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# Implementing Food Insecurity Screening on a College Campus

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IMPLEMENTING FOOD INSECURITY SCREENING ON A COLLEGE CAMPUS

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Norma Jean Martinez

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### Abstract

**Background.** Students attending universities have higher rates of food insecurity than U.S. households. Most college campuses do not routinely screen students for food insecurity, which can affect students' health and school performance. Currently, the university health clinic does not screen students for food insecurity. **Purpose.** To screen all students who present to the university clinic for food insecurity and evaluate students with food insecurity for malnutrition. **Evidence.** Forman et al. (2018) and Abu and Oldewage-Theron (2019) found that food insecurity was present at some of the largest Texas universities at rates higher than the national average. **Project Objectives.** To screen 80%-90% of patients aged 18 to 25 years who visited the university clinic for food insecurity; to decrease the percentage of patients with very low food security score by 100%; and to decrease the percentage of patients with malnutrition by 100%. **Methods.** Two validated screening tools were used to screen students between the ages of 18-25 evaluated at the clinic for food insecurity and malnutrition. Treatment criteria were established for those students identified as being food insecure utilizing established clinical practice guidelines. **Results.** Results show 97% ( $n = 116$ ) of 120 patients have been screened, 92.5% ( $n = 111$ ) have been classified as high food secure, 5% ( $n = 7$ ) were classified as low food secure, 2% ( $n = 2$ ) were classified as very low food secure. One patient was identified as being malnourished. **Implications.** Identifying students with food insecurity, treating malnutrition, and providing food resources can improve overall student health.

*Keywords:* food insecurity, college student food insecurity, college student food, prevalence, college student malnutrition, clinical practice guidelines



### **Implementing Food Insecurity Screening on a College Campus**

The U.S. Department of Agriculture (USDA) defines food insecurity as a lack of access to enough food for an active and healthy life (USDA Economic Research Service, 2022a). It is important to understand that food insecurity and hunger are two terms that are closely related but are two distinct topics (Hunger & Health, 2021). Hunger is a personal and physical sensation of discomfort, while food insecurity is a lack of available financial resources for food at the household level (Hunger & Health, 2021).

In 2020, 38.3 million people lived in food-insecure households (USDA Economic Research Service, 2022b). The USDA classifies food insecurity into two categories, low food security and very low food security. Low food security is defined as reduced quality, variety, or desirability of diet (USDA Economic Research Service, 2022a). Very low food security is defined as multiple indications of disrupted eating patterns and reduced food intake (USDA Economic Research Service, 2022a). Low-income families are affected by multiple overlapping issues such as social isolation, lack of affordable housing, and economic/social disadvantages, indicating that food insecurity does not exist in isolation (Hunger and Health, 2021). It is a significant undertaking to obtain data that correlates to various causes of food insecurity. Hunger and Health (2021) explores the impact of food insecurity as a social determinant of health and the effects it has on individuals and population outcomes.

Food insecurity is impacting college campus populations throughout the United States. Today, many of the 20 million Americans who are pursuing higher education are experiencing food insecurity (Laska et al., 2020). Food insecurity among college students is a known public health concern that may have implications for academic performance, retention, and graduation rates (Payne-Sturges et al., 2017).

### **Current Clinical Guidelines**

The Committee on National Statistics (CNSTAT) has assessed the USDA's food security measurement and monitoring methods and concluded that measurement and monitoring methods are appropriate for the continued surveying of the presence of food insecurity (USDA Economic Research Service, 2022a). CNSTAT has recommended that the USDA continue to measure and monitor food insecurity regularly with household surveys (USDA Economic Research Service, 2022a). Food insecurity must be measured utilizing appropriate survey methodologies that effectively evaluate the level of food insecurity. The USDA has developed several survey modules to screen for food insecurity. The U.S. Household Food Security Survey Module (HFSSM) consists of 18 items using a three-stage design to keep respondent burden to a minimum (USDA Economic Research Service, 2022c). The U.S. Adult Food Security Survey Module (AFSSM) consists of 10 items using a three-stage design modified for households without children (USDA Economic Research Service, 2022c). A short form survey provided by the USDA consists of six items that is utilized when the HFSSM and AFSSM cannot be utilized (U.S. Department of Agriculture Economic Research Service, 2022c). It is important to note that utilizing a standardized survey tool to screen for food insecurity allows for consistency in ranking of the severity of food insecurity. The USDA has introduced three levels of classifying food security (high, low, very low food security), based on recommendations from the CNSTAT (USDA Economic Research Service, 2022c). The survey tool asks a total of 6 questions regarding access to food or lack thereof. Every question answered yes, often, or sometimes is given the raw score of 1 point and 0 points for answering no. High food security, with a score of 0-1, is defined as no reported indications of food-access problems or limitations. Low food security, with a score of 2-4, consists of reports of reduced quality or variety of diet but no

indication of reduced food intake. Very low food security, with a score of 5-6, reports multiple indications of disrupted eating patterns and reduced food intake (USDA Economic Research Service, 2022a).

Malnutrition associated with food insecurity is a global concern. Malnutrition is a condition suffered by numerous people around the world due to disease, poverty, hunger, and war (Cederholm et al, 2019). The Global Leadership Initiative on Malnutrition (GLIM) engaged with several clinical nutrition societies to focus on standardizing the clinical practice of malnutrition diagnosis (Cederholm et al., 2019), and recommended the use of a two-step model for risk screening. Assessment findings used in the diagnoses of malnutrition are weight loss, low body mass index (BMI), reduced muscle mass, reduced food intake or assimilation, and disease burden/inflammation (Cederholm et al., 2019). The Malnutrition Universal Screening Tool (MUST) is one of the validated screening tools of the two-step model recommended by GLIM. The MUST is utilized for clinical practice to assess for nutritional status and to identify malnutrition. The body weight, height, and BMI are obtained from patients. A score of 0, 1, or 2 is assigned based on the BMI parameter (Weekes et al., 2004). Unintentional weight loss in the previous 3 to 6 months is evaluated. A score of 0, 1, or 2 is assigned based on percentage of weight loss. Acute illness with reduced food intake (estimated) for greater than 5 days is evaluated. A score of 0 was given if the person answered no to having an acute illness with reduced food intake greater than 5 days. A score of 2 was given if the person answered yes to having an acute illness with reduced food intake greater than 5 days. A total score is calculated to evaluate the overall risk of malnutrition. Once the overall risk of malnutrition is calculated, the risk score determines the procedure to follow (Weekes et al., 2004). Risk score is categorized as low, medium, or high. If patients have a low-risk score, the assigned procedure is routine clinical

care with a yearly follow-up visit. If patients score a medium risk, the assigned procedure is to observe and evaluate food intake. Patient are asked to document food intake for the previous 3 days to assess adequacy of food intake. If food intake is determined to be adequate, a repeat screening is conducted within 2 to 3 months. If food intake is determined to be inadequate it is recommended that providers encourage patients to increase nutritional intake, monitor patients more frequently, and review the plans of care regularly. If patients score high risk, the assigned procedure is to treat the malnutrition. The interventions require an increase in overall nutritional intake, referral to a dietician or nutritional support team, and review of the plans of care monthly (Weekes et al., 2004). After screenings are complete and treatment plans are initially developed and reviewed, providers must evaluate the patients' physical function for any deficiencies, which includes a physical examination and laboratory diagnostics. Laboratory parameters, such as a complete blood count, lipid profile, and electrolytes, can provide pertinent information regarding patients' nutritional status (Reber et al., 2019). Laboratory diagnostics that can help detect specific nutritional deficiencies include vitamin levels such as vitamin C, vitamin D, vitamin E, vitamin K, thiamine, vitamin B6, vitamin B12, and folic acid, as well as trace elements such as zinc, selenium, and iron (Reber et al., 2019).

### **Statement of the Problem**

Food insecurity is an emerging concern among students attending universities/colleges, causing a threat to students' health and academic success, due to its high prevalence (Ahmad et al., 2021). Non-profit organizations, states, school administrators, and students have engaged in several efforts to help reduce hunger on university/college campuses (Congressional Research Service, 2021). Food pantries, swipe sharing programs, and assisting students with supplemental

nutrition assistance programs (SNAP) are initiatives funded by some states (Congressional Research Service, 2021).

The prevalence of food insecurity among universities exists but the number of students experiencing food insecurity varies throughout the country. New studies on food insecurity have increased over the last 10 years, but research on undergraduate students at universities lags behind (Forman et al., 2018). Today, food insecurity is being recognized as a public health problem on college campuses. Identifying students experiencing food insecurity and assisting students in identifying appropriate resources to address this issue are starting to gain traction across the country (Forman et al., 2018). Recent data suggests that the prevalence of food insecurity in U.S. undergraduate student populations ranges from 14.1% to 58.8%, compared to 12.3% of U.S. households (Forman et al., 2018). Food insecurity rates differ in every state based on various population characteristics and social/economic conditions (USDA Economic Research Service, 2022b).

When a comprehensive micro-assessment of the on-campus clinical site where my project was carried out was acquired, it was apparent that the student population who attended the clinic did not get screened for food insecurity. This, in turn, restricted the clinic from being able to identify food insecurity among students visiting the clinic. It also prevented clinic personnel from being able to assist students who were food insecure in obtaining appropriate resources. Furthermore, failure to identify students who were food insecure prevented providers from fully evaluating food insecure students for nutritional deficiencies, and initiating treatment as needed.

**Background and Significance**

In the State of Texas, rates of food insecurity exceed the U.S. average in households (USDA Economic Research Service, 2022b). A recent study evaluating food insecurity was conducted at one of the largest universities in Texas, the University of Texas at Austin. This study reported that 23.5% of the students were experiencing some form of food insecurity (Forman et al., 2018). It also identified that there was a higher percentage of Hispanics with food insecurity than White, non-Hispanic or Asian students (Forman et al., 2018). Another study conducted at Texas Tech University found that food insecurity was also prevalent on this campus. Among the students who participated in this study, only 40% were food secure while the other 60.0% had varying levels of food insecurity (Abu & Oldewage-Theron, 2019). Abu and Oldewage-Theron (2019) found that almost half of the students (46.3%) experiencing food insecurity were White, non-Hispanic, with the remaining students (53.7%) being of Hispanic, Black, Asian, and American Indian descent.

Nazmi et al. (2018) performed a systemic review of eight studies, which revealed food insecurity at U.S. higher education institutions was three times higher than food insecurity within national households. This study suggested that food insecurity might impact one in every two students within U.S. universities/colleges (Nazmi et al., 2018). A variety of survey methodologies have been utilized to obtain data regarding food insecurity, which have provided researchers and clinicians with better insight into the prevalence of food insecurity and contributing factors. Malnutrition is a concern often associated with food security that is within the low to very low food secure range. Malnutrition (e.g., undernutrition) may be caused by a lack of assimilation of nutrients, or compromised intake. Malnutrition may also be caused by inflammation or other mechanisms associated with underlying disease states (Cederholm et al.,

2019). There has been a fundamental lack of consensus on diagnostic criteria for application in clinical settings, even though malnutrition is a global concern that is associated with increased morbidity, mortality, and cost (Cederholm et al., 2019).

