but rather provide benefit to the patients they are serving.

There is clinical benefit for providers to screen, document, and manage NI among their patients. The electronic health record (EHR) serves as a foundation for the documentation, screening, and assessment of NI (DeSilvey, et al., 2018). Benefits of utilizing the EHR also includes obtaining population data, improving reimbursement for assessment and intervention, and fostering research and quality improvement measures related to NI. CPT® and ICD-10-CM codes are available for the reimbursement of the screening and diagnosis of NI. If a provider is using a standardized screening tool, such as the HVS survey, two CPT® codes are available: 96160 for the administration of a patient-focused health risk assessment instrument with scoring and documentation, per standardized instrument, or 96161 for the administration of caregiver-focused health risk assessment instrument for the benefit of the patient, with scoring and documentation, per standardized instrument (American Academy of Pediatrics, 2020). The ICD-10-CM code Z59.4, lack of adequate food and safe drinking water, is a billable code for the documentation of risk related to lack of access to healthy food. A patient does not also need to have the lack of safe drinking water for this code to be used.

Access to healthy food may be more likely achieved for these patients if resources such as pamphlets and handouts are also provided in the clinic setting regarding the location of low-cost or free local food options, such as food pantries. NPs have a unique responsibility to address and treat the holistic needs of a patient, and food access is a major social determinant of health that can be easily improved with their provider's assistance. Additionally, access to a healthy diet may play a large role in both preventing and treating chronic disease.

Developing and incorporating a food prescription program may also assist college students on improving access to fruits and vegetables and assist in developing healthy food-choice habits. Additionally, college students with underlying chronic diseases, such as type 2 diabetes, will have improved management of their conditions by following a healthy diet. Those at-risk for developing chronic diseases will also decrease their potential for these conditions with a well-balanced, healthy diet provided by the food prescription program. Providing an interdisciplinary approach in the clinic with social workers and dietitians, if available, may help address and support the additional disparities and barriers that lead to NI. Addressing NI at this stage in an individual's life may lead to mental health and chronic disease prevention, improved health outcomes, and reduced healthcare expenditures and overall utilization.

Recommendations for NDSU and Universities

University systems, and more specifically NDSU, have a unique opportunity to improve the health and success of students through streamlining programs and improving overall food access options for their students. Assessments of dining centers and meal cost options should be completed to reduce the overall cost burden for students. Prominent feedback received by students at NDSU was that the cost of meals and overall meal plans was substantially higher than they felt reasonable or affordable. Providing low-cost meal options and more affordable meal plans are helpful interventions to solving the NI issue. Additionally, providing on-campus, convenient food storage and refrigeration options for both daily packed meals and snacks and increased dormitory use may help the ease and quality of maintaining healthy meals.

Another recommendation for universities stems from an effort found in literature and previously discussed. Providing information and assistance for students in registering for SNAP may improve the ability of obtaining healthy food. This assistance may be paired with the initial

registration process students complete when entering the university, as many students are not aware of this opportunity and if they qualify. Increased education for university officials may be needed to improve overall campus knowledge of the programs. Additionally, pairing and centralizing this student assistance support with other departments that are frequently utilized for personal student needs will improve convenience and ease of accessing the resource, therefore increasing the chances of students utilizing the help. One option on the campus of NDSU would be placing a federal assistance support center within the Student Union, possibly coupled with OneStop, a group who already assists with federal aid and student loans, and advertising the services to inform students about its availability. Education about SNAP and eligibility requirements can effortlessly be provided to individuals who assist with the application process.

Universities may also be able to mitigate some of the challenges for food access by creating community partnerships. Partnerships between colleges and food pantries, major health systems, public health departments, county services, and/or local food markets may promote a holistic, well-rounded approach to supporting our college student food access needs. Some of these partnerships may be utilized to incorporate financial or food preparation classes within the community and on campus to help students manage their finances and understand how to prepare healthy meals.

NDSU has taken some positive steps towards meeting student food needs during the course of this project. Since the start of this project, an on-campus food pantry committee and NI prevention task force was formed, and a pantry was established, which was initiated by the campus community. The pantry is centrally located in the Student Union and work is currently being conducted to reduce stigma and meet the food needs of its students. Additionally, a Swipe Out Hunger program was established (NDSU, 2021). This is a national program aimed at

providing students with short-term, temporary food needs by providing meal swipes at the dining center. It is funded by the newly-created NDSU Food Security Fund which seeks donations for means of supporting food access for students. Students are required to apply for the swipes, which may potentially place a barrier to use. Some students may feel embarrassed or shameful of applying, so making the application of this program more welcoming or open will help increase access. It is recommended that the university increase its marketing of the Swipe Out Hunger, the Food Security Fund, and its food pantry to bring more awareness, support, and knowledge of the opportunities; increasing public displays of stigma reduction through posters and visual tools more frequently will also help students feel more comfortable accessing food through the pantry, applying for SNAP, and requesting swipes for the dining center. Further research is warranted for understanding the barriers to use and overall student needs from this pantry. Continued efforts by the NI prevention task force and university support are highly encouraged.

