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## Food insecurity, depression, disordered eating styles, and body mass index among university students

Cristal Medina

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## ABSTRACT

### FOOD INSECURITY, DEPRESSION, DISORDERED EATING STYLES, AND BODY MASS INDEX AMONG UNIVERSITY STUDENTS

Cristal Medina, M.S.  
School of Health Studies  
Northern Illinois University, 2018  
Josephine Umoren, Director

Food insecurity is higher among college students than in the general population. Food insecurity can lead to a variety of health outcomes. The present cross-sectional study investigated the relationship between food insecurity and body mass index (BMI), depression, and disordered eating among university students. The study was carried out at eight public universities in the Midwest.

Students at participating universities in the Midwest were recruited electronically. They were asked to complete an online survey which consisted of the U.S. Adult Food Security Scale, the Center for Epidemiological Studies Depression Scale, and the Three Factor Eating Questionnaire. Participants were also asked to report their height and weight measurements to calculate BMI.

Participants included 2,794 students over the age of 18. The food insecurity rate was 29.1%, which was more than double the national average of 11.8%. Food insecurity was significantly ( $P<.0001$ ) associated with depression and disordered eating, but not with BMI ( $P=0.12$ ). Students who were food insecure had significantly higher ( $P<.0001$ ) BMI, depressive symptoms, and disordered eating. Food insecurity affects university students at higher than average rates and appears to have an effect on BMI, depressive symptoms, and disordered eating.

NORTHERN ILLINOIS UNIVERSITY  
DE KALB, ILLINOIS

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FOOD INSECURITY, DEPRESSION, DISORDERED EATING STYLES, AND  
BODY MASS INDEX AMONG UNIVERSITY STUDENTS

BY

CRISTAL MEDINA  
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A THESIS SUBMITTED TO THE GRADUATE SCHOOL  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE  
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SCHOOL OF HEALTH STUDIES

Thesis Director: Dr. Josephine Umoren

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## CHAPTER 1

### INTRODUCTION

#### Background

The consistent and adequate access to food may seem like a basic human right, yet it is one that many Americans are not guaranteed. Individuals who experience food insecurity do not have the means to regularly access enough food. Food insecurity affects 11.8% of all households in the United States.<sup>1</sup> The available data shows that food insecurity rates are higher on American college campuses than in the general population, ranging from 21-59%.<sup>2-9</sup> Food insecurity leads to a reduction in not only total food intake, but also a reduction in food quality and a disruption in eating patterns.<sup>10</sup>

Food insecurity is an important issue to address because it is associated with many negative health outcomes. Multiple studies have linked food insecurity to a higher likelihood of overweight and/or obesity, poorer diet quality, increased stress, increased anxiety, greater depression, and disordered eating.<sup>11-15</sup> Among college students, food insecurity is reported to increase likelihood of depressive symptoms, higher stress, worse sleep quality, worse diet quality, disordered eating, anxiety, suicidal ideation, a higher body mass index (BMI), and reporting fair/poor health.<sup>2,6,7,16-18</sup> Food insecurity also compromises a student's academic performance.<sup>2,3,5,8,9,16,19</sup>

College students are a key group to study because they face higher rates of food insecurity than the general population.<sup>2-9</sup> Addressing health issues among those who are food

insecure is very important as this group typically has limited resources. Thus, it is important to find the most efficient way to help food insecure students improve or maintain their health. One way to help this cause is to closely examine the relationship between food insecurity and related health outcomes among university students.

Several studies have shown that food insecurity is associated with a higher BMI, depressive symptoms, and disordered eating.<sup>6,7,11-17,20</sup> These health outcomes are important to study because of their implications. Overweight (BMI=25.0-29.9kg/m<sup>2</sup>) and obesity (BMI≥30kg/m<sup>2</sup>) affect the majority of American adults. More than 2 out of 3 American adults (70.7%) are overweight (32.8%) or obese (37.9%).<sup>21</sup> Overweight and obesity are risk factors for several chronic diseases, including type 2 diabetes, heart disease, high blood pressure, nonalcoholic fatty liver disease, osteoarthritis, some types of cancer, and stroke.<sup>22</sup> In 2016, 6.7% of Americans reported at least one major depressive episode. This rate was highest (10.9%) among adults between 18-25 years of age.<sup>23</sup> Depression often coexists with disordered eating.<sup>24</sup> Symptoms of clinical depression and disordered eating, such as uncontrollable and emotional eating, are associated with a higher BMI, putting those with depression or disordered eating behaviors at risk for overweight/obesity and the associated health consequences.<sup>25-27</sup>

A relationship exists between food insecurity, overweight/obesity, depressive symptoms and disordered eating styles.<sup>11-15</sup> There is limited research on these associations among college students.<sup>6,7,17,18</sup> Further research on the health outcomes of food insecurity among university students is required.

## Justification

Food insecurity is defined as having uncertain or limited access to nutritionally adequate, safe, and acceptable food and affects 11.8% of all households in the United States.<sup>1</sup> Multiple studies found food insecurity rates to be much higher among American college students than in the general population, reaching up to 59% of students.<sup>2-9</sup> Food insecurity has been found to lead to a greater likelihood of a higher BMI, depression, and disordered eating.<sup>6,7,11-15,17,18,20</sup>

The present study investigated the interactions between food insecurity, depression, disordered eating styles, and BMI among students at multiple Midwestern universities. When the research was conducted, the literature on food insecurity among university students was very limited. The available literature has grown since then but is still fairly limited. Studies have investigated the relationship between two or three of the above-mentioned variables, but not all four. The present study aimed to contribute to the research linking food insecurity with BMI, depressive symptoms, and disordered eating, as well as contribute to the limited research involving the health outcomes of food insecurity among university students.

## Statement of the Problem

Food insecurity among American college students has been found to be as high as 59% of students.<sup>2-9</sup> Food insecurity has been associated with many negative health outcomes.<sup>2,6,7,11-18</sup> The proposed study investigated the relationship between food insecurity and BMI, depressive symptoms, and disordered eating styles among university students

## Variables

### The Independent Variable

The independent variable in the present study was food insecurity.

### The Dependent Variables

The dependent variables for the present study were BMI, depressive symptoms, and disordered eating styles.

### Operational Definitions

1. **Food insecurity** - Food insecurity was measured by the United States Department of Agriculture's (USDA) U.S. Adult Food Security Survey (AFSS).<sup>28</sup> Food insecurity was defined by combining the USDA's definitions for low food security and very low food security. Food security was defined by combining definitions for high food security and marginal food security.<sup>10</sup>
2. **BMI** - BMI was calculated as  $\text{kg/m}^2$  and classified as underweight/normal ( $\leq 24.99 \text{ kg/m}^2$ ) or overweight/obese ( $\geq 25 \text{ kg/m}^2$ ).<sup>29</sup>
3. **Disordered eating**- Disordered eating included emotional eating, uncontrolled eating, and cognitive restraint, as measured by the Three Factor Eating Questionnaire (TFEQ-R18V2).<sup>30</sup>

4. **Depression-** Depression was defined as a score greater than 10 on the Center for Epidemiologic Studies Short Depression Scale (CESD-10).<sup>31</sup>

### Study Objective

The overall purpose of this study was to determine the association between food insecurity and depression, disordered eating, and BMI among university students at multiple universities in the Midwest.

### Research Questions

1. Is there an association between food insecurity and BMI?
2. Does BMI differ between those who are food secure and those who are food insecure?
3. Is there an association between food insecurity and depression?
4. Does the level of symptoms of clinical depression differ between those who are food secure and those who are food insecure?
5. Is there an association between food insecurity and disordered eating?
6. Do disordered eating scores differ between those who are food secure and those who are food insecure?

## Hypotheses

1. There will be an association between food insecurity and BMI.
2. There will be a statistically significant difference in BMI between those who are food secure and those who are food insecure.
3. There will be an association between food insecurity and depression.
4. There will be a statistically significant difference in depressive symptoms between those who are food secure and those who are food insecure
5. There will be an association between food insecurity and disordered eating.
6. There will be a statistically significant difference in disordered eating scores between those who are food secure and those who are food insecure.

## CHAPTER 2

### METHODOLOGY

#### Study Design

The present cross-sectional study used survey methodology to assess the association between food insecurity, depressive symptoms, disordered eating styles, and BMI among students at eight universities in the Midwest. An application for the use of human subjects was submitted to the Northern Illinois University Institutional Review Board (IRB) for approval prior to contacting outside institutions (see Appendix B). Once the application was approved (see Appendix C), the IRB offices at outside institutions were contacted (see Appendix D). The researcher worked with IRB offices at all participating institutions to determine how to recruit students.

#### Study Population and Recruitment

Students over the age of 18 who were currently enrolled at public universities in Illinois were eligible to participate. Exclusion criteria included being under the age of 18 and not being a current student at one of the eligible universities. Every public university in Illinois was contacted. Nine schools approved the recruitment of their students; however, contact was lost with one school and recruitment on that campus was not initiated. The eight institutions that participated included Northern Illinois University (NIU), Eastern Illinois University (EIU),

Northeastern Illinois University (NEIU), Western Illinois University (WIU), Southern Illinois University at Carbondale (SIU-C), Southern Illinois University at Edwardsville (SIU-E), University of Illinois at Chicago (UIC), and Chicago State University (CSU). Students were recruited electronically (see Appendix D). A mass email containing the survey link was sent to all students at NIU, EIU, WIU, and SIU-E. Department chairs or directors were contacted at SIU-C, UIC, and CSU. Student organizations were contacted at NIU, NEIU, and UIC. The survey was open for two months from November 1<sup>st</sup> through December 31<sup>st</sup>, 2017.

Students who agreed to participate and met the inclusion criteria were directed to follow a link to access the online study survey. The first screen a participant saw once he/she followed the link was the survey cover letter (see Appendix F). An Application for Waiver of Consent (see Appendix E) was submitted so that the consent to participate was given by reading the cover letter and completing the survey. The cover letter informed students that participation was voluntary and anonymous. It also notified students that responses were kept confidential. Additionally, the cover letter informed participants that by completing the survey, they were eligible to enter a raffle to win one of two \$25 Visa gift cards. Participants who wished to be entered in the raffle were asked to email the researcher at [niuhealthoutcomesstudy@gmail.com](mailto:niuhealthoutcomesstudy@gmail.com) to enter the raffle. The winners were randomly selected using Excel's random number generator and notified via email. The survey also included a closing letter which thanked students for their participation and provide appropriate resources for counseling services (see Appendix F).

## Study Instrument and Measure Outcomes

Data on food security, depression, and disordered eating styles was collected using the Health Outcomes of University Food Insecurity Survey (see Appendix K), which combined multiple validated instruments. The survey combined the 10-item AFSS (see Appendix G), the 10-item CESD-10 (see Appendix H), and the 18-item TFEQ-R18V2 (see Appendix I). Permission was not needed to use the AFSS or the CES-D since both tools were freely available to the public and could be used in research. Permission was sought and granted to use the TFEQ-R18V2 (see Appendix J).

Food security was assessed using the AFSS, which is a subset of the validated Household Food Security Survey Module (HFSSM). The complete 18-item HFSSM and two subsets, the 10-item AFSS and the 6-item Food Security Scale, have been used in several studies examining food insecurity.<sup>2-9,12-14,16,32</sup> Furthermore, multiple studies have used the AFSS to assess food insecurity among college students.<sup>3,4,5,9,16</sup> The AFSS categorizes food security as high food security (*“No reported indications of food-access problems or limitations.”*), marginal food security (*“One or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake.”*), low food security (*“Reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake.”*), and very low food security (*“Reports of multiple indications of disrupted eating patterns and reduced food intake.”*).<sup>10,28</sup>

Depressive symptoms were measured using the CESD-10, which is a shortened form of the CES-D that shows strong internal consistency, validity, and correlation to the original form.<sup>31</sup> Correlation between items on the CESD-10 and the original long-form has been as high  $r=0.97$ .<sup>26</sup>

Both the original and the shortened form were used in similar studies investigating depression, BMI, and/or disordered eating.<sup>26,27</sup>

Disordered eating styles, which included emotional eating (*“The propensity to overeat in relation to negative mood states, e.g., when feeling lonely, anxious, or depressed.”*), uncontrolled eating (*“The tendency to lose control over eating when feeling hungry or when exposed to external stimuli.”*), and cognitive restraint (*“The tendency to control food intake in order to influence body weight and body shape.”*) were assessed using the TFEQ-R18V2.<sup>30</sup> The TFEQ-R18V2 is a shortened and validated form of the original 51-item TFEQ.<sup>33,34</sup> The TFEQ was developed using an obese population, but the TFEQ-R18 was validated for use in the general population.<sup>35</sup> The TFEQ-R18 was revised and structured into the TFEQ-R18V2 (Comparative Fit Index = 0.96; Cronbach’s Alpha = 0.78-0.94). The TFEQ-R18V2 was validated for use in Northern American populations.<sup>34</sup> Both the original and the shortened form were used in similar studies investigating disordered eating and depressive symptoms and/or BMI.<sup>26,36</sup>

Demographic information was collected, which included age, sex, year in school, and race/ethnicity. Self-reported height and weight measurements were also collected in order to calculate BMI.

### Data Analysis

Data was downloaded from Qualtrics and then imported into the Statistical Analysis Systems statistical software package version 9.4 (SAS 9.4).<sup>37</sup> Descriptive statistics were used to summarize characteristics of the participants. Chi-square, multivariate logistic regression, and

independent sample *t*-tests were used to test the hypotheses. A significance level of 0.05 was set for all analyses.