Food insecurity is a growing problem on college campuses. It is affecting students physically, mentally, and emotionally. Screening for food insecurity should be implemented in every campus for these issues to be addressed, prevented, or treated. A recent study was performed using one of the largest health surveillance databases available and found that students who were identified as food insecure were more likely to use tobacco and marijuana and binge drink (Laska et al., 2020). It also found that students were less likely to have routine medical exams and more likely to be diagnosed with depression, stress, poor mental health, and insufficient sleep (Laska et al., 2020). Food insecure students screened higher for lower grade point averages (GPAs) than students who were food secure (Laska et al., 2020).

Food insecurity has serious implications for mental and physical health, causing deficiencies of essential nutrients, malnutrition, and chronic diseases (Holben & Marshall, 2017). Nutrition is a basic need of life and plays an important role in health promotion and disease prevention (Reber et al., 2019). A decline in nutritional status can result in catabolic metabolism and low-grade inflammation, possibly leading to loss of fat-free mass, immune dysfunction, and a reduced quality of life (Reber et al., 2019). It is imperative to identify patients who are malnourished and at nutritional risk as soon as possible in order to provide effective nutritional support (Reber et al., 2019).

### **Assessment**

The primary care clinic where this project was conducted is located within the campus of a private catholic university in San Antonio, Texas. The clinic offers primary care services to

students, staff, faculty, contracted vendors, and university administrators. The clinic provides laboratory services, immunizations, and is now offering on-sight COVID-19 testing. Dental services are also offered twice a month. Due to the COVID-19 pandemic, changes to the clinic had to be implemented for the safety of patients and staff. The clinic is now only able to accommodate two patients at time in the waiting room. The reception desk and the waiting room are both protected and partitioned with clear Plexiglas. Patients who present with COVID-19 symptoms are asked to wait in their car or outside the clinic to be evaluated by a provider who is fully prepped with the appropriate personal protective equipment (PPE).

There are four providers who are doctoral-prepared family nurse practitioners (FNPs). Three of the FNPs provide patient care. The fourth FNP is the clinic director and oversees the administrative actions of the clinic. Of the three FNPs who provide patient care, one works at the clinic full-time while the other works part-time on Mondays, Wednesdays, and Fridays. The third FNP works every Tuesday afternoon. The other two providers work from 08:00 am to 05:00 pm. There is a medical director who oversees the clinic and is kept informed by the clinic director.

There are four medical assistants (MAs). Two of the MAs are assigned to the front desk and the other two MAs are assigned to the back area and are situated parallel to the patient rooms. The MAs who sit in the front answer phone-calls, verify insurance, register patients, collect fees for services, collect ordered labs, administer vaccines, schedule appointments, and call the patients regarding lab results. The MAs who are assigned to the back triage the incoming patients, set-up patient rooms, assist providers, chaperone well-woman examinations, administer ordered medications, and process stat laboratory specimens. All the MAs are cross-trained and can assist each other if needed. The clinic has two fully equipped rooms. There is one additional room in the back end of the clinic that is designated for dental procedures.



The allotted time for a patient visit can vary from 15 minutes to 45 minutes. Visits can consist of simple follow-up visits, wellness visits, immunizations, well-woman examinations, or sports physical examinations. When patients present to the clinic with COVID-19 symptoms, the patients are instructed to wait in their vehicle in a designated parking spot or wait outside the clinic in a designated area and check-in via telephone, prompting the front desk to triage patients over the phone and obtain registration information. The MAs speak with the patients over the phone and obtain reasons for visits, obtain signs and symptoms the patients are experiencing, review medication histories, and collect payment. The MAs instruct the patients to remain in their car and inform them that the provider will be out shortly to evaluate them. The MAs notify the providers of patient arrivals. The providers review the triage notes, patient's medical history, allergies, previous encounters, and medications prior to seeing patients for evaluation. The clinic can see as few as three patients or up to 23 patients in a day. On average, ten patients per day are seen. There are days when providers are pulled from the clinic to provide scheduled services at school vaccination clinics.

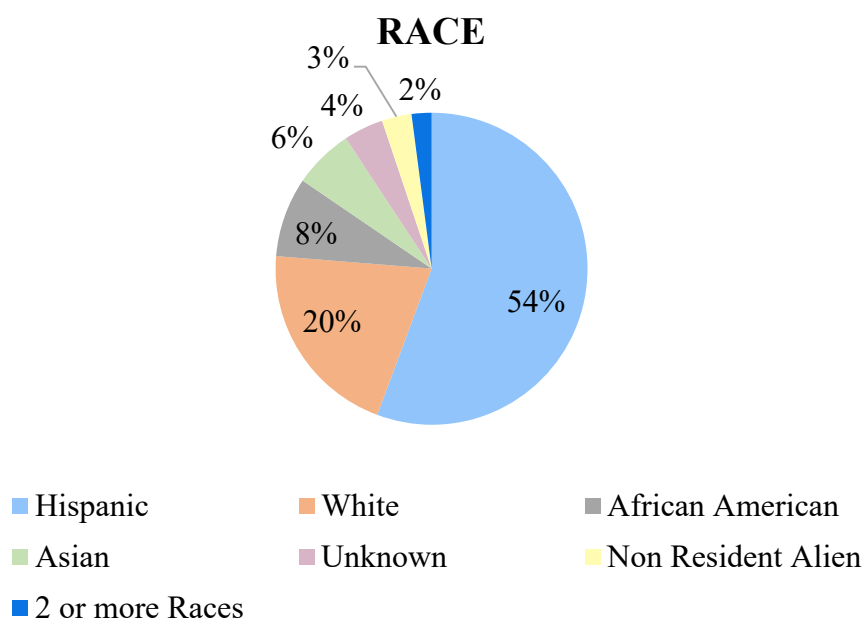
The top diagnoses in the clinic are encounters for immunizations. The data is skewed due to the fact that the clinic is considered a primary health clinic and a wellness clinic. The clinic has hosted several community outreach clinics for the administration of immunizations that is included in this data. Due to the COVID-19 pandemic, COVID-19 and upper respiratory infection are the next two most common diagnoses for the clinic. The clinic sees approximately 6,385 patients per year.

The private catholic university in which the clinic is located has a fall 2021 enrollment of 7,490 students, which includes undergraduate, graduate, and professional studies students (Office of Institutional Research, 2021). The clinic's electronic health records (EHRs) cannot

consistently and accurately provide patient demographic information. However, demographic data was obtained from the Office of Institutional Research (2021) for the university's student population, which are the primary users of the clinic's services. Figure 1 provides a summary of the racial makeup of the student population.

**Figure 1**

*Racial Diversity of the Student Population*



About half of the students attending the university are Hispanic (54%). Approximately one fourth of the students attending the university are White (20%). The remaining quarter of students are African American (8%), Asian (6%), Unknown (4%), non-resident alien (3%), and two or more races (2%) (Office of Institutional Research, 2021). Sixty percent of the student population is female and 40% is male (Office of Institutional Research, 2021). The EHR reveals that the vast majority of patients are between the ages of 19 to 45 years (99.8%) with 0.1% of patients ranging from 11 to 18 years of age, and 0.1% of patients ranging from 46 to 64 years of age. A total of 2,931 students live off campus, and 995 students live on campus (Office of

Institutional Research, 2021). Ninety nine percent of the freshman population receive financial assistance, with \$22,505 of need-based scholarships and grants being awarded to each of them (Office of Institutional Research, 2021).

Students attending the university are required to have medical insurance as a condition of enrollment. Insurance enrollment is verified every semester. Many of the students enroll in the university-offered health insurance, Wellfleet, while others have their own personal insurance. Of patients seen in the clinic during the months of March to June 2022, Wellfleet had 32.1% enrollment, Blue Cross Blue Shield had 10.7%, Aetna had 20.4%, United Health Care had 11.8%, Cigna had 6.4%, and other payors had 18.6%.

### **Organization's Readiness for Change**

Currently, staff and providers are unaware of how food insecurity is defined, the prevalence of food insecurity on college campuses, and the impact that food insecurity has on students. During one of the routine morning staff meetings, I was invited to discuss the project with staff and providers. All the clinic personnel were interested in the project and were receptive to the information provided. They were genuinely surprised about the national prevalence of food insecurity on colleges campuses and interested in the interventions that other colleges implemented to address those students who had low to very low food security. The clinic personnel asked a variety of questions about the project process and the different definitions of food security. Some clinical personnel were very interested in assisting with addressing this issue and kept food resources at hand.

### **Stakeholders and Stakeholder Engagement**

The stakeholders who participated in the project included the medical director, four doctoral-prepared FNP's, four MAs, two work-study students, and all of the incoming student

patients who were evaluated in clinic. Prior to the implementation of the project there was no clinical process in place that allowed the clinic to evaluate for food insecurity. The role of the medical director was to assure appropriate and safe functioning of the clinic. The medical director also approved the implementation of the project and coordinated a trip to the San Antonio Food Bank.

One of the doctoral-prepared FNPs was also the director of the clinic. Her role as the director of the clinic was to assure appropriate daily functioning of the clinic and fill in to evaluate patients as needed. The director of the clinic allowed me to implement my project and provided me with supplies and computer access, and asked the clinic staff for their full support in implementing this project. A letter of support was obtained from the director of the clinic (Appendix A).

The role of the doctoral prepared FNPs was to review the food survey with the patients and implement the MUST, if needed. The role of the MAs and work-studies was to hand out a clipboard to the patients that included the food questionnaire, and to calculate questionnaire scores, noting on the chart when patients completed the questionnaires. The MAs also flagged charts if the patient was identified as being low food secure or very low food secure. In the initial meeting with the staff, dates for the project were discussed extensively for the collection of the questionnaires. The MAs misunderstood the timeline in the transition from spring to summer sessions, and stopped the dissemination of the questionnaires temporarily after I went on summer break. I spoke with the staff and asked for the continuation of the dissemination of the questionnaires. Reminder emails were also sent out to clinic personnel asking them to continue dissemination of the questionnaires. The role of the patients was to complete the food questionnaires and to answer any subsequent questions when their responses were being

evaluated. Patients followed instructions and completed questionnaires. Some of the patients calculated their questionnaire scores, while others left comments on the sheets. Patients also asked the MAs if they completed the survey correctly to avoid any errors, which indicated interest in participating in the project.

All of the stakeholders were open minded and motivated to assist in the implementation of the new screening process to provide quality healthcare that was advantageous to patients and was consistent with the mission of the university.

### **Project Identification**

#### **Purpose**

The clinic did not screen students for food insecurity prior to implementation of this project. There was neither information available at the clinic to determine the extent of food insecurity at the university nor any information on how food insecurity was affecting the overall health of students presenting to the clinic. The purpose of this quality improvement project was to screen students who presented to the university clinic for food insecurity, utilizing the USDA six item short form screening survey for food insecurity and the MUST to detect the risk of malnutrition, in order to develop an individualized plan of care for those identified as low or very low food secure.

#### **Objectives**

The objectives for this evidenced-based project were to:

1. screen 80%-90% of patients aged 18 to 25 years who visit the clinic for food insecurity.
2. enter 100% of results collected in the EHR.
3. decrease the percentage of patients with very low food security score by 100%.
4. decrease the percentage of patients with malnutrition by 100%.