Recommendations for the Community

The Fargo-Moorhead community, which NDSU is situated within, can contribute to the mitigation of NI for students through a number of mechanisms. First, as recommended for NDSU as well, community and university partnerships should be developed and maintained. Opportunities for the Great Plains Food Bank and local foods pantries exist to help supply and support the NDSU food pantry, provide access to emergency food services outside of the campus for students living off-campus, and implement educational events for financial and food preparation skills in the community. Local farmers markets and public health services should also consider support of the prescription food program noted above. Investigation into grants and community funding options for this program would be helpful in initiating and maintaining the food prescription program.

Decreasing NI stigma in the community is a major factor for households and students alike who lack access to food. Much of the general public is not aware of the issues and concern surrounding college student NI, therefore increasing the public awareness of the issue will help advance inclusivity and support. The community may also consider efforts such as urban community gardens, and increasing community transportation near campus. Further research and recommendations within the community are encouraged for future exploration of this topic.

Table 6*Recommendations for Clinics, Universities, and Communities*

	Recommendations
Student Health/Primary Care Clinics	<ul style="list-style-type: none"> ▪ Increase recognition and management of NI as part of health promotion and disease prevention for this population. ▪ Implement Hunger Vital Signs™ screening within the clinic. ▪ Increase food resource information accessibility in clinics. ▪ Provide referrals and an interdisciplinary care approach with dietary, social work, community resources, and clinic staff. ▪ Develop and incorporate a food prescription program.
NDSU/University Systems	<ul style="list-style-type: none"> ▪ Conduct a thorough dining center and meal plan assessment. ▪ Provide low-cost meal options. ▪ Reduce the overall cost of meal plans to make more affordable for a greater number of students. ▪ Provide on-campus food storage and refrigeration access. ▪ Increase efforts and centralize assistance to help students apply for federal assistance programs, such as SNAP or WIC. ▪ Engage and participate in community partnerships and health campaign efforts. ▪ Incorporate financial and food preparation classes. ▪ Reduce stigma of NI amongst the campus and student body. ▪ Continue to support a food pantry on campus in an easily accessible location. ▪ Utilize programs such as Swipe Out Hunger; create or improve the application process for swipes.
Communities	<ul style="list-style-type: none"> ▪ Community and university partnership implementation and/or maintenance. ▪ Community food bank support and supplementation of the university food pantry. ▪ Support and provide emergency food access for students off-campus. ▪ Local farmers markets and grocery stores may consider sponsorship or partnership of the food prescription program. ▪ Identification of grants or public funding opportunities for program and food access support. ▪ Increase community transportation ease and options near campus. ▪ Increase public knowledge of college student NI. ▪ Reduce stigma of NI across the general public.

Dissemination

Dissemination efforts of this project include the communication of findings and recommendations from this study to the NDSU food pantry and NI task force group, NDSU Student Health Clinic, Great Plains Food Bank, and to NPs and universities in general who may have interest in this topic. The overall project design, implementation plan, and timeline of this project was shared with NPs at the North Dakota Nurse Practitioner Association Pharmacology

Conference as a virtual poster on September 24th and 25th, 2020. The findings of this study will be shared during the NDSU College of Health Professions poster presentation event in May 2021. Upon approval of this dissertation, an executive summary of findings and recommendations will be shared with the NDSU Student Health Clinic, NDSU NI task force committee, and the Great Plains Food Bank in Fargo, ND. The NDSU Student Health Clinic is uniquely eligible to incorporate the Hunger Vital Signs™ two-question screener into their work flow and improve NI identification and management by the NPs employed within the practice. This researcher also plans to author for publication the findings of this study in *The American Journal of Nursing*, *The American Academy of Nurse Practitioners*, and *The Clinical Advisor for NPs*.

Strengths and Limitations

Several strengths and limitations exist for this study. Overall, the study was limited by a relatively small response rate. The data were collected on a Midwest campus with a predominately White student population, therefore, applicability to campuses with greater racial diversity may be limited. It was a strength of the study, however, that NI was observed within the context of a solitary setting at one campus, with the responses of the students being reflective of the student body composition.

Students may be facing other barriers or improvements to accessing food which cannot be controlled for – loss of employment, increased financial concerns, pandemic implications, or personal health events. Students who were invited to participate were assured anonymity by the faculty and student researcher, but the personal relationship with the investigators may limit responses. Participants may have felt hesitancy in answering openly for fear of their responses being found out.

The COVID-19 pandemic provided some limitations as student living situations may have biased or influenced the data as students moved back home with parent(s) or guardian(s). Campus dining center changes and nearby food access opportunity variations may have also impacted the outcomes of student responses. Additionally, no previous data related to NI regarding COVID-19 is available for comparison.

Another possible limitation identified was that students may have been aware of the intended outcome of the survey and therefore subjectively answered the provided questions. Depending on their experience with NI, some students may also have underlying negative feelings and therefore may have responded differently than their current situation.

Conclusion

The purpose of this project was to explore the prevalence, risk factors, and implications of NI among college students to provide recommendations to the university and healthcare community. Results of this project supported the need for increased awareness and identification of NI and related correlates among college students for disease prevention and future successful outcomes. NPs play a unique and important role in addressing social determinants of health and risk factor mitigation aimed at encouraging disease prevention and health promotion. NPs also have a unique ability to address and manage the needs of patients holistically. Access to a healthy diet may play a large role in both the prevention and treatment of chronic diseases. Healthcare providers, especially in settings that care for college students, have access to resources and screening tools for the health promotion needs of this population.