The relationship between food insecurity, depression, disordered eating styles, and BMI was analyzed. High food security (score=0) and marginal food security (1-2), as measured by the AFSS, were categorized as food security. Low food security (3-5) and very low food security (6-10) were categorized as food insecurity. These categories were used to assess whether an association existed between food insecurity and BMI, food insecurity and depression, and food insecurity and disordered eating styles. They were also used to determine if BMI, depressive symptoms, and disordered eating differed between food secure and food insecure individuals (see Table 1).

The CESD-10, which measured depression, includes 10 items and each response is given a score from 0 (rarely or none of the time) to 3 (all of the time). Total scores can be categorized as not depressed (<10) or depressed ( $\geq 10$ ). The present study used total scores as a continuous variable when determining if depressive symptoms varied between those who were food secure and those who were food insecure. The above-mentioned categories were used to test for an association between depression and food insecurity (see Table 1).

The TFEQ-R18V2, which measured disordered eating behaviors, includes 18 items. Each item is given a score between 1 (definitely false) and 4 (definitely true). Scores are summed for each of the three subscales individually, as well as one single, cumulative score. The raw scale scores can then be transformed to a 0–100 scale  $[(\text{raw score} - \text{lowest possible raw score}) / \text{possible raw score range}] \times 100$ . In the current study, the scores were analyzed as continuous variables to determine if there was a difference in disordered eating in food secure versus food insecure individuals. The scores were also categorized by dividing them into relative

tertiles. The top tertile was labeled as “highest disordered eating” and the bottom two were “medium disordered eating” and “lowest disordered eating”, respectively. This was done to determine if disordered eating was associated with food insecurity (see Table 1).

BMI was calculated as  $\text{kg/m}^2$ . BMI was separated into two categories, underweight/normal ( $\leq 24.99 \text{ kg/m}^2$ ) and overweight/obese ( $\geq 25 \text{ kg/m}^2$ ). These categories were used when testing for an association between food insecurity and BMI. BMI was analyzed as a continuous variable when determining if BMI differs between food secure and food insecure individuals (see Table 1).

### Monitoring of Data

All data was kept confidential and not shared with anyone outside the research team. Participants were asked not to use their names or any other identifying information on the survey. Collective survey responses were downloaded from Qualtrics, after which they were exported into SAS 9.4 for statistical analyses. The individual surveys will be kept for up to two years after the study has been completed, then they will be deleted. Survey data was kept in a password-protected file

Table 1

## Statistical Tests and Variables to Address Each Research Question

<b>Research Question</b>	<b>Hypothesis</b>	<b>Test</b>	<b>Variables</b>
1 Is there an association between food insecurity and BMI?	There will be an association between food insecurity and BMI.	<ul style="list-style-type: none"> <li>• Chi-Square</li> <li>• Logistic Regression</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> <li>○ BMI</li> </ul> </li> </ul>
2 Does BMI differ between those who are food secure and those who are food insecure?	There will be a statistically significant difference in BMI between those who are food secure and those who are food insecure.	<ul style="list-style-type: none"> <li>• Independent Sample <i>t</i>-test</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> </ul> </li> <li>• Continuous               <ul style="list-style-type: none"> <li>○ BMI</li> </ul> </li> </ul>
3 Is there an association between food insecurity and depression?	There will be an association between food insecurity and depression.	<ul style="list-style-type: none"> <li>• Chi-Square</li> <li>• Logistic Regression</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> <li>○ Depression</li> </ul> </li> </ul>
4 Does the level of symptoms of clinical depression differ between those who are food secure and those who are food insecure?	There will be a statistically significant difference in depressive symptoms between those who are food secure and those who are food insecure.	<ul style="list-style-type: none"> <li>• Independent Sample <i>t</i>-test</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> </ul> </li> <li>• Continuous               <ul style="list-style-type: none"> <li>○ Depressive symptoms</li> </ul> </li> </ul>
5 Is there an association between food insecurity and disordered eating?	There will be an association between food insecurity and disordered eating.	<ul style="list-style-type: none"> <li>• Chi-Square</li> <li>• Logistic Regression</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> <li>○ Disordered eating</li> </ul> </li> </ul>
6 Do disordered eating scores differ between those who are food secure and those who are food insecure?	There will be a statistically significant difference in disordered eating scores between those who are food secure and those who are food insecure.	<ul style="list-style-type: none"> <li>• Independent Sample <i>t</i>-test</li> </ul>	<ul style="list-style-type: none"> <li>• Categorical               <ul style="list-style-type: none"> <li>○ Food security</li> </ul> </li> <li>• Continuous               <ul style="list-style-type: none"> <li>○ Disordered eating scores</li> </ul> </li> </ul>

## CHAPTER 3

### RESULTS

#### Characteristics of the Participants

Total participants included 2,794 undergraduate and graduate students from eight universities (see Table 2). The average age was 23.6 years. Over two-thirds (71%) of participants were female. The majority (69%) identified as non-Hispanic White. Less than half (47.5%) had an overweight or obese BMI. Food insecurity, as measured by the AFSS (Cronbach's  $\alpha=.89$ ), affected 29.1% of the sample. Over half (51.9%) of the participants qualified as depressed based on the parameters set by the CESD-10 (Cronbach's  $\alpha=.85$ ). About one third (33.8%) exhibited "highest disordered eating" as measured by the TFEQ-R18V2 (Cronbach's  $\alpha=.91$ ).

The estimated response rate was 2.6%. This figure was estimated because it was not possible to know how many students received the online survey link. Half of the schools sent out a mass email with the survey link and were able to give the researchers the exact number of students reached. The other half of the schools required the researchers to contact department heads, directors, or student organization and ask them to email the survey link to students. There is no way of knowing how many students received the link at these schools, so the enrollment rate was used instead. The total number of students reached was calculated by adding the number of students who received the mass emails with the number of students enrolled at the other four universities. The estimated response rate of 2.6% was likely lower than the actual response rate.

Table 2

## Characteristics of the Participants

Characteristic	Total (N=2794)
Age (N=2790)	
Mean (Standard Deviation)	23.6 (6.8)
Median	22
Sex	
Male	809 (29%)
Female	1985 (71%)
Race/Ethnicity	
African American	278 (10%)
Asian	186 (6.7%)
Hispanic	282 (10%)
Native American	7 (0.3%)
Non-Hispanic White	1927 (69%)
Other	114 (4%)
Academic Level	
Freshman	409 (14.6%)
Sophomore	314 (11.2%)
Junior	633 (22.7%)
Senior	797 (28.5%)
Graduate	641 (22.9%)
Food Security	
Food Secure	1981 (70.9%)
Food Insecure	813 (29.1%)
BMI (n=2781)	
Underweight/Normal	1460 (52.5%)
Overweight/Obese	1321 (47.5%)
Depression	
Not Depressed	1344 (48.1%)
Depressed	1450 (51.9%)
Disordered Eating	
Lowest Disordered Eating	919 (32.9%)
Medium disordered eating	932 (33.4%)
Highest Disordered Eating	943 (33.8%)

## Food Insecurity and BMI

Hypothesis 1. *There will be an association between food insecurity and BMI.*

A Chi-Square test initially showed that food insecurity and BMI were associated ( $P < .0001$ ).

However, once adjusted for age, sex, race/ethnicity, year in school, depression, and disordered eating, multivariate logistic regression showed that food insecurity and BMI were not significantly associated ( $P = 0.12$ ), ultimately disproving this hypothesis. Although not significant, those who were food insecure were 1.2 times more likely to have an overweight/obese BMI than those who were food secure.

BMI was significantly associated with disordered eating ( $P < .0001$ ), age ( $P < .0001$ ), sex ( $P < .0001$ ), race/ethnicity ( $P < .0001$ ), and year in school ( $P = .0014$ ). Those who had highest disordered eating were 2.9 times more likely to have an overweight/obese BMI than those with lowest disordered eating behaviors. Males were more likely than females to have an overweight/obese BMI. Likelihood of having an overweight/obese BMI increased with every year of age. African Americans and Hispanics were about 2 times more likely to have an overweight/obese BMI than Whites, while Asians were less likely. Finally, undergraduate seniors were about 1.5 times more likely to have an overweight/obese BMI than graduate students (see Table 3).

Table 3

## Odd Ratio Estimates for Overweight/Obese BMI

Effect	Point Estimate	95% CL	P-value
Highest disordered eating	2.90	(2.36, 3.57)	<.0001*
Age	1.06	(1.04-1.08)	<.0001*
Male	1.60	(1.34-1.90)	<.0001*
African American	1.97	(1.49-2.59)	.0019*
Asian	0.67	(0.48-0.92)	.0070*
Hispanic	2.08	(1.59-2.72)	.0006*
Undergraduate Seniors	1.47	(1.17-1.86)	<.0001*

CL=Confidence Limits; \* Denotes statistically significant result ( $P < 0.05$ ).

Hypothesis 2. *There will be a statistically significant difference in BMI between those who are food secure and those who are food insecure.*

An independent sample *t*-test showed that those who were food insecure had higher BMIs than those who were food secure ( $P<.0001$ ), proving this hypothesis correct (see Figure 1).

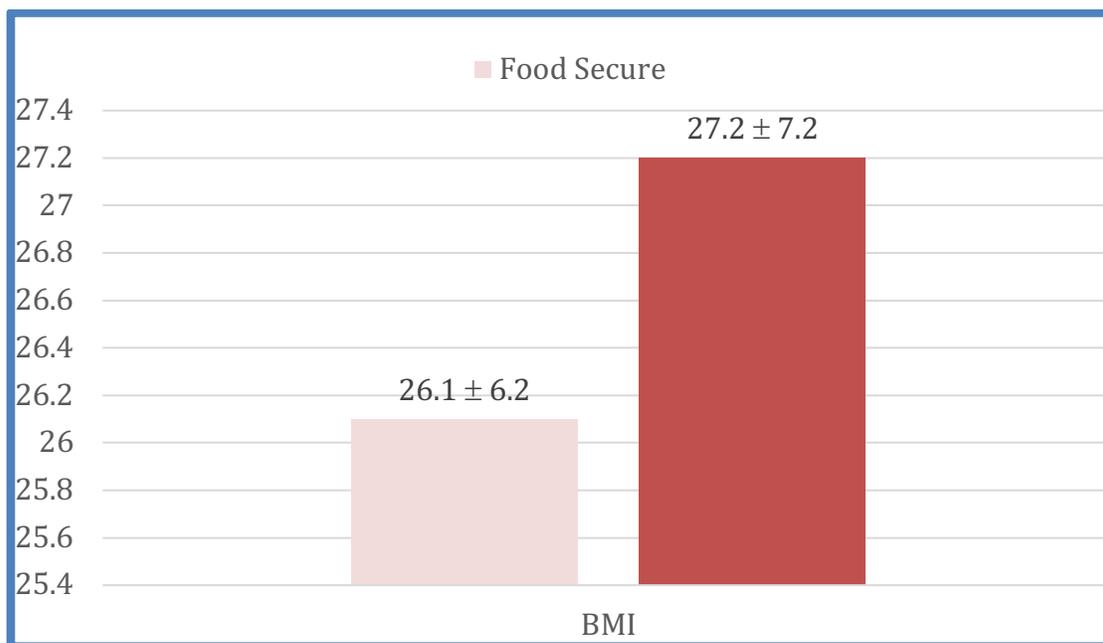


Figure 1. Mean BMI in Food Secure Vs. Food Insecure Participants

### Food Insecurity and Depression

Hypothesis 3. *There will be an association between food insecurity and depression.*

Both unadjusted analysis and analysis adjusted for age, sex, race/ethnicity, year in school, BMI, and disordered eating showed a significant ( $P<.0001$ ) association between food insecurity and depression. Those who were food insecure were 2.4 times more likely to be depressed.

Depression was also significantly associated with disordered eating ( $P<.0001$ ) and year in school ( $P=.0145$ ). Those who had highest disordered eating were 3.8 times more likely to be depressed than those with lowest disordered eating. Undergraduate juniors were 1.6 times more likely to be depressed than graduate students (see Table 4).

Table 4  
Odd Ratio Estimates for Depression

Effect	Point Estimate	95% CL	P-value
Food Insecurity	2.43	(2.02, 2.93)	<.0001*
Highest disordered eating	3.75	(3.06-4.61)	<.0001*
Undergraduate Juniors	1.55	(1.21-1.99)	.0368*

CL=Confidence Limits; \* Denotes statistically significant result ( $P<0.05$ ).

Hypothesis 4. *There will be a statistically significant difference in depressive symptoms between those who are food secure and those who are food insecure.*

This hypothesis was proven correct with an independent sample *t*-test. Depressive symptoms were increased ( $P<.0001$ ) in those who were food insecure versus those who were food secure (see Figure 2).