**Anticipated Outcomes**

It was anticipated that the implementation of this project would screen students between the ages of 18 and 25 years to determine if they had food insecurity. Patients who had a low to a very low food security score were then screened for malnutrition. If patients met the criteria for low to very low food security and/or malnutrition, the providers then evaluated the patients to determine what diagnostics needed to be ordered and what type of treatment plans needed to be developed to address these issues.

**Summary and Strength of the Evidence**

Food insecurity is a condition that can greatly affect the morbidity and mortality of individuals. Without adequate nutrition, both physical and mental health can be greatly affected. Many college and university staff are unaware of the prevalence of food insecurity on their campuses. In order to determine the extent of this problem and to identify ways to address this issue, I completed an extensive review of the literature, using key terms, in the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane library, Elsevier (Science Direct), Medline, Springer Link, PubMed, Professional Development Collection, Psychology and Behavioral Sciences Collection. Key words used to initiate the literature review were food insecurity, food insecurity and college students, clinical practice guidelines for food insecurity, guidelines for malnutrition, clinical practice guidelines for malnutrition, malnutrition in young adults, and malnutrition screening in clinical practice. The Melnyk and Fineout-Overholt (2015) system was utilized to determine the level and strength of the evidence. This classic classification system provides seven levels of evidence, with each level utilizing a different study design to determine the quality, validity, and applicability of

evidence to the patient care environment. Table 1 provides an overview description of each of these levels.

**Table 1**

*Level of Evidence*

Level of Evidence	Study Design
I	Systemic reviews and meta-analysis of randomized controlled studies
II	Single, randomized controlled studies
III	Quasi-experimental studies and non-randomized controlled studies
IV	Cohort or case-control studies
V	Systematic review or meta-synthesis of qualitative or descriptive studies
VI	Single, qualitative, or descriptive studies
VII	Expert opinion of authorities and/or reports of expert committees

The Johns Hopkins Nursing Evidenced-Based Practice (JHNEBP) system was utilized to rate the quality of the evidence (Dang & Dearholt, 2018). The JHNEBP system is comprised of four different levels designated by letters A, A-B, B, and C to help denote the quality of a study. The quality of studies are based on a combination of study design, sample size, scientific evidenced reviewed, appropriateness of recommendations, and generalizability (Dang, & Dearholt, 2018). Table 2 provides an overview of the JHNEBP system, and the criteria used for each of the levels.

**Table 2***Quality of Evidence*

Quality of Evidence	Criteria
A	<b>High:</b> Conclusive, consistent, generalizable, sufficient sample size for design; adequate control, definitive conclusions, consistent recommendations based on comprehensive literature review that includes thorough references to scientific evidence.
A-B	<b>High-Good:</b> Fairly conclusive, consistent, sufficient evidence. Meets some criteria from both A and B levels.
B	<b>Good:</b> Reasonably conclusive, consistent, sufficient sample size for study designs; reasonably consistent recommendations based on fairly comprehensive literature review that includes references to scientific evidence. However, there may be some conflicting evidence.
C	<b>Low:</b> Inconclusive, inconsistent, insufficient evidence, insufficient sample size for the study design, inconsistent results, little references to scientific evidence. Conclusions cannot be drawn.

A total of 13 articles were used for an in-depth review of the literature for this project.

Appendix B outlines the evidentiary table and rating of the evidence for this project.

### College Food Security Assessment

Millions of people in the United States experience food insecurity each year due to a lack of consistent access to a sufficient amount of safe and nutritious food, which is a necessity for the wellbeing and health of humans (Riddle et al., 2020). Riddle et al. (2020) implemented a cross-sectional analysis of data utilizing the U.S. AFSSM to screen for food insecurity on a campus at Northeast University in the spring and fall semesters. The study focused on all people at the university, including undergraduate students, graduate students, medical students, faculty, and staff. Findings revealed high food insecurity on the college campus. Riddle et al. (2020) conducted this study due the emerging evidence that college and university students faced higher rates of food insecurity compared to the national average. The first survey in this study indicated that among students ( $n = 1,037$ ), 19.6% were food insecure, with a combination of 11.1% being



low food secure and 8.6% being very low food secure. An additional 16.4% were marginally food secure (Riddle et al., 2020). The second survey in this study indicated that among students ( $n = 1,123$ ), 15% were food insecure with a combination of 7.8% being low food secure and 7.2% percent being very low food secure. Riddle et al. (2020) also wanted to evaluate the gap that existed in the literature between food insecurity rates among all campus populations, including students, faculty, and staff. The results revealed that between groups, graduates had a food insecurity rate of 20.8%, medical students had a food insecurity rate of 20%, and undergraduates had the lowest food insecurity rate at 17.5%. One limitation of this study was that it focused solely on screening for food insecurity but did not provide any interventions to address the issue.

Abu and Oldewage-Theron (2019) performed a cross-sectional survey on one of the largest campuses in Texas, with a student population of 37,000. The Household Food Insecurity Access Scale (HFIAS) was utilized to assess the severity of food inadequacy (Coates et al., 2007). The survey was placed online, and a link was provided for students to be able to access it. The study was advertised on student announcement platforms and in student areas such as the free speech area near the university library and student union building. The HFIAS was utilized to measure individual household food access, and the Dietary Diversity Scale was used to assess nutritional intake (Abu & Oldewage-Theron, 2019). Although the study had a small response rate, 59.5% of respondents had varying levels of food insecurity. Out of those respondents, 14.4% were moderately food insecure and 13.4% were severely food insecure (Abu & Oldewage-Theron, 2019). The results of this study demonstrated that students can be identified as being food insecure and prompted possible strategies to be implemented in the future, such as

programs on budgeting, money management skills, and planning healthy meals on a limited budget (Abu & Oldewage-Theron, 2019).

Bydalek et al. (2020) performed a descriptive study to assess food security in nursing students to determine the prevalence and significance of the issue. A total of 100 students participated in the study. Information was acquired using a survey that consisted of a modified version of the USDA 18-item HFSSM (Bydalek et al., 2020). Seventy-nine percent of the nursing students were between the ages of 18 to 24 years, mostly female (91%), and mostly Caucasian/White (83%). Twenty-five percent of the respondents admitted to cutting down meal sizes to conserve food, while 27% stated that purchasing food was not possible and 13% reported losing weight because of food shortages (Bydalek et al., 2020). This study was unique in that it included the use of BMI and weight as an assessment factor in determining levels of food security. A limitation of this study was the relatively small sample.

In another study on food insecurity on college campuses, Leung et al. (2021) examined the impact of food insecurity in colleges, measured from 1999-2003 and 2015-2017, and whether associations differed due to economic independence during college. It was a longitudinal panel study with a sample size of 1,508 students, and the USDA 18-item HFFSM was utilized. The Panel Study of Income Dynamics was also utilized to collect data to compare distributions of sociodemographic characteristics (Leung et al., 2021). Results showed 14.9% of those enrolled in college who experienced food insecurity also had lower household incomes and received SNAP during childhood. Food insecurity during college was also found to be associated with a 45% higher prevalence of food insecurity in adulthood (Leung et al., 2021).

Forman et al. (2018) utilized a cross-sectional survey of undergraduate students, collecting data during the 2014 fall semester the 2015 fall semester. Email announcements were

sent to the department chairs in the colleges as the primary means of recruitment. The research assistant brought the survey questionnaires to class sections if department chairs agreed to help. The primary data collection tool used for this study was the six-item short form of the HFSSM, which took only 10 to 15 minutes to complete. The use of this validated survey tool strengthened the validity of the findings. Among the 1,069 students who participated, 23.5% were food insecure, 31% reported being hungry, and 12.5% reported food insecurity and being hungry (Forman et al., 2018). These findings were beneficial in determining the extent of food insecurity among college students and the extent of hunger that existed among college students. Additionally, these findings provided the university with pertinent data to help decrease food insecurity on campus.

Ahmad et al. (2021) performed a study at the University Putra Malaysia, using a cross-sectional design, to investigate the relationship between food security status, psychosocial factors, and academic performance among undergraduate students. Data collection was carried out from May 2019 to January 2020 using an online survey. Selected representatives from each course were briefed about the study and instructed to share the online questionnaire with all of their classmates. The AFSSM was utilized to assess for food security using the six-item short form. This study found that among undergraduate students (n=663), 62.8% were food insecure (Ahmad et al., 2021). The study also discovered that students experienced psychosocial factors that resulted from food insecurity. These psychosocial factors included stress (65.5%), depression (59.9%), and anxiety (42.3%) (Ahmand et al., 2021). Food insecurity negatively affected students' health and academic performance. The study suggested a significant association between low GPA and food insecurity, as well as high stress, anxiety, and depression (Ahmand et al., 2021). Students' ability to concentrate in class is interfered with when the body

does not have enough food and becomes fatigued, experiencing sleep deprivation and anxiety (Ahmand et al., 2021).

In another study, Payne-Sturges et al. (2017) assessed 237 undergraduate students for the prevalence of food insecurity using the USDA 18-item HFSSM and the patient health questionnaire 9 to assess for depression. It was a cross-sectional study examining the association between food insecurity, demographics, characteristics, and potential financial risk factors (Payne-Sturges et al., 2017). The study took place at a large mid-Atlantic public university. The results showed that 15% of participants were food insecure and 16% were at risk for food insecurity (Payne-Sturges et al., 2017). Results validated the concern about food insecurity on campus and opened the conversation to address the issue and create outreach programs.

Nazmi et al. (2018) conducted a systematic review to document and describe eight studies to date that had been conducted on food insecurity and identify the methodologies used to estimate food security and synthesize available food security prevalence data from U.S. higher education settings. Two of the studies used the USDA 10-item survey module AFSSM, and six studies used the six-item HFSSM. The total number of undergraduate students examined in the various studies ranged from  $n = 1,822$  to 33,394. Results showed food insecurity for all eight studies at a rate that ranged from 21%-58.8%. The lowest prevalence of food insecurity (21%) was at the University of Hawaii. The highest prevalence of food insecurity (58.8%) was at Western Oregon University. Two-year colleges averaged a higher food insecurity prevalence (47.5%-54.1%) compared to 4-year colleges (42.2%-42.2%) (Nazmi et al., 2018). The systematic review revealed that food insecurity was three times higher in colleges than standard household rates.

El Zein et al. (2019) performed a cross-sectional study to assess the prevalence of food insecurity and its sociodemographic health, academic, and food pantry correlates among 1<sup>st</sup> year college students in the United States. A total of 855 students participated and data was obtained from eight different universities from 1<sup>st</sup> year students, including participants' age, gender, race, BMI, GPA, parental educational levels, employment status, Pell grant reciprocity, place of residence, and meal plan (El Zein et al., 2019). The measuring tools used consisted of the 10-item AFSSM, anthropometric measurements, the 19-item Pittsburgh Sleep Index and the 14-item Cohen's Stress Scale and Eating Attitudes Test-26 (El Zein et al., 2019). Study participants were female (68.8%), 19 years (65.4%), non-Hispanic White (62.4%), and employed (43%), having a mean BMI of  $24.7 \pm 5.2$  kg/m<sup>2</sup>, high food security (55.7%), food insecurity (19%) with both low food security (12.0%), and very low food security (7.0%) being present (El Zein et al., 2019). The study concluded that food-insecure students had higher perceived stress, poorer sleep, and disordered eating behaviors (El Zein et al., 2019). There were no significant differences with BMIs and being food secure or food insecure, but students with food security had higher GPAs (3.5-4.0) compared to those who were food insecure (2.5-2.59) (El Zein et al., 2019).