NI is experienced at significantly higher rates among college students than the general public, and this project supported previous data that suggested this trend. The implementation of a survey, data analysis, and written recommendations were completed within needs assessment

project. Multiple factors and barriers influence the ability of college students to access food, leading to poorer mental and physical health outcomes and decreased academic success. The objectives of this project were met and add to the growing body of knowledge that supports addressing this concerning public health issue.

REFERENCES

- Academy of Nutrition and Dietetics. (2019). *Academy supports new ICD-10-CM codes for food insecurity*. <https://www.eatrightpro.org/news-center/on-the-pulse-of-public-policy/from-the-hill/academy-supports-new-icd-10-cm-codes-for-food-insecurity>
- American Academy of Pediatrics. (2020). *Quick reference for social determinants of health (SDOH) coding*. <https://downloads.aap.org/AAP/PDF/SDOH.pdf>
- American Hospital Association. (2017). *Hospitals and food insecurity*. <https://trustees.aha.org/articles/1299-hospitals-and-food-insecurity>
- Alaimo, K. (2005). Food insecurity in the United States: An overview. *Topics in Clinical Nutrition, 20*(4), 281–298. <https://doi.org/10.1097/00008486-200510000-00002>
- Arons, A., DeSilvey, S., Fichtenberg, C., & Gottlieb, L. (2018). *Compendium of medical terminology codes for social risk factors*. Social Interventions Research & Evaluation Network. <https://sirenetwork.ucsf.edu/tools-resources/mmi/compendium-medical-terminology-codes-social-risk-factors>
- Bauer, K. W., Widome, R., Himes, J. H., Smyth, M., Holy Rock, B., Hannan, P. J., & Story, M. (2012). High food insecurity and its correlates among families living on a rural American Indian Reservation. *American Journal of Public Health, 102*(7), 1346–1352.
- Berkowitz, S. A., Seligman, H. K., Meigs, J. B., & Basu, S. (2018). Food insecurity, healthcare utilization, and high cost: A longitudinal cohort study. *The American Journal of Managed Care, 24*(9), 399–404.
- Black, A. K., & Debrunner, M. (2019). Assessing hunger vital signs in a pediatric cardiology clinic. *Pediatrics, 144*(2), 303–303. https://doi.org/10.1542/peds.144.2_MeetingAbstract.303

- 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>
- Bruening, M., Brennhofner, S., van Woerden, I., 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., Dinour, L. M., & Chavez, J. B. R. (2017). Food insecurity and emotional health in the USA: A systematic narrative review of longitudinal research. *Public Health Nutrition*, *20*(17), 3200–3208. <https://doi.org/10.1017/S1368980017002221>
- Bruening, M., van Woerden, I., Todd, M., & Laska, M. N. (2018). Hungry to learn: The prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *International Journal of Behavioral Nutrition and Physical Activity*, *15*(1), 9. <https://doi.org/10.1186/s12966-018-0647-7>
- Cady, C. L. (2014). Food insecurity as a student issue. *Journal of College and Character*, *15*(4).
<https://doi.org/10.1515/jcc-2014-0031>
- Cady, C. (2016). Starving for knowledge: Why campuses need to address student food insecurity. *About Campus*, *21*(2), 27–31. <https://doi.org/10.1002/abc.21238>
- Chilton, M., & Rose, D. (2009). A rights-based approach to food insecurity in the United States. *American Journal of Public Health*, *99*(7), 1203–1211.
<https://doi.org/10.2105/AJPH.2007.130229>

- Choitz, V., & Reimherr, P. (2013). *Mind the gap: High unmet financial need threatens persistence and completion for low-income community college students*. Center for Postsecondary and Economic Success, Center for Law and Social Policy.
<https://eric.ed.gov/?id=ED544243>
- Christoff, P. (2018). Running PDSA cycles. *Current Problems in Pediatric and Adolescent Health Care*, 48(8), 198–201. <https://doi.org/10.1016/j.cppeds.2018.08.006>
- Colby, S. E., Paulson, M., Johnson, L., & Wall-Bassett, E. (2010). Reaching North Dakota's food insecure. *Journal of Hunger & Environmental Nutrition*, 5(1), 129–135.
<https://doi.org/10.1080/19320240903575178>
- Cook, J. T., & Frank, D. A. (2008). Food security, poverty, and human development in the United States. *Annals of the New York Academy of Sciences*, 1136(1), 193–209.
<https://doi.org/10.1196/annals.1425.001>
- Data USA. (2020). *Fargo, ND* [Data set]. <https://datausa.io/profile/geo/fargo-nd/#about>
- Dean, E. B., French, M. T., & Mortensen, K. (2020). Food insecurity, health care utilization, and health care expenditures. *Health Services Research*, 55(S2), 883–893.
<https://doi.org/10.1111/1475-6773.13283>
- De Marchis, E. H., Torres, J. M., Benesch, T., Fichtenberg, C., Allen, I. E., Whitaker, E. M., & Gottlieb, L. M. (2019). Interventions addressing food insecurity in health care settings: A systematic review. *Annals of Family Medicine*, 17(5), 436–447.
<https://doi.org/10.1370/afm.2412>
- DeSilvey, S., Ashbrook, A., Sheward, R., Hartline-Grafton, H., Ettinger de Cuba, S., & Gottlieb, L. (2018). An overview of food insecurity coding in health care settings: Existing and

emerging opportunities. *Hunger Vital Sign™ National Community of Practice*.