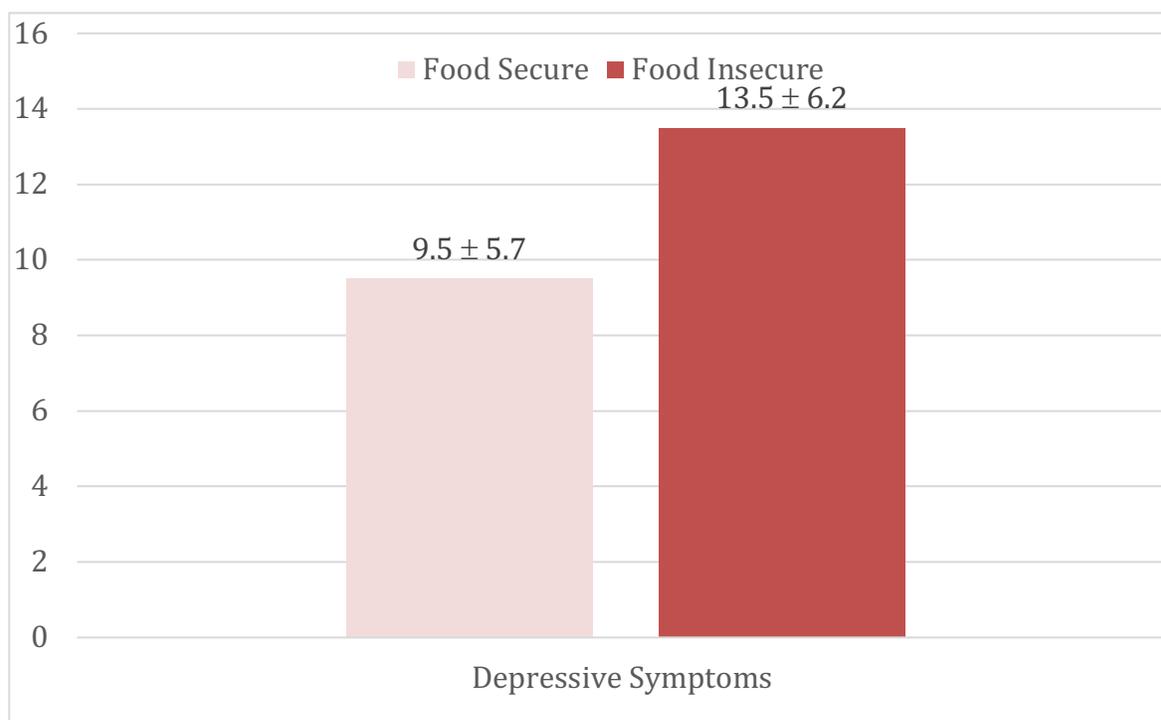


Figure 2. Mean Depressive Symptoms in Food secure Vs. Food Insecure Participants

### Food Insecurity and Disordered Eating

*Hypothesis 5. There will be an association between food insecurity and disordered eating.*

Food insecurity and disordered eating were associated ( $P < .0001$ ) when using unadjusted analysis and analyses adjusted for age, sex, race/ethnicity, year in school, depression, and BMI, proving this hypothesis correct. Those who were food insecure were 1.6 times more likely to have highest disordered eating behaviors.

Disordered eating was also significantly associated with depression ( $P < .0001$ ), BMI ( $P < .0001$ ), sex ( $P < .0001$ ), and race/ethnicity ( $P < .0001$ ). Those who were depressed were 2.6 times more likely to have highest disordered eating. Likelihood of having highest disordered

eating increased by 2.1 times for those who had an overweight/obese BMI. Females were 1.6 times more likely to have highest disordered eating. African Americans were about half as likely as Whites to have highest disordered eating, and Asians were 1.2 times more likely (see Table 5).

Table 5

## Odd Ratio Estimates for Highest disordered eating

Effect	Point Estimate	95% CL	P-value
Food Insecurity	1.63	(1.38, 1.92)	<.0001*
Depression	2.63	(2.27-3.05)	<.0001*
Overweight/Obese BMI	2.14	(1.85-2.48)	<.0001*
Female	1.59	(1.36-1.87)	<.0001*
African American	0.51	(0.40-0.66)	.0023
Asian	1.23	(0.92-1.64)	.0283

CL=Confidence Limits; \* Denotes statistically significant result ( $P<0.05$ ).

Hypothesis 6. *There will be a statistically significant difference in disordered eating scores between those who are food secure and those who are food insecure.*

Independent sample *t*-tests proved that disordered eating was significantly increased ( $P<.0001$ ) in those who were food insecure versus those who were food secure (see Figure 3).

Overall disordered eating, emotional eating, uncontrolled eating, and cognitive restraint were all higher among those who were food insecure (see Table 6).

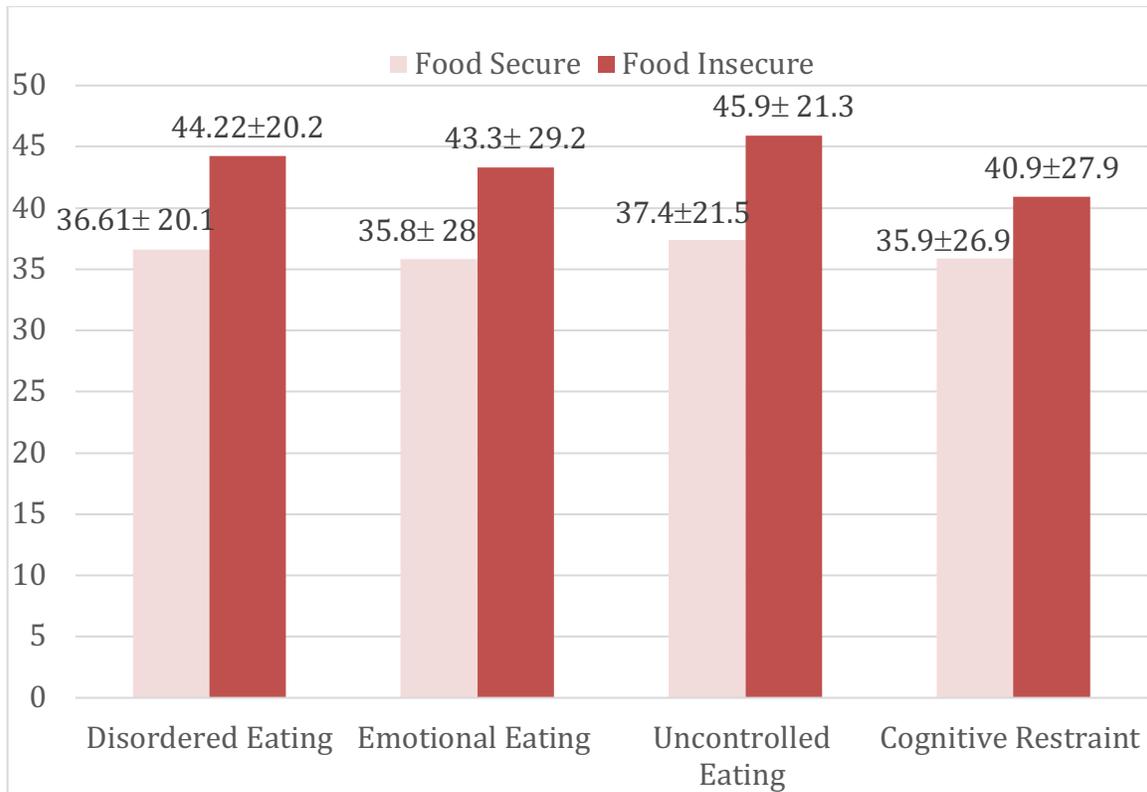


Figure 3. Mean Disordered Eating Levels in Food Secure Vs. Food Insecure Participants

Table 6

## Difference in Means between Food Secure and Food Insecure Participants

Outcome	Food Secure			Food Insecure			<i>P</i> -value
	Mean	Standard Deviation	Standard Error	Mean	Standard Deviation	Standard Error	
BMI	25.78	6.22	0.14	27.20	7.21	0.25	<.0001*
Depressive Symptoms	9.52	5.73	0.13	13.54	6.16	0.22	<.0001*
Overall Disordered Eating	36.61	20.10	0.45	44.22	20.24	0.71	<.0001*
Emotional Eating	35.78	27.98	0.63	43.30	29.20	1.02	<.0001*
Uncontrolled Eating	37.41	21.46	0.48	45.94	21.30	0.75	<.0001*
Cognitive Restraint	35.86	26.94	0.61	40.89	27.88	0.98	<.0001*

\* Denotes statistically significant result ( $P < 0.05$ ).

## CHAPTER 4

### DISCUSSION

The food insecurity rate in this sample of university students was 29.1%, which is more than double the national average of 11.8%.<sup>1</sup> Previous studies have found food insecurity rates among college students to range from 21-59%, placing the results from the present study at the lower end of the range.<sup>2-9</sup> However, the actual food insecurity rate among participants in this study may be higher than reported. This is due to an error in the implementation of the AFSS. While transferring the survey questions to Qualtrics, AFSS question AD3, “In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?”, was left out of the survey. With advice from the USDA Economic Research Service, the researchers followed the missing data protocol outlined in the USDA’s Guide to Measuring Household Food Security.<sup>38</sup> The missing data was coded for in a conservative manner, meaning there may have been a higher number of participants who would have qualified for food insecurity if the question was included. It was not possible to know the true rate of food insecurity among this sample, but it was at least 29.1%.

#### Food Insecurity and BMI

The present study found rates of overweight and obesity in this sample of college students to be lower than the national average for American adults. A total of 71.6% of American adults were overweight or obese in 2016.<sup>21</sup> The combined total in this study was 47.5%, which

was two-thirds of the national average. An explanation for this could be that the median participant age was 22, while the median American adult age is 38 years old.<sup>39</sup> The present study found that an overweight/obese BMI and age were significantly associated, with the likelihood of having an overweight/obese BMI increasing with every year of age. In a study conducted among 209 university freshmen with the mean age of 18.8 years, the rate of overweight/obesity was 33%, which was less than half of the national average.<sup>17</sup> The fact that the samples in the present study and the study on college freshmen were younger than the average American adult could have contributed to the lower rates of overweight or obesity.

Food insecurity and an overweight/obese BMI were not found to be related in the present study. However, those who were food insecure were 1.2 times more likely to have an overweight/obese BMI. These findings are similar to those of the above-mentioned study that included 209 university freshmen. The researchers of that study found that food insecure freshmen were 1.4 times more likely to have an overweight/obese BMI, but food insecurity and BMI were not associated.<sup>17</sup> This differs from other studies that have shown an association between food insecurity and BMI. These other studies, however, were conducted with children, adolescents, and pregnant women, not university students.<sup>11-13</sup> Researchers of a study that investigated the association between food insecurity and obesity in children found that personal food insecurity was associated with obesity in children aged six to 11 years old.<sup>11</sup> The present study differed because it measured household food security in adults. In a study using adolescents between the ages of 12 and 18, researchers found that those from marginally and low food secure households were more likely to be overweight, and those from marginally food secure household were more likely to be obese than those from food secure households.<sup>12</sup> The present study condensed food insecurity categories into “food secure” or “food insecure” and did

not differentiate any further. The third previous study that found an association between food insecurity and BMI was conducted using data on 550 pregnant woman. Researchers found that household food insecurity was associated with a higher BMI at 12 months postpartum in women with overweight or obesity.<sup>13</sup> Although food insecurity has been associated with BMI in a variety of populations, the association has not been found among university students.

Researchers of the present study also found that those who were food insecure had significantly higher BMIs than those who were food secure. These findings mirrored those of a previous study that included incoming students from eight universities. Researchers of that study used independent sample *t*-tests and found that BMIs were higher among food insecure participants. The relationship between food insecurity and BMI required further research. Deeper investigation is needed to better understand how the two interact.

### Food Insecurity and Depression

Results of the present study found the rate of depression to be 51.9%, which was more than seven times the national rate of 6.7% among American adults.<sup>23</sup> There was not a significant difference between males and females or between races/ethnicities. As mentioned earlier, the median age for the present study was 22 years of age. A previous study that analyzed the depression rate in college students found that the rate of high depression levels was 34% and the mean age was 18.8 years. The study used a sample of 209 college freshmen.<sup>17</sup> Another study that analyzed depression rates in college students found the depression rate to be 32%. The study was conducted on 10 college campuses and used a sample of 4,312 college students. Fifty percent of the students in that study were between 18-25 years of age.<sup>7</sup> The national rate of at least one

major depressive episode in those who were 18-25 years of age was 10.9%.<sup>23</sup> Although the national rate among 18-25-year-olds was higher than in the general population, it was still lower than the rate of depression in the present study's sample, as well as in the samples of previous studies using college students. This suggests that depression is higher among university students than in the general population, regardless of age.

As with previous studies, the present study showed food insecurity to be positively associated with depression.<sup>14,17</sup> The present study showed that food insecure university students were 2.4 times more likely to be depressed, while a previous one showed that food insecure college freshmen were about three times more likely to be depressed.<sup>17</sup> A study using 3,518 low-income adults found that those with very low food security were 3.4 times more likely to be depressed, and those with low food security were 2.1 times more likely to be depressed than those with full food security.<sup>14</sup> The current study combined "very low food security" and "low food security" into "food insecurity. The odds of being depressed if food insecure were lower in this study than in previous studies. This could be because the overall depression rates were so high in this study, as discussed earlier. Depression rates could have been high among this sample of college students for a number of reasons, including being away from home for the first time.