El Zein et al. (2020) also conducted a cross-sectional study that examined the sex-specific associations of food insecurity with obesity and dietary intake among college students, and explored these associations by meal plan enrollment. There were 683 students from eight different universities, and the study examined demographics such as age, gender, race, marital status, Pell grant status, housing, meal plan, employment status, and parental educational levels (El Zein et al., 2020). The study was measured using the 10-item AFSSM, anthropometric measurements, and the National Cancer Institute's 26-item questionnaire (El Zein et al., 2020). The vast majority of participants were 20 years (61.2%), and were 69.6% female, 47.8% non-

Hispanic, 54.2 % living off-campus, and 59.6% enrolled in meal plans. Food insecure students had a significantly higher BMI than food secure students (26 compared with 24.2) and obesity increased with the degree of food insecurity (El Zein et al., 2020).

### **Resource Awareness**

El Zein et al. (2018) performed a cross-sectional study to examine the relationship between food insecurity and food pantry awareness related to the use and perceived barriers to use of the food pantry. A total of 899 students participated, using the 10-item AFSSM, and were asked about food pantry awareness (El Zein et al., 2018). The study concluded that 74.3% were female, 77.6% were white, 82.1% were non-Hispanic, 85.6 % were single, 65.6% were undergraduates, 24.3% lived on campus, 49.7% worked part-time, and 23% received Pell grants (El Zein et al., 2018). BMI results were  $23.6 \pm 4.8 \text{ kg/m}^2$  and showed that most (64%) students fell in the healthy (18.5–24.9) BMI category followed in prevalence by the overweight (25.5–29.9) category (21.1%) (El Zein et al., 2018). Results showed that 435 students (48.4%) were high food secure and 181 students (20.1%) were marginal food secure. The remaining 283 students (32%) were food insecure with 138 students (15.4%) having low food security and 145 students (16.1%) having very low food security (El Zein et al., 2018). El Zein et al. (2018) also reported that 70% of students were aware of the existing food pantry, but only 15.6% actually used the food pantry.

Smith et al. (2017) conducted a cross-sectional study in a student-run free clinic to implement a food insecurity screening and referral program and to document the prevalence of food insecurity in low-income patient populations. Food insecurity was assessed using the six-item HFSSM. All patients over the age of 18 years were screened. Brief educational sessions were offered to medical students, residents, and faculty on food insecurity and the impact food

insecurity had on health, along with the importance of screening and referral. During routine visits to the student-run free clinic, staff were informed of their patients' food insecurity results in order to address patients' access to food, provide referrals, and record patients' food insecurity status in the EHR. Staff were also instructed on how to add food insecurity to patients' problem lists in the medical notes and were encouraged to include assessment findings and treatment plans to facilitate follow-up visits. Daily announcements were provided to staff reminding them to address food insecurity during clinic visits and enter patient information in the secure online spreadsheet for follow-up. Patients were assessed on subsequent medical visits to determine if they went to the food pantry or received SNAP benefits (Smith et al., 2017). This study showed that 92.5% of patients were screened for food insecurity and, among the 430 patients screened, 48.4% were food insecure and had a diagnosis of diabetes (Smith et al., 2017). According to Smith et al. (2017), implementing food insecurity screening and referral programs can serve as a useful tool to help determine if food insecurity is an issue for patients and can help providers address food insecurity in the clinical setting. As a result of the study, 201 patients were provided with boxes of nutritious foods onsite monthly, and 64 patients were enrolled into SNAP (Smith et al., 2017).

### **General Food Security Assessment**

Sanjeevei et al. (2018) conducted a cross-sectional study to determine the impact of intrapersonal, home environment, community, and social factors on the diet quality and BMI of low-income women participating in SNAP, and to examine the role of these factors in mediating the relationships between food insecurity, diet quality, and BMI. The 152 participants were measured for height and weight and were given a demographics questionnaire, food frequency questionnaire (FFQ), and a multi-dimensional home environment scale (MHES) questionnaire

(Sanjeevei et al., 2018). The study found that participants were predominantly Hispanic, ranged between 19 and 50 years of age, the average household size was three individuals consisting of one adult and two children with SNAP benefits ranging from \$0-3000 per household and \$16-\$570 per child. The study also found that 28.9% of the participants were healthy, 36.2 % were overweight, 34.9% were obese with an average BMI of 29.6/kg/m<sup>2</sup> (Sanjeevei et al., 2018). The study found that the MHES significantly impacted food insecurity and BMI, and food insecurity prevalence was comparable to nationally represented SNAP households (Sanjeevei et al., 2018). Half of the participants showed lower compliance for reducing saturated fats, cholesterol, and sodium, indicating greater intake of these nutrients (Sanjeevei et al., 2018).

### **Screening Tools for Malnutrition**

Cawood et al. (2018) conducted a study that had patients self-screen for malnutrition utilizing the MUST. This tool uses three criteria to determine if malnutrition exists in patients: BMI, unintentional weight loss, and the effect of acute disease preventing oral nutritional intake for greater than 5 days. Screening was made available on a laptop and placed on a table in the outpatient waiting room, with simple instructions on how to use the screening tool. The first part of this study indicated that 94% of patients agreed to self-screen, 99% found the survey easy to understand, 89% were able to measure height and weight, and 99% were happy to weigh themselves (Cawood et al., 2018). The second part of this study indicated that 65% of patients found it easier to complete the screening with electronic tools, while 55% did not have a preference for using the electronic tool versus using a paper version of the screening tool (Cawood et al., 2018).



### Increasing Food Insecurity Awareness

The USDA Economic Research Service was created to measure food security in the United States. The USDA Economic Research Service plays a leading role in research on food security and provides access for social science scholars to obtain data on food security (USDA Economic Research Service, 2022a). This research's key focus was on food security in U.S. households, the impact of food insecurity on the well-being of children, adults, families, and communities, and the relationship between food security and public assistance, public policy, and the economy (USDA Economic Research Service, 2022a). The USDA Economic Research Service also provides in-depth definitions for food security and provides ranges of food insecurity severity based on recommendations of the CNSTAT of the National Academies of Sciences, Engineering, and Medicine (USDA Economic Research Service, 2022a). Table 3 provides an overview of definitions used for food insecurity.

**Table 3**

*Definitions for Food Insecurity*

Type	Definition
High food security	No food reported indications of food-access problems or limitations
Marginal food security	One or two reported indications which is typically anxiety over food sufficiency or shortage in house has little or no indication of changes in diet or food intake are both categorized as food security
Low food security	Reports of reduced quality or desirability of diet with no indication of reduced food intake
Very low food security	Reports of multiple indications of disrupted eating patterns and reduced food intake are both categorized as food insecurity

The USDA Economic Research Service has recently added a section on their website labeled “Interactive Charts and Highlights” that provides various aspects of food security, such as trends in U.S. food security, trends in food insecurity among U.S. households with children, and food insecurity and very low food security by education, employment, disability status, and labor force.

### **Summary of the Evidence**

Evidence suggests that the implementation of screening tools to detect food insecurity and malnutrition should be a priority on university/college campuses, as food insecurity is a significant issue for this population. Food insecurity and malnutrition have a significant impact on the well-being of students and can greatly affect their performance in school. When food insecurity and malnutrition are identified by clinic providers, a treatment plan can be formulated that addresses any issues associated with malnutrition, and referrals for food resources can be provided.

### **Methods**

During my assessment of the clinic site, I noticed that the clinic director had provided the staff with an informative article regarding food insecurity among children in emergency departments, and I asked the staff what resources were currently available for college students on campus. This generated some discussion that led to the suggestion of screening for food insecurity among enrolled students who presented to the clinic. After an assessment of the clinical site, a cursory review of the literature, discussion with the clinic staff, and discussion with my project advisor, my preceptor and I decided to pursue the topic of screening for food insecurity as the focus for this project. A more thorough review of the literature was performed in order to determine the simplest and most effective ways to approach this issue within the

clinic. The processes of the clinic were examined to provide helpful ideas for the implementation of the project. This quality improvement project was designed based on findings from the literature review and suggestions from the medical and clinic directors, in collaboration with my clinical mentor, the providers, and staff. During the development of the project, I routinely spoke with my clinical mentor and the clinical staff before the implementation plan was finalized in order to ensure sustainability of the project.

### **Project Framework**

Implementation of any project to improve clinical processes necessitates using some kind of framework to guide the implementation process. The Plan-Do-Study-Act (PDSA) model aided in the implementation of this project. The PDSA cycle is commonly used in health care settings for quality improvement processes (Coury et al., 2017). After collecting and reviewing data from the clinic during the assessment period and after reviewing the literature, the most appropriate survey methods and clinical practice guidelines were identified for this project (Plan). The implementation of planned interventions occurred in the health services clinic on campus (Do). The questionnaires and EHR records were evaluated to assess participants' responses as well as progress in improving their nutritional status, if participants were identified as low or very low food secure (Study). Once the project findings were evaluated, they were disseminated and a determination of whether to continue or modify the clinical project was made by the clinic (Act). The PDSA cycle provides a structure for the clinic to improve the services they provide based on current clinical practice guidelines and allows providers and staff a means to visualize the change process (Coury et al., 2017).

**Project Interventions**

This quality improvement project was implemented over the span of 10 weeks, consisting of various interventions that were essential to acquiring patient data to determine if food insecurity was an issue for patients and to determine a means to address any identified food insecurities. The implementation of this quality improvement project began on March 29, 2022 and continued through July 08, 2022.

All providers and staff were provided with education on the new workflow processes, questionnaires, clinical practice guidelines used to evaluate for malnutrition, and available resources for patients identified as being food insecure. Patients between the ages of 18 and 25 years presenting to the health clinic were screened. Patient flow was modified based on food security score. The MUST screening tool was administered to patients who scored low to very low food secure by the provider. Patients were provided with food resources if they scored low to very low food secure. Providers evaluated and treated patients based on MUST screening scores. There were six elements to this project, which consisted of a questionnaire that included the six-item USDA HFSSM and demographic information; the MUST malnutrition screening tool, modifications to patient flow, distribution of food security literature to increase student awareness about food security and to encourage utilization of local resources; staff and provider education on the project interventions; and development of treatment plans using clinical practice guidelines for patients identified as low or very low food secure. Figure 2 summarizes the project interventions.

**Figure 2***Interventions*

- 
1. Provide education about food insecurity to staff and providers, MAs, and work-study students.
  2. Implementation of six-item HFSSM and demographic questionnaire for qualifying patients between ages 18-25 and flag EHR for low to very low food secure.
  3. Modification of patient flow for patients identified as low or very low food secure.
  4. Implementation of the MUST screening tool for low or very low food secure patients.
  5. Evaluation of patients by the provider. Treatment plan based on MUST score.
  6. Distribution of food security information and available resources on and off campus.
- 

**Implementation of a Food Insecurity Screening**

The USDA six-item short form screening questionnaire for food insecurity (Appendix C) was selected and administered to all patients between the ages of 18 and 25 years who were seen at the clinic. This questionnaire was selected based on its ease of use, accuracy, and length. The questionnaire was a reasonable and reliable substitution to the 18-item and 10-item surveys (USDA Economic Research Service, 2022c). Various researchers have preferred the use of this questionnaire for assessing food insecurity, as identified in the review of the literature.