<http://childrenshealthwatch.org/foodinsecuritycoding/>

DeWit, E. L., Meissen-Sebelius, E. M., Shook, R. P., Pina, K. A., Miranda, E. D. D., Summar, M. J., & Hurley, E. A. (2020). Beyond clinical food prescriptions and mobile markets: Parent views on the role of a healthcare institution in increasing healthy eating in food insecure families. *Nutrition Journal*, *19*(1), 1–12. <https://doi.org/10.1186/s12937-020-00616-x>

Dubick, J., Mathews, B., & Cady, C. (2016). *Hunger on Campus: The Challenge of Food Insecurity for College Students | Safe Supportive Learning* (pp. 1–47). [https://safesupportivelearning.ed.gov/resources/hunger-campus-challenge-food-insecurity-college-students\[](https://safesupportivelearning.ed.gov/resources/hunger-campus-challenge-food-insecurity-college-students/)

El Zein, A., Colby, S., Zhou, W., Shelnutt, K., Greene, G., Horacek, T., Olfert, M., & Mathews, A. (2020). Food insecurity is associated with increased risk of obesity in US college students. *Current Developments in Nutrition*, *4*. <https://doi.org/10.1093/cdn/nzaa120>

El Zein, A. E., Mathews, A. E., House, L., & Shelnutt, K. P. (2018). Why are hungry college students not seeking help? Predictors of and barriers to using an on-campus food pantry. *Nutrients; Basel*, *10*(9).

<http://dx.doi.org.ezproxy.lib.ndsu.nodak.edu/10.3390/nu10091163>

El Zein, A., Shelnutt, K. P., Colby, S., Vilaro, M. J., Zhou, W., Greene, G., Olfert, 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*, *19*. <https://doi.org/10.1186/s12889-019-6943-6>

- Feeding America. (2020). *Map the meal gap 2020*.
<https://www.feedingamerica.org/sites/default/files/2020-06/Map%20the%20Meal%20Gap%202020%20Combined%20Modules.pdf>
- Flores, H. L., & Amiri, A. (2019). CE: Addressing food insecurity in vulnerable populations. *AJN The American Journal of Nursing*, *119*(1), 38–45.
<https://doi.org/10.1097/01.NAJ.0000552585.15471.a7>
- Gaines, A., Robb, C. A., Knol, L. L., & Sickler, S. (2014). Examining the role of financial factors, resources and skills in predicting food security status among college students. *International Journal of Consumer Studies*, *38*(4), 374–384.
<https://doi.org/10.1111/ijcs.12110>
- Gregory, C. A., & Coleman-Jensen, A. (2017). Food insecurity, chronic disease, and health among working-age adults. Economic Research Report, 235. Washington, DC: U.S. Department of Agriculture, Economic Research Service.
- Goldrick-Rab, S., Broton, K., & Brunjes Colo, E. (2016). *Expanding the national school lunch program to higher education* [Policy brief]. Wisconsin Hope Lab.
https://hope4college.com/wp-content/uploads/2018/09/Wisconsin-HOPE-Expand-Lunch_Program.pdf
- Goldrick-Rab, S., Richardson, J., Schneider, J., Hernandez, A., & Cady, C. (2018). *Still hungry and homeless in college*. Wisconsin Hope Lab. <https://hope4college.com/wp-content/uploads/2018/09/Wisconsin-HOPE-Lab-Still-Hungry-and-Homeless.pdf>
- Gundersen, C., & Ziliak, J. P. (2014). Childhood food insecurity in the U.S.: Trends, causes, and policy options. *The Future of Children*, *24*(2), 1–19.
<https://doi.org/10.1353/foc.2014.0007>

- Hager, E. R., Quigg, A. M., Black, M. M., Coleman, S. M., Heeren, T., Rose-Jacobs, R., Cook, J. T., de Cuba, S. A. E., Casey, P. H., Chilton, M., Cutts, D. B., Meyers, A. F., & Frank, D. A. (2010). Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*, *126*(1), e26–e32. <https://doi.org/10.1542/peds.2009-3146>
- Henry, L. (2017). Understanding food insecurity among college students: Experience, motivation, and local solutions. *Annals of Anthropological Practice*, *41*(1), 6–19. <https://doi.org/10.1111/napa.12108>
- Holben, D. H., & Marshall, M. B. (2017). Position of the academy of nutrition and dietetics: Food insecurity in the United States. *Journal of the Academy of Nutrition and Dietetics*, *117*(12), 1991–2002. <https://doi.org/10.1016/j.jand.2017.09.027>
- Hornung, S. (2017). Rethinking hunger in our state. *High Plains Reader*. <https://hpr1.com/index.php/opinion/editorial/rethinking-hunger-in-our-state/>
- Hughes, R., Serebryanikova, I., Donaldson, K., & Leveritt, M. (2011). Student food insecurity: The skeleton in the university closet. *Nutrition & Dietetics*, *68*(1), 27–32. <https://doi.org/10.1111/j.1747-0080.2010.01496.x>
- Joyce, K. (2018). Food security screening: Addressing EHR, coding challenges. *AAP News*. <https://www.aappublications.org/news/2018/04/02/hit040218>
- Kadaba, L. (2020). Why NPs are especially suited to address social determinants of health. *Florence Health*. <https://huddle.florence-health.com/discover/content/article/why-np-are-especially-suited-to-address-social-determinants-of-health/>
- Kim, J. E., & Tsoh, J. Y. (2016). Cigarette smoking among socioeconomically disadvantaged young adults in association with food insecurity and other factors. *Preventing Chronic Disease*, *13*. <https://doi.org/10.5888/pcd13.150458>