In this study, depression was also associated with disordered eating behaviors, which aligned with the results of a previous study.<sup>26</sup> Those who were depressed were 3.8 times more likely to have highest disordered eating behaviors, which included uncontrolled eating, cognitive restraint, and emotional eating. A previous study that conducted secondary analysis on 743 women found that depressive symptoms were positively associated with emotional eating.<sup>26</sup> Emotional eating was one of the eating behaviors included in the overall disordered eating behavior scores analyzed in this study, but the association between emotional eating and

depression was not specifically analyzed. Regardless, the findings of these studies are not surprising since depression and disordered eating often co-occur.<sup>24</sup>

Another finding of the present study was that depressive symptoms were higher in those who were food insecure than those who were food secure. Researchers from previous studies had similar findings.<sup>7,15</sup> The study that was conducted on 10 college campuses and included 4,312 students showed that depression rates were higher among those who were food insecure.<sup>7</sup> Another study examined food insecurity in 97 adults with mood disorders. The study found that depression was significantly higher in adults with food insecurity.<sup>15</sup> This could be due to the decreased nutrient intake that may occur in those who are food insecure. A lack of certain nutrients, such as the amino acids tryptophan and tyrosine, omega-3 fatty acids, carbohydrates, and multiple vitamins and minerals, has been linked to depression.<sup>40</sup>

Previous studies have shown an association between depressive symptomology and a higher BMI, but the present study did not.<sup>25,26</sup> A study using 639 participants in the Supplemental Nutrition Assistance Program found that higher depressive symptoms were associated with a higher BMI.<sup>25</sup> These results are similar to the results of secondary analysis on 743 women that was described above. Those results also showed that increased depressive symptoms were associated with increased BMI. Indirect effects of depressive symptoms on BMI included increased emotional eating.<sup>26</sup> In the present study, depression was associated with disordered eating behaviors, including emotional eating, while disordered eating behaviors were associated with BMI. However, specific pathways between more than two variables, such as the potential pathway between depression and a higher BMI with disordered eating as a mediator, were not analyzed.

## Food Insecurity and Disordered Eating

In the present study, food insecurity was associated with disordered eating. Food insecure participants were 1.6 times more likely to have the highest disordered eating. There have been previous studies that examined the differences in disordered eating behaviors between food insecure and food secure groups.<sup>7,13,20</sup> Two of these studies were previously described, one used 550 pregnant women and the other used 4,312 community college students. Similar to the results of the current study, the previous studies found those who were food insecure had higher disordered eating than those who were food secure.<sup>7,13</sup> The third study used food pantry clients. Researchers of that study found that those with the highest level of food insecurity had higher levels of binge eating, cognitive restraint, and overall eating disorder pathology. Participants with highest food insecurity also had higher weight self-stigma and worry.<sup>20</sup> Levels of worry or stress were not assessed in this study, but it would have been interesting to assess if an association existed between food insecurity and worry or stress and worry or stress and disordered eating.

The current study also showed that disordered eating behaviors were associated with depression, BMI, gender, and race among university students. Those who had the highest disordered eating level were 2.6 times more likely to be depressed. A previous study using college students also found disordered eating to be associated with depression. That study was conducted on 635 undergraduate university students and found that binge eating was associated with depressive symptoms.<sup>27</sup> These findings again support the previous finding that depression and disordered eating often co-occur.<sup>24</sup>

In this study, the likelihood of highest disordered eating among females was 1.6 times higher than males. African Americans were half as likely as Whites to have highest disordered eating, while Asians were 1.2 times more likely than Whites to have highest disordered eating. The previous studies on disordered eating and food insecurity have either not examined differences in disordered eating based on sex or race or have not reported significant associations between disordered eating and sex or race.<sup>7,13,20</sup>

### Implications

Food insecurity affects a college student's health in a number of ways, including increasing depression, increasing disordered eating, increasing BMI, increasing stress, decreasing sleep quality, decreasing diet quality, increasing anxiety, increasing suicidal ideation, and increasing likelihood to report fair/poor health.<sup>2,6,7,16-18</sup> The present study found that food insecure university students were 1.2 times more likely to have an overweight/obese BMI, 2.4 times more likely to be depressed, and 1.6 times more likely to have highest disordered eating than their food secure counterparts. Furthermore, food insecure students had significantly higher BMIs, depressive symptoms, and disordered eating. Depression and disordered eating, which often coexist, have previously been associated with a higher BMI, and overweight and obesity are risk factors for several chronic diseases.<sup>21,22,24-27</sup> These results suggest that food insecurity affects a university student's health and wellness negatively.

Although the current literature suggests that food insecurity negatively impacts a student's health, further research on the health outcomes of food insecurity among college students is needed. The relationship between food insecurity and biochemical data or disease

states among university students should be examined. Further research also needs to investigate how to most efficiently serve this population, which already has limited financial resources.<sup>7</sup>

These students need resources that go beyond an on-campus food pantry. However, before the problem can be addressed, it needs to be understood. The full consequences of food insecurity among college students is unknown. School officials, health professionals, and policy makers need to understand the extent of the problem, so they can best address it. Therefore, it is imperative that researchers take a closer look at the mental, physical, and emotional toll that food insecurity is having on college students.

### Strengths

One of the main strengths of this study was the large sample size. The large sample size strengthened the accuracy of statistical values. Another strength was the fact that participants were recruited from multiple schools throughout the state. These strengths allowed for greater generalizability of the study's findings. The study survey was mainly made up of validated instruments, which was another strength. These instruments all showed good internal consistency in the present study (Cronbach's  $\alpha=.85-.91$ ). Overall, the researchers attempted to have the data collection and analysis be as sound as possible.

## Limitations

The present study had a few limitations. To begin, all data were self-reported. This was a limitation because it was not possible to know how honest a participant was while responding. Another limitation was the error in the AFSS implementation. Because a question was left out, the rate of food insecurity was not as accurate. Although the method by which the researchers addressed the missing data was sound, the best practice would have been to implement the instrument as it was intended to. An additional limitation was that the response rate could not be accurately determined since it was not possible to know how many students received the survey ink. Future researchers should request this information from everyone involved in distributing the survey.

The original survey asked a participant to report “gender” versus biological “sex”. This prompted some students to reach out to the researchers and ask that the question be changed in order to promote inclusivity. The question was changed during the first month the survey was open, as soon as it was brought to the researchers’ attention. This was a limitation because the question could have deterred students from finishing the survey.

The fact that participants were not originally asked to report where they were currently enrolled was also a limitation. The researchers added a question asking participants to list their university about halfway into the survey being open. Having this question present from the beginning would have allowed the researchers to conduct analyses separated by campus. The researchers could have compared food insecurity rates on college campuses in different regions of the state and compared food insecurity rates on rural versus suburban campuses. Food insecurity rates on campuses with food pantries could have been compared to rates on campuses

without food pantries. It would have also been helpful to know whether a student lived on campus, had a meal plan, and utilized a food pantry. The answers to these questions would provide a better picture of the student's situation. These questions should be asked in future research involving students and food insecurity.

Researchers planning on conducting a similar study in the future should take these limitations into consideration. Despite limitations of the overall study, all instruments used to create the study survey were appropriate. Additional questions could have been added to gather data on specific school attended, living arrangements, meal plans use, food pantry use, chronic disease, stress, and worry.

## CHAPTER 5

### CONCLUSION

The present study sought to investigate the interactions between food insecurity and BMI, depression, and disordered eating among university students. The objectives were to determine if food insecurity was associated with BMI, depression, and disordered eating, and also to determine whether BMI, depressive symptoms, and disordered eating were higher among food insecure students than food secure students. The study included 2,794 students from eight 4-year universities in the Midwest.

Researchers found that food insecurity affected 29.1% of the population in the study, which was more than double the rate among the general U.S. population (11.8%)<sup>1</sup>. Food insecurity was significantly associated with depression and disordered eating, but not with BMI. However, those who were food insecure were more likely to have an overweight/obese BMI. Those who were older, male, African American, and Hispanic also had increased likelihood of having an overweight/obese BMI. Food insecure individuals were more likely to be depressed and have highest disordered eating behaviors. Those who had highest disordered eating were more likely to be depressed, and those who were depressed, had on overweight/obese BMI, females, and Asians were also more likely to have highest disordered eating. BMI, depressive symptoms, and disordered eating behaviors were all significantly higher among the food insecure students than they were among food secure students.

The present study contributed to the limited research on the health outcomes of food insecurity among university students, as well as the literature on the prevalence of food insecurity on college campuses. Recommendation for further research include examining the

health outcomes of food insecurity among university students more closely, which can potentially include focusing on disease states or biochemical data. Food insecure students would benefit from further research on the effects of food security on a university student's mental, physical, and emotional health. This would allow school officials, health professionals, and policy makers to better understand how to serve this population.

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APPENDIX A

REVIEW OF LITERATURE

## FOOD INSECURITY AND UNIVERSITY STUDENTS

Food insecurity rates on university campuses in the United States have been found to be higher than rates in the general population.<sup>1-9</sup> In a sample of 354 of its students, an Oregon university found 59% of students to be food insecure. Food insecurity was measured using the US Department of Agriculture Household Food Security Survey Module (HFSSM): 6-Item Short Form.<sup>2</sup> Using a subscale of the HFSSM, the 10-item US Adult Food Security Scale (AFSS), a cross-sectional study found 35% of student participants to be food insecure. The study surveyed 1,882 students from Northern Illinois University, Eastern Illinois University, Southern Illinois University and Western Illinois University.<sup>3</sup> Another cross-sectional study using the AFSS found that 21% of University of Hawai'i at Ma'noa students were food insecure, with another 24% being at risk for food insecurity. The sample included 441 students from 31 randomly selected classes.<sup>4</sup> A study conducted on 3,765 students from 34 community colleges and 4-year universities used the AFSS to show a total food insecurity rate of 48%.<sup>5</sup> A study using the HFSSM showed the food insecurity rate to be 25.7% among a sample of 1,035 college students. Two similar studies, each using 10 different campuses and the 6-item HFSSM Short Form, found food insecurity rates to be 39% among 4,312 students and 42% among 8,932 students.<sup>7,8</sup> Finally, a study conducted at a community college used the AFSS to show that 56% of the 301-student sample was food insecure.<sup>9</sup> Prevalence of food insecurity among college students varies and could be depending on region and method of assessment. The present study examined food insecurity on 8 4-year universities in the Midwest.

Food insecurity in university students compromises health, diet, and academic quality.<sup>10</sup> A cross-sectional study at the University of Alberta collected data on 58 clients of the on-campus food bank. Researchers found that 44.8% of participants were moderately food insecure and 44.8% were severely food insecure. Out of all respondents, 32.8% reported fair/poor general health, 27.6% reported fair/poor mental health, and 60.3% reported not having enough money for food caused at least one adverse academic outcome. Those who were severely food insecure had a higher chance of having fair/poor general health, having fair/poor mental health, being unable to concentrate in class/during an exam, and consuming fewer fruits, vegetables, and legumes.<sup>10</sup> The study that took place in Oregon also found that food insecure students were more likely to report fair/poor health.<sup>2</sup> A New York study that students who reported fair/poor health were more likely to be food insecure.<sup>11</sup>

Multiple studies in the U.S. have shown the impact of food insecurity on academic performance.<sup>2,3,5,8,9,12</sup> Food insecurity among university students has been associated with a lower grade point average (GPA).<sup>2-4</sup> In the study using 34 campuses, 32% of food insecure students reported that a hunger or housing problem had an impact on their education. Furthermore, 55% reported not being able to purchase a required textbook, 53% reported missing class, and 25% reported having to drop a class.<sup>5</sup> Researchers in another study focusing on food insecure students and education found that 80% of participants reported that food insecurity affected academic performance. Over 55% reported that food insecurity affected their ability to go to class. Four percent of participants also reported that food or housing insecurity caused them to miss college for a semester or longer.<sup>12</sup> The dire effects that food insecurity can have on a college student's academic performance and health highlights the importance of further researching the effects of food insecurity on university students.

## FOOD INSECURITY AND BMI

Food insecurity has been associated with a higher BMI.<sup>13-15</sup> A study using secondary analysis of the National Health and Nutrition Examination Survey (NHANES) data from 9,701 participants aged 2-11 years examined child-level food insecurity, personal food insecurity, and obesity.<sup>13</sup> Food insecurity was measured using the 8-item US Child Food Security Scale, which is a subset of the HFSSM, and BMI was calculated using height and weight measures taken during a physical examination. Obesity status was defined as BMI greater than or equal to the 95<sup>th</sup> percentile for the participant's age and sex. The study found a positive association between obesity and personal food insecurity in children aged 6-11.<sup>13</sup> This study used child participants to investigate the association between food insecurity and a higher BMI, whereas the present study used university students over the age of 18.

Another study used NHANES data to examine the association between food insecurity and BMI. The study used a cross-sectional sample of 7,435 participants who were aged 12-18.<sup>14</sup> Participants were categorized into high food security, marginal food security, low food security, and very low food security using the 18-item HFSSM. Weight status was categorized using BMI-for-age and sex percentiles. Central obesity was also examined and defined by waist circumference.<sup>14</sup> The study found that participants from marginally food secure and low food secure households were significantly more likely to be overweight than those from high food secure households. Those from marginally food secure, low food secure, and very low food secure households were 1.4-1.5 times more likely to have central obesity than high food secure participants.<sup>14</sup> This study also used younger participants than the present study.

A previous study using secondary analysis of data from the Pregnancy, Infection, and Nutrition Study (PIN) examined the associations between food insecurity and several factors, which included weight status.<sup>15</sup> The subjects were 550 pregnant women over the age of 16 who participated in PIN. Food insecurity was measured using the 18-item HFSSM. BMI was calculated using height and weight measures taken by researchers. The study found a significant interaction between level of food insecurity and weight status. BMI was higher in pregnant women who had any level of food insecurity. Women who experienced any level of food insecurity also gained and retained more postpartum weight than women who were not food insecure.<sup>15</sup> This study shows that food insecurity is associated with weight. However, this study only looked at pregnant women. The proposed study will investigate this association in men and women.

The above-mentioned studies all show an association between food insecurity and a higher BMI.<sup>13-15</sup> However, these studies were not conducted on university students specifically. Studies that have examined food insecurity and BMI in college students have found that food insecure students have higher BMIs than food secure students. Researchers of a study conducted on 209 college freshmen found that food insecure students were 1.37 times more likely to have an overweight/obese BMI. However, food insecurity and BMI were not significantly associated.<sup>16</sup> A study with a sample of 1,035 incoming university students showed that food insecure participants had a higher BMI than food secure participants.<sup>6</sup> The present study examined if an association between food insecurity and BMI existed, as well as if BMI differed between food insecure and food secure students.