Patients were provided a paper version of the survey during the registration process at their appointment. Additional information was added to the six-item USDA HFSSM in order to collect some demographic information from the patients, and included age, date of service, reason for visit, education grade level, employment status, race/ethnicity, and living situation. Although the addition of the demographic information to the USDA six-item short form screening questionnaire increased the length of the questionnaire, it did not make the form so long as to discourage patients from completing it, and it provided useful information about the

patients being seen in order to evaluate the results in context. The MUST questionnaire was embedded on opposite sides of the sheet for the providers to use if patients were scored as being very low food secure. Once patients completed the screening questionnaire, the MAs calculated patient scores. Based on the calculated scores, patients were categorized as food secure, low food secure, or very low food secure. The providers reviewed the questionnaire and returned it to the MA. The completed questionnaires were kept with the completed triage sheets and results entered into the patients' EHRs. Providers reviewed patients' screening scores as part of the clinic visit. The clinic staff and work-study students played a vital role in the dissemination and scoring of the patients' screening questionnaires. Data was collected from the screening questionnaires every week and the information entered into an annotated Excel spreadsheet for data analysis. The patient flow was modified by having the MAs obtain patients' height and weight if patients scored very low food secure. This information was needed in order to complete the MUST questionnaire for these patients.

### **Implementation of the MUST**

If patients were classified as low food secure or very low food secure, providers evaluated these patients for malnutrition and developed a treatment plan to address any malnutrition issues, as necessary. The MUST screening questionnaire that was located on opposite sides of the food insecurity questionnaire was initiated by the providers for any patient who scored as very low food secure. The MUST asked questions regarding BMI, weight loss, and reduced food intake during the health history portion of the examination. Once complete health histories were obtained, providers performed physical examinations to determine if any evidence of malnutrition existed. Malnutrition is preventable and mostly reversible with early and adequate nutritional therapy (Reber et al., 2019). Appendix D provides the recommended

MUST screening criteria and overall clinical guidelines for addressing malnutrition in a clinic setting.

### **Provider Assessment of Patients**

Providers performed a physical examination on patients who scored very low food secure, looking in particular for any signs of malnutrition or nutritional deficits. This included muscle strength, cognitive function, and energy levels, which are relevant to assess in the clinical setting (Reber et al., 2019). Other important components of the nutritional assessment were observing and documenting oral nutritional intake, including qualitative and quantitative aspects such as protein intake, fat intake, and carbohydrate intake, in addition to evaluation of perceived energy levels and micronutrient intake (Reber et al., 2019). This required providers to include a dietary intake recall as part of the clinic visit when examining patients who scored very low food secure. Based on the health history, physical examination, and nutritional assessment, providers determined the overall risk for malnutrition for patients identified as very low food secure.

This information also served as a determinant for providers to order diagnostic testing for selected patients who scored very low food secure. Assessment of blood work in the clinical setting is routinely done and can provide pertinent information regarding patients' nutritional status (Reber et al., 2019). All students at the university are required to have some form of health insurance as a condition of enrollment, and most insurances cover laboratory diagnostic costs. However, based on insurance coverage limitations, a maximum of five of the most important laboratory diagnostics were permitted to be ordered for this project. These laboratory diagnostics included a complete blood count (CBC), comprehensive metabolic panel (CMP), magnesium level, phosphorus level, and iron level. The providers were given a list of laboratory diagnostics with prices to use for those patients who needed to pay out of pocket. This served as a reminder

for providers to be mindful and aware of the financial burden on patients. Since there were no provisions in place to provide free testing, lab costs were provided to the patient for consideration. Table 4 shows the cost of the allowed laboratory diagnostics for this project. The client amount is the cost the patient would pay if the patient had the laboratory diagnostics drawn immediately after the clinic visit. The patient amount is the cost the patient would pay if the patient left the clinic and decided to have the laboratory diagnostics drawn at a later date and time.

The patient flow was modified, if the patient scored very low food secure, to obtain height and weight. The MUST was administered by the provider for patients who scored very low food secure. The distribution of food resources was administered to patients who scored low to very low food secure. The patient was evaluated and provided treatment by the provider if they scored low, medium, or high risk on MUST screening tool.

**Table 4**

*Lab Panel and Cost*

Laboratory Diagnostic	Client Amount	Patient Amount
CBC	\$5.00	\$45.00
CMP	\$18.38	\$88.07
Magnesium	\$22.19	\$55.12
Phosphorus	\$10.72	\$51.38
Iron	\$16.94	\$46.12
Total Cost	\$74.85	\$285.69



## Development of a Treatment Plan

Treatment plans were developed once patients' nutritional statuses were assessed. The providers amended the treatment plans once laboratory diagnostic results, if carried out, were reviewed. Treatment plans included any necessary referrals, nutritional recommendations, and follow-up visits.

The providers were encouraged to calculate energy requirements utilizing the simplified general rule based on energy values (Reber et al., 2019). This rule is based on energy values between 25-35 kcal per kilogram of body weight per day, with adjustment made for underweight patients. Reber et al. (2019) offered a simplified breakdown of the recommended macronutrient requirements, looking at proteins, carbohydrates, and fats based on kilograms of body weight per day. Table 5 provides the energy content per gram for each of the macronutrients, as well as the

**Table 5**

### *Macronutrient Requirements for Adults*

Macronutrient	Energy Content per Gram	Recommended Amount/Kg Body Weight/Day
Proteins	4 kcal	1.0 – 1.5 grams
Carbohydrates	4 kcal	Max. 3-5 grams
Fats	9 kcal	0.8 – 1.5 grams

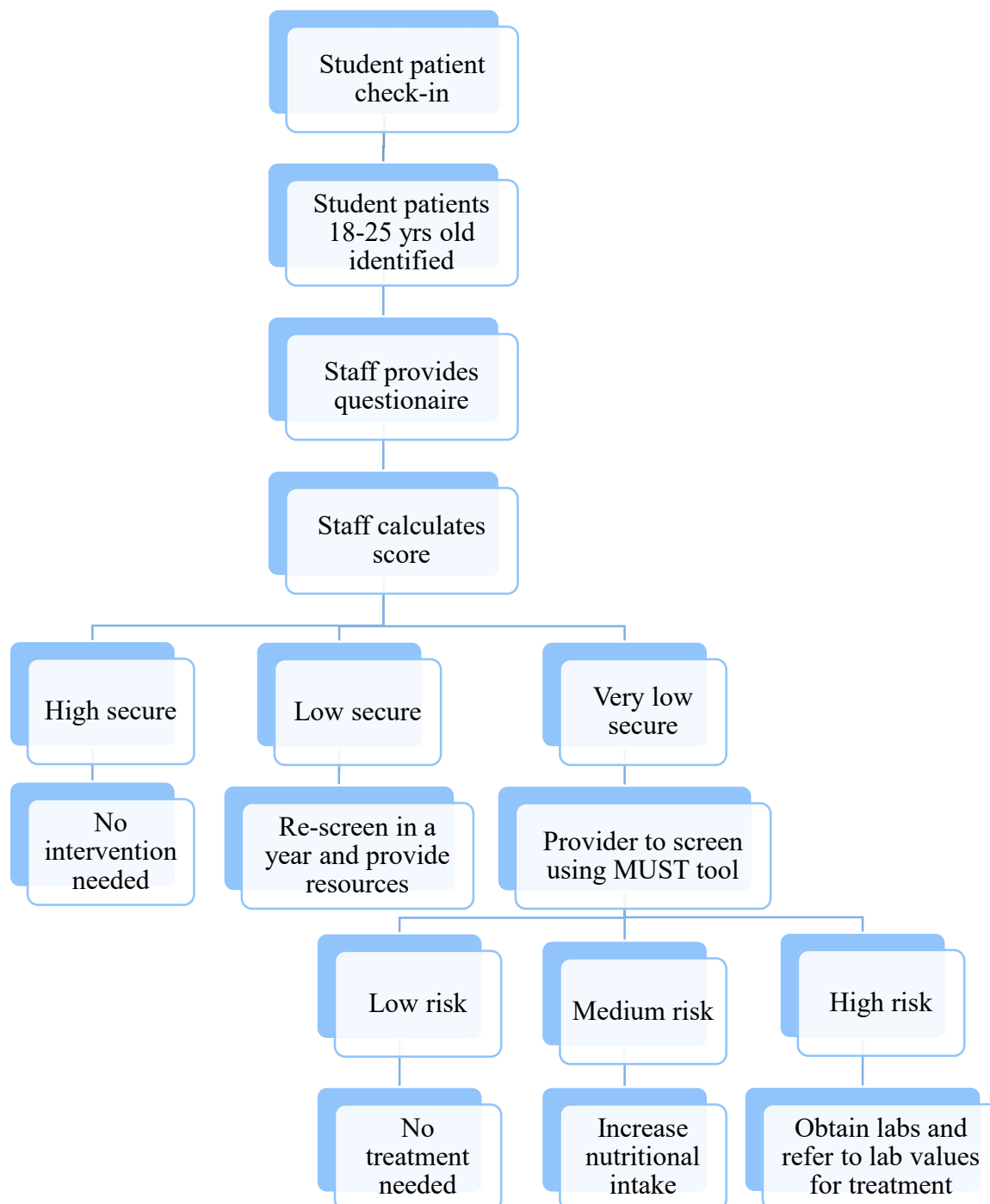
recommended amount of macronutrients per kilogram per day for adults, based on the recommendations of Reber et al. (2019). These were the parameters used by the providers to determine the diet needed for the patients. Additionally, the providers included recommendations in the treatment plans to address any electrolyte or iron deficiencies. Patients were asked to reschedule a follow-up visit with their provider within a year, if a low risk was scored on the

MUST questionnaire; within 2 to 3 months if a medium risk was scored on the MUST questionnaire; and monthly if a high risk was scored on the MUST questionnaire.

### **Patient Flow Modification**

There were minimum modifications made to the current patient flow, which primarily impacted the staff. The MAs and work-studies had to add some additional steps during the patient intake process. The food insecurity questionnaire screening had to be placed in patients' paperwork so patients could complete the questionnaire prior to their visit with the providers. The questionnaires were then reviewed and scored by the MAs before the results were given to the providers. The patients' BMI were calculated and entered on the MUST questionnaire if they scored very low food secure.

The providers also had a few changes to their patient flow. Providers reviewed questionnaires and returned them to staff for high food secure status. Low food secure patients were flagged for follow-up calls in 2 to 3 months and provided food resources. The MUST screening was administered to patients who scored very low food secure. All patients were provided a physical examination and health history. In addition, when providers had patients who scored very low for food security, they utilized the MUST questionnaire to assess for malnutrition. Patients who scored low risk for malnutrition were flagged in the EHR for a repeat screening within the next year. Patients who scored medium risk for malnutrition were flagged in the EHR for a repeat screening within 1 month, and an increase in nutritional intake utilizing the energy content previously described was included in the treatment plan. Patients who scored high risk for malnutrition received an order for the laboratory bundle as previously described and scheduled a follow-up visit with a repeating screening for the next week. Figure 3 outlines the workflow processes.