- Knol, L. L., Robb, C. A., McKinley, E. M., & Wood, M. (2019). Very low food security status is related to lower cooking self-efficacy and less frequent food preparation behaviors among college students. *Journal of Nutrition Education and Behavior, 51*(3), 357–363. <https://doi.org/10.1016/j.jneb.2018.10.009>
- Laterman, K. (2019, May 2). Tuition or dinner? Nearly half of college students surveyed in a new report are going hungry. *The New York Times*. <https://www.nytimes.com/2019/05/02/nyregion/hunger-college-food-insecurity.html>
- Lower-Basch, E., & Lee, H. (2014) *SNAP policy brief: College student eligibility* [Policy brief]. Center for Postsecondary and Economic Success, Center for Law and Social Policy. https://www.clasp.org/sites/default/files/publications/2017/04/SNAP-Policy-Brief_College-Student-Eligibility-Update-1.pdf
- Ma, J., Baum, S., Pender, M., & Libassi, C. (2019). *Trends in college pricing 2019*. College Board. Retrieved from <https://research.collegeboard.org/pdf/trends-college-pricing-2019-full-report.pdf>
- Maroto, M. (2013). Food insecurity among community college students: Prevalence and relationship to GPA. *Journal of Nutrition Education and Behavior, 45*(4, Supplement), S35. <https://doi.org/10.1016/j.jneb.2013.04.095>
- Maslow, A.H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370-96.
- Melo, A., Matias, M. A., Dias, S. S., Gregório, M. J., Rodrigues, A. M., de Sousa, R. D., Canhão, H., & Perelman, J. (2019). Is food insecurity related to health-care use, access and absenteeism? *Public Health Nutrition, 22*(17), 3211–3219. <http://dx.doi.org.ezproxy.lib.ndsu.nodak.edu/10.1017/S1368980019001885>

- Meza, A., Altman, E., Martinez, S., & Leung, C. W. (2018). "It's a feeling that one is not worth food": A qualitative study exploring the psychosocial experience and academic consequences of food insecurity among college students. *Journal of the Academy of Nutrition and Dietetics*. <https://doi.org/10.1016/j.jand.2018.09.006>
- Morris, L. M., Smith, S., Davis, J., & Null, D. B. (2016). The prevalence of food security and insecurity among Illinois university students. *Journal of Nutrition Education and Behavior*, 48(6), 376-382.e1. <https://doi.org/10.1016/j.jneb.2016.03.013>
- National Institute of Mental Health [NIMH] (2016). Major depression among adults. National Institute of Mental Health. Retrieved from <https://www.nimh.nih.gov/health/statistics/prevalence/major-depression-among-adults.shtml>
- Nikolaus, C. J., Ellison, B., & Nickols-Richardson, S. M. (2019). Are estimates of food insecurity among college students accurate? Comparison of assessment protocols. *PLOS ONE*, 14(4), e0215161. <https://doi.org/10.1371/journal.pone.0215161>
- Nikolaus, C. J., Ellison, B., & Nickols-Richardson, S. M. (2019). College students' interpretations of food security questions: Results from cognitive interviews. *BMC Public Health*, 19(1), 1282. <https://doi.org/10.1186/s12889-019-7629-9>
- North Dakota State University (2021). *Swipe out hunger*. Dean of Students, North Dakota State University. https://www.ndsu.edu/deanofstudents/resources/swipe_out_hunger/
- North Dakota State University. (2020). *Qualtrics*. Group Decision Center. <https://www.ndsu.edu/gdc/qualtrics/>
- Office of Behavioral & Social Sciences Research. (2020). *Social and Behavioral Theories*. National Institute of Health <http://www.esourceresearch.org/Default.aspx?TabId=736>