## FOOD INSECURITY AND DEPRESSIVE SYMPTOMS

A positive association between food insecurity and depressive symptoms has previously been found adults.<sup>17,18</sup> A study examining the relationship between household food insecurity and depressive symptoms using secondary analysis of NHANES data on 3,518 adults found that food insecurity was positively associated with depression and a higher prevalence of depression was found with worsening food insecurity.<sup>17</sup> The study found an association between food insecurity and depression, but it is unknown if food insecurity leads to depression or if depression can lead to food insecurity. Food insecurity was assessed using the 18-item HFSSM and depressive symptoms were assessed using the 9-item Patient Health Questionnaire.<sup>17</sup>

More support on food insecurity and depression comes from data from a cross-sectional nutrition survey of adults with clinically defined mood disorders, also known as Structured Clinical Interview for DSM-IV-TR Axis 1 Disorders.<sup>18</sup> The survey used two validated questions to define food insecurity: 1) In the past 12 months did you worry that there would not be enough to eat because of lack of money? 2) In the past 12 months did you not have enough food to eat because of lack of money. It used Hamilton Depression Scale (Ham-D) to measure depression. Ham-D scores were significantly higher in those with food insecurity. The study also found that food insecurity was significantly more prevalent in adults with mood disorders versus the general population.<sup>18</sup> This study shows that food insecurity is higher among those with mood disorders, and severity of depression is higher among those experiencing food insecurity.

A couple of previous studies have examined depression in food insecure college students.<sup>7,11</sup> One of the studies that took place at 10 campuses found that those who were food insecure had higher rates of depression. Fifty-five percent of students with very low food security and 36% of students with low food security had probable clinical depression. These rates were higher than in those with marginal food security (33%) and students with high food security (20%).<sup>7</sup> Researchers of another study found that students with depression were more than two times more likely to be food insecure.<sup>11</sup> The present study also examined if depression rates were higher among food insecure students, and it also tested for an association.

## FOOD INSECURITY AND EATING STYLES

Previous research has found that food insecurity can lead to disordered eating behaviors, such as avoidant food behaviors, binge eating, dieting, guilt about eating, preoccupation with food and weight, and vomiting.<sup>15</sup> The study performed secondary analysis on data from the Pregnancy, Infection, and Nutrition Study to examine the associations between food insecurity and disordered eating, among other factors. Participants were categorized as food insecure, marginally food secure, and food secure using the HFSSM. Disordered eating was assessed using the 26-item Eating Attitude Test. The study found that poor eating attitudes were higher among women who were marginally food secure or food insecure, compared to those who were food secure.<sup>15</sup>

Another study used 503 food pantry clients to investigate disordered eating and food insecurity. The study measured food insecurity via the Radimer Cornell Food Insecurity Measure, eating disorder pathology via the 18-item Eating Disorders Diagnostic Scale for DSM 5, dietary restraint via the Eating Disorder Examination Questionnaire, weight self-stigma via the Weight Self-Stigma Questionnaire, and worry via the Penn State Worry Questionnaire.

Researchers found that those with the higher level of food insecurity had significantly higher binge eating, ED pathology, dietary restraint, weight self-stigma, and worry than those with lower food insecurity.<sup>19</sup> Since food insecurity affects college students at a higher rate, the present study examined the relationship between food insecurity and disordered eating among college students.

### DEPRESSIVE SYMPTOMS, DISORDERED EATING STYLES, AND BMI

Depressive symptoms and disordered eating styles have both been associated with a higher BMI.<sup>10-22</sup> A survey on the association between depressive symptoms and BMI among SNAP participants found that depression was a strong and significant predictor of BMI. A higher depression score was associated with a higher BMI.<sup>21</sup> The study measured depressive symptoms using the Patient Health Questionnaire-2 and calculated BMI from objective height and weight measures taken by interviewers.

Another study that examined the relationship between depressive symptoms and BMI also included eating styles. The study used secondary analysis of data from a randomized controlled trial known as ACTION to examine the relationship among depressive symptoms, BMI, and eating styles.<sup>22</sup> The study measured eating styles, which included emotional eating, uncontrolled eating, and cognitive restraint, using the Three Factor Eating Questionnaire (TFEQ), measured depression using the Center for Epidemiological Studies Depression Scale (CES-D), and calculated BMI using weight and height measures. The study found that increased depressive symptoms were associated with an increased BMI. Increased emotional eating was found to be an indirect effect of depressive symptoms on BMI.<sup>22</sup> The study shows that depressive symptoms are associated with a higher BMI and that emotional eating can be one of the factors that links depressive symptoms to a higher BMI.

A study used the survey method to examine the relationship between unhealthy eating behaviors and obesity in low-income women enrolled in WIC.<sup>20</sup> Eating behaviors, which included emotional eating, uncontrolled eating, and cognitive restraint, were assessed using the 18-item Three Factor Eating Questionnaire (TFEQ-R18). Obesity status was determined using BMI calculated by height and weight measures taken by WIC staff. The study found that those categorized as severely obese scored the highest on emotional eating, uncontrolled eating, and cognitive restraint.<sup>20</sup> Although there is an association between eating styles and BMI, there can be several other factors, such as depressive symptoms and food insecurity, that play a role in the relationship.

The above-mentioned studies all show the association between depressive symptoms, eating styles, and BMI. However, the studies did not examine food insecurity as a factor in the relationship. The present study examined the relationship among food insecurity, depression, eating styles, and BMI in university students.

### DISORDERED EATING AND DEPRESSIVE SYMPTOMS

Depressive symptoms have been associated with disordered eating styles.<sup>23</sup> A study using the survey method examined the relationship between binge eating, depressive symptoms, eating styles, and BMI in 625 undergraduate students at a mid-Atlantic university. The online survey measured binge eating using the definition from the Diagnostic and Statistical Manual of Mental

Disorders 5<sup>th</sup> edition, measured depression using the Center for Epidemiological Studies Depression Short Scale (CESD-10), measured emotional eating and external eating using the Dutch Eating Behaviors Questionnaire, and calculated BMI using self-reported height and weight. Binge eating was correlated with depressive symptoms, emotional eating, and external eating, but not with BMI.<sup>23</sup> The study showed that there is an association between depressive symptoms, binge eating, and negative eating styles, which included emotional and external eating. The present study used this evidence to further examine the relationship between food insecurity, depressive symptoms, eating styles, and BMI among university students.

### SUMMARY OF LITERATURE

Pervious research has shown an association between food insecurity and a higher BMI, while those focused on college students have not.<sup>6,13-16</sup> Some studies have linked food insecurity and depression.<sup>7,11,17,18</sup> Researchers have also found an association between food insecurity and disordered eating.<sup>15,19</sup> Both depressive symptoms and disordered eating styles have been associated with a higher BMI.<sup>20-22</sup> Furthermore, there has been an association found between depressive symptoms and disordered eating styles.<sup>23</sup> These findings provide evidence that a relationship exists between food insecurity, a higher BMI, depression, and disordered eating. The present study contributed to the research on this relationship among university students.

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APPENDIX B

IRB APPLICATION

Application for Institutional Review of Research  
INVOLVING HUMAN SUBJECTS

**Note:** Please complete this form thoroughly keeping in mind that the primary concern is the **potential risk** (economic, ethical, legal, physical, political, psychological/emotional, social, breach of confidentiality, or other) to the participants. Provide copies of all materials to be used in the investigation. The Institutional Review Board (IRB) must have enough information about the transactions with the participants to evaluate the risks of participation.

**Name(s) and employee ID for faculty, Z-ID for students**

Cristal Medina; Z1804822

**Status:**                     Faculty     Graduate Student     Undergraduate Student

**Department:**

Health and Human Sciences

**Mailing Address (if not department):**

1110 Varsity Blvd DeKalb, IL 60115

831-245-6357

**Phone:**  
**E-mail**

z1804822@student  
s.niu.edu

**Project Title:**

Investigating the Interaction Between Food Insecurity, Depressive Symptoms, Eating Styles, and Body Mass Index Among University Students

**Proposed Data Collection Start Date:**

November 2017

**Note:** Unless the authorized departmental reviewer (e.g., chair or designee) has deemed on the screening form that IRB review is not needed, all projects must receive formal written clearance from the IRB Chair (or an IRB member designated by the Chair) prior to the start of data collection.

**Type of Project** (Check one)

Departmental Research (faculty/student projects not externally funded and not indicated below)

Graduate Thesis/Dissertation (IRB application should be submitted AFTER proposal defense)

**Advisor/Committee Chair** (& e-mail): Dr. Josephine Umoren; jxu1@niu.edu

- Undergraduate Project (Senior thesis/capstone, research rookies, independent study)

**Advisor/Committee Chair (& e-mail):**

- Externally Sponsored Research

A complete copy of the grant proposal or contract must accompany this application form for IRB review to take place.

Source of Funding:

Title of grant proposal (if different from IRB protocol):

- Name of principal investigator on grant proposal:

- Office of Sponsored Projects file number (Note: this is not the grant number):

OSP#

- Other

Specify:

#### Part I. Purpose and Procedures:

- 1) Describe the purpose of your study and the reason(s) this study is needed. Include any necessary background information and a description of your hypothesis or your research question.

The purpose of this study is to investigate the relationship between food insecurity and BMI, depressive symptoms, and disordered eating styles in university students. This study is unique because it investigates the interactions between food insecurity, depression, eating styles, and body mass index (BMI) among university students. Research on food insecurity among American university students is limited. Previous studies have examined rates of food insecurity on American university campuses, but have not examined the effects. The study is also unique because it will be investigating the interactions between food insecurity, depression, eating styles, and BMI. Previous studies have investigated the relationship between two or three of these factors, but not all four. Association between food insecurity and a higher BMI has been found, but research has failed to explain why this relationship exists. This study will contribute to the understanding of the association between food insecurity and BMI by investigating that association through depressive symptoms and eating styles. It will also contribute to the limited research involving food insecure university students.

Research questions include:

1. Is there an association between food insecurity status and BMI?
2. Is there an association between food insecurity and depressive symptoms?
3. Is there an association between food insecurity and disordered eating?
4. Is BMI associated with depression and disordered eating?
5. Is disordered eating associated with depressive symptoms?

2) The following items will help the IRB reviewers understand the step-by-step procedures of your study:

2A) Explain the participant **eligibility** and **exclusion** criteria that will be used.

Eligibility for the study includes both male and female students of Illinois public universities over the age of 18. Exclusion criteria includes under the age of 18 and not a current student at an Illinois public university.

2B) Explain the **recruitment** procedures (how will participants learn about the study?). If using the snowballing technique, please explain who contacts potential participants (other participants or the researcher). *Please attach recruitment scripts, flyers, or postings.*

Students from all public universities in Illinois will be asked to participate in this study via email. The IRB at each of the universities will be contacted to learn the process for recruiting their students. The students will be recruited by sending out an email asking them to participate in the study, explaining the study requirements and providing them with the link to the study. The Clearinghouse Review and Mass Email Request Form will be submitted in order to email the study information and survey link to NIU to students.

2C) Explain the **consent process** (verbal and/or written procedures for informing participants of the nature of the study and what they will do).

*[Please attach all documents (assent, consent, parent permission) that are appropriate for each group of subjects participating in the study. Consent forms should be prepared for adult participants (age 18 or over). Assent forms should be prepared for minor subjects appropriate to their ages, and permission form(s) for parents or legally authorized representatives should also be prepared. For children too young to comprehend a simple explanation of participation, parental permission is sufficient only if the research will provide direct benefit to the subject, a member of the subject's family, or other children with the same condition as the subject.]*

Administering the survey online requires participants to read the email and consent to participate. Those who agree to participate and meet the inclusion criteria will be directed to follow the link to access the online survey. The first screen a participant will see once he/she follow the link is the survey cover letter (see Medina\_2). An Application for Waiver of Consent (see Medina\_3) will be submitted so that the consent to participate will be given by reading the cover letter and completing the survey. The cover letter will inform students that participation is voluntary and anonymous. It will also notify students that responses will be kept confidential.

2D) Describe the **data collection** procedures including what data will be collected, how it will be collected (include a description of any interventions to be used), the duration of participation in the study session(s), and how the session(s) will end.

An online survey will be used for data collection since the potential participants are students at all public universities in Illinois. The surveys/questionnaires will be uploaded onto Qualtrics, an online data collection system. Questionnaires and the print version of the online survey are attached. Participants will receive the link to the survey by email following each university's process. The survey will be available online for a month with a reminder email sent after two weeks. It is estimated that the survey will take 15-20 minutes. The last page of the survey will thank participants for their participation and direct them to self-help online resources should they require them. The questionnaires do not ask participants for their name or other identifying information. All data will be kept anonymous and confidential and Qualtrics assigns each participant a code, therefore no personal identifiers will be obtained.

Data on food security, depression, and disordered eating styles will be collected using the Effects of University Food Insecurity Survey (see Medina\_4) that takes approximately 15 minutes to complete. The survey combines multiple validated instruments, which includes the 10-item US Adult Food Security Scale (AFSS), the Center for Epidemiologic Studies Depression Short Scale (CESD-10), and the 18-item Three Factor Eating Questionnaire (TFEQ-R18V2). Permission was not needed to use the AFSS or the CES-D since both tools are freely available to the public and can be used in research. Permission was sought and granted to use the TFEQ-R18V2 (see Medina\_5).