**Figure 3***Workflow Process*

***Student Resources***

Many of the students who attend the university were unaware of the resources the university had to offer regarding food security. The university has a food pantry that is readily available to students at no cost and is located on the main campus to provide nutritional foods for any students and staff in need. The food pantry is open Monday through Friday and only requests that the user of the resources complete a short form that asks about household size, dietary restrictions, and allergies. The food pantry also offers other additional resources, including links to the city food bank and two other agencies that provide resources, if needed. Information was dispersed in pamphlet form and provided verbally.

Educational pamphlets and resources were kept in a designated area for easy retrieval by the clinic staff. Educational pamphlets were distributed to the healthcare team and patients in the clinic. The educational pamphlets contained information on food insecurity as well as resources that are available locally, such as food pantries, SNAP, and the city food bank.

**Healthcare Team Education on Food Insecurity**

The healthcare team was provided a detailed overview of this project during weekly staff meeting, which were held every Thursday morning. This overview covered information about food insecurity, including relevant statistics, the screening tools that were to be used, the project components, and recommended treatments based on clinical practice guidelines. The healthcare team was instructed on how to score the USDA six-item short form HFSSM questionnaire and the MUST questionnaire. The providers were provided a laboratory order sheet for those patients scoring high risk for malnutrition. Malnutrition treatment varied for each patient based on individualized patient findings. The clinical practice guidelines on malnutrition were utilized for this project, as previously described in the treatment plan development section.

**Organizational Barriers**

One organizational barrier that occurred at the beginning of the project implementation involved miscommunication. The implementation of the project began a few days after the initial start date. The staff in the clinic said that they forgot about the start date and neglected to add the questionnaires to the clipboards that were handed out to patients during the check-in process. The staff was very apologetic and immediately resolved the matter and began to include the questionnaires. Another barrier that occurred was towards the end of project. The MAs stopped screening students when I was out for 2 weeks in the summer. Screening was restarted once I returned to collect additional questionnaires and data.

**Organizational Facilitators**

The medical director, clinic director, providers and staff all contributed to the implementation of the project and were exceptional organizational facilitators. They all provided encouragement that assisted in the success of the project. The medical director went above and beyond, organizing a trip to the city food bank for the clinic and other departments to teach about food insecurity.

**Ethical Considerations**

The University of Incarnate Word Institutional Review Board reviewed the project and deemed it to be not regulated research. The screening process was reviewed by the clinic director and my clinic mentor prior to implementation. There was no risk of harm to the patients. In fact, implementation of this screening process potentially identified students at risk for food insecurity and malnutrition who might have otherwise been missed prior to implementation of the project. All patient data collected was kept in the providers' office in a folder. Questionnaires did not contain any patient identifiers.

I completed all required Health Insurance Portability and Accountability Act training before the start of the DNP project. All patient records, both EHR and paper, were maintained in compliance with current HIPAA regulations.

### Results

The clinic provided services to 325 patients throughout the duration of the project. Of the 325 patients who were seen in the clinic, 120 met the criteria and were provided a food insecurity questionnaire. Analysis of the data revealed that 97% ( $n=116$ ) of the patients who were eligible were screened for food insecurity, and 3% ( $n=4$ ) declined completing the food insecurity questionnaire or left it blank.

### Demographics

The food insecurity questionnaire also assisted me in gathering valuable demographic information that may be a contributing factor for patients developing food insecurity. Table 6 provides a summary overview of the demographic findings.

**Table 6**

*Patient Demographics, March–June 2022*

Age (years)	Patients ( $n = 120$ ) (%)
18-21	75 (62.5%)
22-25	45 (37.5%)
Sex	
Male	54 (45%)
Female	66 (55%)
Race	
White	95 (79.1%)
Black	13 (10.8%)
Other	12 (10%)
Ethnicity	

Hispanic	57 (47.5%)
Non-Hispanic	63 (52.5%)
Level of education	
Undergraduate	85 (70.8%)
Graduate	35 (29.1%)
Work	
Yes	52 (43.3%)
No	68 (56.6%)

The age group frequently seen in the clinic were those between 18 and 21 years (62.5%), and those between 22 to 25 years (37.5 %). A total of 79.1% selected White as their race, 10.8% Black, and 10% other; 47.5% were Hispanic, 52.5% non-Hispanic; 70.8% were undergraduate and 29.1% graduate students; and 51.6% worked and 56.6% did not work.

#### **Six-Item HFSSM and MUST Questionnaires**

Once patients completed the six-item USDA HFSSM questionnaire, it was reviewed and a score was assigned, indicating the level of food security for the patient. During the project period, the six-item USDA HFSSM questionnaire was provided to 124 patients. Of the 124 patients, 120 completed the questionnaire and were issued a score; four patients opted not to complete the questionnaire or left it blank. Once food security status was determined based on the questionnaire scores, the results were reviewed by the MA and provider. All completed questionnaires were scanned into the patients' corresponding EHR.

Of the 120 patients screened, 92.5% ( $n = 111$ ) were classified as high food secure, 5.7% ( $n = 7$ ) were low food secure, and 1.6% ( $n = 2$ ) were very low food secure. All of the patients who scored low food secure ( $n = 7$ ) and very low food secure ( $n = 2$ ) were screened for malnutrition using the MUST questionnaire. Providers also completed a health history and physical examination on the patients who scored low food secure and very low food secure. Of

the 1.6% who scored very low food secure, only one patient scored high risk for malnourishment. None of the low food secure patients scored high risk for malnourishment. The provider was able to easily develop a plan of care for the patient at high risk for malnourishment. The provider recommended that the patient have laboratory diagnostics obtained, including a CBC, CMP, magnesium, and phosphorus. The provider utilized the encounter screen for nutritional disorder current procedural terminology code of Z13.21. The patient was scheduled a follow-up visit within a week to discuss the laboratory diagnostic results. Based on the patient's laboratory diagnostic results, no additional treatment plan was required. Another follow-up visit was scheduled for a month later. During this time the patient increased nutritional intake as outlined in the treatment plan. Upon the return visit, the patient was screened again using the MUST questionnaire, this time scoring low risk for malnourishment.

All patients who were classified as low food secure or very low food secure were scheduled follow-up visits as outlined in the MUST questionnaire clinical practice guidelines recommendations (Appendix D). Of the 5.7% ( $n = 7$ ) patients who scored low secure, 100% ( $n = 7$ ) obtained a high food secure classification following the recommended treatment plan, and of the 1.6% ( $n = 2$ ) patients who scored very low food secure, 100% obtained a high food secure classification following the recommended treatment plan.

### **Discussion**

As food provides nourishment to the body, which is a necessity for life, screening for food insecurity will help to detect those individuals at risk for malnourishment. As previously discussed, college campuses do not routinely screen students for food insecurity. During my assessment of this clinic, it was apparent that the providers and staff were unaware of food insecurity and the screening methods used by the USDA. The staff and providers were cognizant



of the deficiency in knowledge regarding this topic and exhibited a willingness to participate and facilitate the food insecurity screening. Patients in the study were successfully and efficiently screened and aided with the concise facilitation, constant interaction, and open forum provided by the staff.

The project had several strengths, such as the provision of a straightforward questionnaire, the effective screening of qualified patients by knowledgeable staff, and the possession of appropriate resources for patients. The questionnaire was organized, clear-cut, and only asked six questions, aside from the demographic questions. My findings were similar to those of Owens et al. (2020) regarding the accuracy of the USDA six-item HFSSM in screening for food insecurity. Owens et al. (2020) utilized a validated two-item Food Sufficiency Screener and the USDA six-item HFSSM to assess for food insecurity and was able to obtain their data by sending surveys to students via email. Owens et al. (2020) began with a two-item Food Sufficiency Screener and proceeded with the USDA six-item HFSSM if both questions were answered “no.” Owens et al. (2020) utilized the USDA six-item HFSSM to determine the level of food insecurity. Of the 502 participants who responded to two-item Food Sufficiency Screener, 319 (63.6%) failed the screening. Of these 319 participants, 96 (30.1%) scored low food secure on the USDA six-item HFSSM while 68 (21.3%) scored very low food secure. While the two-item Food Sufficiency Screener may be a preferred screening tool for food security due to the brevity of the tool, it tended to overestimate those with food insecurity by approximately 50%. However, the USDA six-item HFSSM seem to accurately identify those individuals with low to very low food security (Forman et al., 2018; Owen et al, 2020; & Smith et al., 2017). This suggests that utilization of the USDA six-item HFSSM was an appropriate

instrument to use for this project to establish an accurate picture of the number of students who are low to very low food secure at the university.

Owens et al. (2020) was one of the few studies that addressed food insecurity screening during the COVID 19 pandemic. Owen et al. (2020) found that COVID-19 had a significant impact on the employment status of many of the participants that resulted in limiting the availability of money to purchase food. Many participants were furloughed or lost their jobs during COVID-19. This resulted in 52.2% of those unemployed students being food insecure with 29.2% of these students being food secure. This contrasts with findings from my project. I found that 38.3% of our patients were employed and food secure while 54.2% of our patients were unemployed and food secure. The number of patients identified as being low to very low food secure was small compared to the overall number of patients seen for this project. Six patients (5%) that worked were identified as being low or very low food secure. Three patients (2.5%) that were unemployed were identified as being low or very low food secure. The fact that 99% of students at the university receive some form of financial aid that covers many of the educational expenses may account for the low incidence of food insecurity. Approximately \$22,505 of need-based scholarships and grants are award to each student (Office of Institutional Research, 2021). Forman et al. (2018) found that 47% of students at the University of Texas at Austin were receiving financial aid with 23% of the students working. Despite these findings, 31% of students reported being hungry and 23.5% were found to be food insecure.

Results from my project revealed that 45% of students were male and 55% were female. The ethnicity of the students seen at health services were 79.1% White, 10.8% Black, and 10% other. Yet 47.5% also identified as being Hispanic. This is an important consideration, as several studies identified sex and ethnicity as significant factors in identifying food insecurity (Owens et

al., 2020; Bydalek et al., 2020; & Smith et al. 2017). These studies found that students who identified as food insecure were primarily female and either Black or Hispanic. Approximately half of the patients seen at our health clinic identified as Hispanic and 10% identified as Black. Despite the findings from previous studies, most of the patients seen at our health clinic were determined to be food secure. One possible explanation for this finding is that all students are required to carry health insurance as part of registration and most of the students receive some form of financial aid that can cover the expenses of receiving care from the health clinic.

The literature presented conflicting information about whether undergraduate or graduate students experienced greater food insecurity. Riddle et al. (2020) found that graduate students had 3% higher rate of food insecurity compared to undergraduate students. Owen et al. (2020) found that undergraduates had a higher rate of food insecurity compared to graduate students. Of the patients seen at the university health clinic for this project, 85 patients (70.8%) were reported as undergraduate students and 35 patients (29.2%) were reported as graduate students. Findings revealed 5.7% ( $n = 7$ ) of the patients were low food secure and 1.6% ( $n = 2$ ) were very low food secure. This suggests that food insecurity is low among the university students presenting to the health clinic. However, do the age inclusion criteria, I may not have captured a significant number of the graduate students since these students tend to be older. Expansion of age inclusion criteria might reveal different findings.