- Patil, S. P., Craven, K., & Kolasa, K. (2018). Food insecurity: How you can help your patients. *American Family Physician*, 98(3), 143–145.
- Patton-López, M. M., López-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>
- Penn, J., Boatey, D., Lardy., G. (2016). *NDSU student food security survey: Spring 2016* [Unpublished manuscript]. Division of Student Affairs, North Dakota State University.
- Phillips, E., McDaniel, A., & Croft, A. (2018). Food insecurity and academic disruption among college students. *Journal of Student Affairs Research and Practice*, 0(0), 1–20.
<https://doi.org/10.1080/19496591.2018.1470003>
- Phipps, E. J., Singletary, S. B., Cooblall, C. A., Hares, H. D., & Braitman, L. E. (2016). Food insecurity in patients with high hospital utilization. *Population Health Management*, 19(6), 414–420. <https://doi.org/10.1089/pop.2015.0127>
- Rottapel, R., & Sheward, R. (2016). *The Hunger Vital Sign: Best practices for screening and intervening to alleviate food insecurity*. Siren. <https://sirennetwork.ucsf.edu/tools-resources/resources/hunger-vital-sign-best-practices-screening-and-intervening-alleviate-food>
- Rowland, B., Mayes, K., Faitak, B., Stephens, R. M., Long, C. R., & McElfish, P. A. (2018). Improving health while alleviating hunger: Best practices of a successful hunger relief organization. *Current Developments in Nutrition*, 2(9).
<https://doi.org/10.1093/cdn/nzy057>

- Traynor, K. (2019). Ohio health center tests healthy food prescriptions. *American Journal of Health-System Pharmacy*, 76(19), 1455–1456. <https://doi.org/10.1093/ajhp/zxz176>
- United Healthcare Services. (2019). *2019 social determinants of health ICD-10 codes*. <https://www.uhcprovider.com/content/dam/provider/docs/public/resources/other-resources/2019-SDOH-ICD-10-Codes.pdf>
- United States Department of Agriculture, Economic Research Service [USDA-ERS]. (2018). Definitions of food security. *Food Security in the U.S.* <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx>
- United States Government Accountability Office [U.S. GAO]. (2018). *Report to Congressional Requesters: Better information could help eligible college students access federal food assistance benefits*. <https://www.gao.gov/assets/700/696254.pdf>
- Watson, T. D., Malan, H., Glik, D., & Martinez, S. M. (2017). College students identify university support for basic needs and life skills as key ingredient in addressing food insecurity on campus. *California Agriculture*, 71(3). <https://doi.org/10.3733/ca.2017a0023>
- Weatherspoon, D., Oehmke, J., Dembélé, A., Coleman, M., Satimanon, T., & Weatherspoon, L. (2013). Price and expenditure elasticities for fresh fruits in an urban food desert. *Urban Studies*, 50(1), 88–106. <https://doi.org/10.1177/0042098012448555>
- Wood, J. L., & Harris, F. (2018). Experiences with “acute” food insecurity among college students. *Educational Researcher*, 47(2), 142–145. <https://doi.org/10.3102/0013189X17752928>

- Woolf, S. H., Aron, L., Dubay, L., Simon, S. M., Zimmerman, E., & Luk, K. X. (2015). *How are income and wealth linked to health and longevity?* [Issue Brief No. 1]. Washington, DC: The Urban Institute; Richmond, VA: Virginia Commonwealth University, Center on Society and Health.
- Wooten, R., Spence, M., Colby, S., & Anderson Steeves, E. (2018). Assessing food insecurity prevalence and associated factors among college students enrolled in a university in the Southeast USA. *Public Health Nutrition*, 1–8.
<http://dx.doi.org.ezproxy.lib.ndsu.nodak.edu/10.1017/S1368980018003531>
- Zepeda, L. (2018). Hiding hunger: Food insecurity in middle America. *Agriculture and Human Values*, 35(1), 243–254. <https://doi.org/10.1007/s10460-017-9818-4>

APPENDIX A. IRB APPROVAL



September 15, 2020

Dr. Molly Secor-Turner
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #PH21046, "NUTRITIONAL INSECURITY AMONG COLLEGE STUDENTS ON A MIDWEST CAMPUS"

NDSU Co-investigator(s) and research team: Stephanie Hendricks
Date of Exempt Determination: 9/15/2020 Expiration Date: 9/14/2023
Study site(s): NDSU Funding Agency: n/a
The above referenced human subjects research project has been determined exempt (category 2(i)) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, Protection of Human Subjects). This determination is based on the original protocol received 9/11/2020.

Please also note the following:

- If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
- The study must be conducted as described in the approved protocol. Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Report any significant new findings that may affect the risks and benefits to the participants and the IRB.

Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.
Sincerely,

A handwritten signature in purple ink that reads "Kristy Shirley".

Kristy Shirley, CIP, Research Compliance Administrator

For more information regarding IRB Office submissions and guidelines, please consult https://www.ndsu.edu/research/for_researchers/research_integrity_and_compliance/institutional_review_board_irb/. This Institution has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

INSTITUTIONAL REVIEW BOARD

NDSU Dept 4000 | PO Box 6050 | Fargo ND 58108-6050 | 701.231.8995 | Fax 701.231.8098 | [ndsu.edu/irb](https://www.ndsu.edu/irb)

Shipping address: Research 1, 1735 NDSU Research Park Drive, Fargo ND 58102

NDSU is an EQAA university

APPENDIX B. SURVEY

Food Access Among NDSU College Students

Block 3

Q1.1. NDSU

North Dakota State University
Department of Nursing
1919 N University Dr.
Fargo, ND 58102
NDSU Dept. 2670
PO Box 6050
Fargo, ND 58108-6050
701.231.7395

Nutritional Insecurity Among College Students on a Midwest Campus

Dear Study Participant,

My name is Stephanie Hendricks, and I am a Graduate Student in the Doctor of Nursing program at North Dakota State University. I am conducting a research project to understand food access barriers, food insecurity risk factors, and prevalence among college students at NDSU.