Food security will be assessed using the AFSS, which is a subset of the validated US Department of Agriculture Household Food Security Survey Module (HFSSM). The complete 18-item HFSSM and the 10-item AFSS have been used in several studies examining food insecurity. Furthermore, the AFSS has been used in multiple studies specifically focusing on college students.

Depressive symptoms will be measured using the CESD-10, which is a shortened form of the CES-D that shows strong internal consistency, validity, and correlation to the original form. Correlation between items on the CESD-10 and the original long-form has been as high  $r=0.97$ .<sup>15</sup> Both the original and the shortened form were used in similar studies investigating depression, BMI, and/or disordered eating.

Disordered eating styles, which include emotional eating, uncontrolled eating, and cognitive restraint, will be assessed using the TFEQ-R18V2. The TFEQ-R18V2 is a shortened and validated form of the original 51-item TFEQ. The TFEQ was developed using an obese population, but the TFEQ-R18 has been validated for use in the general population. The TFEQ-R18 has been revised and structured into the TFEQ-R18V2 (Comparative Fit Index = 0.96; Cronbach's Alpha = 0.78-0.94). The TFEQ-R18V2 has been validated for use in Northern American populations.<sup>20</sup> Both the original and the shortened form were used in similar studies investigating disordered eating, depressive symptoms and/or BMI.

Demographic information will also be collected, which includes age, gender, and race/ethnicity. Self-reported height and weight measurements will also be collected in order to calculate BMI.

2E) If applicable, explain the procedures for providing **compensation**.

2F) If applicable, explain the procedures for **debriefing** participants. *Please attach a debriefing script or sheet*

**Reminder:** Attach copies of all questionnaires, surveys, interview questions, listing of all information/data to be collected, etc. It is the responsibility of the researcher to obtain any relevant permission for copyrighted materials. If the research involves an oral interview or focus group discussion that could evolve as it progresses, include a list of discussion topics and any “starter” questions for each topic that can reasonably be expected to be covered. If a *draft* of a written questionnaire or survey is attached, it should be clearly labeled as such and a final version must be submitted *before* data collection begins.

## Part II: Research Participants

3) Participant demographics:

Gender: M  F  Both

Estimated age(s):

18+

Are any subjects under age 18? Yes  No

**Potentially vulnerable populations** (please indicate if any of the following groups are the **target population of the study**)

Pregnant women & fetuses

Prisoners

Decisionally impaired/mentally disabled

Specific ethnic group(s) (list in box):

If any potentially “vulnerable populations” have been indicated above, please explain the necessity for using this particular group, or if specific groups are excluded from the study, please indicate the exclusion criteria used.

Target number of participants in the **entire study** (including controls) from start to finish (keep in mind that this is just an **estimate of the total**):

200

4) Please explain any outside institutional (i.e., schools, hospitals) approval you will need to obtain and how approval will be sought. Provide scripts, letters, or emails providing any information that will be used to obtain needed approvals/permission. It is the responsibility of the researcher to follow all applicable policies of any outside institution(s).

The IRB offices of all public universities in Illinois were contacted by email to inquire about the process to recruit their students for research participation. An email (see Medina\_6) was sent to the following universities:

- Chicago State University
- Eastern Illinois University
- Governors State University
- Illinois State University
- Northeastern Illinois University
- Southern Illinois University Carbondale
- Southern Illinois University Edwardsville
- University of Illinois at Chicago
- University of Illinois at Springfield
- University of Illinois at Urbana–Champaign
- Western Illinois University

To date not all of the universities have replied with instructions for the procedure to gain approval to recruit their students and disperse the survey. Each institution's specific procedure will be followed. (Cristal attach the responses you have received so far)

### Part III: Risk/Benefit assessment

5) What knowledge/benefit(s) to the field will be gained from the study?

This study will contribute to the understanding of the association between food insecurity and BMI as affected by depressive symptoms and eating styles. It will also contribute to the limited research involving food insecure university students.

6) What direct benefit(s) are there to the participant(s) (if any) from the proposed research? *[For example, learning a new skill, psychological insight, teaching experience] [Please note that compensation is **NOT** considered a direct benefit.]*

N/A

7) Describe any potential risks (breach of confidentiality, economic, ethical, legal, physical, political, psychological/emotional, social, or other) to the subjects posed by the proposed research. (Note: Some studies may have “no reasonably foreseeable risks.”) Investigators are required to report all unexpected and/or adverse events to the IRB. Therefore, it is important that you list all reasonably anticipated risks because unanticipated adverse events may need to be reported by NIU to OHRP.

There are no reasonably foreseeable risks. However, this project survey includes questions that ask about depressive symptoms and disordered eating styles, as well as height and weight measurements. Therefore some individuals may feel uncomfortable disclosing such personal information.

- 8) Federal regulations require that researchers use procedures that minimize any risks to participants. What procedures will be used to minimize each risk and/or deal with the challenge(s) stated in “7” above?

Because there may be a possibility that some individuals may experience discomfort from answering some of the questions, precautions are being taken to avoid a breach in confidentiality. All responses will be kept anonymous and the Qualtrics survey will only be accessible to the researcher. Survey data will be downloaded to a password-protected file.

- 9) If support services are required to minimize risk of harm to participants, explain what will be provided (list of services available). [*A resource list for the DeKalb area is available on the ORC website – if using this, please provide a copy with your application.*]

The last page of the survey will provide a list of online mental health and eating disorder counseling resources (see Medina\_7). Since the participants will be coming from multiple schools, national resources available to all will be provided, Students are instructed to refer to their institution's counseling and psychological services if needed.

- 10) How do the potential benefits of the study *justify* the potential risks to the participants?

The study will provide research where there is a gap in the current literature. The intention of this study is to understand more about the effects of food insecurity on the college student population. If the health effects are better understood, they can be better addressed. The benefit of a potential increase in attention to food insecure college students overall is greater than the potential risks to the study participants.

#### Part IV: Consent Document Variations

- 11) Will audio, video, or film recording be used? Yes   
No

If **yes**, specify the recording format to be used.

Please keep in mind that specific consent must be sought in the informed consent document(s) by including a **separate signature/date line giving consent** for recording. This is in addition to the signature/date line giving consent to participate in the research project.

- 12) Will this project require the use of consent/assent documents written in a language other than English?

Yes  No

**Reminder:** If non-English documents will be used, please have the document translator **provide documentation** (email or written) that the translation is equivalent to the English version. [*This can be done after the protocol is approved in order to minimize the number of changes needed.*]

13) Are you requesting a **waiver of a signed** informed consent document?

Yes  No

Please indicate the justification for requesting this waiver:  
document

which

The only record linking the subject to the research would be the signed consent and the principal risk of the research would be breach of confidentiality.

The research involves minimal risk to the subjects and involves no procedures for written consent is normally required outside of the research context (e.g., online surveys).

14) Are you requesting a **waiver/alteration** of some other aspect of the informed consent document?

*[This section is relevant for studies involving **deception**.]*

Yes  No

14a) Please explain which aspects of informed consent will be missing or altered along with a justification for the change.

14b) Please explain how the project meets all of the following criteria:

1) The research presents no more than minimal risk of harm to the participants.

2) The waiver/alteration will not adversely affect the rights or welfare of the participants.

3) The research could not practicably be carried out without the waiver or alteration.

4) Whenever appropriate, the participants will be provided with additional pertinent information after participation.

15) Will any HIPAA protected health information be collected as part of the data?

Yes  No

If **yes**, describe the procedures for protecting the information.

*[Please provide a copy of your HIPAA disclosure form to be given to participants.]*

16) Will any protected school records be collected as part of the data?

Yes  No

If **yes**, describe the procedures for protecting the information.

### Part V: Confidentiality and Anonymity

17) Will identifying information be connected to the data (even through an identification key linking identities to a pseudonym or code that is kept separate from the data)? Yes  (**confidential** data) No  (**anonymous** data)

18) If you answered **yes to question #17**, describe precautions to insure the privacy of the subjects, and the confidentiality of the data, both in your possession and in reports and publications.

19) If you are collecting your data through an on-line survey tool, will the survey instrument collect email and/or IP addresses with the data?

No  **The survey will be set so that email/IP addresses are NOT collected**

Yes  **IP and/or email addresses WILL be collected with the data**

N/A  **I am not using an online survey tool.**

20) How will the records (data, recordings, and consent forms) be stored? **Also** indicate how long records will be kept and how and when they will be disposed of.

*[Note: Signed informed consent documents must be maintained for 3 years following completion of the study.]*

Collective survey responses will be downloaded from Qualtrics, after which they will be exported into SAS 9\_3 for analyses to take place. The individual surveys will be kept in a password protected file for up to two years after the study has been completed, then they will be deleted.

### Part VI: Projects Involving Deception *[complete only if your study includes deception]*

21) Describe the deception being used. Be sure to clarify whether this is deception by **omission** (an important aspect of the study is withheld from the participants) or **commission** (the participant is misled about some aspect of the study) or both.

*[Complete item 14 if aspects of consent are missing.]*

22) Why is deception a necessary and unavoidable component of the experimental design?

23) Debriefing of participants will be:

Immediate (directly following the research session)

Delayed

Full (all aspects of deception will be revealed)

Partial (some aspects of deception will remain unexplained)

a) If debriefing is delayed, why is the delay necessary, and when will it occur?

b) If debriefing is partial, why is the partial debriefing necessary? Would the participant be harmed in any way by full debriefing?

c) If debriefing is partial, will full debriefing occur later?

d) Does the presence of deception increase risk of harm to the participants?

e) Is the respondent free to withdraw his/her data after being fully debriefed?

24) Who will provide the debriefing?

**Reminder:** Please include a copy of your debriefing script/sheet with this application.

**Part VII: Credit and Compensation**

25) If participants will receive course credit for participation, please describe it below.

26) If participants will receive some other form of compensation for participation, please describe it below.

27) Describe any alternative tasks that will be available for participants to earn the credit or compensation.

**Part VIII: Conflict of interest**

28) Do any of the researchers conducting this study have any potential conflicts of interest?

*[Conflicts of interest may include financial or personal interest, or any condition in which the investigator's judgment regarding a primary interest may be biased by a secondary interest.]* Yes  No

29) If **yes** to the above question, please describe the nature of the conflict of interest.

**Part IX: Researcher Qualifications**

30) In addition to listing the investigators' names, indicate their qualifications to conduct procedures to be used in this study.

N/A

31) State the date of completion of the **CITI Human Subjects Protection** training program(s) for the individuals

listed in the question above. The required course is "**Social & Behavioral Research - Basic/Refresher, Basic**

**Course.** The required CITI training is accessible from the ORCI website at [http://www.niu.edu/orci/human\\_research/training/index.shtml](http://www.niu.edu/orci/human_research/training/index.shtml) If you have comparable training, please attach certification verifying this. [*Note: NIU policy requires that research investigators must complete appropriate training before conducting human subjects research.*]

Cristal Medina:08/24/2016; Dr. Umoren: April, 2015

**To be completed by investigator and confirmed by advisor (if student project) and departmental reviewer. Initials indicate all required parties ratify that application is complete:**

**Checklist of items required to accompany completed application form:**

1. \_\_\_\_\_ Complete grant proposal/contract (for externally funded projects)
2. \_\_\_\_\_ All surveys, questionnaires, interview questions, or other instruments to be used
3. \_\_\_\_\_ Subject recruitment/introductory materials
4. \_\_\_\_\_ Informed consent documents (must select at least one):
5. \_\_\_\_\_ Consent form for adults (if participants are age 18 or over)
6. \_\_\_\_\_ Assent form for minors (if participants are under age 18)
7. \_\_\_\_\_ Parental permission form (if participants are under age 18)

**Initial indicating all listed materials are attached and application is complete; INCOMPLETE APPLICATIONS WILL NOT BE PROCESSED. The investigator will be notified of deficiencies in the application via e-mail from the Office of Research Compliance and Integrity (ORCI); if no response is received by the ORCI thirty (30) days the application will be considered withdrawn.**

Investigator \_\_\_\_\_ Advisor (if student project) \_\_\_\_\_ Department  
Chair/Designee \_\_\_\_\_

**REQUIRED SIGNATURES: ALL PROJECTS****CERTIFICATION**

I certify that I have read and understand the policies and procedures for research projects that involve human subjects and that I intend to comply with Northern Illinois University Policy. Any changes in the approved protocol will be submitted to the IRB for written approval prior to those changes being put into practice unless it involves an immediate safety issue for the subject during a procedure. (In such instances, the researcher is required to promptly notify the IRB after the fact.) I also understand that all non-exempt projects require review at least annually.

Investigator(s) Signature(s)	Date
<div style="border: 1px solid black; width: 100px; height: 20px; margin: 0 auto;"></div>	
Signature of Faculty Advisor (Student Project Only)	Date
<div style="border: 1px solid black; width: 100px; height: 20px; margin: 0 auto;"></div>	

**Authorized Departmental Review:**

- Project qualifies for Administrative Review.  
Cite the appropriate exempt category:
- Project qualifies for Subcommittee Review.  
Cite the appropriate expedited category:
- Project is referred for review by the convened IRB.

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Signature of Authorized Departmental Reviewer	Printed name	Date
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Return this form, together with necessary documentation, to the Office of Research Compliance and Integrity, Lowden Hall, 301. For information or additional assistance with the approval process, please call the office at (815) 753-8588 or access the ORCI web page at [www.niu.edu/orci](http://www.niu.edu/orci).