Identification of malnutrition is imperative when patients are recognized as being food insecure. It is crucial that patients at risk for malnutrition are started on timely and adequate nutritional plan (Reber et al., 2019). Although healthcare staff may have a limited time to screen for malnutrition, a recent study has provided evidence that people can effectively screen themselves using the MUST screening tool (Cawood et al., 2018). The Cawood et al. (2018)

study solidified the ease of using the MUST screening tool, allowing providers to identify patients at risk for malnutrition. During the course of this project, providers were able evaluate a total of seven students for malnutrition using the MUST screening tool and found one patient to be at high risk for malnutrition. The providers were able to follow the MUST protocol to implement an effective treatment plan to address this risk.

There were several similarities between my project and a study conducted by Smith et al. (2017). Both clinical settings were in a primary care clinic. Both provided a brief educational session to patients and information on local food pantries and SNAP programs was provided to the patients. The Smith et al. (2017) study and my project's educational sessions both included information on food insecurity, its impact on one's health, and the importance of screening. My project differed somewhat from the Smith et al. (2017) study in that local food pantry information included information about the university's food pantry as well as the city's food bank in addition to the SNAP information. My project also flagged patients who scored low to very low food secure in the EHR in order to schedule the patients for follow-up visits. I chose to have the patients re-screened for food insecurity and malnutrition to determine if any progress was made towards obtaining a high food secure status.

Overall, results from this project differed from findings found at other major universities. As previously mentioned, the high percentage of students receiving financial aid and the requirement that all students have health insurance as part of registration may account for these findings. This project focused solely on those students that presented to the health clinic as patients. Therefore, these results may not be typical of the entire university student population. Limitations of this project are addressed below.

**Limitations**

One of the biggest obstacles to implementing this project was COVID-19. Due to the COVID-19 pandemic, screening processes had to be altered on-site. As part of these process changes, no patients were allowed to use paper forms for registration or screening in their cars. Rather, patients completed registration online and remained in their cars until it was time to be seen by the providers. This meant that the USDA six-item HFSSM questionnaire and the demographic questionnaire were not completed for several weeks at the beginning of the project. After several weeks had past, the university relaxed the COVID-19 regulations due to a drop in confirmed COVID-19 cases thus allowing students to enter the health clinic if they were screened as low risk for COVID-19 exposure. Once the patients were able to enter the clinic, MAs had them complete the questionnaires and required paperwork prior to the provider entering the examination room.

Implementation of this project began during the mid-spring timeframe and continued into the summer. The student census dropped after the 1<sup>st</sup> week of May, which corresponded to the end of the spring semester. This resulted in a decreased number of students being seen at the health clinic and thus a decreased number of students screened. The MAs at the health clinic also stopped screening patients during the 1<sup>st</sup> week of May assuming that I had completed the implementation of project. After 2 weeks, I returned to the health clinic and screenings were restarted. I talked to the providers and the staff about sustainability of the project.

Another noted limitation for this project was the age inclusion criteria utilized for this project. A total of 325 patients were seen throughout the duration of the project. The age criteria of patients 18-25 years old limited the number of patients eligible to be screened. Patients older

than 25 years of age were not screened. It is possible that I missed identifying older individuals who were food insecure including graduate students at the university.

This project only screened students presenting to the health clinic for another health-related issue. Therefore, the occurrence of food insecurity may not accurately reflect the rate of food insecurity for the entire university population.

### **Sustainability**

Communication is key for sustainability in the clinic. Staff members were diligent and provided the questionnaire to all qualified patients. For the duration of the project, reminder emails were sent to the staff about the project and the time frame needed for collection. Staff work on their computers consistently and reviewed their email often. They were receptive to the sent emails and responded back. Staff also communicated with me face-to-face on clinic days.

The staff were not planning on continuing the project once I left the clinic if results did not show a significant number of patients being identified food insecure, despite the importance of screening for food insecurity. After the findings were presented to the clinic, the staff did not feel compelled to continue the project. As the majority of incoming patients were food secure, staff felt that students who attended were seen at the university health clinic were food secure and no interventions were needed. I recommend that the screening for food insecurity being moved from the health clinic to the university as a whole in order to capture all new incoming students during orientation. This would provide the university a better picture about the food insecurity status of the entire student population. I also recommend dissemination of educational materials on food resources available on campus and within the community to help alleviate food insecurity for those in need. I will have to wait and see if these recommendations are implemented within the university.

### **Recommendations and Implications for Practice**

A multistep approach with the utilization of a short form two-item Food Sufficiency Screener and six-item USDA HFSSM may be beneficial for the continuation of food insecurity screening at the university. The shorter length of the two-item Food Sufficiency Screener may appeal more to the students. However, as previously discussed, the two-item Food Sufficiency Screener only asks two questions. If the patient answers “no” to both questions, then the university could proceed with providing the six-item USDA HFSSM in order to obtain food security score and level of food security. The two-item Food Sufficiency Screener has a tendency to overestimate food insecurity. Therefore, it would be important to follow-up any positive screens with the six-item USDA HFSSM. Nikolaus et al. (2019) recently carried out a study among college students that produced more consistent estimates for food insecurity using the multistep approach compared to the six-item USDA survey alone.

Screening patients at the health clinic for the 10 weeks of this project has only captured a small glimpse of the full picture. Screening other areas of the campus will increase the detection of students who may be food insecure. Food insecurity negatively affects a students’ health and academic performance (Ahmad et al., 2021). Ahmad et al. (2021) found that students with food insecurity had low GPAs, and high stress, anxiety, and depression levels. Ahmad et al. stated that when the body does not obtain enough food, one becomes fatigued, and will experience sleep deprivation and anxiety, causing the body to become fragile and interfering with a student’s ability to concentrate in class. I recommend that food insecurity education be introduced to all incoming freshman and new staff including providing them with local resources such as the university food pantry, local food banks, and SNAP program contact information. Information could be provided in-person by the university food pantry spokesperson discussing the services

they provide and where they are located. Local food bank personnel could also provide in-person information about their services, location, and processes for obtaining food during orientation. Information about food insecurity and resources to address food insecurity could be provided in university newsletter, email communication, and online to ensure that faculty, staff, and students are aware of this unspoken health issue and have access to resources to assist anyone who may have food insecurity. These recommendations are consistent with the mission of the university on social justice and ensuring that the needs of vulnerable populations are addressed.

**Relevance to DNP Prepared Nurse Practitioner**

One of the roles of a doctoral-prepared nurse practitioner is to help create policies. Health policy influences health disparities, health care financing, and social justice in the delivery of care (American Association of Colleges of Nursing, 2006). It is important that the doctoral-prepared nurse practitioner use current evidence to direct their practice including the use of peer reviewed clinical practice guidelines. It is also important that the doctoral-prepared nurse practitioner look at patients from a holistic viewpoint including the status of patients' nutrition. Following the USDA nutritional guidelines when screening for food insecurity helps the doctoral-prepared nurse practitioner to identify patients at risk for malnutrition and include measures in the plan of treatment to address this issue.

A doctorate in nursing practice graduate must be proficient in quality improvement strategies and create sustaining changes at the organizational and policy level (American Association of Colleges of Nursing, 2006). A doctoral-prepared nurse practitioner needs to examine all the processes that can affect the care of patients. In the case of this project, further evaluation of costs associated with laboratory diagnostic testing should be explored further in order to create a useful laboratory diagnostic bundle that could be ordered and processed in a cost effective, timely manner to determine if malnutrition is present.



Doctorate in nursing practice graduates must remain current in practice and vigilant in being apprised of emerging health problems and barriers to care. The American Association of Colleges of Nursing (2006) state that doctorate in nursing practice graduates should be able to organize care to address emerging practice problems and ethical dilemmas (American Association of Colleges of Nursing, 2006).

### **Conclusion**

The implementation of this project was conducted with the enormous help and teamwork of the staff in the health clinic. Interventions were successfully implemented and goals were achieved. Although the results were not what I expected to find, it allowed us to consider other variables that may influence food insecurity at the university that may have been missed with this project. It was a nice surprise to find that the vast majority of patients presenting the university health clinic were high food secure. The health of students has a direct impact on their success at the university.

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**Appendix A****Letter of Support**

University of the Incarnate Word  
Health Services Clinic  
4301 Broadway, CPO #30  
San Antonio, TX 78209

January 5, 2022

To whom it may concern,

The Medical Director, Dr. Shaylon Rettig and Clinical Director, Ronda Gottlieb, DNP, APRN, FNP-C have granted permission for Norma J. Martinez conduct her DNP Project within the Health Services Clinic. She will have access the UIW Health Services' medical records to collect data relative to her project titled "Implementing Food Insecurity Screening on a College Campus." Ms. Martinez has permission to access the medical records both pre- and post-intervention. The data elements to be collected have been discussed.

The project will begin January 2022 and conclude December 2022. We are delighted to participate and contribute to this DNP project.

Sincerely,

A handwritten signature in black ink, appearing to read "V. Rendón-Cazarez".

Vanessa L. Rendón-Cazarez  
DNP, APRN, FNP-C  
Phone: 210-829-6017  
Fax: 210-829-3125  
vlrendon@uiwtx.edu

## Appendix B

### Evidentiary Table for Summary of Evidence

Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
Abu, B., & Oldewage-Theron W. (2019)	The purpose of this study was to assess for food insecurity and coping strategies among Texas Tech university students.	Cross-sectional survey	(n=173) Of the participants, 40.5% were food secure, 59.5% had varying levels of food insecurity. Of the participants 14.4% were moderately food insecure and 13.4% were severely food insecure. Those who were food insecure worked longer hours (20/hrs./wk.) versus (15/hrs./wk.) for those who were food secure. Coping strategies: 45 students did not respond. Sixty-nine indicated none and 20 indicated 2 strategies. The results of the study can help identify patients who are food insecure and provide them with the proper resources and evaluate for malnutrition.	Level VI	C
Ahmad et al. (2021)	The purpose of this study was to determine an association between food security status, psychosocial factors, and academic performance among university students.	Cross-sectional study	Of the participants 67.6% of the respondents were female. Of the participants 96.4% respondents lived independently, 82.5% had a working father, 64.1% had a working mother, and the mean monthly income was \$1619.20. Of the participants 62.8% were food insecure. The mean GPA of the participants was 3.42. Of the participants 65.5% experienced stress, 59.9% experienced depression and 42.3% experienced anxiety. The results of this study helped identify food insecurity and included psychosocial factors and other demographics that are helpful. This study utilized different screening tools to obtain the information. This study was well controlled. Limitations included that the severity of the food insecurity was not mentioned.	Level II	B



Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
Bydalek et al., (2020)	This study assessed food security in nursing students to determine the prevalence and significance of the issue	Mixed-methods descriptive design	There was a 23.4% response rate with 79% of the participants between the ages of 18-24. Ninety one percent of the participants were female and 83% were Caucasian/White. Twenty-five percent of the participants responded to cutting down meal sizes to conserve food. Twenty-seven percent of the participants reported that purchasing food was not possible with 13% losing weight because of the food shortage	Level III	B
Cawood et al. (2018)	The purpose of this study was to examine the concurrent validity and ease of use of self-screening using an electronic version of 'MUST' by patients compared with healthcare professional screening (HCP). It also compared patient preference for electronic versus paper-based self-screening with 'MUST'.	Cross-sectional study	Study 1 found that 94% of the participants agreed to self-screening with seven discrepancies between the self-reporting and the HCP screening (participants recorded incorrect height and weight). Of the participants, 99% found the electronic MUST easy to understand, Eighty-nine percent of the participants were able to measure height and weight and 99% of the participants were happy to weigh themselves. Study 2 revealed that 65% of the participants found it easier to complete the MUST electronically compared to the paper based version and 55% had no preference between the electronic and paper based versions.	Level II	B
El Zein et al., (2020)	The objective of the study was to examine the sex-specific associations of food insecurity with obesity and dietary intake among college students exploring these associations by meal plan (MP) enrollment	Cross-sectional study	Demographics revealed that 61.2% of the participants were 20 years old, 69.6% were female, 47.8% were non-Hispanic white, 52.4% lived off-campus, and 59.6% were enrolled in a MP. FI students had a significantly higher BMI than FS students (26.0% compared with 24.2%). There was a trend in increased obesity with higher degrees of food insecurity. The study found that obesity is related to food insecurity and differences were presented based on other factors such as gender. Findings from the study	Level II	B

Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
			supported that psychological and physiological processes were involved when making food choices		
El Zein et al. (2019)	The objective of this study was to assess the prevalence of food insecurity and its sociodemographic health, academic, and food pantry correlates among first-year college students in the United States.	Cross-sectional Study	(n=1,168) Demographics revealed that 68.8% of participants were female, 65.4% were 19 years old, 62.4% were non-Hispanic white, and 43% were employed. The mean BMI was $24.7 \pm 5.2$ kg/m <sup>2</sup> . Of the 1,168 participants, 692 (81.0%) were food secure with 476 (55.7%) having high food security and 216 (25.3%) with marginal food security. Nineteen percent of the participants were food insecure with 103 (12.0%) having low food security and 60 (7.0%) having very low food security. The study found that food insecure students had higher perceived stress, poorer sleep, and disordered eating behaviors. No significant differences were noted in BMI between those who were food secure and those who were food insecure. Students identified as being food secure had higher GPAs (3.5-4.0) compared to GPAs (2.5-2.59) of those who were food insecure.	Level II	B
El Zein et al., (2018)	The objective of this study is to examine the relationship between food insecurity and food pantry awareness, use, and perceived barriers to use.	Cross-Sectional Study	predominantly female (74.3%), white (77.6%), non-Hispanic/Latino (82.1%), single (85.6%), and undergraduates (65.6%). 24.3% live on-campus (49.7%) work (part-time, full-time) 23% Pell grant recipients (BMI) was $23.6 \pm 4.8$ kg/m (64%) students fell in the healthy (18.5–24.9) BMI Overweight (25.5–29.9) category (21.1%) 435 students (48.4%) high food security. 181 of these respondents (20.1%) with marginal food security. 283 respondents (32%) food insecure, consisting of 138 students (15.4%) low food	Level II	B

Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
			security 145 students (16.1%) with very low food security This data provides insight to food insecurity on campus. Provides barriers students have using the pantry or its existence.		
Forman et al. (2019)	The purpose of this research is to estimate the prevalence of food insecurity and hunger among undergraduate students and identify the factors associated with food insecurity and with hunger in the population attending the University of Texas at Austin	Cross-Sectional survey	Among the 1069 students, 23.5% are food insecure, 58% are women, 17% first generation attendees, 47% received financial aid, 23% are working, 50% paid for part of living expenses, 31% reported being hungry, 12.5% reported food insecure and hungry.	Level II	B
Leung et al. (2021)	This study examined the impact of food insecurity in college (measured from 1999-2003) and (measured 2015-2017) and whether association differs due to economic independence during college.	Longitudinal panel study	It was noted that 14.9% of college students had food insecurity; had lower household incomes; and received SNAP during childhood Food insecurity was associated with 45% higher prevalence of food insecurity in adulthood	Level II	B
Nazmi et al., (2018)	The objectives of this study was to document and describe the number of studies to date and the methodologies used to estimate food security and synthesize available food security prevalence data from US higher education settings	Systematic review	Food insecurity for all 8 studies ranged from 43.5%-58.8%. The lowest prevalence of food insecurity was 21% at the University of Hawaii. The highest prevalence of food insecurity was 58.8% at Western Oregon University. Two year colleges (47.5%-54.1%) showed a higher food insecurity prevalence than the four year colleges (42.2%-42.2%). The systematic review showed that food insecurity is three times higher in colleges than in general households. The review recommended use of	Level V	C

Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
			the USDA 6-item HFSSM to detect for food insecurity		
Owens et al., (2020)	The purpose of this study was to assess the prevalence and determinants of food insecurity among college students during COVID-19 pandemic.	Cross-sectional study	(N = 502) Overall response rate was 4.4%. Results revealed the following characteristics of the participants: 93% female, 50.4% white, 37.8% graduate students, 60.4% classified as normal weight (BMI <25kg/m2). Of the 502 participants, 65.5% failed to pass the 2-item food sufficiency screener. Those being scored as food insecure than completed the USDA 6-item short HFSSM with 30.8% being classified as low food secure and 21.9% very low food.	Level V	C
Payne-Sturges et al., (2017)	The purpose of this study was to estimate the prevalence of food insecurity among students at a large mid-Atlantic publicly funded university and examine the association between food insecurity, demographic characteristics, potential financial risk factors, and self-reported physical and mental health and academic performance and identify possible risk factors for food insecurity.	Cross-sectional study	Of the participants that took part in this study 15% were food insecure, 16% were at risk for food insecurity. Results validated the concern for food insecurity on campus and identified underlying factors contributing to food insecurity. The study also discussed possible interventions to address food insecurity such as nutrition education and outreach programs	Level III	B
Riddle et al., (2020)	The purpose of this study was to understand the prevalence and factors associated with food insecurity among all campus populations and help fill the gap in the literature.	Cross-sectional analysis	<b>Survey 1</b> n=1,037 with 19.6% experiencing food insecurity (11.1% low insecurity and 8.6% very low food insecurity) and 16.4% experiencing marginal food insecurity. <b>Survey 2</b> n=1123 with 15.0% experiencing food insecurity (7.8% low food insecurity and 7.2% very low food insecurity)	Level II	B

Reference	Purpose	Setting	Findings/Implications	Level of Evidence	Quality of Evidence
			<b>Food insecure</b> Undergraduates 17.5% Graduates 20.8% Medical students 20% These findings suggest that examining food insecurity should include all campus populations to obtain an optimal assessment of the issue.		
Sanjeevi et al. (2018)	The purpose of this study is to determine the impact of intrapersonal, home environment, community, and social factors on diet quality and body mass index (BMI) of low-income women participating in SNAP and to examine the role of these factors in mediating the relationships between food insecurity, diet quality and BMI	Cross-sectional study	The study found that the multi-dimensional home environment scale significantly identified factors that impact food insecurity in addition to BMI. Food insecurity prevalence is comparable to SNAP households (nationally represented). Half of the participants showed lower compliance for saturated fats, cholesterol, and sodium indicating greater intake of these nutrients. A majority of participants showed lesser compliance for dietary guidelines adherence index 2015 components such as dark green vegetables, legumes, fruits, whole grains.	Level VI	C
Smith et al., (2017)	The purpose of this study is to implement a food insecurity screening and referral program in student-run free clinics	Cross-Sectional screening	Results show that 92.5% (430/463) of patients were screened for food insecurity. Of the patients screened, 48.4% of patients with diabetes were food insecure. Of the patients screened, those with food insecurity were primarily Latinos (97.7%) and female (74%). Two hundred one patients were provided with monthly boxes of nutritious foods onsite and 64 patients were receiving SNAP. This data provided helpful information to apply to practice	Level III	B

## Appendix C

### Food Questionnaire (Patient Section)

**Date:** \_\_\_\_\_ / \_\_\_\_\_ / **2022**

**Grade Level:** ☐ Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐ Graduate

**Reason for visit:** \_\_\_\_\_ **Age** \_\_\_\_\_

**Race/Ethnicity:** \_\_\_\_\_

**Do you live on- campus?** Yes or No      **Do you work?** Yes or No      **Work-study** Yes or No

### Six-Item Food Security Module

These next questions are about the food eaten in your household in the last 12 months, since last year and whether you were able to afford the food, you need. Check one

**1.** The first statement is, “The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

☐ Often true ☐ Sometimes true ☐ Never true ☐ Don’t know

**2.** “(I/we) couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

☐ Often true ☐ Sometimes true ☐ Never true ☐ Don’t know

**3.** In the last 12 months, since last (name of current month), did (you/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 #4 ☐ Don’t Know- Skip #4

**4.** IF YES ABOVE, please answer: How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

☐ Almost every month ☐ Some months but not every month ☐ Only 1 or 2 months ☐ Don’t Know

**5.** In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

☐ Yes ☐ No

**6.** In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?    ☐ Yes ☐ No ☐ Don’t Know

Score \_\_\_\_\_

**Food Security Status:** High (0-1), Low (2-4), Very Low (5-6)      **Screen for Malnutrition** Yes No

## Appendix D

### Malnutrition Universal Screening Tool (Provider Section)

Provider use only		
<b>BMI</b>		
<b>Total Risk</b>		
<b>Plan</b>	Low-Repeat Screen in 1 yr Medium-Repeat screen in 1 Mo. High-Order labs and repeat screen in 1 week	Labs-CBC, CMP. MAG, PHOS,IRON
<b>Treatment</b>	Low Medium High	None Increase nutritional intake Refer to lab values
<b>Follow-up</b>		

### Malnutrition Universal Screening Tool (MUST)

BMI (kg/m2)		Unintentional weight loss in the past 3-6 months		Acute illness with reduced intake (estimated) for $\geq 5$ days
$\geq 20$	0	$\leq 5\%$	0	
18.5-20.0	1	5-10%	1	
$\leq 18.5$	2	$\geq 10\%$	2	

### Overall Risk for Malnutrition

Total	Risk	Procedure	Implementation
0	Low	Routine clinical care	Clinic: Weekly Nursing home: monthly Outpatient: Yearly in at-risk patient groups, eg., age $\geq 75$ years Clinic, nursing home, and outpatient Document dietary intake for 3 days.

Total	Risk	Procedure	Implementation
1	Medium	Observe	If adequate: Little concern and repeat screening (hospital weekly, care home at least monthly, community at least every 2-3 months). If inadequate: clinical concern. Follow local policy, set goals, improve, and increase overall nutritional intake, monitor and review care plan regularly. Clinic, nursing home, and outpatient
$\geq 2$	High	Treat	Refer to dietician, nutritional support team, or implement local policy. Set goals, improve and increase overall nutritional intake. Monitor and review care plan. (Hospital -weekly, care home- monthly, community-monthly