Because you are a student at NDSU, you are invited to take part in this research project. Your participation is completely voluntary and you may change your mind or withdraw from the study at any time, without penalty to you.

It is not possible to identify all potential risks involved with research procedures, however, we have taken reasonable safeguards to minimize any known risks. One of these risks is that some of these questions could cause emotional or psychological distress, and you are therefore free to withhold any answers you do not wish to share. Additionally, your personal information will remain protected and confidential. This study is anonymous, meaning not even members of the research team will know your information.

By taking part in this research, you may benefit by understanding more about the food access needs of students on campus. Recommended improvements will be suggested among the campus, healthcare system, and community, with hopes of improving physical and emotional health and career success for students.

The survey should take about 10 minutes to complete. Questions are inclusive of demographics, food needs survey, and open-ended questions regarding personal beliefs about barriers to food on campus and how COVID-19 has affected your food access.

Upon completion of the survey, you will be entered into a random drawing for two \$50 gift cards for your participation.

If you have questions about this project, please contact me at (701)652-5109 or steph.l.tollefson@ndsu.edu, or contact my advisor, Molly Secor-Turner at (701) 231-7517 or Molly.Secor-Turner@ndsu.edu.

You have rights as a research participant. If you have questions about your rights or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program at (701)231-8995, toll-free at 1-855-800-6717, by email at ndsu.irb@ndsu.edu, or by mail at: NDSU HRPP Office, NDSU Dept. 4000, PO Box 6050, Fargo, ND 58108-6050.

Thank you for taking part in research. If you wish to receive a copy of the results, please contact me at steph.l.tollefson@ndsu.edu.

Participant Consent:

I have read the above information and agree to participate in this study. I am at least 18 years of age.

AFSSM Block

Q2.1. Please choose the best answer to the question below from the last 30 days.

Which of these statements best describes the food eaten in your household in the last 30 days?

- Enough of the kinds of food I want to eat
- Enough, but not always, the kinds of food I want
- Sometimes not enough food to eat
- Often not enough to eat
- Don't know or refuse

Q2.2. For these statements, please tell me whether the statement was often true, sometimes true, or never true for your household in the last 30 days.

"I worried whether my food would run out before I got money to buy more."

- Often true
- Sometimes true
- Never true
- Don't know or refuse

Q2.3. For these statements, please tell me whether the statement was often true, sometimes true, or never true for your household in the last 30 days.

"The food that I bought just didn't last, and I didn't have money to get more."

- Often true
- Sometimes true
- Never true
- Don't know or refuse

Q2.4. For these statements, please tell me whether the statement was often true, sometimes true, or never true for your household in the last 30 days.

"I couldn't afford to eat balanced meals."

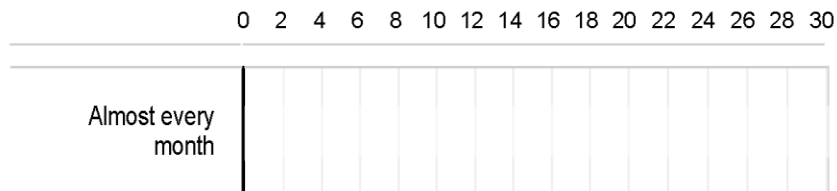
- Often true
- Sometimes true
- Never true
- Don't know or refuse

Q2.5. In the last 30 days, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No (skip next question)
- Don't know

Q2.6.

[IF YES ABOVE] In the last 30 days, how many days did this happen?



Q2.7.

In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- Don't know

Q2.8.

In the last 30 days, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- Don't know

Q2.9.

In the last 30 days, did you lose weight because there wasn't enough money for food?

- Yes
- No
- Don't know

Q2.10.

In the last 30 days, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

- Yes
- No (Skip next question)
- Don't know (skip next question)

Q2.11. [IF YES ABOVE] In the last 30 days, how many days did this happen?

	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Click to write Choice 1																

Demographic Block

Q3.1. How do you primarily attend the courses you take through NDSU (>50% of the time)?

- Online, but live in the Fargo/Moorhead community
- Online, but live outside of the Fargo/Moorhead community
- On-campus in Fargo

Q3.2. What is your current age?

Q3.3. What year of study are you currently in at NDSU?

- Freshman
- Sophomore
- Junior
- Senior
- Fifth-year senior
- Graduate student, 1st year
- Graduate student, 2nd year
- Graduate student, 3rd year
- Graduate student, 4th year
- Other

Q3.4. How would you describe your gender identity? We offer some options, and we encourage you to respond in any way that you prefer. Possible options: Nonbinary, Genderqueer, TransMale/Trans Man, TransFemale/Trans woman, Man, Woman. You may also indicate "prefer not to respond".

Respond here if you feel comfortable:

Prefer not to respond

Q3.5. What is your current marital status?

Single (never married)

Married, or in a domestic partnership

Widowed

Divorced

Separated

Other, if you feel comfortable responding

Prefer not to respond

Q3.6. What is your ethnicity?