APPENDIX C

IRB APPROVAL



NORTHERN ILLINOIS UNIVERSITY

## Office of Research Compliance, Integrity & Safety

*Division of Research & Innovation Partnerships*

### Exempt Determination

31-Oct-2017  
Crystal Medina  
School of Health Studies

RE: Protocol # **HS17-0306** "**Investigating the Interaction Between Food Insecurity, Depressive Symptoms, Eating Styles, and Body Mass Index Among University Students**"

Dear Crystal Medina,

Your application for institutional review of research involving human subjects was reviewed by Institutional Review Board #1 on **31-Oct-2017** and it was determined that it meets the criteria for exemption 2.

Although this research is exempt, you have responsibilities for the ethical conduct of the research and must comply with the following:

**Amendments:** You are responsible for reporting any amendments or changes to your research protocol that may affect the determination of exemption and/or the specific category. This may result in your research no longer being eligible for the exemption that has been granted.

**Record Keeping:** You are responsible for maintaining a copy of all research related records in a secure location, in the event future verification is necessary. At a minimum these documents include: the research protocol, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to participants, all correspondence to or from the IRB, and any other pertinent documents.

Please include the **protocol number (HS17-0306)** on any documents or correspondence sent to the IRB about this study.

If you have questions or need additional information, please contact the Office of Research Compliance and Integrity at 815-753-8588.

APPENDIX D

RECRUITMENT MATERIALS

## INITIAL EMAIL SENT TO IRB AT OUTSIDE INSTITUTIONS

To whom this may concern,

My name is Cristal Medina and I am a Nutrition and Dietetics graduate student at Northern Illinois University. I would like to recruit students at your university to participate in an online survey for my thesis research project. I am inquiring about your IRB approval process. Would your school honor the IRB application approved from Northern Illinois university, or would I need to apply through your institution?

Can you also please tell me how I would go about sending the survey link to your students?

Thank you for your assistance,  
Cristal Medina

## LIST OF OUTSIDE INSTITUTIONS THAT WERE CONTACTED

- **Chicago State University**
  - (773) 995-2405
  - [irb@csu.edu](mailto:irb@csu.edu)
  - The CSU IRB Administrator is Crystal Wiley-Brown, MS, MBA.
  - Current IRB Office hours are Tuesdays and Wednesdays from 11:00am - 4:00pm.
- **Eastern Illinois University**
  - Research Office: (217)581-2125
  - Cheryl Siddens, Compliance Coordinator - IRB/IACUC
    - (217) 581-8576
    - [casiddens@eiu.edu](mailto:casiddens@eiu.edu)
- **Governors State University**
  - Research office: [ospr@govst.edu](mailto:ospr@govst.edu)
- **Illinois State University**
  - Research Office:
    - [ResearchOffice@IllinoisState.edu](mailto:ResearchOffice@IllinoisState.edu)
    - (309) 438-2528
  - Research Ethics and Compliance:
    - [REC@IllinoisState.edu](mailto:REC@IllinoisState.edu)
    - (309) 438-2529
- **Northeastern Illinois University**
  - [IRB@neiu.edu](mailto:IRB@neiu.edu)
  - (773) 442-4675
- **Southern Illinois University Carbondale**
  - Human subjects committee:
    - [siuhsc@siu.edu](mailto:siuhsc@siu.edu)
    - 618-453-4533
- **Southern Illinois University Edwardsville**
  - [graduateschool@siue.edu](mailto:graduateschool@siue.edu)
  - (618) 650-3010
- **U of I at Chicago**
  - [ovcrweb@uic.edu](mailto:ovcrweb@uic.edu)
  - 312) 996-4995
- **U of I at Springfield**
  - [ora@uis.edu](mailto:ora@uis.edu)
  - 217-206-7409
- **U of I at Urbana/Champaign**
  - [irb@illinois.edu](mailto:irb@illinois.edu)
  - 217.333.2670
- **Western Illinois University**
  - (309) 298-1191
  - [IRB@wiu.edu](mailto:IRB@wiu.edu)

## EMAIL SENT TO DEPARTMENTS

Hello,

My name is Cristal Medina and I am a Nutrition and Dietetics graduate student at NIU. I have received approval to recruit your students for my thesis. The Institutional Review Board (IRB) at your institution instructed me to contact department chairs/directors and ask for assistance in distributing my survey link.

My thesis investigates the health outcomes of food insecurity among university students.

Food insecurity is significantly higher on college campuses than in the general population, yet there has not been a study that explores specific health outcomes of food insecurity among university students. This study is the first (to my team's knowledge) to investigate the effects food insecurity has on a student's health behaviors.

As you can tell, I am quite passionate about this topic. I want to survey as many students as possible. The survey is open to all current students over the age of 18 (any major, any grade level) at all Illinois public universities. It will take approximately 10 minutes to complete. Participants will be eligible to enter a raffle to win one of two Visa gift cards!

I would be so grateful if you would agree to pass my survey along to your students, and/or fellow faculty who can share with students.

Should you have questions/comments, please reply to me directly and do not "reply all".

Thank you in advance!  
Cristal Medina

## EMAIL SENT TO STUDENT ORGANIZATIONS

Hello,

My name is Cristal Medina and I am a Nutrition and Dietetics graduate student at NIU. I am currently recruiting students for my thesis survey. I have received approval from your institution to email my survey link to student organizations. I was wondering if you would be able to forward my survey link to your members.

The survey is open to all current students over the age of 18 (any major, any grade level), and will take approximately 10 minutes to complete. Participants will be eligible to enter a raffle to win one of two Visa gift cards!

Survey can be found at:

[https://niu.az1.qualtrics.com/jfe/form/SV\\_8ICqbnsv5SeRBs1](https://niu.az1.qualtrics.com/jfe/form/SV_8ICqbnsv5SeRBs1)

Should you have questions/comments, please reply to me directly and do not "reply all".

Thank you in advance!

Cristal Medina

## SCRIPT FOR RECRUITMENT EMAILS SENT TO STUDENTS

Hello,

Current students over the age of 18 are needed for a graduate thesis study. Participation involves taking a 10-minute online survey. Participants will be eligible to enter a raffle to win one of two Visa gift cards!

To participate, follow this link:

[https://niu.az1.qualtrics.com/jfe/form/SV\\_8ICqbnsv5SeRBs1](https://niu.az1.qualtrics.com/jfe/form/SV_8ICqbnsv5SeRBs1)

Thank you!

Cristal Medina  
Dietetic Intern, Graduate Assistant  
M.S. Dietetics Candidate  
Northern Illinois University  
B.S. Food and Nutrition  
San Diego State University, 2016  
[Cmedina2@niu.edu](mailto:Cmedina2@niu.edu)

APPENDIX E

APPLICATION FOR WAIVER OF CONSENT

## Northern Illinois University – Institutional Review Board

### **Application for Alteration of the Requirement to Obtain Written Informed Consent**

Standard procedure is that the informed consent of research participants should be documented through a written and signed consent form. If there is good reason why this approach should be different in your study, provide the relevant information and include an example of how consent will be obtained. When considering the justification for alteration it must be understood that the risk to subjects is not in answering the phone, carrying on a conversation, or completing a written questionnaire, but in the content of the questions and possible answers.

### **Waiver or alteration of required elements of informed consent**

Under certain conditions described in the Federal Regulations, the Institutional Review Board (IRB) may approve a consent *procedure* which does not include, or which alters, some prescribed elements of informed consent, or a Committee may, in very rare instances, waive the requirement that informed consent be obtained. In cases where the research or subject would be jeopardized by full consent procedures, full or partial consent may be waived by the IRB if it is found that all 4 of the following considerations are met:

1. the research poses no more than minimal risk to subjects,
2. the waiver or alteration will not adversely affect subjects' rights and/or welfare,
3. it is not practicable to carry out the research in question without the waiver or alteration, and
4. information will be provided to the participants after participation is completed, if appropriate.

If these conditions seem to apply, Principal Investigators should consult the federal regulations for additional information (see [Title 45 Code of Federal Regulations 46.116\(d\)](#)).

The requirement for a written, signed consent *form* may be waived by the Institutional Review Board if

- a. the signed consent form itself might compromise the confidentiality of the data describing the subject and the subject prefers that no signed consent form be used; or
- b. the research presents no more than minimal risk and involves no procedures for which written consent is normally required outside the research context.

If a principal investigator wishes a waiver of the requirement for a consent form this should be indicated on the following page and complete justification of the request for the waiver showing compliance with the regulations governing waivers should be provided.

Waiving the requirement for a *signed, written form* does not waive the requirement that subjects be informed of the nature of the research, and that their consent (or the permission of their legal representatives, when appropriate) be obtained.

### **Implied consent**

When data are gathered by anonymous questionnaires (i.e., there is no possibility of anyone, including the researchers or other participants, identifying subjects or associating any subpart of the data with an individual), the return of the completed questionnaire implies the consent of the subject. No written informed consent form for the subject's signature is required. However, such questionnaires should be accompanied by a cover letter that provides all of the applicable

elements of consent and includes a statement that completion and return of the questionnaire implies consent to participate.

### **Oral consent**

Oral rather than written consent may be obtained for research involving no more than minimal risk. Oral consent may also be appropriate under certain other circumstances and with IRB approval. For example, research in which identification by the consent document itself would place the subject at risk ordinarily makes oral consent preferable to written consent. (See Title 45, [Code of Federal Regulations, Part 46.117\(c\)](#).) Also, oral consent may be approved for interviews conducted by telephone under certain circumstances. (See [Title 45, Code of Federal Regulations, Part 46.117\(c\)](#).)

If you are requesting that consent be obtained orally, provide an explanation of why oral consent is appropriate, and include an example of the statement that will be read to subjects. In most cases in which consent is obtained orally, subjects should be provided with a written information statement, which includes all of the elements of informed consent except the signature of the subject. If you are requesting that informed consent be waived, attach an explanation of why this is appropriate.

## **Northern Illinois University – Institutional Review Board Request for Variation of Informed Consent**

---

Informed consent of the participant is one of the fundamental principles of ethical research with human subjects. Informed consent is also mandated by Federal regulations (45 CFR 46) and NIU policy for research involving human subjects. An investigator should seek a waiver of written or verbal informed consent only under compelling circumstances.

The Institutional Review Board determines which type of consent applies to your research but please indicate the type that you recommend. The guidance information on the previous page will assist you in this process. A complete waiver of informed consent is a very rare occurrence.

---

Waive written informed consent (i.e., waiver of the signature as in internet/online surveys) (complete Section A below).

Waive or alter required elements of informed consent process (complete Section B below indicating which of the required elements you are seeking to have waived. See p. 19 NIU Policies and Procedures or 45 CFR 46.116).

### **Section A: Request for waiver of *written* informed consent (i.e., waiver of the signature)**

I believe that this protocol is eligible for exemption of the requirement for written informed consent because the protocol meets **one** of the following criteria: (NOTE: Even when written informed consent is waived, the investigator is required to give subjects full consent information, and to obtain their voluntary consent orally.)

The only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research and the

subject's wishes will govern. (*Example: Conducting interviews with street gang members about illegal gang activities. The only record of the name or other identifying information of the subject would be the signed consent form and knowledge of an individual's participation or information provided could lead to potential legal, social, or physical harm.*)

Explain:

The research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. (*Example: Conducting telephone interviews with political staffers about how recent fundraising rules have changed the campaign process and no questions are being asked that could result in potential embarrassment, personally or professionally.*)

Explain: The Effects of University Food Insecurity Survey presents participants with no more than minimal risk of harm. Responses will be anonymous and data will only be shared with the research team.

Section B: Request for waiver or alteration of the required element(s) of informed consent process

I believe that this protocol is eligible for waiver or alteration of required elements of the informed consent process because the protocol meets **all four** of the following criteria: (Provide supporting information for each criterion)

1. The research presents no more than minimal risk of harm to subjects

2. The waiver or alteration will not adversely affect the rights and welfare of the subjects

3. The research could not practicably be carried out without the waiver or alteration

4. Whenever appropriate, the subjects will be provided with additional pertinent information after participation.

Elements of informed consent for which a waiver is requested and the rationale for each:

APPENDIX F

OPENING/CLOSING SURVEY SCREEN

## OPENING SCREEN

Dear Participant,

My name is Cristal Medina and I am a Nutrition and Dietetics graduate student at Northern Illinois University. I would like to thank you for taking the time to assist me with my graduate thesis.

The following survey will take approximately 10-15 minutes. Your participation in this research project is completely voluntary. There are no known risks to participation. Your responses will be anonymous and confidential. Data from this research will be reported only as a collective combined total. Please note that you must be a current Illinois public university student over the age of 18 to participate.

By completing the following survey, it is implied that you have given your approval to take part in this study. Your participation will qualify you to enter a raffle for the chance to win a \$25 Visa gift card. To be entered into the raffle, please email the researcher at [niuhealthoutcomesstudy@gmail.com](mailto:niuhealthoutcomesstudy@gmail.com). Send an email with the subject title “study gift card” and include your preferred contact information.

If you have any questions about this project, please do not hesitate to contact me ([cmedina2@niu.edu](mailto:cmedina2@niu.edu)) or my thesis director, Dr. Josephine Umoren ([jxu1@niu.edu](mailto:jxu1@niu.edu)). Information on the rights of research participants is available through the Northern Illinois Institutional Review Board, 815-753-8588, Email: [jgommel@niu.edu](mailto:jgommel@niu.edu).

Thank you for your assistance in this important work,

Cristal Medina  
Graduate Student  
Northern Illinois University

## CLOSING SCREEN

Dear Participant,

Thank you so much for taking this survey! You are very much appreciated. If the survey has caused you any discomfort, please see resources below:

- Psychology Today
  - Website: <https://www.psychologytoday.com/>
- Anxiety and Depression Association of America
  - Website: <https://adaa.org/>
- National Eating Disorder Association
  - Website: <http://www.nationaleatingdisorders.org/>
- Eating Disorder Hope
  - Website: <https://www.eatingdisorderhope.com/treatment-centers/illinois-il>

If additional resources are needed, please refer to your institution's counseling and psychological services.

Thank you for your assistance in this important work,

Cristal Medina  
Graduate Student  
Northern Illinois University

APPENDIX G

U.S. ADULT FOOD SECURITY SURVEY

[IF SINGLE ADULT IN HOUSEHOLD, USE "I," "MY," AND "YOU" IN PARENTHEICALS; OTHERWISE, USE "WE," "OUR," AND "YOUR HOUSEHOLD."]

HH2. Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last (name of current month).

The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

HH3. "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
- DK or Refused

HH4. "(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
- DK or Refused

AD1. 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 AD1a)
- DK (Skip AD1a)

AD1a. [IF YES ABOVE, ASK] 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
- DK

AD2. 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
- DK

AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- DK

AD4. In the last 12 months, did you lose weight because there wasn't enough money for food?

- Yes
- No
- DK

AD5. In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

- Yes
- No (Skip AD5a)
- DK (Skip AD5a)

AD5a. [IF YES ABOVE, ASK] 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
- DK

APPENDIX H

CENTER FOR EPIDEMIOLOGIC STUDIES SHORT DEPRESSION SCALE

### Center for Epidemiologic Studies Short Depression Scale (CES-D-R 10)

Below is a list of some of the ways you may have felt or behaved.

Please indicate how often you have felt this way during the past week by checking the appropriate box for each question.

	<b>Rarely or none of the time</b> (less than 1 day)	<b>Some or a little of the time</b> (1-2 days)	<b>Occasionally or a moderate amount of time</b> (3-4 days)	<b>All of the time</b> (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I could not "get going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX I

THREE FACTOR EATING QUESTIONNAIRE R18-V2

**This section contains statements and questions about eating habits and feelings of hunger.**  
*Read each statement carefully and answer by ticking the alternative that best applies to you.*

**1. I deliberately take small helpings to control my weight**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**2. I start to eat when I feel anxious**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**3. Sometimes when I start eating,  
I just can't seem to stop**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**4. When I feel sad, I often eat too much**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**5. I don't eat some foods because they make me fat**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**6. Being with someone who is eating often makes me want to also eat**

- <sub>1</sub> Definitely true  
<sub>2</sub> Mostly true  
<sub>3</sub> Mostly false  
<sub>4</sub> Definitely false

**7. When I feel tense or "wound up", I often feel I need to eat**

- <sub>1</sub> Definitely true  
<sub>2</sub> Mostly true  
<sub>3</sub> Mostly false  
<sub>4</sub> Definitely false

**8. I often get so hungry that my stomach feels like a bottomless pit**

- <sub>1</sub> Definitely true  
<sub>2</sub> Mostly true  
<sub>3</sub> Mostly false  
<sub>4</sub> Definitely false

**9. I'm always so hungry that it's hard for me to stop eating before I finish the food on my plate**

- <sub>1</sub> Definitely true  
<sub>2</sub> Mostly true  
<sub>3</sub> Mostly false  
<sub>4</sub> Definitely false

**10. When I feel lonely, I console myself by eating**

- <sub>1</sub> Definitely true  
<sub>2</sub> Mostly true  
<sub>3</sub> Mostly false  
<sub>4</sub> Definitely false

**11. I consciously hold back at meals to keep from gaining weight**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**12. When I smell appetizing food or see a delicious dish, I find it very difficult to keep from eating - even if I've just finished a meal**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**13. I'm always hungry enough to eat at any time**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**14. If I feel nervous, I try to calm down by eating**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**15. When I see something that looks very delicious, I often get so hungry that I have to eat right away**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**16. When I feel depressed, I want to eat**

- <sub>1</sub> Definitely true
- <sub>2</sub> Mostly true
- <sub>3</sub> Mostly false
- <sub>4</sub> Definitely false

**17. Do you go on eating binges even though you're not hungry?**

- <sub>1</sub> Never
- <sub>2</sub> Rarely
- <sub>3</sub> Sometimes
- <sub>4</sub> At least once a week

**18. How often do you feel hungry?**

- <sub>1</sub> Only at mealtimes
- <sub>2</sub> Sometimes between meals
- <sub>3</sub> Often between meals
- <sub>4</sub> Almost always

APPENDIX J

PERMISSION TO USE THE TFEQ-R18V2

Permission to use TFEQ-R18

Hello Mr.Karlsson,

My name is Cristal Medina and I am a nutrition graduate student at Northern Illinois University. I am emailing because I am interested in using the TFEQ-R18 as part of my graduate thesis. I am investigating the effects of food insecurity on health outcomes of university students and would appreciate your permission to use the scale as part of my survey.

Thank you,  
Cristal Medina

Cristal Medina  
Dietetic Intern, Graduate Assistant  
M.S. Dietetics Candidate  
Northern Illinois University  
B.S. Food and Nutrition  
San Diego State University, 2016  
[cmedina2@niu.edu](mailto:cmedina2@niu.edu)  
831.245.6357

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Hi Cristal,  
You have permission to use the TFEQ-R18 in your research. I suggest you use the latest version, TFEQ-R18V2, which has been validated in North American populations.

Best regards,  
Jan

Jan Karlsson, Psychologist, Research supervisor  
Associate professor  
University Health Care Research Center  
Örebro University Hospital  
Region Örebro County  
Box 1613  
SE-701 16 Örebro  
Sweden  
Email address: [jan.karlsson2@regionorebrolan.se](mailto:jan.karlsson2@regionorebrolan.se)

Obesity Unit  
Medical Department  
Örebro University Hospital  
Järnvägsgatan 16B  
SE-703 62 Örebro  
Sweden

Örebro University  
School of Health and Medical Sciences  
SE-701 82 Örebro  
Sweden  
Email address: [jan.karlsson@oru.se](mailto:jan.karlsson@oru.se)

APPENDIX K

STUDY SURVEY

## Health Outcomes of University Food Insecurity Survey

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### Start of Block: Intro

Dear Participant, My name is Cristal Medina and I am a Nutrition and Dietetics graduate student at Northern Illinois University. I would like to thank you for taking the time to assist me with my graduate thesis. The following survey will take approximately 10-15 minutes. Your participation in this research project is completely voluntary. There are no known risks to participation. Your responses will be anonymous and confidential. Data from this research will be reported only as a collective combined total. **Please note that you must be a current Illinois public university student over the age of 18 to participate.** By completing the following survey, it is implied that you have given your approval to take part in this study. Your participation will qualify you to enter a raffle for the chance to win a \$25 Visa gift card. **To be entered into the raffle, please email the researcher at niuhealthoutcomesstudy@gmail.com.** Send an email with the subject title “study gift card” and include your preferred contact information. If you have any questions about this project, please do not hesitate to contact me (cmedina2@niu.edu) or my thesis director, Dr. Josephine Umoren (jxu1@niu.edu). Information on the rights of research participants is available through the Northern Illinois Institutional Review Board, 815-753-8588, Email: jgommel@niu.edu. Thank you for your assistance in this important work, Cristal Medina Graduate Student Northern Illinois University

### End of Block: Intro

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### Start of Block: Demographics

Q1.1 Please choose the answer that best describes you.

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Q1.2 What is your sex?

- Male (1)
- Female (2)
-

Q1.3 What is your race/ethnicity?

- African American (1)
- Asian American (2)
- Hispanic (3)
- Native American (4)
- Non-Hispanic White (5)
- Other (6)

*Skip To: Q1.5 If What is your race/ethnicity? = African American*

*Skip To: Q1.5 If What is your race/ethnicity? = Asian American*

*Skip To: Q1.5 If What is your race/ethnicity? = Hispanic*

*Skip To: Q1.5 If What is your race/ethnicity? = Native American*

*Skip To: Q1.5 If What is your race/ethnicity? = Non-Hispanic White*

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Q1.4 If you selected "Other", please describe below.

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Q1.5 What year are you in school?

- 1st (1)
  - 2nd (2)
  - 3rd (3)
  - 4th or higher (4)
  - Graduate (5)
-

Q1.6 What is your age?

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Q1.7 What is your major?

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Q1.8 What is your height **in inches** (1 foot = 12 inches)? Enter only the number (Ex: five feet five inches = 65).

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Q1.9 What is your weight **in pounds**? Enter only the number (Ex: 165 pounds = 165)

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Q27 Where are you currently enrolled?

- Chicago State University (2)
- Eastern Illinois University (3)
- Governors State University (4)
- Illinois State University (5)
- Northeastern Illinois University (6)
- Northern Illinois University (1)
- Southern Illinois University Carbondale (7)
- Southern Illinois University Edwardsville (8)
- University of Illinois Chicago (9)
- University of Illinois Springfield (10)
- University of Illinois Urbana/Champaign (12)
- Western Illinois Univeristy (11)

End of Block: Demographics

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Start of Block: AFSS

Q2.1 Below are several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months.

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Q2.2 “(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.” Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

- Often true (1)
  - Sometimes true (1)
  - Never true (0)
  - Don't know (0)
- 



Q2.3 "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 (1)
  - Sometimes true (1)
  - Never true (0)
  - Don't know (0)
- 



Q2.4 “(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 (1)
  - Sometimes true (1)
  - Never true (0)
  - Don't know (0)
-



Q2.5 In the last 12 months, since last (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 (1)
- No (0)
- Don't know (0)

*Skip To: Q2.7 If In the last 12 months, since last (current month), did (you/you or other adults in your household... != Yes*

---



Q2.6 [IF YES] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month (1)
  - Some months but not every month (1)
  - Only 1 or 2 months (0)
  - Don't know (0)
- 



Q2.7 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes (1)
  - No (0)
  - Don't know (0)
-



Q2.11 In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes (1)
  - No (0)
  - Don't know (0)
- 



Q2.8 In the last 12 months, did you lose weight because there wasn't enough money for food?

- Yes (1)
  - No (0)
  - Don't know (0)
- 



Q2.9 In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

- Yes (1)
- No (0)
- Don't know (0)

*Skip To: End of Block If In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole d... != Yes*

---



Q2.10 [IF YES] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month (1)
- Some months but not every month (1)
- Only 1 or 2 months (0)
- Don't know (0)

End of Block: AFSS

---

Start of Block: CESD



Q3.1 Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way **during the past week** by checking the appropriate box for each question.

	Rarely or none of the time (less than 1 day) (0)	Some or a little of the time (1-2 days) (1)	Occasionally or a moderate amount of time (3-4 days) (2)	All of the time (5-7 days) (3)
I was bothered by things that usually don't bother me. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had trouble keeping my mind on what I was doing. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt depressed. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that everything I did was an effort. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt hopeful about the future. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt fearful. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My sleep was restless. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was happy. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt lonely. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could not "get going". (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: CESD

---

Start of Block: Block 3

Q4.1 The section below contains a number of statements and questions about eating habits and hunger feelings. Read each statement carefully and answer by marking the alternative that best applies to you.

	Definitely true (4)	Mostly true (3)	Mostly false (2)	Definitely false (1)
I deliberately take small helpings to control my weight. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I start to eat when I feel anxious. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes when I start eating, I just can't seem to stop. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I feel sad, I often eat too much. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't eat some foods because they make me fat. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being with someone who is eating often makes me want to also eat. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I feel tense or "wound up", I often feel I need to eat. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often get so hungry that my stomach feels like a bottomless pit. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am always so hungry that it's hard for me to stop eating before I finish the food on my plate. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

When I feel  
lonely, I console  
myself by eating.  
(10)

I consciously hold  
back at meals to  
keep from gaining  
weight. (11)

When I smell  
appetizing food or  
see a delicious  
dish, I find it very  
difficult to keep  
from eating - even  
if I've just  
finished a meal.  
(12)

I'm always  
hungry enough to  
eat at any time.  
(13)

If I feel nervous, I  
try to calm down  
by eating. (14)

When I see  
something that  
looks very  
delicious, I often  
get so hungry that  
I have to eat right  
away. (15)

When I feel  
depressed, I want  
to eat. (16)



Q4.2 Do you go on eating binges even though you're not hungry?

- Never (1)
- Rarely (2)
- Sometimes (3)
- At least once a week (4)



Q4.3 How often do you feel hungry?

- Only at mealtimes (1)
- Sometimes between meals (2)
- Often between meals (3)
- Almost always (4)

**End of Block: Block 3**

---

**Start of Block: Block 4**

Q5.1 Thank you for taking this survey!

**End of Block: Block 4**

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**Start of Block: Last Page**

Q26 Dear Participant, Thank you so much for taking this survey! You are very much appreciated. If you feel you need counseling and feel uncomfortable receiving counseling or would like more information on finding therapists/treatment facilities outside of your university, the following resources are a good place to start.

Psychology Today	Website:
<a href="https://www.psychologytoday.com/">https://www.psychologytoday.com/</a>	Anxiety and Depression Association of America
Website: <a href="https://adaa.org/">https://adaa.org/</a>	National Eating Disorder
Association	Website: <a href="http://www.nationaleatingdisorders.org/">http://www.nationaleatingdisorders.org/</a>
Eating Disorder Hope	Website:

<https://www.eatingdisorderhope.com/treatment-centers/illinois-il>  
assistance in this important work, Cristal Medina Graduate Student Northern Illinois University

Thank you for your

**End of Block: Last Page**

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