Black or African American

American Indian or Alaska Native

Asian

Native Hawaiian or Other Pacific Islander

Hispanic, Latino/a, or Spanish origin

Middle Eastern or North African

White

Other race, ethnicity, or origin:

Q3.7. What is your current GPA?

- 4.0 or higher
- 3.80-3.99
- 3.50-3.79
- 3.20-3.49
- 3.00-3.19
- 2.99 or less

Q3.8. Are you an international student?

- Yes; If yes, what is your country of origin?

- No

Q3.9. Are you an immigrant to the US?

- Yes
- No

Q3.10. Are you or have you been a refugee?

- Yes
- No

Q3.11. Where did you grow up?

- North Dakota
- Minnesota
- South Dakota
- Other state in the US:

- Other area outside of the US:

Q3.12. Please choose the option that best describes your current living situation.

"I currently live in a...."

- Campus dorm
- On-campus or campus-owned apartment
- Sorority or fraternity house
- International student housing
- With parent(s) or guardian(s)
- Off-campus, renting apartment or home
- Off campus, own home
- Do not have access to housing (homeless)

Q3.13. How many dependent children do you currently have?

	0	2	4	6	8	10
Number of dependent children						

Q3.14. Do you currently have a meal plan on campus?

- Yes
- No (skip next two questions)

Q3.15. Does the number of days allowed on your meal plan meet your food needs each week?

- Yes (Skip next question)
- No

Q3.21. What was your household (estimated) annual gross income for 2019?

- Less than \$10,000
- \$10,000 - \$29,999
- \$30,000 - \$49,999
- \$50,000 - \$69,999
- \$70,000 - \$89,999
- \$90,000 - \$109,999
- \$110,000 - \$149,999
- More than \$150,000

Q3.22. What is your current estimated credit card debt?

Q3.23. What is your current estimated student loan debt?

- Less than \$10,000
- \$10,000 - \$29,999
- \$30,000 - \$49,999
- \$50,000 - \$69,999
- \$70,000 - \$89,999
- \$90,000 - \$109,999
- \$110,000 - \$149,999
- More than \$150,000

Q3.24. Please list any medical conditions you have been diagnosed with (past or present), as you feel comfortable sharing:

Block 2

Q4.1. What barriers, if any, do you feel keeps students from accessing adequate amounts of healthy food on campus? Feel free to use space provided to answer anonymously. This information will be used for feedback to our campus administrators, healthcare providers, and vested community personnel. Your information is kept completely anonymous.

Q4.2. Has COVID-19, also known as the Corona Virus, impacted your ability to access food? For example, has this pandemic allowed for you to eat more or less nutritious foods that meet your activity levels needs and that you enjoy to eat? Please explain why:

APPENDIX C. EXECUTIVE SUMMARY

EXECUTIVE SUMMARY: NUTRITIONAL INSECURITY AMONG COLLEGE STUDENTS ON A MIDWEST CAMPUS

Introduction

Nutritional insecurity (NI) is a condition that occurs when an individual experiences a decreased amount and frequency of healthy food intake, due to lack of money or other resources. It is estimated that college students experience NI at concerning higher rates (upwards of 60%) compared to the general public (12%). NI may lead to lifelong significant emotional, physical, mental, and cognitive health issues. Despite the negative effects of NI among this population, millions of college students continue to have limited access to food, and unfortunately, it is not routinely screened for in the clinic.

Purpose and Design of the Project

- The purpose of the project was to determine overall NI rates and relating factors of students on the campus of NDSU to provide recommendations for increasing food access to better health outcomes.
- A survey was sent to all students (both undergraduate and graduate) in Fall 2020 who were enrolled in at least one course through NDSU; the survey included demographic questions, a validated 10-question USDA Adult Food Security Survey Model, and two open-ended questions regarding COVID-19 and personal barriers to accessing healthy food.



Results and Conclusion

- ❖ Prevalence of NI among students at NDSU found to be nearly 20%; follows national trends of being higher than general public at 12% overall.
- ❖ Risks for NI determined to be: higher grade level/further in years of study, living off campus and rent home/apartment, low annual income (<\$30k), unemployed but looking for work or working part-time, minority/underserved population.
- ❖ GPA directly affected by NI severity.
- ❖ COVID-19 further complicated access to healthy food for majority of students.
- ❖ Mental and physical health disorders were directly associated with NI. Multiple conditions were noted, but depression and anxiety were most commonly reported. |

Recommendations

- Increase recognition of the risk of NI and associated negative implications among college students for health promotion and disease prevention.
- Initiate the validated 2-question Hunger Vital Sign™ (HVS) screener into clinics.
- Increase utilization of the electronic health record (EHR) and optimize clinic flow for screening and treatment of NI.
- Utilize a multidisciplinary approach and referral process to meet food access needs and address associated social determinants of health.
- Increase visual education and information about local food access options throughout campus and clinics to increase the knowledge of and reduce the stigma surrounding NI.
- Develop partnerships between community, university, and healthcare resources and personnel focused on increasing food access for college students.
- Assess campus dining centers and university meal plans for reduction of meal costs and increased healthy food options. Increase on-campus food storage and refrigeration for packed meals.
- Future research needs include: NI impacts on international, minority, and underserved student populations, barriers to university food pantry use, and increased information regarding COVID-19 effects on NI among college students.

